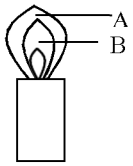
MAKUENI COUNTY CLUSTER PREPARATORY EXAMINATION 2016

233/1
CHEMISTRY
PAPER 1
(THEORY)
JULY/AUGUST 2016
TIME: 2 HOURS.

1. The following represents a Bunsen Burner flame.



(a) Name the parts of the flame labeled A and B. (2 marks)
(b) Identify the hottest part of the flame. Give a reason. (1 mark)

2. Give the I.U.P.A.C name of the oxide of nitrogen that:-
(i) Relights a glowing splint (1 mark)
(ii) Forms brown complex compound with acidified Iron (II) sulphate solution (1 mark)
(iii) Reacts with water to form nitric (V) acid (1 mark)

3. The table below shows P^H values of substances A, B, C and D. Study it and answer the questions that follow.

Substance	A	B	C	D
P^H	3	10	1	7

(a) Which substance is likely to be pure water (½ mark)
(b) Which solution contains the lowest concentration of hydrogen ions? (½ mark)
(c) In the equation below, identify the reagent that acts as a base. Give a reason for your answer. (2 marks)

$$H_2O_{2(aq)} + H_2O_{(l)} \rightleftharpoons H_3O^+_{(aq)} + H^-_{(aq)}$$

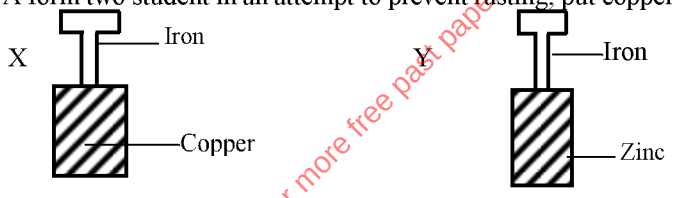
4. Identify the particles which enable the following substances to conduct electricity.
(i) Aluminium metal (1 mark)
(ii) Molten lead (II) bromide

5. Element R – 238 decays in series forming different nuclides as shown below.

$$R \xrightarrow{X} P \xrightarrow{Y} T$$

(a) Identify the type of decay X and Y (2 marks)
(b) Give one use of radioactive isotopes in medicine (1 mark)

6. A form two student in an attempt to prevent rusting, put copper and zinc in contact with iron as shown below.



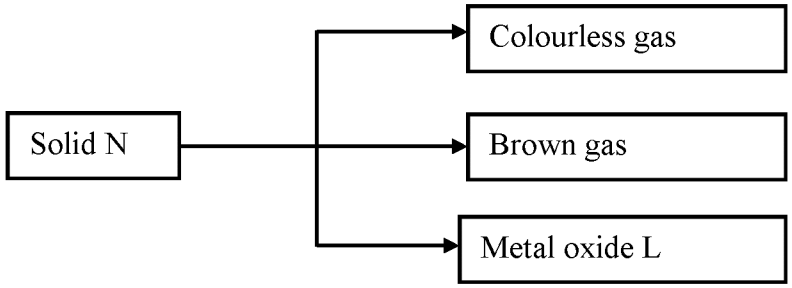
(i) State what would happen in set up **X** and **Y** after one week. (2 marks)
(ii) Explain your answer in diagram **Y**. (1mark)

7. Study the table below and answer the questions that follow.

Ion	X^{3+}	Y^{2-}
Electron arrangement	2,8	2,8,8

(a) Write the electronic arrangement of elements. X and Y
(b) Write the formula of the compound that would be formed between X and Y.

8. Study the flowchart below and answer the questions that follow.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720592479

(a) Write the formula of the anion present in solid N. (1 mark)

(b) Solid N in the flow chart above burns in air with a red flame. Identify the

(i) Cation present in solid N (1mark)

(ii) Metal oxide L

9. Study the information in the table below and answer the question the table below the table.

Bond	Bond energy ($kJmol^{-1}$)
C-H	414
Cl-Cl	244
C-Cl	326
H-Cl	431

Calculate the enthalpy change for the reactor. (3marks)

$CH_{4\,(g)} + Cl_{2\,(g)} \;-\; CH_3Cl_{(g)} + HCl_{(g)}$

10. The table below shows the tests carried out on separate samples of water drawn from a well and the results obtained.

Test	**Results**
(i) Addition of excess aqueous ammonia	White precipitate
(ii) Addition of a few drops of dilute sulphuric (VI) acid	No observable change
(iii) Addition of dilute hydrochloric acid followed by a few drops of Barium Chloride	White precipitate

(a) Identify the cation and the anion present in the water. (1 mark)

(b) Write an ionic equation for the reaction which takes place in test (iii) (1 mark)

11. Study the structure below.

$C_3H_7COOC_2H_5$

(a) Name the compound (1 mark)

(b) Name the compounds used to prepare the above compound. (1mark)

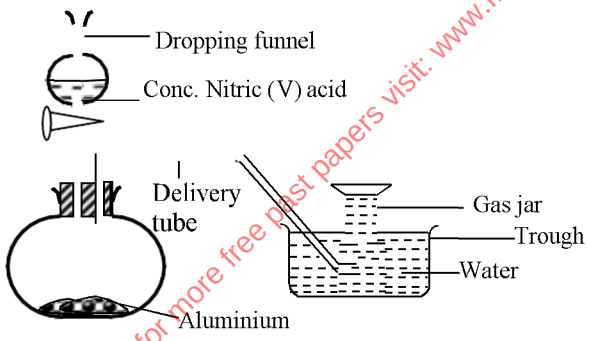
(c) What is the identifying physical property of the above compound?

12. Study the information in the table and answer the questions below.

Substance	Solubility g/100g water
V	126
W	2

Describe how a solid sample of substance V could be obtained from solid mixture of V and W. (3 marks)

13. In order to prepare hydrogen gas in the laboratory a student set-up the apparatus shown in the diagram below. Study it and answer the questions that follow.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(a) Suggest why the student did not collect hydrogen gas.

(b) In a separate experiment the student reacted iron and hydrochloric acid to prepare hydrogen gas.

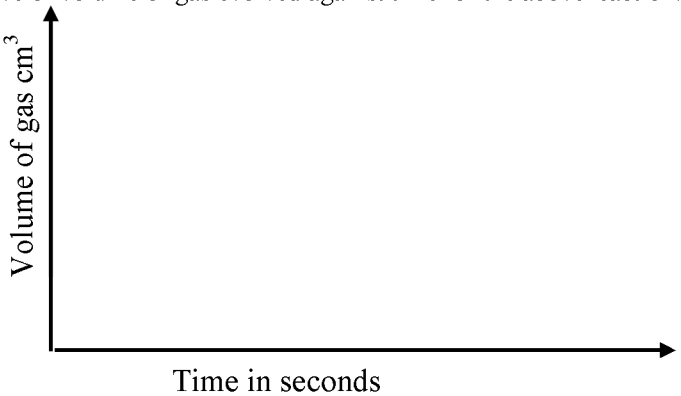
(i) Write an ionic equation for the reaction. (1mark)

(ii) The hydrogen gas produced was found to have a foul smell. Suggest an explanation for this. (1mark)

14. In an experiment, excess magnesium ribbons were immersed in ethanoic acid and the gas evolved was measured at 10 seconds intervals.

(a) Write an equation for the reaction between Ethanoic acid and magnesium ribbon. (1mark)

(b) Sketch a curve of volume of gas evolved against time for the above reaction.



(c) On the same axis above sketch the curve that would be obtained of hydrochloric acid was used. Label the curve 1. (1 mark)

15. When excess chlorine is bubbled through cold dilute sodium hydroxide solution, the resulting solution is a bleaching agent.
(a) Write a chemical equation for the reaction that produces the bleaching agent. (1 mark)
(b) Name the bleaching compound and show how it bleaches using an equation. (2 marks)

16. An element X has a relative atomic mass of 88. When a current of 0.5 amphere was passed through a fused chloride of X for 32 minutes 10 seconds, 0.44g of X was deposited.
(i) Determine the charge of element X (1 Faraday = 96500C) (2 marks)
(ii) Write the formula of hydroxide of X. (1 mark)

17. (a) Name two ores from which zinc is extracted. (1 mark)
(b) During extraction of zinc metal, the ore is subjected to froth floatation. Give a reason why this process is necessary. (1 mark)
(c) Name one alloy of zinc and state its use.

18. (a) State Graham"s law of diffusion.
(b) Two gases A and B have relative densities of 1.98 and 2.90 respectively. They diffuse under the same conditions.
(i) Compare their rates of diffusion (1 mark)
(ii) Determine the relative molecular mass of A, given that the relative molecular mass of B is 64. (2 marks)

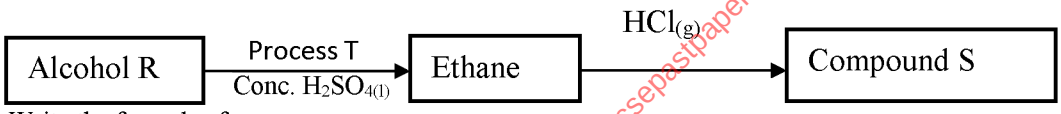
19. The table below shows elements in the halogen group of the periodic table. Study the table and answer the questions that follow.

Element	Atomic number	Melting point ^{0}C
Fluorine	9	-218
Chlorine	17	-101
Bromine	35	-7
Iodine	53	114

(i) Name the element likely to be a solid at room temperature. Explain (1 mark)
(ii) Explain why the melting point increases from fluorine to iodine. (2 marks)

20. Starting with aluminium sulphate, describe how a solid sample of aluminium hydroxide could be prepared. (2 Marks)

21. Study the following flow chart and answer the questions that follow.



(i) Write the formula of

I. Alcohol R (1 mark)
II. Compound S (1 mark)
(ii) Name process T (1 mark)

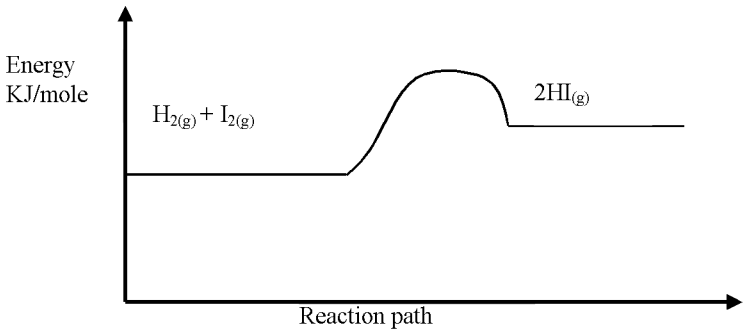
22. The table below gives atomic numbers of elements represented by the letters A, B, C and D.

Element	A	B	C	D
Atomic number	15	16	17	20

Use the information to answer the questions that follow.
(a) Name the type of bonding that exists in the compound formed when A and D react. (1 mark)
(b) Select the letter which represents the best oxidizing agent. Give a reason for your answer. (1 mark)
(c) Give a reason why phosphorous is stored under water. (1 mark)

23. Production of hydrogen iodide can be demonstrated by the equation.

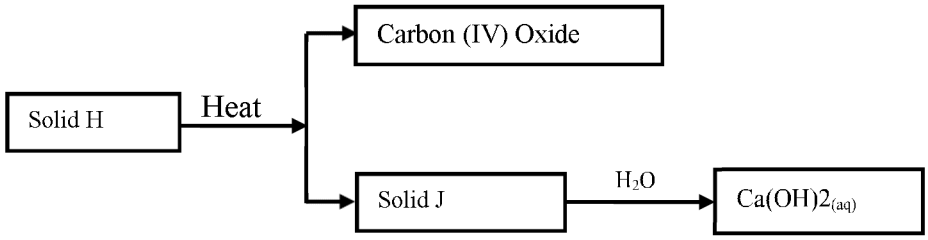
$H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$



Explain how the following would affect the yield of hydrogen iodide.
(i) Increase in temperature (2 marks)
(ii) Decrease in pressure (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

24. Use the scheme below to answer the questions that follow.



(a) Identify the solids; S and J (2 marks)
(b) State one commercial use of solid J. (1 mark)
Given the equations, determine the heat of formation of ethanol. (3 marks)

$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$ $\Delta H = -393Kj/mol$
$H2(g) + O(g) \longrightarrow H\ O$ $\Delta H = -286Kj/mol$
$-\ 2 \qquad 2\ (l)$
$C_2H_5OH\ (l) + 3O_{2(g)} \longrightarrow 2CO_{2(g)} + 3H_2O_{(l)}$ $\Delta H = -1368kJ/mol$

Explain how you would separate a mixture of ammonium chloride and sodium chloride into its pure components. (2 marks)

25. Natural Gallium consists of two isotopes ^{68}Ga and ^{71}Ga in the ratio 3:2 respectively. Given that the atomic number of gallium is 31.
(a) Calculate the number of neutrons in the isotope ^{68}Ga. (½ mark)
Calculate the relative atomic mass of gallium (1½ mark)
A piece of burning magnesium was lowered into a gas jar of Carbon (IV) oxide.
(b) State the observations made. (2 marks)
Write an equation for the reaction in (a) above. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

MAKUENI COUNTY CLUSTER PREPARATORY EXAMINATION 2016

233/2
CHEMISTRY
PAPER 2
(THEORY)
JULY/AUGUST 2016
TIME: 2 HOURS.

1. (a) The grid below is part of the periodic table. Letters are not actual symbols. Study it and answer the questions that follow.

G								
				I		K	L	
H			J				M	N

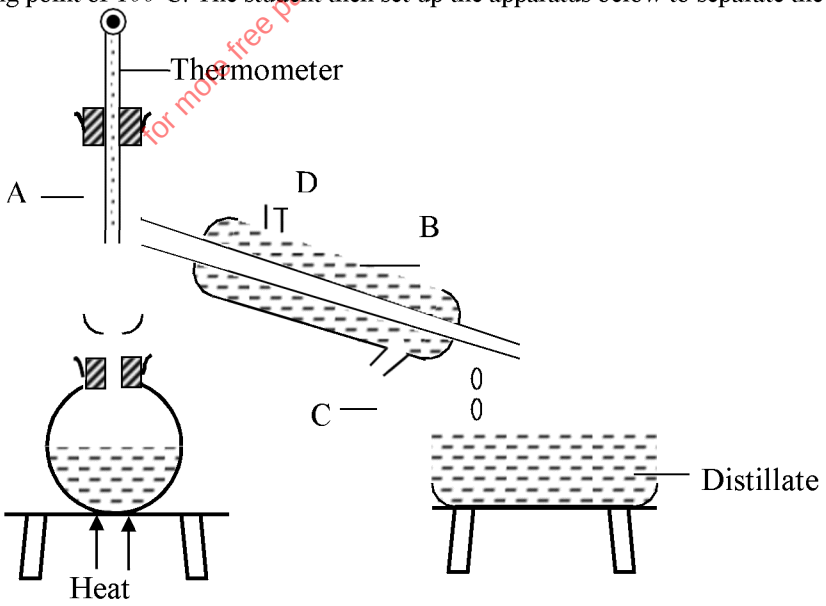
(i) Give the letters representing atoms that can form a singly-charged anion. (1 mark)
(ii) Identify the most electromagnetic element in the grid. Explain. (1 mark)
(iii) Identify the strongest reducing agent. (1 mark)
(iv) Write the formula of the most stable compound formed when **J** and **K** react (1 mark)
(v) Give the name of the type of bond in the compound formed in (iv) above. (½ mark)
(vi) Give the chemical family name of **L** and **M**. (½ mark)
(viii) Write the ionic equation for the reaction in which gas **L** is bubbled through a solution with ions of M. (1mark)
(ix) Element P is alkaline earth metal and belongs to period 2. Indicate its position on the grid. (1 mark)

(b) Use the information in the table below to answer the questions that follow.

Element	**Atomic number**	**Melting point ^{0}C**
Q	11	98
R	12	650
S	14	1410
T	17	-102
U	18	-189
V	19	64

Give a reason why the melting point of:
(i) Q is higher than of V. (1 mark)
(ii) R is higher than of Q. (1 mark)
(iii) S is the highest. (1 mark)

2. (a) A form one student crushed banana leaves with water and left the mixture for some days. He found that the mixture had fermented. He suspected that the mixture had been contaminated with ethanol which has a boiling point of 78^{0}C while water has a boiling point of 100^{0}C. The student then set up the apparatus below to separate the mixture.

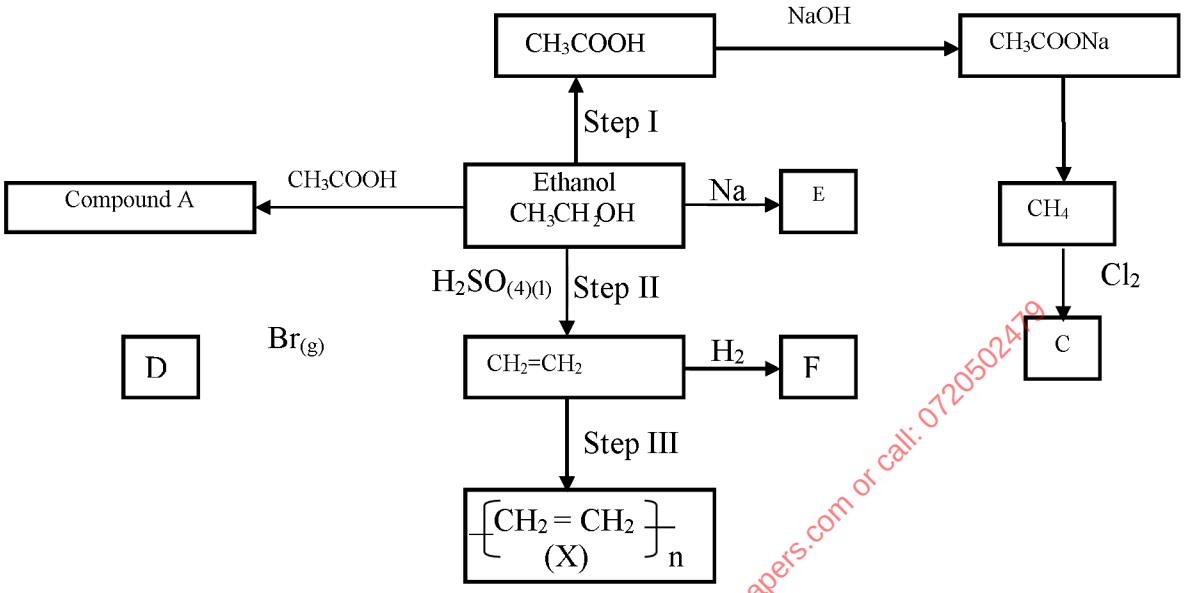


(i) Name the piece of apparatus labelled B. (1 mark)
(ii) What is the purpose of the thermometer in the set up? (1 mark)
(iii) At what point of apparatus B should the tap water be connected. Explain. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(iv) Name the part labelled A and state its function (2 marks)
(v) Which liquid was collected first? Explain (1 mark)
(vi) What is the name given to the above method of separating mixtures? (1 mark)
(vii) What property of the components of the mixture makes it possible for the components to be separated by the method? (1mark)
(viii) State two applications of the above method of separation. (2 marks)
(b) A form two student was supplied with a liquid suspected to be water.
(i) Describe one chemical test that would be carried out to show that the liquid was water.
(ii) How would it have been proved that the liquid is pure water? (1 mark)

3. The flow chart shows some chemical reactions.



(a) Draw the structural formula and names of the following compounds. (3 marks)

Compound	Name	Structure formula
A		
C		
D		

(b) Write the name of the processes that leads to the formation of substances A and F. (1marks)

Substance	Process
A	
F	

(c) Name the type of reaction and conditions required for the formation Step 1 (1 mark)
(d) If the relative molecular mass of compound X is 84000 units, determine the value of n (C = 12, H = 1) (1 mark)
(e) Write an equation that leads to the formation of substance E. (1 mark)
(f) State and explain the observation made when substances F and $CH_2=CH_2$ are burnt in excess air. (2 marks)
(g) Given the thermochemical equations for combustion of ethanol, hydrogen and graphite (carbon)

$C_2H_5OH_{(aq)} + 3O_{2(g)} \longrightarrow 2CO_{2(g)} + 3H_2O_{4(l)}$ $\Delta H = -1368kJ/mol$

$H_{2(g)} + -O_{2(g)} \longrightarrow H_2O_{(l)}$ $\Delta H = -286\ kJ/mol$

$C_{(s)} + O_{2(g)} \longrightarrow CO2(g)$ $\Delta H = -393\ kJ/mol$

(i) Draw an energy cycle diagram to represent the above information linking the formation of ethanol with its enthalpy of combustion and its constituents. (2 marks)
(ii) Calculate the enthalpy of formation of ethanol (2 marks)

4. In an experiment to study the rate of reaction between duralumin (an alloy of aluminium, magnesium and copper) and hydrochloric acid, 0.5g of the alloy were reacted with excess 4M hydrochloric acid. The data in the table below was recorded. Use it to answer the questions that follow.

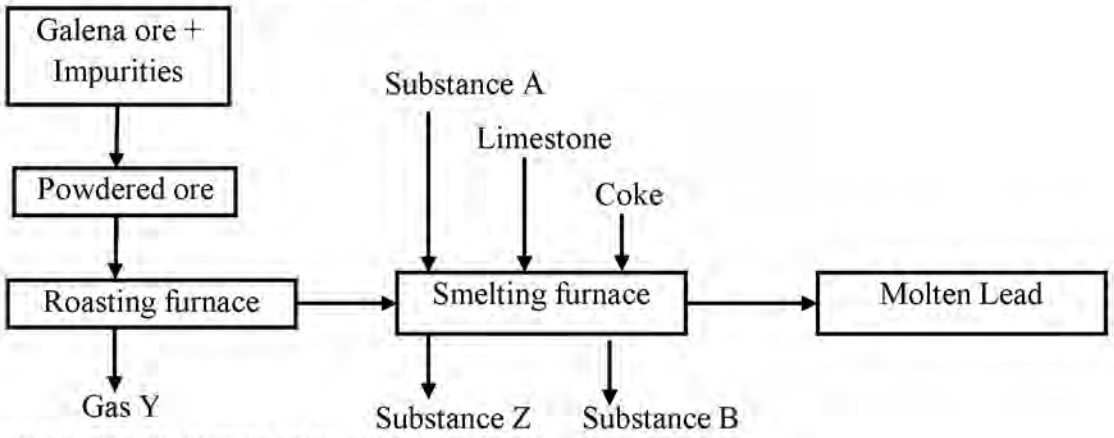
Time (minutes)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0
Vol of gas evolved, cm^3	0.0	220.0	410.0	540.0	620.0	640.0	640.0	640.0

(a) (i) Plot a graph of total volume of gas produced against time. (3 marks)
(ii) From the graph, determine the volume of the gas produced at the end of the 2½ minutes. (1 mark)
(b) Determine the rate of reaction between the 3rd and 4th minute. (1 mark)
(c) Give a reason why some solid remained at the end of the experiment. (2 mark)
(d) Given that 2.5cm3 of the total volume of gas was from the reaction between magnesium and

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

hydrochloric acid. Calculate the percentage by mass of aluminium present in 0.5g of the alloy.
(Al = 27, Molar gas volume = 24000cm^3) (3 marks)

5. The chart shows the extraction of lead from its ore.



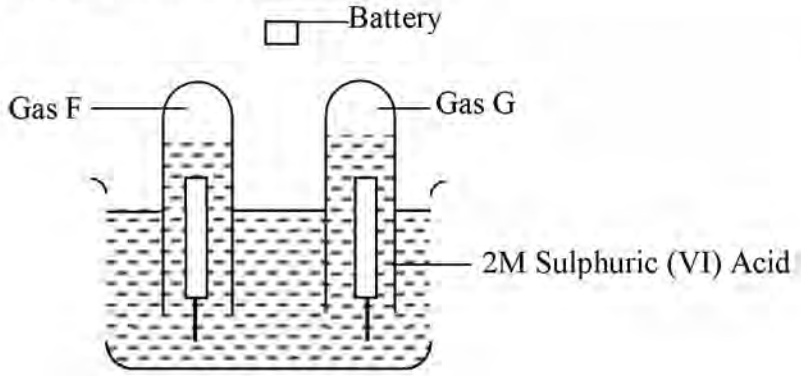
(a) Write the chemical formula of the chief ore. (1 mark)
(b) Name the possible impurities present in the ore. (2 marks)
(c) Why is it necessary for the ore to be converted into powder form? (1 mark)
(d) Identify process X and state it"s significance (1 mark)
(e) Write equations for the reaction taking place in the
I. Roasting furnace (1 mark)
II. Formation of substance B (1 mark)
It is not advisable to use lead pipes in transporting drinking water. (1 mark)
(f) Identify one of the impurities present in molten lead obtained by the process. (1 mark)
(g) State one use of lead (1 mark)

6. (a) Study the standard electrode potentials below and answer the questions that follow. The letters do not represent the actual symbols of the elements.

	Eθ volts
$E^{2+(aq)} + 2e^-$	$E_{(s)}$ -0.44
$A+(aq) + e^-$	$A_{(s)}$ -2.92
$½D_{2(s)} + e^-$	$D^-_{(aq)}$ +1.36
$B^{+(aq)} + e^-$	½ $C_{2(g)}$ 0.00
$_{(aq)} + e$	$B_{(s)}$ +0.52

(i) Identify the strongest reducing agent. Give a reason. (1 mark)
(ii) Select two half cells when combined produce the highest potential difference and determine the electromotive force. (2 marks)
(iii) Which element is likely to be hydrogen? Give a reason (2 marks)
(iv) Explain whether the reaction represented below can take place. (2 marks)
$2A^+_{(aq)} + E_{(s)} \rightarrow 2A_{(s)} + E^{2+}_{(aq)}$

(b) The apparatus below shows the set up that was used in the electrolysis of 2M Sulphuric (VI) acid. Study it and answer the questions that follow.



(i) Write an equation for the reaction that produce gas F. (1 mark)
(ii) Describe how gas G can be identified (1 mark)
(iii) Why is the concentration of the acid expected to increase during electrolysis. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

7. The following results were obtained in an experiment to determine the heat of neutralization of $50cm^3$ 2M hydrochloric acid and $50cm^3$ 2M sodium hydroxide.

Mass of plastic cup	=	45.1g
Initial temperature of acid	=	27.0^0C
Initial temperature of alkali	=	23.0^0C
Mass of plastic cup + HCl + NaOH	=	145.1g
Temperature of the mixture of acid and alkali	=	38.5^0C

(a) Define heat of neutralization (1 mark)

(b) Write an ionic equation for the neutralization of hydrochloric acid and sodium hydroxide. (1 mark)

(i) The amount of heat produced during the experiment (2 marks)
(Specific heat capacity of solution = $4.2jg^{-1}k^{-1}$, density of solution = $1gcm^3$)

(ii) Molar heat of neutralization for the reaction. (2½ marks)

(c) Explain why the molar heat of neutralization of NaOH and Ethanoic acid of equal volume and molarity would be less than the value obtained in C (ii) above. (1 mark)

(d) Write down the thermochemical equation for reaction between NaOH and dilute hydrochloric acid above (1 mark)

(e) Draw an energy level diagram for the neutralization reaction in (e) above. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

MAKUENI COUNTY CLUSTER PREPARATORY EXAMINATION 2016
CHEMISTRY 233/3
CONFIDENTIAL

Requirement;

In addition to the apparatus and fittings found in a chemistry laboratory each candidate will require the following:

- Solid P (1.8g of oxalic acid) in a stoppered container.
- Solution Q – 100cm^3
- Pipette and pipette filler.
- 100 cm^3 measuring cylinder.
- 250cm^3 beakers (two)
- 250cm^3 volumetric flasks.
- 1 label
- Burette
- One boiling tube
- Five dry clean test tubes in a rack
- Clamp stand
- Solution L – 50cm^3
- Stop watch
- 10cm^3 measuring cylinder (2)
- Tripod stand and wire gauze
- Thermometer (-10°C – 110°C)
- Test tube holder
- Funnel
- 250 cm^3 conical flasks (2)
- Test tube holders
- Distilled water
- White tile
- Solid D – 2g Lead II Nitrate in a stoppered container.
- Solid M – 2g Sodium Chloride in a stoppered container.
- Solid T – 2g Malleic Acid in a stoppered container.
- Solid Sodium Hydrogen Carbonate in a stoppered container.

Access to:-

- 2M Sodium Hydroxide supplied with a dropper.
- 2M Ammonium Hydroxide with a dropper.
- 0.05M Potassium Iodide solution with a dropper.
- Acidified Potassium Dichromate (VI) with a dropper.
- Acidified potassium manganate (VII) supplied with a dropper.
- Phenolphthalein indicator supplied with a dropper.
- Bunsen burner.

Notes:

1. Solution Q is prepared by dissolving 4g of sodium hydroxide in distilled water and diluting to one litre.
2. Solution L is prepared by dissolving 3.16g of potassium manganate (VII) in 200cm^3 of 2MH_2S0_4 and adding water to make up to one litre.
3. Acidified potassium dichromate (VI) is prepared by dissolving 29.4g in 400cm^3 of 2MH_2S0_4 and adding water to make up to one litre.

for more free kcse past papers visit: www.freekcsepastpapers.com or call: 0720502479

MAKUENI COUNTY CLUSTER PREPARATORY EXAMINATION 2016

233/3

CHEMISTRY

Paper 3

Practical

July/ August 2016.

Time: 2 ¼ Hours

1. You are provided with:
- 1.8g of dibasic acid H_2X labeled solid P.
- Solution Q containing 1.0g of sodium hydroxide in 250 cm^3 of the solution.
- Phenolphthalein indicator.

You are required to:
- Prepare 250.0cm^3 of solution using solid P.
- Determine the value of X in the formula H_2X

Procedure:

Place all solid P in 250cm^3 beaker. Add about 100cm^3 of distilled water to the beaker. Swirl until all the solid dissolves. Transfer the solution into a 250cm^3 volumetric flask. Top up with distilled water to the mark and label it solution P. Using a measuring cylinder transfer about 100cm^3 of the solution P into a 250cm^3 beaker, preserve the rest in the volumetric flask for procedure II.

Pipette 25cm^3 of solution Q into a clean conical flask. Add 2- 3 drops of phenolphthalein indicator to the 25 cm^3 solution in the conical flask. Fill the burette with solution P from the beaker. Titrate until the pink colour disappears. Repeat two more times and record the results in the table below.

Table1.

	1	2	3
Final burette reading			
Initial burette reading			
Volume of solution P used (cm^3)			

(4 marks)

a) Calculate the average volume of solution P used. (1 mark)
b) Calculate the molarity of solution Q (Na = 23.0, O = 16.0, H = 1.0). (2 mark)
c) How many moles of sodium hydroxide were pipette. (1 mark)
d) How many moles of the acid, solution P reacted with 25.0 cm^3 of solution Q. (2 marks)
e) How many moles of H_2X were present in 1.8g of solid P. (2 marks)
f) Determine the value of X in the formula H_2X (H = 1) (2 marks)

B) **Procedure II**

You are provided with:-
- Acidified potassium manganate VII, solution L.
- Solution P dibasic acid H_2X
- A stop watch / clock
- Thermometer.

You are required to determine how the rate of reaction of potassium manganate VII, solution L with the dibasic acid, solution P varies with change in temperature.

Using a 10cm^3 measuring cylinder, place 2.0cm^3 of solution L portions into FIVE test tubes on a test tube rack.

Clean the measuring cylinder and use it to place 10.0cm^3 of solution P into a boiling tube. Prepare a water bath by placing about 200cm^3 of water in beaker and start heating it. Insert a thermometer in solution P in the boiling tube and place the boiling tube in the warm water bath till the solution P attains temperature of 40^{0}C. Remove the boiling tube from the water bath and add the first portion of solution and the same time start a stop watch. Record the time taken for the purple colour of the mixture to decolourise in table II below. Repeat the experiment by using 10.0cm^3 of solution P at temperature on 50^{0}C, 60^{0}C, 70^{0}C and 80^{0}C. Record the times in table II.

Complete the table by computing –

a) Table II

Temperature of solution.				
Time for colour to decolourise (sec)				
–				

(5 marks)

b) Plot a graph of (y axis) against temperature (3 marks)

for more free past papers visit www.freekcsepastpapers.com or call 0720502412

c) From the graph determine the time taken to decolourise the mixture if the mixture is at a temperature of 65^0C. (2 Marks)

d) How does the rate of reaction of potassium manganate (VII) with oxalic acid vary with temperature? (1 mark)

2. You are provided with solid D, carry out the tests below. Write your observations and inferences in the spaces provided.

a) Using a boiling tube, dissolve all solid D in about $20cm^3$ distilled water, label this as solution D. Divide the solution obtained into three portions of about $2cm^3$. Retain the remaining solution for use in question 2 a. (iv).

i) To the first portion add aqueous sodium hydroxide dropwise until in excess.

Observation	Inferences
(1mark)	(1mark)

ii) To the second portion add aqueous ammonium hydroxide dropwise until in excess.

Observation	Inferences
(1mark)	(1mark)

iii) To the third portion add a few drops of potassium iodide.

Observation	Inferences
(½ mark)	(½ mark)

iv) Using a clean boiling tube dissolve all solid M in about $10cm^3$ distilled water. To about $2cm^3$ of solution, add few drops of solution D. Heat the contents of the test tube strongly.

Observation	Inferences
(1mark)	(1mark)

b) You are provided with solid T. carry out the tests below. Write your observations and inferences in the spaces provided.

i) Place about one third of solid T on a metallic spatula and burn it using a Bunsen burner.

Observation	Inferences
(1mark)	(1mark)

ii) Place the remaining of solid T in a test tube. Add about $6cm^3$ of distilled water and shake the mixture well. (retain the mixture for use in test C)

Observation	Inferences
(1mark)	(1mark)

c) i) To about $2cm^3$ of the mixture, add a small amount of solid sodium hydrogen carbonate.

Observation	Inferences
(1mark)	(1mark)

ii) To about 1 cm^3 of the mixture add $1.0cm^3$ of acidified potassium chromate (VI) and warm.

Observation	Inferences
(1mark)	(1mark)

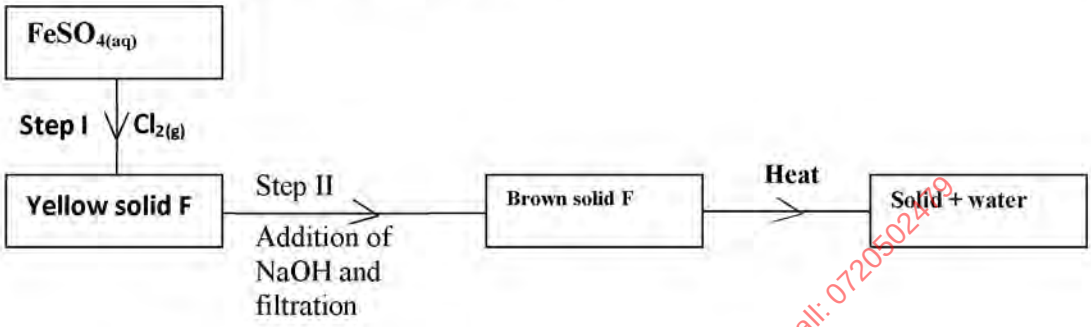
iii) To about $2cm^3$ of the mixture add two drops of acidified potassium manganate (VII).

Observation	Inferences
(1mark)	(1mark)

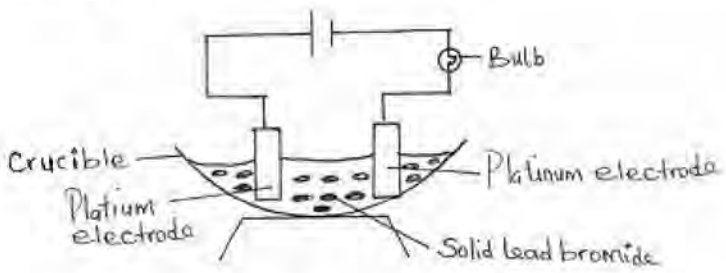
for more free pastpapers visit www.freekcsepastpapers.com or call 0720502479

CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2016
233/1
CHEMISTRY
PAPER 1
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

1. Two elements A and B have electronic configurations 2.8.3 and 2.6 respectively.
   (a) To which group and period does element B belong? (1mk)
   (b) If the two react, what is the formula of the compound they form? (1mk)
2. 600cm³ of oxygen gas diffused through a porous hole in 50 seconds. How long will it take 80cm³ of sulphur (IV) oxide to diffuse through the same hole under the same conditions (S = 32, O = 16). (3mks)
3. Study the scheme below and answer the questions that follow.



   (i) Write down the formula of the yellow solid **F**. (1mk)
   (ii) What property of chlorine is shown in Step **I**? (1mk)
   (iii) Write an equation for the reaction which occurs in Step **II**. (1mk)
4. Describe how a solid sample of lead (II) sulphate would be prepared using the following reagents: dilute nitric (V) acid, lead (II) carbonate solid sodium sulphate and distilled water. (3mks)
5. Using dots (•) and crosses (x), show bonding in:
   (a) The compound formed when nitrogen reacts with fluorine (atomic numbers F = 9, N = 7). (2mks)
   (b) Sodium oxide (atomic numbers Na = 11, O = 8). (2mks)
6. M grammes of a radioactive isotope decayed to 5 grammes in 100 days. The half-life of the isotope is 25 days.
   (a) What is meant by half-life? (1mk)
   (b) Calculate the initial mass M of the radioactive isotope. (2mks)
7. Determine the oxidation number of:
   (i) Manganese in $KMnO_4$. (1mk)
   (ii) Chromium in $Cr_2O_7^{2-}$ (1mk)
8. An element X is atomic number 3, relative atomic mass 6.94 and consists of two isotopes of mass numbers 6 and 7 respectively.
   (a) What is the mass number of the more abundant isotope of X? (1mk)
   (b) Calculate the relative abundance of each of the isotopes. (2mks)
9. In an experiment to investigate the conductivity of a substance a student used the set up shown below. The student noticed that the bulb did not light.



   (i) What had been omitted in the set up? (1mk)
   (ii) Explain why the bulb lights up when the omission is corrected. (1mk)
10. Name the process that takes place when:
   (i) Fats or oils are hydrolyzed using an alkali. (1mk)
   (ii) Sulphur is added to rubber in the manufacture of rubber tyres. (1mk)
11. (a) Name **two** cations responsible for hard water. (2mks)
   (b) Name **two** chemicals that are used to remove hardness of water. (2mks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502409

12. Ethanol (CH_3CH_2OH) and dimethylether (CH_3OCH_3) are two compounds with the same molecular mass. Explain why ethanol has a much higher boiling point (78.2°C) than dimethylether (-24°C). (2mks)

13. Classify the following as either compounds or mixtures. (3mks)

	Substance	Type of substance
(a)	Air	
(b)	Salt solution	
(c)	Sugar	

14. (a) What is meant by molar heat of formation? (1mk)

(b) Calculate the molar enthalpy of formation of ethyne (C_2H_2) given the following.

$C_2H_2 + {}^5/_2O_{2(g)} \rightarrow 2CO_{2(g)} + H_2O_{(l)}$ $\Delta H = -1300kJ/mol$

$C_{(S)} + O_{2(g)} \rightarrow CO_{2(g)}$ $\Delta H = -394kJ/mol$

$H_{2(g)} + {}^1/_2O_{2(g)} \rightarrow H_2O_{(l)}$ $\Delta H = -286kJ/mol$ (2mks)

15. Study the information in the table below and answer the questions that follow:

Salt	Solubility (g/100g water)	
	at 50°C	at 80°C
G	43	58
Y	82	138

A mixture containing 40g salt G and 120g salt Y in 100g of water at 80°C was cooled to 50°C.

(a) Which salt crystallized out? Give reason. (2mks)

(b) Calculate the mass of the salt that crystallized out. (1mk)

16. When the oxide of metal Z is heated in the presence of metal X, it is reduced. The oxide of metal X is reduced by metal Y. Arrange the three metals in order of increasing reactivity. (2mks)

17. The molecular formula mass of gas A is 28 and its empirical formula is CH_2.

(a) Determine the molecular formula of gas A (C = 12.0, H = 1.0). (2mks)

(b) Write the equation of the reaction between A and 1 mole of chlorine gas. (1mk)

18. State **one** use of each of the following apparatus in the laboratory. (3mks)

(i) Dessicator.

(ii) Crucible.

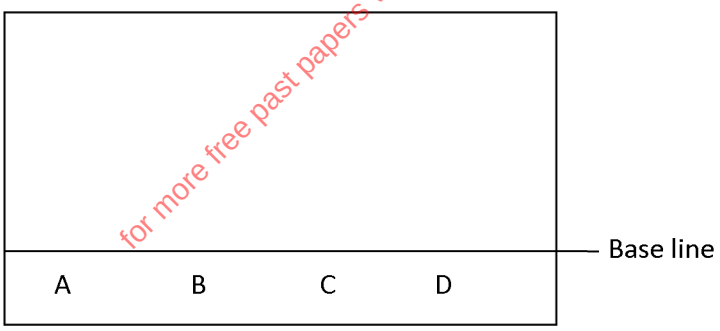
(iii) Deflagrating spoon.

19. (a) State the **two** conditions necessary for rusting to occur. (1mk)

(b) State **two** reasons why tin coating is used in food cans. (2mks)

20. Describe how a pure sample of copper turnings can be obtained from mixture of copper turnings and zinc carbonate. (3mks)

21. The diagram below shows sports of pure substances **A**, **B** and **C** on a chromatography paper. Spot **D** is that of a mixture.



After development **A**, **B**, **C** were found to have moved 4cm, 1.5cm and 3cm respectively. **D** had separated into two spots which had moved 3cm and 4cm.

(i) On the diagram show the positions of all the spots after development. (3mks)

(ii) Identify the substances present in the mixture **D**. (1mk)

22. Chlorine is used to prepare vinyl chloride (chloroethene) $CH_2 = CHCl$.

(i) State why vinyl chloride ($CH_2 = CHCl$) undergoes addition polymerization. (1mk)

(ii) Name the polymer formed. (1mk)

(iii) Complete the following equation to show how the two monomers combine during polymerization. (1mk)

$CH_2 = CHCl + CH_2 = CHCl \rightarrow$

23. Explain how a sample of $CH_3CH_2CH_2OH$ could be distinguished from a sample of CH_3CH_2COOH. (2mks)

24. A form on student was supplied with a colourless liquid suspected to be water.

(i) Describe one chemical test that could be carried out to show that the liquid was water. (1mk)

(ii) How could it have been shown that one liquid was pure water? (1mk)

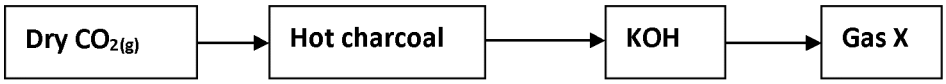
25. During extraction of copper, the ore is first concentrated and roasted to produce copper (I) sulphide.

(a) Name the ore from which copper is commonly extracted. (1mk)

for more free past papers visit www.freekcsepastpapers.com or call 0720502479

(b) Write an equation for the reaction in which copper (I) sulphide is produced by roasting the ore in air. (1mk)
(c) Give **one** effect that the process in (b) above could have on the environment. (1mk)
(d) Give **one** use of copper metals. (1mk)

26. Study the scheme below and answer the questions that follow.



(i) Write an equation involving hot charcoal and dry carbon (IV) oxide gas. (1mk)
(ii) Name gas X and state one chemical property of the gas. (2mks)

27. How does the use of manganese (IV) oxide in the laboratory preparation of chlorine gas differ from its use on the laboratory preparation of oxygen gas. (1mk)

28. Briefly explain the following observations.
(i) Alkaline earth metals are generally less reactive than the alkali metals. (1mk)
(i) The order of reactively increases down group I elements but decreases down group (VII) elements. (2mks)

29. Study the table below showing tests carried out on a sample of water and results obtained then answer the questions that follow.

	TESTS	**RESULTS**
(i)	Addition of NaOH solution dropwise until in excess.	White precipitate formed which dissolve in excess.
(ii)	Addition of aqueous $NH_{3(aq)}$ dropwise until in excess.	Colouress solution obtained.
(iii)	Addition of dilute HCl acid followed by $BaCl_2$ solution.	White ppt is formed.

(a) Identify the anion present in the water. (1mk)
(b) Write an ionic equation for the reaction in (iii) above. (1mk)
(c) Write the formula of the complex ion formed in (ii) above. (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2016
233/2
CHEMISTRY
PAPER 2
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

1. (a) The grid given below represents part of the periodic table. Study it and answer the questions that follow. Letters do not represent the actual symbols of the elements.

								A
				B				
	C		D			E		
	F							

(i) What name is given to the group of elements to which **C** and **F** belong?
(ii) Which letter represents the element that is the least reactive? (½mk)
(iii) What type of bond is formed when **B** and **E** react? Explain. (2mks)
(iv) Write the formula of the compound formed when D and oxygen gas reacts.
(v) On the grid, indicate with a tick (✓) the position of element G which is in the third period of the periodic table and forms G^{3-} ion. (1mk)

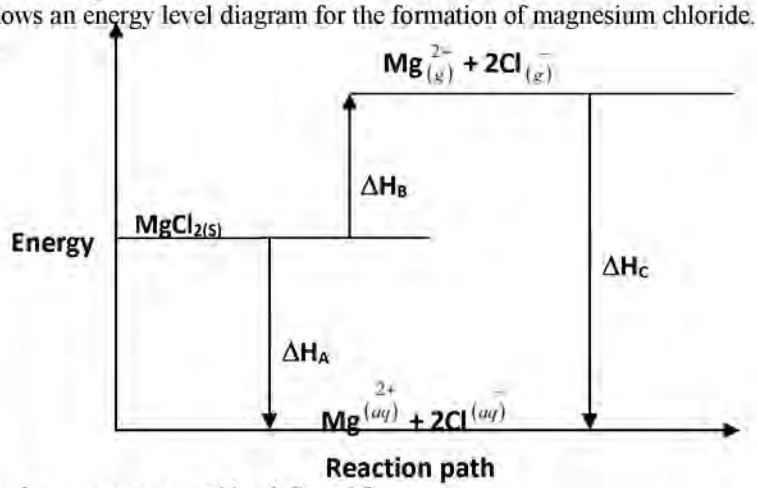
(b) Study the information in the table below and answer the questions that follow. Letters do not represent the actual symbols of the substances.

Substance	Melting point (°C)	Boiling point (°C)	Solubility in water	Density at room temp. (g/cm³)
H	-117	78.5	Very soluble	0.8
J	-78	-33	Very soluble	7.7×10^{-4}
K	-23	77	Insoluble	1.6
L	-219	-183	Slightly soluble	1.33×10^{-3}

(i) Which substance would dissolve in water and could be separated from the solution by fractional distillation. Give a reason. (2mks)
(ii) Which substance is a liquid at room temperature and when mixed with water, two layers would be formed. (1mk)
(iii) Which letter represents a substance that is a gas at room temperature and which can be collected.
I Over water? Explain. (2mks)
II By downward displacement of air?
(Density of air = 1.29×10^{-3} g/cm³ at room temperature). (1mk)

2. A student fro Nyeri High School wanted to determine the enthalpy change of combustion when a hydrocarbon with the formula C_6H_{14} was burnt. The following are the results of the experiment done.
Mass of water = 100g
Initial temperature = 18.0°C
Final temperature = 58.0°C
Mass of the hydrocarbon burned = 0.43g
Specific heat capacity of water = $4.2 Jg^{-1}k^{-1}$

(a) Write a balanced equation for the combustion of the hydrocarbon. (1mk)
(b) (i) Calculate the amount of heat given out in kJ when 0.43g of the hydrocarbon burn in air. (2mks)
(ii) Calculate the number of moles of the hydrocarbon that were burnt. (1mk)
(iii) Calculate the molar enthalpy of combustion of the hydrocarbon. (2mks)
(c) The theoretical value of the heat released when 1 mole of the hydrocarbon is burnt is 4194.7kJ/mol^{-1}. Give **two** reasons why the value obtained from this experiment is less than the theoretical value. (1mk)
(d) The diagram below shows an energy level diagram for the formation of magnesium chloride. Study it and answer the questions that follow.



(i) State the enthalpy changes represented by A,B and C

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

(ii) What is the relationship between ΔH_A, ΔH_B, and ΔH_C. (½mk)

(e) (i) Define heat value of a fuel. (1mk)

(ii) Give **two** reasons why wood and charcoal are chosen for domestic heating. (2mks)

3. (a) Use the standard electrode potentials for A, B, C, D and F given below to answer the questions that follow.

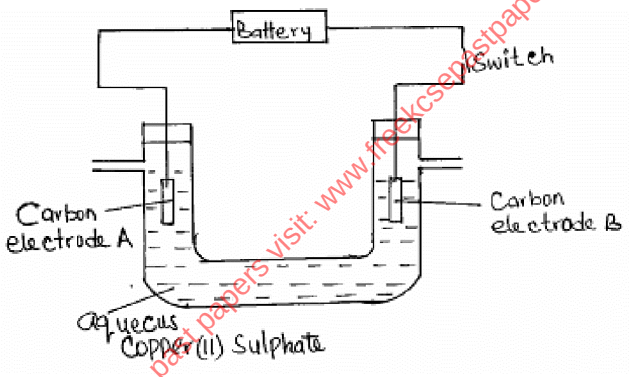
	E^{θ} (Volts)
$A^{2+}_{(aq)} + 2e \rightleftharpoons A_{(S)}$	-2.90
$B^{2+}_{(aq)} + 2e^{-} \rightleftharpoons B_{(S)}$	-2.38
$C^{+}_{(aq)} + e^{-} \rightleftharpoons ½C_{2(g)}$	0.00
$D^{2+}_{(aq)} + 2e^{-} \rightleftharpoons D_{(S)}$	+0.34
$½F_{2(g)} + e^{-} \rightleftharpoons F_{(aq)}$	+2.87

(i) Which element is likely to be hydrogen? Give a reason for your answer? (2mks)

(ii) What is E^{θ} the strongest reducing agent? (1mk)

(iii) Calculate the e.m.f of the cell that would be formed when half cells of B and D are combined. (1mk)

(b) Aqueous copper (II) sulphate was electrolysed using the set up shown below.



(i) When the switch was closed, a gas was produced at electrode **B**.
Which electrode is the anode? (1mark)

(ii) Write the half equation for the reaction at electrode **B**. (1 mark)

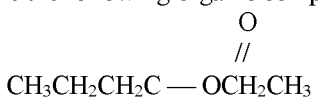
(iii) What happens to the PH of the electrolyte above during electrolysis? Explain. (2 marks)

(iv) If carbon electrodes were replaced with copper electrodes in the cell above, write the equations for the reaction that would occur at the anode. (1mark)

(c) During electrolysis of aqueous copper (II) sulphate using copper electrodes, a current of 0.2 amperes was passed through the cell for 5 hours. Determine the change in mass of the cathode that occurred as a result of the electrolysis process (Cu = 64, IF = 96,500C). (3mks)

4. (a) (i) What are unsaturated hydrocarbon compounds? (1mk)

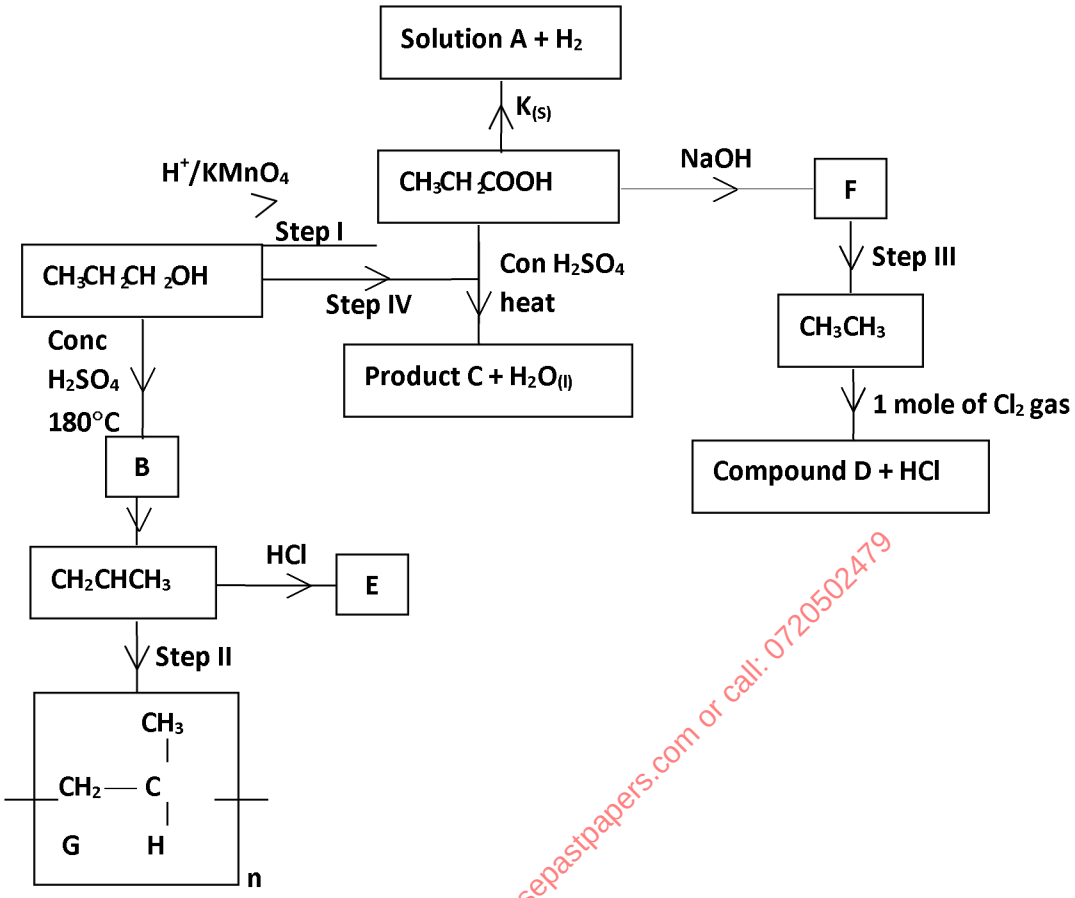
(ii) Name the following organic compound. (1mk)



iii) Draw the structure of the following compound 2-methylbutan-l-ol. (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(b) The scheme below shows a series of reactions starting with propanol.

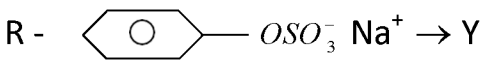


for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

(i) Name the type of reaction in Steps **I** and **II**. (1mk)
(ii) Write equation for the reaction that takes place in Step **III**. (1mk)
(iii) Name substances **A**, **D**, **E** and **F**. (2mks)
(iv) Draw the structural formula of compound **C**. (1mk)
(v) Give **one** disadvantage of continued use of substance **G**. (1mk)
(vi) State the type of reaction involved in formation of compounds **B** and **D**. (1mk)
(vii) If the relative molecular mass of G is 35, 700, determine the value of n. (2mks)

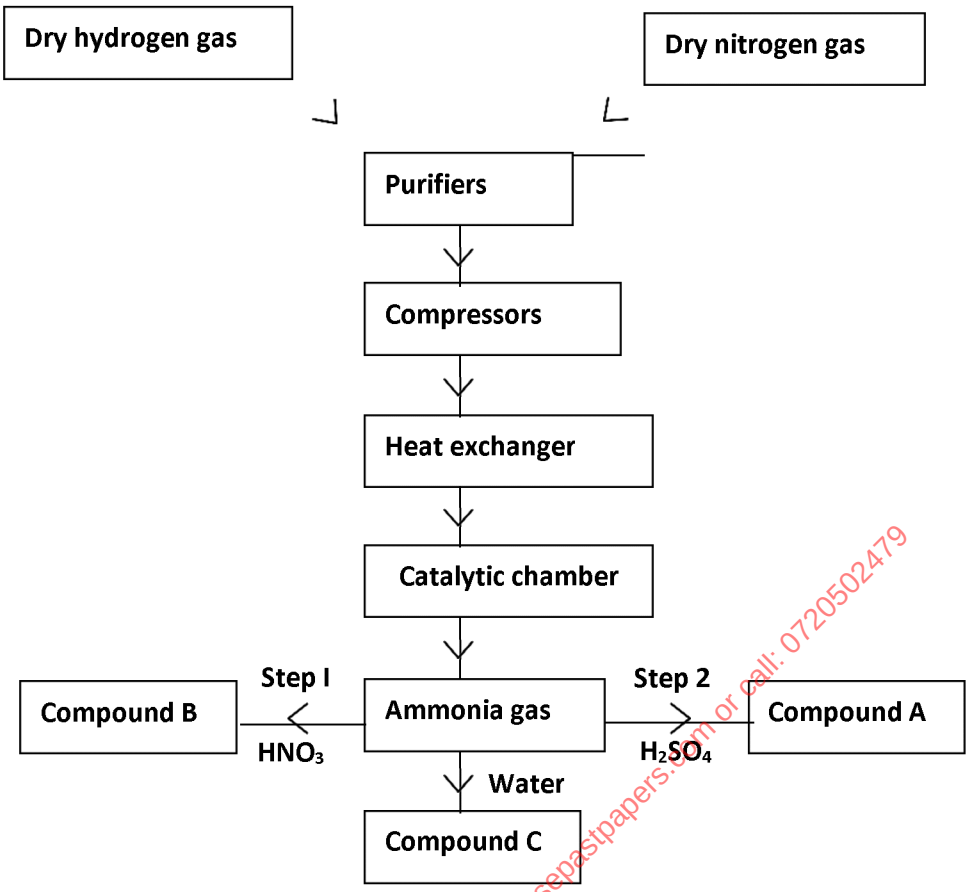
(c) Below are structures of two cleansing agents.

$R - COO^-Na^+ \rightarrow X$



(i) Identify the cleaning agent suitable for use in water containing $MgSO_4$.
(ii) State **one** disadvantage of using this cleaning agent. (1mk)

5. The flow chart below shows the large scale manufacture of ammonia gas and some ammonium compounds. Study it and answer the questions that follow.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(a) What are the sources of the following raw materials?
   (i) Hydrogen gas. (½mk)
   (ii) Nitrogen gas. (½mk)

(b) What optimum conditions are needed during the manufacture of ammonia in the:
   (i) Compressor. (1mk)
   (ii) Catalytic chamber. (1mk)

(c) Why should the gas be passed through the compressor. (1mk)

(d) Write an equation for the reaction that occurs in Step **I**. (1mk)

(e) Give **one** use of Compound **B**. (1mk)

(f) Calculate the percentage of nitrogen in Compound **A**. (2mks)

(g) I What observation would be made if Compound **C** was added to a sample suspected to contain copper (II) ions dropwise then in excess? (2mks)

   II Name the compound formed when Compound **C** is added in excess. (1mk)

(h) Study the equation below and use it to answer questions that follow.

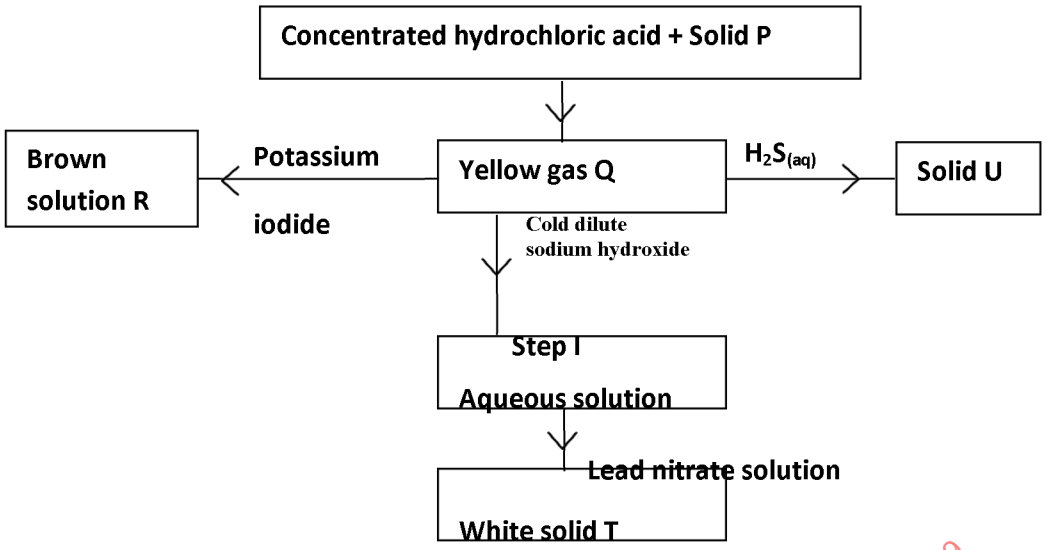
$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)} \qquad \Delta H = -Ve$$

What would be the effect on the yield of ammonia gas when:

I pressure is increased. (1mk)

II Temperature is decreased. (1mk)

6. Study the flow chart below and answer the questions that follow.



(a) Give the names of the following. (3mks)
(i) Solid **P**
(ii) Solid **U**
(iii) Solid **T**

(b) Write the equation for the reaction taking place in Step **I**. (1mk)

(c) Write the equation for the reaction between concentrated hydrochloric acid and solid P. (1mk)

(d) Explain what would happen if hot concentrated sodium hydroxide was used in place of cold dilute sodium hydroxide. (1mk)

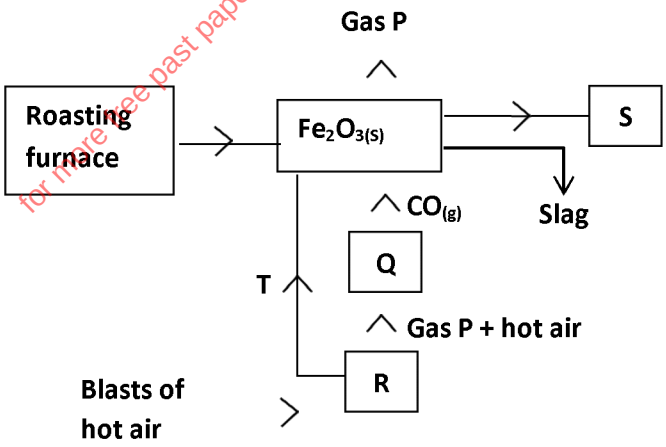
(e) State **two** differences between bleaching by chlorine and bleaching by sulphur (IV) oxide. (2mks)

Chlorine	**Sulphur (IV) oxide**

(f) When chlorine water is left under sunlight, the yellow fades to form a colourless solution. Use a chemical equation to explain this observation. (1mk)

(g) Explain **two** pollution effects caused by chlorine and its compounds to the environment. (2mks)

7. The flow chart below is for the extraction of iron metal. Study it then answer the questions that follow.



(a) Identify: (3mks)
(i) Gas **P**
(ii) Solid **Q**
(iii) Solid **R**

(b) Name the main ore used during extraction of iron. (1mk)

(c) Identify **one** substance present in the slag. (1mk)

(d) Write the equation for the reaction that takes place leading to formation of solid **S**. (1mk)

(e) Give the role of solid **R** in the process. (1mk)

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

233/3
CHEMISTRY
PAPER 3 (PRACTICAL)
JULY/AUGUST 2016

CONFIDENTIAL
CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK – 2016
In addition to apparatus and fittings found in a chemistry laboratory, each candidate will require the following:

1. About 150cm³ of solution A, labelled as solution A.
2. About 150cm³ of solution B, labelled as solution B.
3. About 80cm³ of solution C, labelled as solution C.
4. One pipette (25.0ml).
5. One pipette filler.
6. One burette.
7. One 250ml volumetric flask.
8. One label.
9. 500cm³ of distilled water.
10. Three conical flasks.
11. 10mls measuring cylinder (one)
12. One 100mls measuring cylinder.
13. One boiling tube.
14. Six test tubes.
15. One 100mls plastic beaker.
16. One thermometer.
17. 1g of solid X, supplied in a stoppered container.
18. Solid F (0.2g), supplied in a stoppered container.
19. One spatula.
20. 1g of $NaHCO_3$ in an envelope/or a stoppered container.

Access to:

1. Phenolphthalein indicator supplied with a dropper.
2. Bunsen burner.
3. Acidified potassium dichromate (VI) supplied with a dropper.
4. Universal indicator supplied with a dropper.
5. PH chart (4 – 11)
6. 2M NaOH.
7. 2M NH_4OH
8. 0.1M NaCl.
9. Acidified barium chloride.

NOTES:

- Solid X is $Al_2(SO_4)_3.16H_2O$, molecular weight = 630.38.
- Solid F is ascorbic acid $C_6H_8H_6$, molecular weight 176.13
- Solution A is prepared by taking 180cm³ of conc. HCl (gravity 1.18), and adding it to 600cm³ of distilled water in a 1 litre volumetric flask and adding it to the mark.
  Label this as solution A.
- Solution B is prepared by dissolving 80g of NaOH pellets in 800cm³ of distilled water, transfer to 1 litre volumetric flask and add distilled water up to the mark, label this as solution B.
- Solution C is prepared by dissolving 25g of ethane dioic acid ($H_2C_2O_4.2H_2O$).
  (Also called oxalic acid) in 600cm³ of distilled water, transfer to 1 litre volumetric flask and add distilled water to the mark, label this as solution C.
- Acidified potassium dichromate (VI) is made by dissolving 3.16g of solid $K_2Cr_2O_7$ in 600cm³ of 2M H_2SO_4 and diluting it with distilled water to make 1 litre.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2016
233/3
CHEMISTRY
PAPER 3
(PRACTICAL)
JULY/AUGUST, 2016
TIME: 2¼ HOURS

1. You are provided with:
- Acid A labelled solution A.
- 2.0M sodium hydroxide solution labelled solution B.
- Solution C containing 25.0g per litre of an alkanoic acid.

You are required to:
(a) Prepare a dilute solution of sodium hydroxide, solution B.
(b) Determine the:
(i) molar mass of the alkanoic acid.
(ii) reaction ratio between sodium hydroxide and acid A.

PROCEDURE I
Using a pipette and a pipette filler, place 25.0cm³ of solution B into a 250.0ml volumetric flask. Add about 200cm³ of distilled water. Shake well. Add more distilled water to make up to the mark. Label this solution D. Retain the remaining solution B for use in Procedure **II**.

Fill a burette with solution C. Using a clean pipette and a pipette filler, place 25.0cm³ of solution D into a 250ml conical flask. Add two drops of phenolphthalein indicator and titrate with solution C. Record your results in table 1. Repeat the titration two more times and complete the table.

Table I	I	II	III
Final burette reading (cm³)			
Initial burette reading (cm³)			
Volume of solution C (cm³) added			

Determine the:
(i) Average volume of solution C used. (1mk)
(ii) Concentration of solution D in moles per litre. (1mk)
(iii) Concentration of the alkanoic acid in solution C in moles per litre
(1 mole of the acid reacts with 3 moles of the base). (1mk)
(iv) Molar mass of the alkanoic acid. (1mk)

PROCEDURE II
Fill a clean burette with solution A. Place 5cm³ of solution A into a 100ml beaker.
Measure the initial temperature of solution A in the beaker and record it in table **II**.
Using a 10ml or a 100ml measuring cylinder, measure 25cm³ of solution B.
Add it to solution A in the beaker and immediately stir the mixture with the thermometer. Record the maximum temperature reached in table **II**. Repeat the experiment with other sets of volumes of solutions A and B and complete the table.

Table II

Volume of solution A (cm³).	5	9	13	17	21	25
Volume of solution B (cm³).	25	21	17	13	9	5
Maximum temperature (°C).						
Initial temperature (°C).						
Change in temperature, ΔT.						

(6mks)

(a) On the grid provided, plot a graph of ΔT (Vertical axis) against the volume of solution A. (3mks)
(b) From the graph, determine the volume of solution A which gave the maximum change in temperature. (1mk)
(c) Determine the volume of solution B that reacted with the volume of solution A in (b) above. (1mk)
(d) Calculate the:
(i) ratio between the volumes of solution A and B that neutralized one another. (1mk)
(ii) concentration in moles per litre of the acid in solution A.
(Assume that the volume ratio is the same as the mole ratio). (1mk)

2. (a) You are provided with a solid X. Carry out the tests that follow.
Write your observations and inferences.
(i) Place half a spatula endful of solid X in a clean dry test tube. Heat gently and then strongly until no further change.

Observations	Inferences
(1mk)	(1mk)

(ii) Dissolve the remaining solid X in about 10cm³ of distilled water.

for more free past papers visit: www.freekcsepastpapers.com or call 0720502479

Divide the solution into four portions.

I To the first portion, add 2M sodium hydroxide solution drop wise until in excess.

Observations	Inferences
(1mk)	(1mk)

II To the second portion, add 2M ammonia solution dropwise until in excess.

Observations	Inferences
(1mk)	(1mk)

III To the third portion, add 3 to 4 drops of sodium chloride.

Observations	Inferences
(1mk)	(1mk)

IV To the fourth portion, add three drops of acidified Barium chloride solution.

Observations	Inferences
(1mk)	(1mk)

3. You are provided with a solid F. Carry out the following tests and record your observations and inferences in the spaces provided.

(a) Take one half a spatula end full in a clean spatula and ignite in a non luminous flame.

Observations	Inferences
(1mk)	(½mk)

(b) Place all the remaining solid F in a dry test tube. Add about 10cm³ of distilled water and shake the mixture. (Retain the mixture for use in tests (c), (d) and (e).

Observations	Inferences
(½mk)	(1mk)

(c) Using 2cm³ of the mixture obtained in (b) above, determine the pH of the mixture.

Method	Observations	Inferences
	(1½mks)	(½mk)

(d) To 2cm³ of the mixture obtained in (b) above, add all the sodium hydrogen carbonate provided.

Observations	Inferences
(1mk)	(1mk)

(e) To 2cm³ of the mixture obtained in (b) above, add three drops of acidified potassium dichromate (VI).

Observations	Inferences
(1mk)	(1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY JOINT EXAMINATION – 2016

233/1
CHEMISTRY
PAPER 1
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

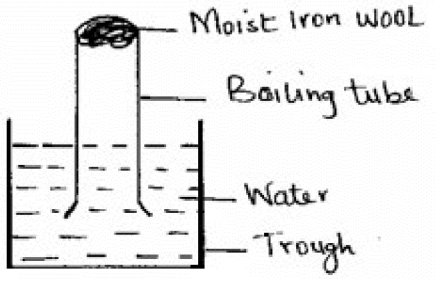
1. Name the most suitable method you can use to separate;
   (a) Xanthophyll and chlorophyll in green leaves. (1 mark)
   (b) Oil from simsim seeds. (1 mark)

2. The table below shows atomic numbers of four elements **W**, **X**, **Y** and **Z**.

Element	W	X	Y	Z
Atomic number	20	17	19	9

   (a) Write electron arrangement of the ion of **Z**. (1 mark)
   (b) (i) Write the formula of the compound formed between **W** and **X**. (1 mark)
   (ii) Name the bond(s) and structure of the compound in (i) above. (1 mark)

3. A student set-up an experiment as shown below. Moist iron wool was placed in a boiling tube and inverted over water.



   (a) What was observed after two days? (1 mark)
   (b) Explain the observations. (1 mark)
   (c) What would be observed if a large piece of iron wool was used? (1 mark)

4. Element X is found in period 3 group (IV) it consists of two isotopes 28_X and Q_X. A sample of X was found to consist of 90% of 28_X if the relative atomic mass of X is 28.3, work out the number of neutrons in Q_X. (3 marks)

5. Study the table below and answer the questions that follow:

Element	Atomic radius (nm)	Ionic radius (nm)
P	0.168	0.095
Q	0.094	0.133
R	0.124	0.156
S	0.146	0.086

   (i) State the elements which are metals. (1 mark)
   (ii) Identify the strongest reducing agent. Give a reason. (2 marks)

6. The diagram below represents an apparatus found in a chemistry laboratory.
   Give its name. (1 mark)

7. Given the following bond energies.
   C – C (347kJ mol^{-1})
   C – H (413kJ mol^{-1})
   C = C (612kJ mol^{-1})
   H – H (435.9kJ mol^{-1})
   Calculate the enthalpy change of hydrogenation of ethene. (3 marks)

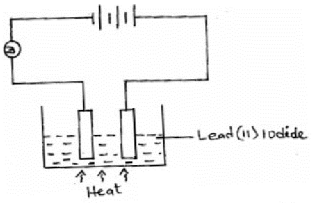
8. When hydrogen gas was passed over heated lead (II) oxide in a combustion tube and the gaseous products cooled, a colourless liquid was obtained.
   (i) Which chemical test would you use to confirm the colourless liquid above?
   (1 mark)

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

(ii) What observations were made in the combustion tube? (1 mark)

(iii) Write an equation for the reaction between hydrogen and lead (II) oxide. (1 mark)

9. The diagram below shows an experiment for investigating electrical conductivity in lead (II) iodide. Study it and answer the questions that follow.



(a) On the diagram;

(i) Label the cathode. (1 mark)

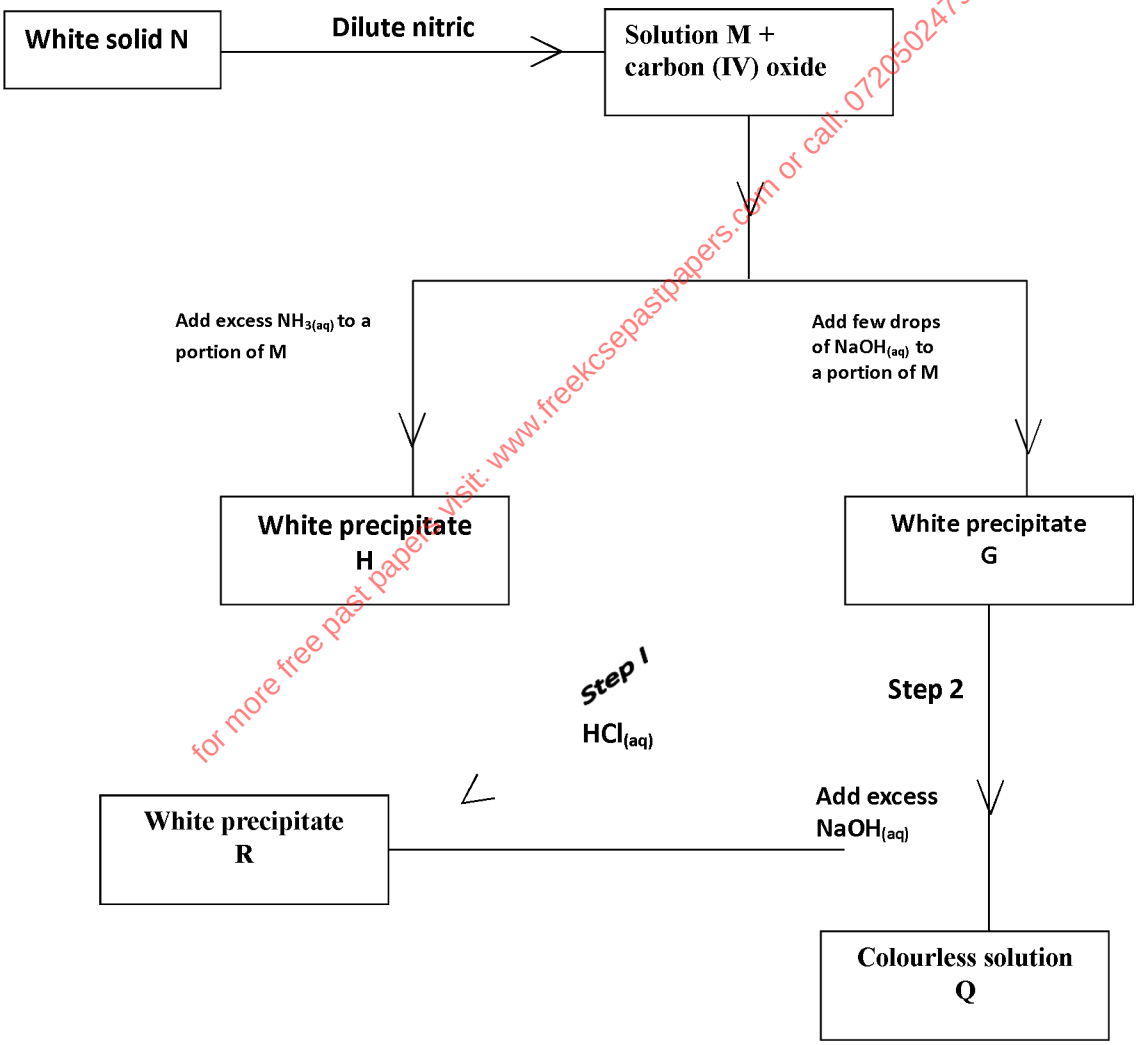
(ii) Show the direction of movement of electrons. (1 mark)

(b) Write an equation for the reaction that takes place at the anode. (1 mark)

10. (a) State the Graham"s law of diffusion. (1 mark)

(b) Two gases A and B diffuse in the ratio 2: 1 if the molecular mass of gas A is 16g, find the molecular mass of B. (2 marks)

11. Study the flow chart below and answer the questions that follow.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(a) Identify solid **N**. (1 mark)

(b) Write down the equation for the reaction that leads to the formation of solution **Q** from the white precipitate **G**. (1 mark)

(c) State the property of precipitate **G** that is demonstrated by Step **1** and **2**. (1 mark)

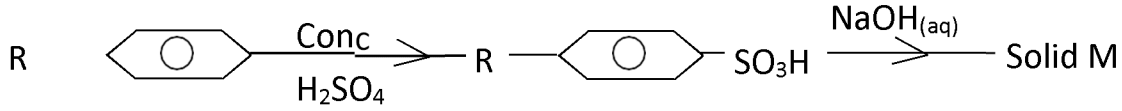
12. The basic raw material for extraction of aluminium is bauxite.

(a) Name the method that is used to extract aluminium from bauxite. (1 mark)

(b) Cryolite is used in the extraction of aluminium from bauxite. State its role.

(c) Aluminium is a reactive metal yet utensils made of aluminium do not corrode easily. Explain this observation. (1 mark)

13. The scheme below represents the manufacture of a cleansing agent M.



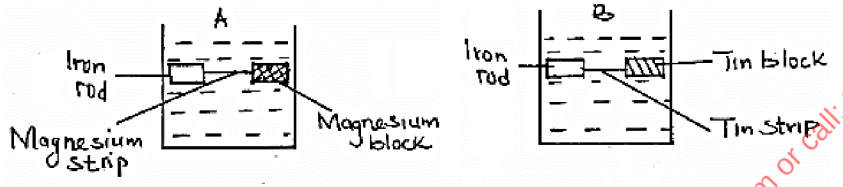
(a) (i) Draw the structure of **M**. (1 mark)
(ii) To which type of cleansing agent does **M** belong? (1 mark)

14. If chlorine gas is passed over heated iron fillings and the product dissolved in water, a yellow solution is formed.
(i) Identify the yellow solution. (1 mark)
(ii) What would be observed if aqueous sodium hydroxide solution was added to the yellow solution? (1 mark)
(iii) Write an ionic equation for the reaction between the yellow solution and sodium hydroxide. (1 mark)

15. Using excess zinc powder and dilute sulphuric (VI) acid describe how a sample of dry zinc sulphate crystals can be prepared. (3 marks)

16. An organic compound Y was analysed and found to contain carbon, hydrogen and oxygen only. 1.29g of Y on complete combustion gave 2.64g of carbon (IV) oxide and 0.81g of water. Find the empricial formula of Y. (C = 12, H = 1, O = 16). (3 marks)

17. The diagrams below were set up by form 4 students to investigate methods of preventing rusting.



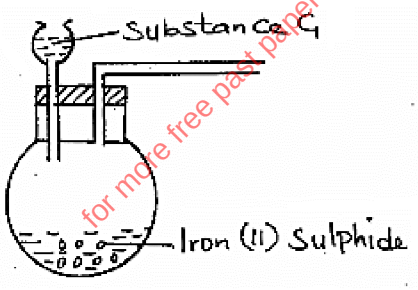
(i) It was observed that rusting occurred in set up B and not in set up A. Explain. (2 marks)
(ii) State **one** other method of preventing rusting in iron. (1 mark)

18. An equilibrium exists between the reactants and products as shown in the equation below.

$$Br_{2(aq)} + H_2O_{(l)} \rightleftharpoons OBr^-_{(aq)} + Br^-_{(aq)} + 2Hr^+_{(aq)}$$

(Orange + yellow) (Colourless)
(i) Select the species that acts as an acid. Explain. (1 mark)
(ii) State and explain the observations made when aqueous sodium hydroxide solution is added to the above equilibrium. (1 mark)

19. The apparatus shown below were set-up to prepare and collect hydrogen sulphide gas.



(a) Name substance **G**. (1 mark)
(b) Complete the set up to show how a dry sample of hydrogen sulphide gas is collected. (2 marks)

20. The boiling points of some compounds of hydrogen and some elements in group (IV) and (VI) of the periodic table are given below.

Compound	Boiling point (°C)	Compound	Boiling point (°C)
CH_4	-174.0	H_2O	100
SiH_4	-112.0	H_2S	-61

(a) Which of the compounds CH_4 and SiH_4 has stronger intermolecular forces. Give a reason. (1 mark)
(b) Explain why the boiling points of H_2O and H_2S show different trends from that of CH_4 and SiH_4. (4 marks)

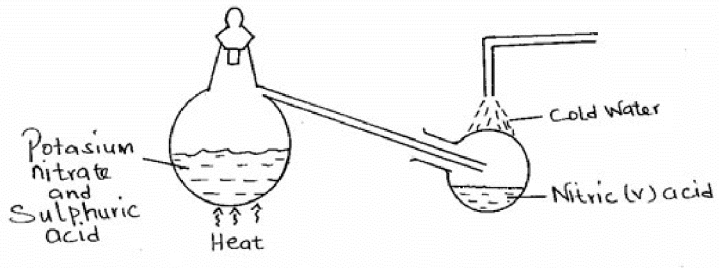
21. Radon $^{222}_{84}Ra$ undergoes alpha decay to form lead, taking 15 days for the original mass to reduce to 6.25%.
(a) Write the nuclear equation for the reaction. (1 mark)
(b) Calculate the half-life of radon. (2 marks)

22. Ethanol and pentane are miscible liquids. Explain how water can be used to separate a mixture of ethanol and pentane.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

23. Illustrate bonding in carbon (II) oxide using dot (•) and cross (x) (C – 6, O – 8). (2 marks)

24. The diagram below shows a set-up that was used to prepare and collect a sample of nitric (V) acid.

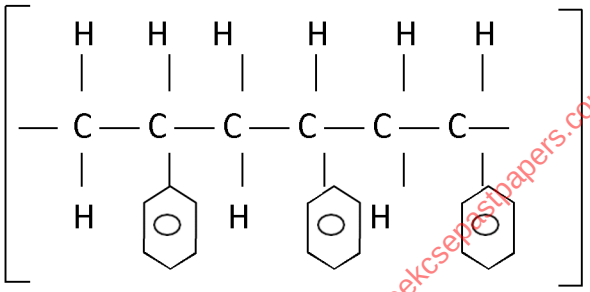


(a) Give a reason why it is possible to separate nitric (V) acid from sulphuric (VI) acid in the set-up. (1 mark)
(b) Name another substance that can be used instead of potassium nitrate. (1 mark)
(c) Give **one** use of nitric (V) acid. (1 mark)

25. A mixture of kerosene and water was shaken and left to stand, ammonia gas was then bubbled into the mixture followed by a few drops of phenolphthalein indicator. State and explain the observations made. (2 marks)

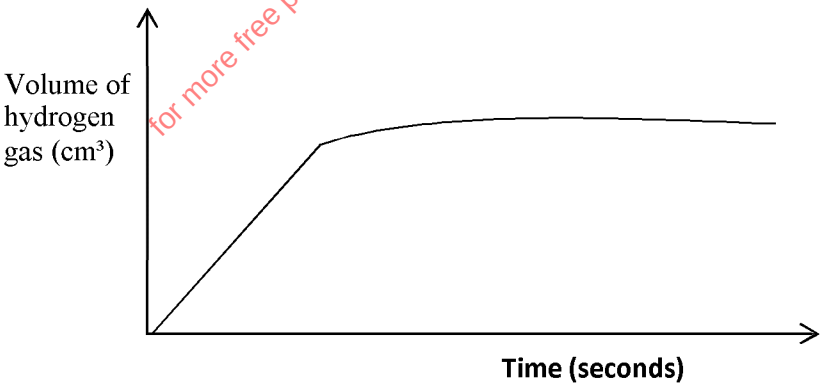
26. Trona is a double salt of sodium with formula Na_2CO_3. $NaHCO_3$. $2H_2O$. Trona is collected, dried and heated to convert it to sodium carbonate.
(i) Write an equation for the decomposition of trona by heat. (1 mark)
(ii) State **two** uses of sodium carbonate. (2 marks)

27. Below is part of a synthetic polymer. Study it and answer the questions that follow.



(i) Draw the structure of its monomer. (1 mark)
(ii) Determine the number of monomers making the above compound if its relative molecular mass is 104,000. The benzene ring has six carbon atoms and five hydrogen atoms (C = 12, H = 1). (2 marks)

28. In an experiment to prepare hydrogen gas using magnesium ribbon and dilute hydrochloric acid, a student plotted volume of hydrogen gas against time as shown in the sketch below.



(a) (i) On the same axes, sketch the curve that would be obtained if a few crystals of copper (II) sulphate are added and label it curve C. (1 mark)
(ii) What would be the function of copper (II) sulphate in the reaction? (1 mark)

29. 1g of element T was completely converted to its chloride, TCl_2. The mass of the chloride formed was 3.96g. Calculate the relative atomic mass of element T. (Cl = 35.5). (3 marks)

for more free pastpapers visit: www.freekcsepastpapers.com or call: 0720502479

KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY
JOINT EXAMINATION – 2016
233/2
CHEMISTRY
PAPER 2
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

1. The table below gives some elements of the periodic table (not actual symbols) and their atomic masses, atomic numbers and melting points.

Element	B	C	D	E	F	G	H	I	J	K
Atomic N°	7	8	19	15	2	9	6	16	12	11
Atomic mass	14	16	39	31	4	19	12	32	40	23
Mpt (°C)	-	-	63.7	44	-272	-223	Vary	113	669	98

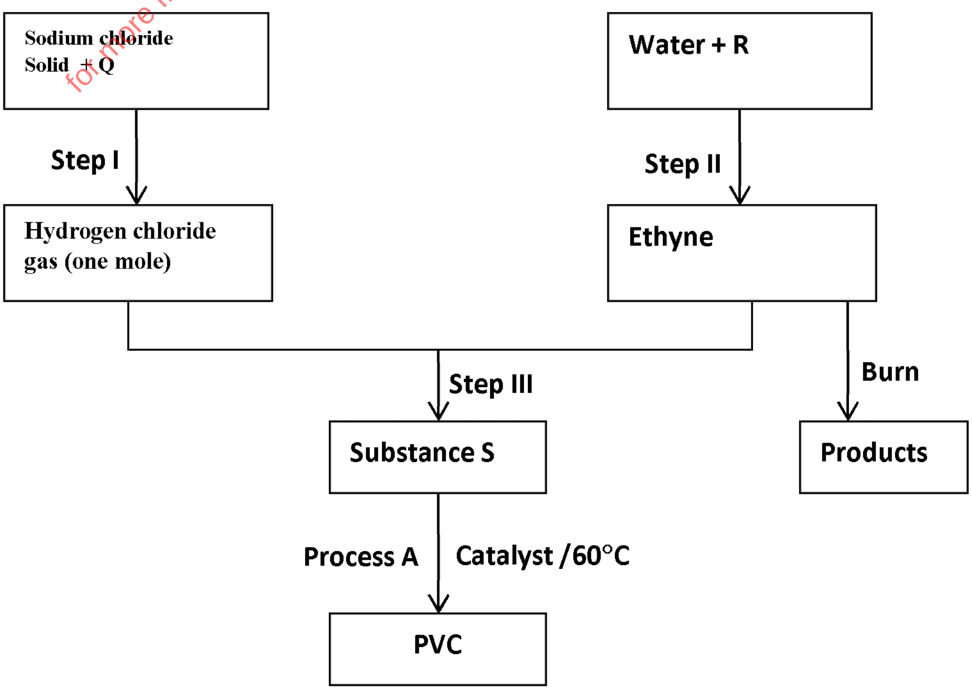
(a) Select **two** elements with oxidation states of -3. (1 mark)
(b) Which elements represents:-
(i) the most powerful reducing agent. (½ mark)
(ii) the most powerful oxidizing agent. (½ mark)
(c) Which metallic element has the highest first ionization energy? (1 mark)
(d) Select **two** elements which when reacted form a compound that conducts electricity in both molten and aqueous state.
(e) Select any **two** elements which when reacted form a compound that dissolves in water to form an acidic solution.
(f) Using dots (•) and crosses (x) to represent valency electrons, draw diagrams to show bonding between **B** and **J**.(2 marks)
(g) Explain why for some elements the atomic mass is not twice the atomic number. (1 mark)
(h) Explain why the melting point of element K is higher than that of element D. (1 mark)
(i) Describe how a solid mixture of the sulphate of element K and lead (II) sulphate can be separated. (3 marks)

2. The solubilities of two salts D and E are given in the following table in each case the solubility is expressed as grammes per 100g of water.

Temperature (°C)	10	20	30	40	50	60	70	80
Solubility of D	17	21	24	29	34	40	47	56
Solubility of E	35.8	36	36.2	36.5	36.8	37.3	37.6	38.0

(a) Using these data plot solubility curves for D and E on the same grid. (5 marks)
(b) Use your graph to answer the following questions:
(i) At what temperature are the solubilities of the two salts equal? (1 mark)
(ii) Estimate the solubility of salt D at O°C. (1 mark)
(iii) A saturated solution of E in 50g of water at 25°C was evaporated to dryness. What was the mass of the residue? (1 mark)
(iv) Two separate 100g of water are saturated at 75°C, one with D and the other with E. What is the difference in mass between the two solutions? (2 marks)
(v) The saturated solution obtained were each cooled to 20°C.
I Calculate the total mass of the two salts precipitated. (2 marks)
II Calculate the mass of each salt dissolved at saturation in 20g of water at 20°C. (2 marks)

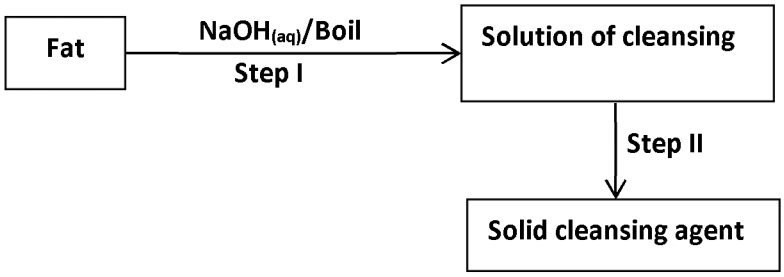
3. (i) Study the flow chart below and answer the questions that follow.



for more free past papers visit: www.kcsepastpapers.com or call: 0720502479

(i) Identify substances **Q** and **R**. (2 marks)
(ii) Using a chemical equation, show how **R** reacts with water. (1 mark)
(iii) Name and draw the structures of substance **S**. (2 marks)
(iv) Name process **A**. (1 mark)
(v) State **two** uses of PVC. (1 mark)

(b) The scheme below was used to prepare a cleansing agent. Study it and answer the questions that follow.



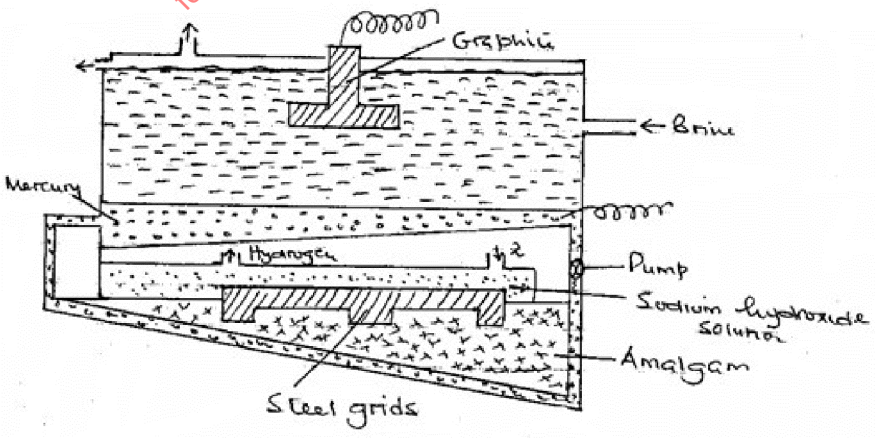
(i) What name is given to the type of cleansing agent prepared by the method above? (1 mark)
(ii) Name **one** chemical substance added in Step **II**. (1 mark)
(iii) What is the purpose of adding the chemical named in b(ii) above. (1 mark)
(iv) Name any other suitable substance that can be used in Step **I**. (1 mark)
(v) Explain how an aqueous solution of the cleansing agent removes oil during washing. (2 marks)

4. (a) The standard reduction potentials for five half cells are shown in the table below.
Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

	E^{θ}(V)
$A_{2(aq)} + 2e^{-} \rightarrow 2A^{-}_{(aq)}$	+1.09
$Q^{2+}_{(aq)} + 2e^{-} \rightarrow Q_{(s)}$	− 0.13
$R^{2+}_{(aq)} + 2e^{-} \rightarrow R_{(s)}$	−2.37
$Y^{2+}_{(aq)} + 2e^{-} \rightarrow Y_{(s)}$	+ 0.34
$S_{2(g)} + 2e^{-} \rightarrow S^{2-}_{(aq)}$	0.00

(i) With a reason identify the strongest reducing agent. (1 mark)
(ii) Which element is likely to be hydrogen. Explain. (1 mark
(iii) Write an equation for the cell formed when Q and Y half cells are joined. (1 mark)
(iv) Calculate the e.m.f of the cell in (iii) above. (1 mark)

(b) The diagram below represents a mercury cell that can be used in the industrial manufacture of sodium hydroxide. Study it and answer the questions that follow.



(i) Name raw material introduced at **2**. (½ mark)
(ii) Name another material that can be used in the cell instead of graphite. (½ mark)
(iii) Write an equation for the reaction.
I that occurs at the anode. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

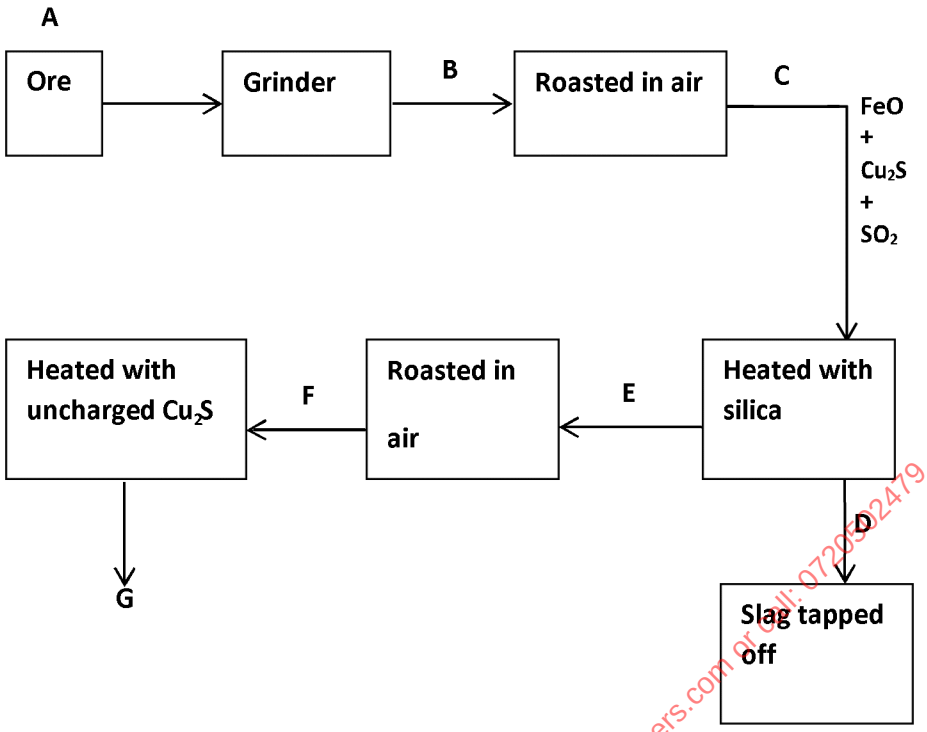
II In which sodium hydroxide is produced. (1 mark)

(iv) Give **two** reasons why mercury is recycled. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(iv) A current of 100 amperes was passed through the cell for five (5) hours. Calculate the mass of sodium hydroxide that was produced.
(Na = 23.0, O = 16.0, H = 1.0, 1 Faraday = 96500C). (3 marks)

5. Study the flow diagram below and answer the questions that follow.



for more free past papers visit www.freekcsepastpapers.com or call: 0720922479

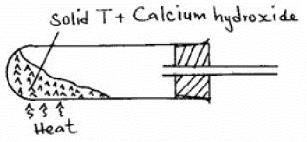
(a) Give the names of the two ores that can be used in the above process in Stage **A**. (1 mark
(b) What process takes place in Stage **B**? (1 mark
(c) Give the equation for the formation of the slag that is tapped off in Stage **D**.
What is the name of the slag? (2 marks
(d) What are the names of the products formed in Stage **G**? (1 mark
(e) What are the main impurities that are contained in the copper obtained in Stage **G**. (1 mark)
(f) Draw a well labelled diagram of the set-up of apparatus that would be used to purify the copper obtained in Stage **G**.
(2 marks)
(g) State **two** uses of copper. (1 mark)
(h) What environmental problems would be associated with copper mining? (1 mark)

6. (a) Methanol is manufactured from carbon (IV) oxide and hydrogen gas according to the equation.

$$CO_{2(g)} + 3H_{2(g)} \rightleftharpoons CH_3OH_{(g)} + H_2O_{(g)} \qquad \Delta H = -ve$$

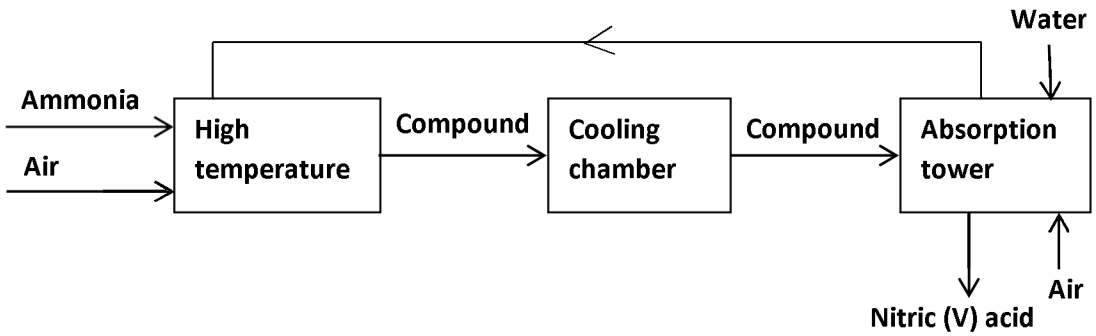
The reaction is carried out in the presence of a chromium catalyst at 400°C and 30Kpa under these conditions, an equilibrium is reached when 2% of the carbon (IV) oxide is converted to methanol.
(i) Explain how the yield of methanol would be affected if; the manufacturing process above is carried out at, 200°C and a pressure of 30Kpa. (2 marks)
(ii) A more efficient catalyst is used. (2 marks)
(b) In an experiment to determine the molar heat of reaction when zinc displaces copper, 0.4g of zinc powder were added to 25.0cm³ of 2.0M copper (II) sulphate solution. The temperature of copper (II) sulphate solution was 24°C, while that of the mixture was 36°C.
(i) Other than increase in temperature, state and explain the observations which were made during the reaction. (3 marks)
(ii) Calculate the heat change during the reaction. (Specific heat capacity of the solution = $4.2Jg^{-1}K^{-1}$ and the density of the solution = $1g/cm^3$. (1 mark)
(iii) Determine the molar heat of displacement of copper by zinc. (Zn = 65). (2 marks

7. (a) The diagram below shows an incomplete set-up used to prepare and collect ammonia gas.



(i) Name solid **T**. (1 mark)
(ii) Write an equation for the reaction that occurred when a mixture of solid **T** and calcium hydroxide was heated.
(1 mark)
(iii) Complete the diagram to show how a dry sample of ammonia gas can be collected. (3 marks)

(b) Ammonia gas is used to manufacture nitric (V) acid as shown below.



(i) Name the catalyst used in the above process. (½ mark)

(ii) Identify compound **U**. (½ mark)

(iii) Write the equation for the reaction that took place in the absorption tower. (1 mark)

(iv) Ammonia and nitric (V) acid are used in the manufacture of ammonium nitrate fertilizer, calculate the amount of the fertilizer manufactured per day, if the daily consumption of ammonia is 2400kg. Assume that the factory is 100% efficient. (N = 14, H = 1, O = 16). (3 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

233/3
CHEMISTRY
PAPER 3
(PRACTICAL)
JULY/AUGUST 2016
TIME: 2¼ HOURS

CONFIDENTIAL

KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY JOINT EXAMINATIONS – 2016

Each candidate will require:
- $30cm^3$ of solution A, Hydrochloric Acid.
- $100cm^3$ of solution C.
- $60cm^3$ of solution F, Sulphuric (VI) Acid (density – $1.84g/cm^3$)
- Solid G, 0.2g of magnesium powder.
- Stopwatch.
- Thermometer (-10 to 100°C).
- 100ml beaker.
- Phenolphthalein indicator.
- Pipette.
- Pipette filler.
- 250ml volumetric flask.
- Distilled water.
- 2 labels.
- 250ml conical flask.
- Burette.
- White tile.
- Filter funnel.
- Stand and clamp.
- About 2.0g of solid H.
- About 0.2g of sodium hydrogen carbonate.
- 6 test tubes in a rack.
- Test tube holder.
- Metallic spatula.
- Boiling tube.
- Red and blue litmus paper.
- About 2.0g of solid J.
- 50ml or 100ml measuring cylinder.

ACCESS TO:
2M NaOH solution.
2M Ammonium hydroxide solution.
2M Barium nitrate solution.
2M Lead (II) nitrate solution.
Bunsen burner.
Acidified potassium dichromate (VI).
Acidified potassium manganate (VII).
2M Nitric (V) acid.

NOTE:
- Solution F is 0.5M sulphuric (VI) acid (density – $1.84g/cm^3$).
- Solution C is made by dissolving 10g sodium hydroxide and 2g sodium nitrate in water to make 1 litre of solution.
- Solution A is 2M hydrochloric acid.
- Solid J is made by mixing hydrated zinc sulphate and ammonium sulphate in the ratio 1: 1.
- Solid H is 1.5g maleic acid.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY
JOINT EXAMINATION – 2016
233/3
CHEMISTRY
PAPER 3
(PRACTICAL)
JULY/AUGUST, 2016
TIME: 2¼ HOURS

1. You are provided with:
- Solution A – 2.0M Hydrochloric Acid.
- Solution C – a solution containing 12g/dm³ of sodium hydroxide contaminated with sodium nitrate.
- Phenolphthalein indicator.

You are required to prepare a dilute solution of hydrochloric acid solution A and use it to determine the purity of sodium hydroxide in solution C.

PROCEDURE

- Using a pipette and a pipette filler place 25cm³ of solution A into a 250ml volumetric flask.
- Add distilled water to make 250cm³ of solution. Label this solution B.
- Pipette 25cm³ of solution B into a 250ml conical flask. Add 2 drops of phenolphthalein indicator.
- Fill the burette with solution C and titrate with solution B until there is a permanent colour change.
- Repeat the titration two more times and complete the table below.

	1	2	3
Final burette reading (cm³)			
Initial burette reading (cm³)			
Volume of C used (cm³)			

(a) Determine the average volume of solution C used. (1 mark)
(b) Calculate the number of moles in
(i) 250cm³ of solution B. (2 marks)
(ii) 25cm³ of solution B. (1 mark)
(c) Calculate the
(i) Number of moles of sodium hydroxide in the average volume of solution C used. (2 marks)
(ii) Mass of sodium hydroxide in 1dm³ of solution C. (2 marks)
(iii) Percentage purity of the sodium hydroxide. (1 mark)

2. You are provided with:
- Sulphuric (VI) acid, solution F.
- 0.2g magnesium, solid G.

You are required to determine the molar heat of reaction, ΔH between magnesium the acid.

PROCEDURE:

- Measure 50cm³ of solution F using a measuring cylinder and place it in a 100cm³ beaker.
- Stir the solution gently with a thermometer and take it"s temperature after every half-minute.
- Record your results in Table III below.
- After one and half minutes, add all of solid G at once. Stir the mixture gently with the thermometer and record the temperature of the mixture after every half-minute in table III up to the sixth minute.

Table III

Time (min)	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
Temperature (°C)				_____									

(a) In the grid provided, plot a graph of temperature (vertical axis) against time. (3 marks)
(b) From the graph determine the change in temperature, ΔT. (1 mark)
(c) Calculate the heat change for the reaction using the expression.
(Heat change = mass of solution x 4.2 x ΔT – assume density of solution = 1.0g/cm³). (2 marks)
(d) Calculate the molar heat of reaction of sulphuric (VI) acid with magnesium. (Mg = 24.0). (2 marks)

3. I You are provided with solid J. Carry out the test below to identify the compound.
(a) Place ½ spatula of solid J in a hard test tube and heat strongly until no further change. Test the gas produced with litmus paper.

Observation	Inference
(1mk)	(1mk)

(b) Place the remaining solid J into a clean boiling tube. Half fill it with distilled water and shake well. Divide the solution into four portions.

Observation	Inference
(1mk)	(1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(i) To the first portion add dilute sodium hydroxide solution dropwise till in excess.

Observation	Inference
(1mk)	(1mk)

(ii) To the second portion add ammonia solution dropwise till in excess.

Observation	Inference
(1mk)	(½mk)

(iii) To the third portion add drops of dilute barium nitrate.

Observation	Inference
(½mk)	(1mk)

(iv) To the fourth portion add a few drops of dilute nitric acid followed by lead (II) nitrate solution and warm.

Observation	Inference
(½mk)	(½mk)

You are provided with solid H. Carry out the tests below.
Write your observations and inferences in the spaces provided.

(a) Place about a spatulaful of solid H on a metallic spatula and burn it using a Bunsen burner.

Observation	Inference
(½mk)	(1mk)

(b) Place the remaining solid H in a boiling tube. Add about 10cm³ of distilled water and shake well. Retain the mixture for use in the tests below.

Observation	Inference
(½mk)	(½mk)

(c) Divide the solution in (b) above into three portions.

(i) To the first portion, add a small amount of solid sodium hydrogen carbonate.

Observation	Inference
(1mk)	(1mk)

(ii) To the second portion, add 1cm³ of acidified potassium dichromate (VI) and warm.

Observation	Inference
(½mk)	(1mk)

(iii) To the third portion, add two drops of acidified potassium manganate (VII).

Observation	Inference
(½mk)	(½mk)

for more free past papers visit www.freekcsepastpapers.com or call: 0720932479

NANDI NORTH AND NANDI CENTRAL JOINT EXAMINATIONS 2016

233/1
CHEMISTRY
PAPER 1
THEORY
JULY / AUGUST 2016
TIME: 2 HOURS

1. Two elements A and B have electronic configurations 2.8.3 and 2.6 respectively.
   (a) To which group and period does element B belong? (1mk)
   (b) If the two react, what is the formula of the compound they form? (1mk)
2. (a) State Charles" Law. (1mk)
   (b) The volume of a sample of nitrogen gas at a temperature of 298k and 600 minHg pressures was $4.8 \times 10^{-2}m^3$. Calculate the temperature at which the volume of the gas would be $3.2 \times 10^{2}m^3$ if pressure is constant. (2mks)
3. The formula given below represents a portion of polymer.
   (a) Give the name of the polymer. (1mk)
   (b) Draw the structure of the monomer used to manufacture the polymer. (1mk)
4. In a closed system, aqueous iron (II) chloride reacts with hydrogen sulphide gas as shown in the equation below.
   $2FeCL_{3(aq)} + H_2S_{(g)} \rightleftharpoons 2FeCl_{2(aq)} + 2HCl_{(aq)} + S_{(s)}$
   State and explain the observation that would be made if dilute hydrochloric acid is added to the system at equilibrium. (2mks)
5. Omolo a student in Form 1 set up an apparatus as shown for the preparation of dry chlorine gas.

   (a) (i) Name substance W. (1mk)
   (ii) State a suitable drying agent. (1mk)
   (b) Identify any **two** mistakes in the set-up. (2mks)
6. The table below shows the results obtained when soap solution was added to different samples of equal volumes of calcium hydroxide solution treated with different amounts of Carbon (IV) oxide.

Sample	Solution	Volume of soap added to sample to lather
C	$50cm^3$ of calcium hydroxide + excess x carbon (IV) oxide.	$10cm^3$
D	$50cm^3$ of calcium hydroxide + little carbon (IV) oxide.	$2cm^3$

7. Hydrogen sulphide gas was bubbled through a solution of zinc nitrate for sometime.
   (i) State the observations made. (1mk)
   (ii) Where should the experiment be carried out and why? (1mk)
8. The diagram below shows set-up used to burn hydrogen and collect the product.
   (a) State why it"s necessary to dry the hydrogen gas before igniting it. (1mk)
   (b) (i) State the precaution that must be taken before igniting the hydrogen. (1mk)
   (ii) State **two** uses of hydrogen gas. (1mk)
9. The diagram below shows acidic and basic oxides fit into the general family of oxides.
   (i) State the name given to the type of oxides that would be placed in the shaded region. (1mk)
   (ii) Give the name of any oxide that could be placed in the shaded region. (1mk)
10. Eugene Kipngetich of Form II at Laboret School set up the following experiment with the help of the two laboratory assistants. Metal rods S, T, U and V were cleaned with sand paper and placed in a beaker containing water. A second set was put in a container of steam and a third set was placed in a beaker containing dilute acid. Bubbles of gas and reaction was observed around some of the rods as shown in the diagrams below.
    (a) It was very necessary to clean the rods with sand paper before dipping them. Explaining. (1mk)
    (b) Arrange the four metals in order of their reactivity starting with the most reactive. (1mk)
11. The following set up was used to investigate some properties of two gases G and H.
    When beaker B was filled with gas G the level of water in the glass tube rose to point II. When the experiment was repeated using gas H, the level of water dropped to point III. Explain these observations. (3mks)
12. Paper chromatography was carried out to investigate presence of amino acids in beans. Study the chromatograms below to answer the questions that follow.

    What conclusion can be drawn from these results? (1mk)
13. Describe how you would prepare a dry sample of lead II chloride starting with lead II carbonate. (3mks)
14. (a) A piece of burning magnesium was lowered into a gas jar containing nitrogen oxide. State and explain the observations made. (2mks)
    (b) Write an equation for the reaction in (a) above. (1mk)
15. The half equations involved in a cell are:-
    $2H_2O_{(l)} + 2e = H_{2(g)} + 2OH_{(aq)}$: $E^e = -0.83V$

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502179

$O_{2(g)} + 2H_2O_{(l)} + 4e = 4OH_{(aq)}$: $E^{\ominus} = -0.40V$

(a) Write the overall equation for the electrochemical cell. (1mk)

(b) Calculate the e.m.f. generated by a battery consisting of ten cells. (1mk)

(c) State **one** environment advantage of using these cells in spacecrafts. (1mk)

16. The structures below are sections of models of the structures of elements P and Q.

(i) In which group of the periodic table do the elements belong?

I. P (1mk)

II. Q

(ii) Which of the two elements is a better conductor of electricity? Explain. (1mk)

17. Air was passed through reagents as shown below.

(i) State and explain the observations made when air is passed through chamber A for a long time. (2mks)

(ii) Name **one** component in C. Explain. (1mk)

18. The following set-up shows the heating of a mixture of equal amounts of sodium chloride and ammonium chloride.

(a) What is substance K? (1mk)

(b) What is the process by which substance K is formed? (1mk)

19. In the industrial extraction of lead metal, the ore is first roasted in a furnace. The solid mixture obtained is then fed into another furnace together with coke limestone and scrape iron. State the functions of each of the following in this process:-

(a) Coke (1mk)

(b) Scrape iron (1mk)

(c) Limestone (1mk)

20. The set-up below was made by a form four student. At the start of the experiment, the bulb did not light.

(a) State and explain the observation made when $Cl_{2(g)}$ was bubbled in the water for about 10 minutes. (2mks)

(b) Write the chemical equation for the reaction which took place at the cathode. (1mk)

21. Use the information below to answer the questions that follow:-

Equation:			Enthalpy of formation
(i) $H_{2(g)} + \frac{1}{2}O_{2(g)}$	→	$H_2O_{(l)}$	$\Delta H_1 = -286kJmol^{-1}$
(ii) $C_{(s)} + O_{2(g)}$	→	$CO_{2(g)}$	$\Delta H_2 = -394kJmol^{-1}$
(iii) $2C_{(s)} + 3H_{2(g)} + \frac{1}{2}O_{2(g)}$	→	$C_{(s)}H_2OH_{(l)}$	$\Delta H_3 = -277kJmol^{-1}$

Calculate the molar enthalpy of combustion of ethanol. Given that: (3mks)

$C_{(s)}H_2OH_{(l)} + 3O_{2(g)} \rightarrow 2CO_{2(g)} + 3H_2O_{(l)}$

22. Dry sulphur (IV) oxide was passed through two pieces of coloured silk both in a gas jar as shown in the diagram

(a) State the observation in the gas jars. (2mks)

(b) What equations to explain your observations in flask II. (2mks)

23. Study the diagram below and answer the questions that follow.

(i) Write the equation for the combustion of propane. (1mk)

(ii) The PH of substance K was found to be less than 7. Explain this observation. (1mk)

24. The table below gives some physical properties of substances A, B and C. Study it and answr the questions that follow.

Substance	Colour	M.P (^{0}C)	Solubility in water	Electrical conductivity	
				Solid	Liqud
A	Black	114	Insoluble	Non conductor	Liquid
B	Black	1326	Soluble	Non conductor	Conducts
C	Black	3730	Insoluble	Conducts	Conducts

Identify the substance that is:

(i) Giant atomic structure (1mk)

(ii) Ionic structure (1mk)

25. Calculate the amount of calcium carbonate that would remain if 15.0g of calcium carbonate were reacted with 0.2 moles of hydrochloric acid. (C = 12.0 = 1.60, Ca = 40.0) (3mks)

26. A certain mass of a metal E_1 reacted with excess dilute hydrochloric acid at 25^{0}C. The volume of hydrogen gas liberated was measured after every 30 seconds. The results were presented as shown in the graph below.

(a) Name one piece of apparatus that may have been used to measure the volume of the gas liberated. (1mk)

(b) (i) On the same axis, sketch the curve that would be obtained if the experiment was repeated at 37^{0}C. (1mk)

(ii) Explain the shape of your curve in (b) (i) above. (1mk)

27. (a) Give **two** reasons why most laboratory apparatus are made of glass. (1mk)

(b) The diagrams below are some common laboratory apparatus. Name each apparatus and state its use.

28. The equation below shows a reversible reaction.

$H_3O^+_{(aq)} + HSO^-_{4(aq)}$ H2O(l) + H2SO4

(i) Identify the acid in the forward reaction and explain. (2mks)

29. (a) Give **two** advantages of hard water. (1mk)

(b) Explain how water hardness is removed by ion exchange method. (2mks)

30. M grammes of radioactive isotope decayed to 5 grammes in 100 days. The half-life of the isotope is 25 days.

(a) What is meant by half-life? (1mk)

(b) Calculate the initial mass M of the radioactive isotope. (2mks)

for more free past papers visit http://www.freekcsepastpapers.com or call: 0720504479

NANDI NORTH AND NANDI CENTRAL JOINT EXAMINATIONS 2016

233/2
CHEMISTRY
PAPER 2
THEORY
JULY / AUGUST 2016
TIME: 2 HOURS

1. The grid below is a Periodic Table. The letters used are not the actual chemical symbols of the elements. Study the table and answer the questions that follow.

G								
			R	J	Q		Y	
D	T				W		U	Z
	E	X						
V								

(a) What name is given to the elements that occupy region X? (1mk)
(b) Write an equation to show how element Y forms an ion. (1mk)
(c) Compare the atomic and ionic radius of T. (1mk)
(d) Explain why the ionization energy of V is lower than that of D. (2mks)
(e) Name the chemical family to which E belongs. (1mk)
(f) An element A is in period 3 and it loses three electrons to form an ion. Write the electronic configuration of an atom of A. (1mk)
(g) Elements D and U combine to form a compound with a giant structure.
(i) Name the giant structure. (1mk)
(ii) State **two** characteristics of the structure. (1mk)
(h) Write the formula of the compound formed when T and Y react. (1mk)
(i) State and explain the change in electrical conductivity from D to T. (2mks)

2. (a) An electrolytic cell is set up a form two class to perform an electrolysis of brine using carbon chloride.
(i) What is brine? (1mk)
(ii) Identify the cations in brine. (1mk)
(iii) Identify the ion discharged at anode and name its factor of discharge. (2mks)
(b) The diagram below shows an electrochemical cell to determine the E^0 of Iron.
The reading on the voltmeter is -0.44V.
(i) On the diagram show by an arrow the direction of the flow of electrons. (2mks)
(ii) State **two** functions of the salt bridge. (2mks)
(iii) Write an equation for the reaction in the Fe^{2+} / Fe half cell. (1mk)
(iv) Identify the reference half cell. (1mk)
(v) Calculate the cell emf given that the reference half-cell has an E^0 value of 0.00V. (2mks)
(vi) Write the cell representation. (1mk)

3. (a) The graph below is temperature-time curve obtained when a block of ice is heated from -4^0C to just over 100^0C.
(i) Name the heat change occurring in region 2. (1mk)
(ii) Identify the state of the substance at region 3. (1mk)
(iii) Explain why there is no change in temperature in region 4. (2mks)
(iv) In which of the regions is there a solid-liquid mixture? (1mk)

(b) To determine the heat of combustion of ethanol, a form four class used the set-up shown below.

Table showing observations

Measurements	**Values**
Steady final temperature of 50ml of water used.	69.5^0C
Initial temperature of water	18.0^0C
Temperature change, □ in K	
Initial mass of Ethanol Burner and Ethanol before burning	28.8g
Final Mass of Ethanol Burner with remaining Ethanol after burning	28.4g
Mass of Ethanol that burnt	

(i) Fill in the missing information in the class table. (1mk)
(ii) The 50ml of water used is de-ionised and its specific heat capacity c, is 4.2kJ/Kg/K. Calculate heat of combustion of the ethanol used. (2mks)
(iii) Calculate the moles of ethanol that were burnt (RMM of ethanol = 46). (2mks)
(iv) Calculate the heat of combustion per mole of ethanol. (2mks)

4. (a) Describe the chemical test that can be used to distinguish sodium sulphate from sodium sulphite. (2mks)
(b) Starting with lead oxide, describe how a pure sample of lead carbonate can be prepared in the laboratory. (3mks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0220502479

(i) What is solubility? (1mk)

(ii) The table below shows the solubility of solids X and Y at different temperatures.

TEMPERATURE (^{0}C)	SOLUBILITY IN g PER 100g OF WATER	
	X	Y
68.0	112.0	65.0
58.0	74.0	55.0
53.0	58.0	48.0
47.0	47.0	45.0
43.0	36.0	43.0

I) Draw the solubility curves on the same axes. (Temperature on the X-axis). (1mk)

II) A solution of 68.0^{0}C contains 80g of solid X and 80g of solid Y. The mixture is cooled to 53.0^{0}C. Using the graph you have drawn in I) above, give the composition of the solid formed. (2mks)

5. (a) A, B, C are three homologous series of organic compounds.

Series	General formula
A	C_nH_{2n-2}
B	C_nH_{2n}
C	C_nH_{2n+2}

(i) What is the name given to series C? (1mk)

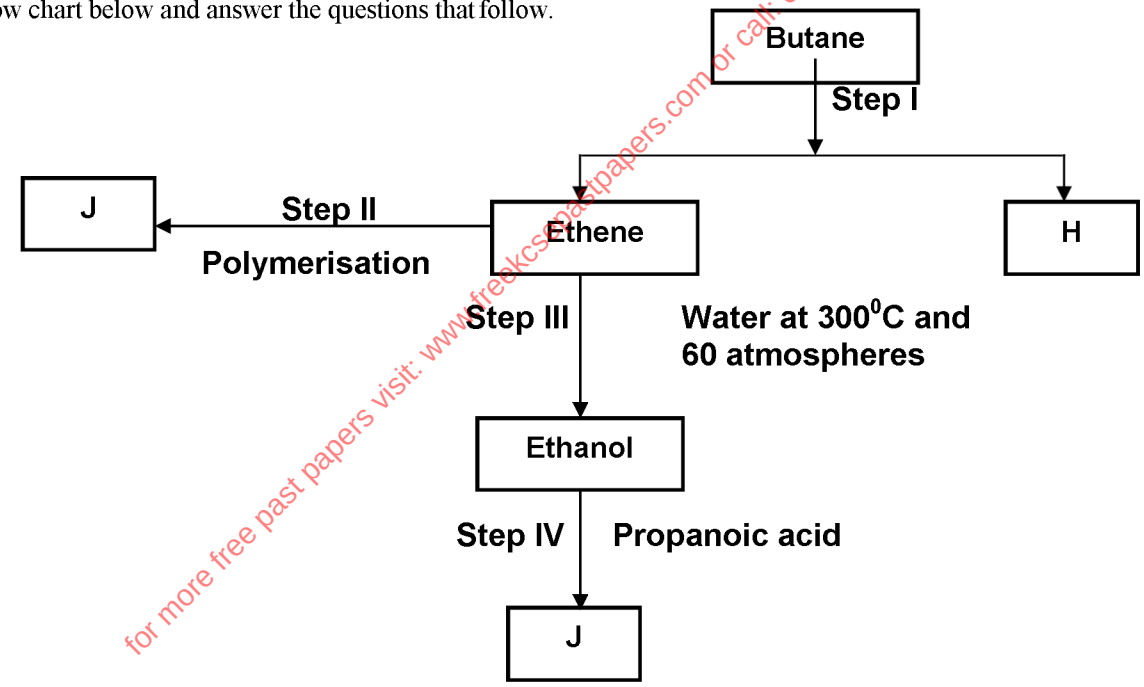
(ii) Write down the name and structural formula of the second member of series "B". (2mks)

(iii) Draw the structural formulae of the first two members of the series „A". (2mks)

(iv) Complete the balance in the following equation:

$CH_3CH_3 + O2 \rightarrow$

(b) Study the flow chart below and answer the questions that follow.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(i) State the conditions for the reaction in step I to occur. (1mk)

(ii) Identify substance H. (1mk)

(iii) Give:-

(I) One disadvantage of the continued use of substances such as J. (1mk)

(II) The name of the process that takes place in step III. (1mk)

(III) The name and the formula of substance K. (2mks)

Name:……

Formula:……

(iv) The relative molecular mass of J is 16,800. Calculate the number of monomers that make up J. (2mks)

6. (a) The first step in the industrial manufacture of nitric acid is the catalytic oxidation of ammonia gas.

(i) What is the name of the catalyst used? (1mk)

(ii) Write the equation for the catalytic oxidation of ammonia gas. (1mk)

(iii) Nitric acid is used to make ammonia nitrate. State **two** uses of ammonium nitrate. (1mk)

(b) Study the apparatus and answer the questions that follow.

(i) Why does nitric (v) acid appear yellow? (1mk)
(ii) Give the identity of gas Q and give its test. (1mk)
(iii) State the use of glass wool and the role of sand in the experiment. (2mks)
(iv) Write an equation to show the decomposition of nitric acid when strongly heated. (1mk)
(c) Determine the oxidation of nitrogen in NO^-_3. (1mk)

7. In the laboratory small quantities of oxygen gas can be generated using the following set-up. Study it and answer the questions that follow.

(a) (i) Give the name of substance R. (1mk)
(ii) What is the purpose of the apparatus labeled S? (1mk)
(iii) Write an equation for the reaction taking place in the round bottom flask. (1mk)

(b) Sodium peroxide react with water at room temperature to produce $0.4dm^3$ of oxygen gas. Determine the mass of sodium peroxide which was reacted with water.
(Molar gas at r.t.p = 24.0 dm^3, Na = 23, O = 16, H = 1) (2mks)

(c) A burning piece of magnesium ribbon continues to burn in a gas jar containing carbon (IV) oxide. Explain. (2mks)

(d) State **two** commercial uses of oxygen gas. (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

NANDI NORTH AND NANDI CENTRAL JOINT EXAMINATIONS 2016
233/3
CHEMISTRY
PRACTICALS
CONFIDENTIAL INSTRUCTIONS TO SCHOOLS

In addition to the apparatus and fittings found in a chemistry laboratory, each candidate will require the following:-

1. About $120cm^3$ of solution Q – 2M hydrochloric acid.
2. About $120cm^3$ of solution R – 2M sodium hydroxide.
3. 2g piece dustless chalk (STRICTLY OMEGA TYPE). Cut a piece which must weigh 2g and label it solid S.
4. Stop watch / clock.
5. 1 pipette.
6. 1 burette.
7. 3 250ml conical flaks.
8. 1 measuring cylinder (100ml)
9. 1 measuring cylinder (10ml)
10. 5 test tubes
11. 1 filter paper
12. Filter funnel
13. 1 dropper
14. $250cm^3$ distilled water.
15. Solid F – Barium nitrate solid.
16. Distilled water.
17. Blue and Red litmus paper.
18. Wooden splint.
19. 10ml measuring cylinder.
20. Boiling tube.
21. 8 clean test tubes.
22. Solid sodium hydrogen carbonate.
23. A small piece of aluminium foil.
24. Test-tube holder.
25. Solid G – maleic acid.

Each student should have access to:-

- Source of heat.
- Acidified potassium manganate (VII) with a dropper.
- Acidified potassium dichromate (VI) with a dropper.
- 0.5M Lead (II) nitrate with a dropper.
- 0.5M Barium nitrate with a dropper.
- 2M sodium hydroxide with a dropper.
- 2M ammonium solution with a dropper.

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

NANDI NORTH AND NANDI CENTRAL JOINT EXAMINATIONS 2016

233/3
CHEMISTRY
PAPER 3
PRACTICAL
JULY / AUGUST 2016
TIME: 2 ¼ HOURS

1. You are provided with:-
   - Solution Q, a 2M solution of Hydrochloric acid.
   - Solution R, a 2M solution of Sodium hydroxide.
   - Solid S, 2g piece of chalk (impure calcium carbonate)

   You are required to determine:
   (i) How the rate of reaction between carbonate varies with concentration of hydrochloric acid.
   (ii) Determine the percentage purity of the carbonate.

Procedure I

(a) Measure 10cm^3 of solution R into a 100cm^3 measuring cylinder. Add distilled water to make 100cm^3 of solution. Transfer the solution into a 250ml conical flask. Label it solution T. Fill the burette with solution T.
(b) Label 5 test tubes 1, 2, 3, 4 and 5.
(c) Using a dropper and a 10ml measuring cylinder, measure 1cm^3 of solution Q into test tube 1.
(d) Measure 100cm^3 of solution Q into a 250ml conical flask. Transfer solid S into the conical flask and **immediately start a stop watch.**
(e) Swirl the remaining mixture for a further 1 minute. Using a dropper and 10ml measuring cylinder draw out 1cm^3 of the mixture into test tube 2.
(f) Swirl the remaining mixture for a further 1 minute, draw 1cm^3 of mixture into test tube 3.
(g) Repeat procedure (f) above and place the mixture in test tubes 4 and 5.
(h) To each of the test tubes 1-5, add 10cm3 of distilled water. transfer contents of test tube 1 into a conical flask. Add 2-3 drops of phenolphthalein indicator. Titrate this solution against solution T in the burette by adding T dropwise till a permanent pink colour just appear. Record the volume of T in the table 1, repeat the procedure with contents of test tubes 2, 3, 4 and 5. Complete the table 1 below.

(RETAIN THE REACTING MIXTURE FOR USE IN PROCEDURE II)

TABLE I

Test Tube Number	**1**	**2**	**3**	**4**	**5**
Time (minutes)	0	1	2	3	4
Final burette reading (cm^3)					
Initial burette reading (cm^3)					
Volume of solution T used (cm^3)					

(6mks)

(a) On the grid provided, plot a graph of volume of solution T(y-axis) against time. (3mks)
(b) (i) From the graph, determine the volume of solution T that react with 1cm^3 of the mixture after 3½ minutes. (1mk)
(ii) Calculate the concentration of the mixture after 3½ minutes. (1mk)
(c) In terms of rate of reaction explain the shape of the graph. (1mk)

Procedure II

Filter solution S obtained in procedure 1 above into a clean conical flask. Pipette 25cm^3 of this solution into a clean conical flask. Add 20cm^3 of distilled water. Rinse the burette and fill with fresh solution T. Titrate using 2-3 drops phenolphthalein indicator. Record your results in the table II. Repeat the procedure two more times and complete the table II below.

Table II

	I	**II**	**III**
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution **T** used cm^3			

(4mks)

(a) Calculate the volume of solution T used. (1mk)
(b) Calculate:-
(i) The number of moles of the excess acid in 25cm^3 of solution Q. (1mk)
(ii) The number of moles of the excess acid in 100cm^3 of solution Q. (1mk)
(c) Calculate the mass of carbonate that reacted with 100cm^3 of solution Q. (1mk)
(d) Calculate the percentage purity of the carbonate in solid S. (1mk)

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

2. You are provided with solid **F** to carry out the tests indicated below and record your observation and inferences in the spaces provided.

(a) Place a spatula end-full of F in a boiling tube. Add about $10cm^3$ of distilled water and shake to dissolve. **(Retain the remaining solid F for use in test (b) below).**

Divide the resultant mixture into four portions.

(i) To the first portion, add $1cm^3$ nitric acid followed by 3 drops of Barium Nitrate solution.

Observation	Inference
(1mk)	(1mk)

(ii) To the second portion, add $1cm^3$ nitric acid followed by 3 drops of Lead (II) nitrate solution.

Observation	Inference
(1mk)	(1mk)

(iii) To the third portion, add aqueous ammonia dropwise until in excess.

Observation	Inference
(1mk)	(1mk)

(iv) To the fourth portion, add sodium hydroxide dropwise until in excess.
Retain the mixture for use in part (v) below.

Observation	Inferences
(1mk)	(1mk)

(v) To the mixture from (iv) above, add a piece of Aluminium foil and warm the mixture gently and carefully.

Observation	Inferences
(2mks)	(1mk)

(i) Using a clean metallic spatula, place a little of the remaining solid F and burn it strongly on a non-luminous flame.

Observation	Inferences
(½mk)	(½mk)

3. You are provided with substance **G.** Carry out the following tests and record your observations and inferences in the spaces provided.

(a) Place a spatula end-full of solid G on a clean metallic spatula and ignite.

Observation	Inference
(1mk)	(1mk)

(b) Put the remaining solid G in a clean boiling tube and add about $10cm^3$ of distilled water divide the solution into four portions.

(i) To the first portion add two drops of acidified potassium manganate (VII).

Observation	Inference
(½ mk)	(1mk)

(ii) To the second portion, add 3 – 4 drops of acidified dichromate (VI).

Observation	Inferences
(½ mk)	(1mk)

(iii) To the third portion, add a half spatula end-full of sodium hydrogen carbonate.

Observation	Inferences
(1mk)	(1mk)

(iv) To the fourth portion, test the PH with universal indicator.

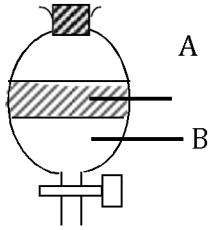
Observation	Inferences
(1mk)	(1mk)

for more free past papers visit www.freecbcpastpapers.com or call: 0720502479

KASSU JOINT EVALUATION EXAMINATION
Kenya Certificate of Secondary Education

233/1
CHEMISTRY
Paper 1
THEORY
JUNE 2016
Time: 2 hours

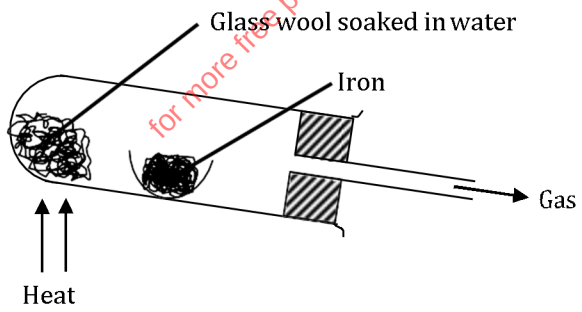
1. (a) Give ***two*** differences between luminous and non-luminous flames. (2 marks)
   (b) How is the non-luminous flame produced? (1 mark)
2. (a) The apparatus below were used to separate a mixture of liquid A and B.



   State ***two*** properties of liquids that make it possible to separate using such apparatus. (2 marks)
   (b) Give the name of the above apparatus. (1 mark)
3. (a) Explain why solid Carbon (IV) oxide is preferred over ordinary ice for use by ice cream venders. (1 mark)
   (b) Name one piece apparatus used to measure volume of gases. (1 mark)
   (c) Draw a diagram of a deflagrating spoon. (1 mark)
4. The table below shows the pH values of solutions P, R, Q and S.

Solution	P	R	Q	S
pH	2	7	6.5	13.5

   (a) Which solution represent:
   (i) Strong base - (1 mark)
   (ii) Weak acid - (1 mark)
   (b) Give an example of solution S. (1 mark)
5. 6.95g of hydrated iron (II) sulphate $FeSO_4.nH_2O$ was dissolved in 250 cm^3 solution resulting into a 0.1M solution. Determine the value of n. (Fe = 56, O = 16, S = 32, H = 1). (3 marks)
6. Rusting leads to fast wearing out of farm tools and equipment as well as buildings.
   (a) Give the chemical name of rust. (1 mark)
   (b) What ***two*** conditions accelerate rusting process? (2 marks)
7. Study the diagram below and answer the questions that follow.



   (a) Write an equation for the reaction that take place in the combustion tube. (1 mark)
   (b) Why would it not be advisable to use potassium in place of iron in the set-up? (1 mark)
   (c) Glass wool should be heated before heating iron. Explain. (1 mark)
8. I. Name the following organic compounds.
   (a) $CH_3CH(CH_3)CH_2CH(Br)CH_3$ (1 mark)
   (b) $HOCH_2 - CHOH - CH_2OH$ (1 mark)
   II. Given
   A $CH_3(CH_2)_{16}COO^- Na^+$
   B $CH_3(CH_2)_6CH(CH_3)CH_2SO_3^- Na^+$
   Identify detergent A and B (2 marks)

for more free past papers visit www.freekcsepastpapers.com or call 0720502479

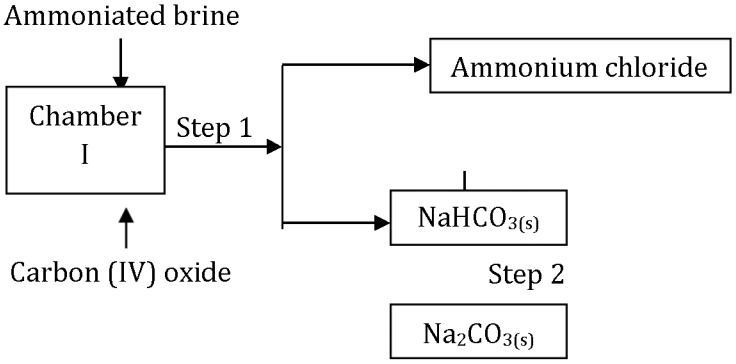
9. In terms of structure and bonding, explain the following.
   (a) Graphite is used as a lubricant. (1 mark
   (b) Alluminium is better conductor of electricity then magnesium. 1 mark)
   (c) Water is a liquid at room temperature while hydrogen sulphide is a gas. (1 mark)
10. (a) Define the term molar latent heat of fusion. (1 mark)
    (b) The molar heat of fusion of ice at O^0C is 6kJ mol^{-1}. Calculate the heat change when 36g of ice is converted to 36g of water at 10^0C. (SHC = 4.2^{-1}g K^{-1}, density = 1.0g/cm^3, H = 1.0, O = 16.0)
11. Draw a well labeled diagram showing how blister copper is purified. (3 marks)
12. Gas Q with a relative molecular mass of 48 took 50 seconds to diffuse through a porous diaphragm. How long will it take for the same amount of hydrogen Chloride (HCl) to diffuse through the same diaphragm under similar conditions? (H = 1.0, Cl = 35.5). (3 marks)
13. (a) Calculate the oxidation state of chromium in the ion Cr_2O^{2-}. (1 mark)
    (b) Using oxidation numbers, determine from the equation below the species which undergoes oxidation and reduction.

    $2FeCl_{2(aq)} + Cl_{2(g)} \longrightarrow 2FeCl_{3(aq)}$

    Oxidation - (1 mark)
    Reduction - (1 mark)
14. Given elements A, B and C with atomic numbers 11, 19 and 13 respectively.
    (a) Compare the atomic radius of A and C. Explain. (2 marks)
    (b) Compare reactivity of A and B. (1 mark)
15. Haber process (the manufacture of ammonia gas) is given by the following equation.

    $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)} \quad \Delta H = -92kJ\ mol^{-1}$.

    State and explain the effect of:
    (a) Introducing some drops of water to the equilibrium. (1 mark)
    (b) Pumping nitrogen gas to the equilibrium mixture. (1 mark)
    (c) Lowering the temperature of the reaction. (1 mark)
16. Elements P and Q have the following atomic numbers 19 and 8 respectively.
    (i) Using dot (●) and cross draw a diagram to show how the elements form bonds. (1 mark)
17. Describe how sodium sulphate crystals can be prepared starting with 50cm^3 of 2M sodium hydroxide and 1M sulphuric (VI) acid. (3 marks)
18. Write ionic equations to show how;
    (a) (i) Excess ammonia solution reacts with a solution containing Copper II ions. (1 mark)
    (ii) Excess sodium hydroxide added to a solution containing Al^{3+} ions. (1 mark)
    (b) Give the name of the following ion $[Zn(NH_3)_4]^{2+}$ (1 mark)
19. (a) Define electrolysis. (1 mark)
    (b) During the electrolysis of molten aluminium oxide, write the equations at the;
    Anode - (1 mark)
    Cathode - (1 mark)
20. (a) Give any ***two*** differences between alpha and beta particles. (2 marks)
    (b) A radioactive isotope T decays by emitting three alpha particles to form what is the atomic number and mass number T?
    Atomic number - (1 mark)
    Mass number - (1 mark)
21. (a) Using acidified potassium dichromate (VI) solution, describe how you would differentiate between sulphur (IV) oxide and hydrogen sulphide. (2 marks)
    (b) Identify the catalyst preffered in contact process. Explain. (2 mark)
22. Study the following part of the solvay process for the manufacture of sodium carbonate and answer the questions that follows:



    (i) State the main source of Carbon (IV) oxide in the process. (1 mark)

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

(ii) Write down the overall equation for the reaction in chamber I. (1 mark)

(iii) Name process in step 1. (1 mark)

23. (a) The following equation involve hydrochloric acid.

$MnO_{2(s)} + 4HCl_{(aq)} \longrightarrow MnCl_{2(aq)} + 2H_2O_{(l)} + Cl_{2(g)}$

State the type of reaction taking place in the reaction. (1 mark)

(b) State ***two*** contrasting chemical properties of hydrogen and chlorine. (2 marks)

24. (a) An element O has two isotopes $_{O}$ containing 90% and Isotope $_{O}$.

(i) What are isotopes? (1 mark)

(ii) Find the R.A.M of O. (2 marks)

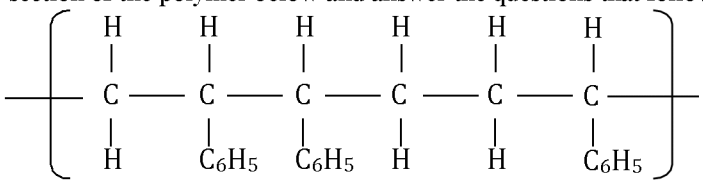
25. (a) When a hydrocarbon is completely burnt in oxygen 4.2g of Carbon (IV) oxide and 1.71g of water were formed.

(a) Determine the empirical formular of the hydrocarbon. (3 marks)

(b) Given that formula mass of compound above is 28. Find the molecular formular. (1 mark)

26. (a) Name the ***two*** types of polymerization. (1 mark)

(b) Study the section of the polymer below and answer the questions that follow.



(i) Give the name of the polymer above. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KASSU JOINT EVALUATION TEST

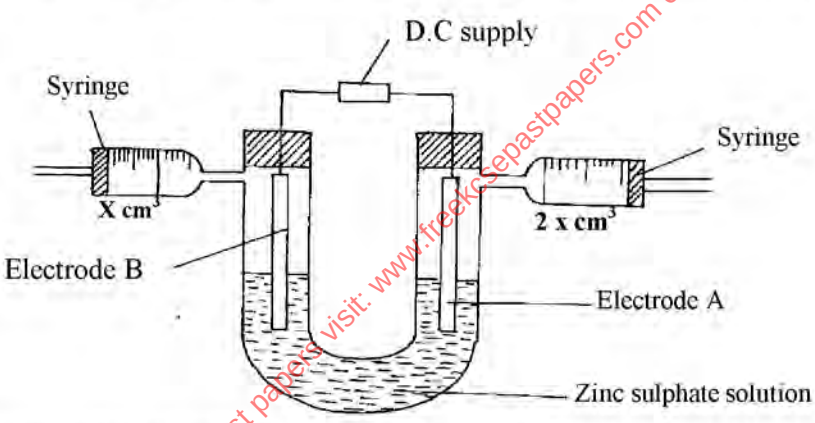
CHEMISTRY
233/2
THEORY
2 Hours

1. The grid below shows part of the periodic table. Use it to answer the questions that follow. The letters do not represent actual symbols.

						S	U	V
P	R					T	X	W
Q								

(a) Which of the elements has the highest atomic radius? Explain. (2 marks)
(b) Identify the most reactive Oxidizing agent. Explain. (2 marks)
(c) Compare the atomic radius of P and R. Explain (2 marks)
(d) Give the formula of one stable ion with an electron arrangement of 2.8 which is:
(i) A Negatively charged divalent ion. (2marks)
(ii) A Positively charged monovalent.
(e) Given that the mass number of W is 40. Write down the composition of its nucleus (2 marks)
(f) Write the formula of the compounds formed between.
(i) Element R and X. (1 mark)
(ii) Give one property of the structure formed when R and X bond. (1 mark)

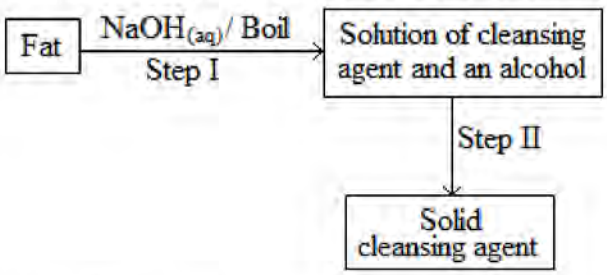
2. An aqueous solution of zinc sulphate is electrolysed using platinum electrodes as shown in the set up below.



In case of free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(a) (i) Write a half equation for the reaction taking place at electrode **A.** (1mark)
(ii) Identify electrodes A and B (2 marks)
(iii) State and explain the observation at electrode **B** if copper plate was used instead of platinum electrode. (2marks)
(b) 0.22g of metal **Q** is deposited by electrolysis when a current of 0.06A flows for 99 minutes.
(RAM of **Q** = 184, 1F = 96500c)
(i) Find the number of moles of **Q** deposited. (1mark)
(ii) Determine the value of n in the metallic ion $\mathbf{Q}^{n+}$ (3marks)
(c) Determine oxidation number of chlorine in ClO_3^- (1mark)
(d) An iron spoon is to be electroplated with silver. Draw a labelled diagram to represent the set-up that could be used to carryout this process. (2marks)

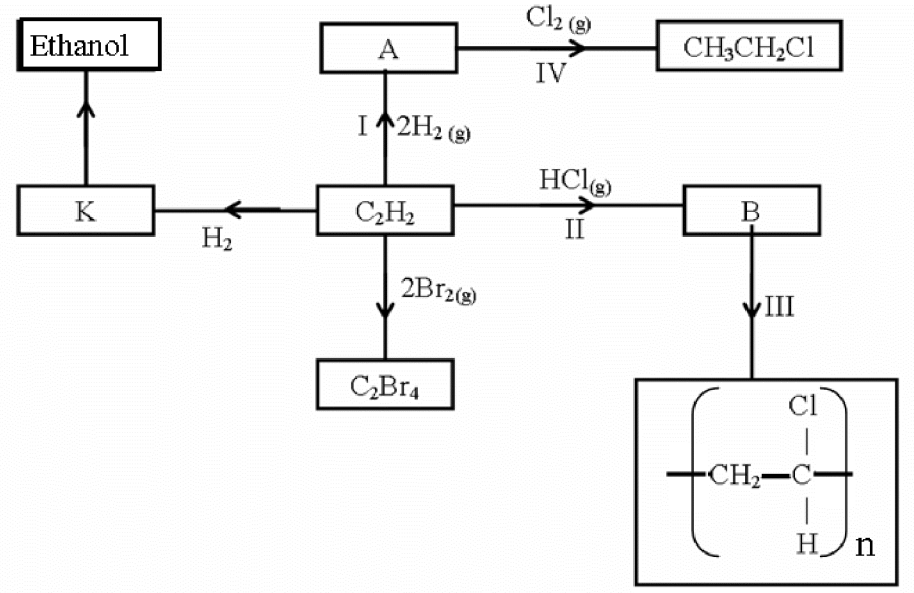
3. (a)The scheme below was used to prepare a cleansing agent. Study it and answer the questions that follow.



(i) What name is given to the type of cleansing agent prepared by the method above? (1mark)
(ii) Name one chemical substance added in step II (1mark)
(iii) What is the purpose of adding the chemical substance named in a (ii) above? (1mark)

(iv) Name any other suitable substance that can be used in step I (1mark)
(v) Explain how an aqueous solution of the cleansing agent removes oil during washing (2marks)

(b). Study the scheme below and answer the questions that follow.



(i) Identify the catalyst used in step I (1mark)
(ii) Name the compounds A and B (2 marks)
(iii) Give one disadvantage of compound formed in step III (1mark)
(iv) Name the reactions taking place at steps: I and IV (1mark)
(v) Describe how substance K is converted to ethanol (2marks)

4. (a) State the Hess" law. (1 mark)
(b) The enthalpies of combustion of calcium, carbon and decomposition of calcium carbonate are indicated below;

$C\ (s) + \frac{1}{2}O_2\ (g) \rightarrow CaO\ (s)$: $\Delta H = -635\ kJmol^{-1}$

$C\ (s) + O_2\ (g) \rightarrow CO_2\ (g)$ $\Delta H = -394\ kJmol^{-1}$

Enthalpy of decomposition of $CaCO_3 = +178\ kJmol^{-1}$

(i) Draw an energy cycle diagram that links the enthalpy of formation of calcium carbonate to enthalpies of combustion of calcium, carbon and decomposition of calcium carbonate. (2 marks)
(ii) Determine the enthalpy of formation of calcium carbonate. (2 marks)
(c) Some average bond energies are given below.

Bond	Energy in kJ mol^{-1}
C – C	348
C – H	414
Cl – Cl	243
C – Cl	432
H – Cl	340

Calculate the energy change for the reaction below. (3 mks)

$C_2H_{6\,(g)} + Cl_{2\,(g)} \rightarrow CH_3CH_2Cl_{(g)} + HCl_{(g)}$

5. (a) Define the term solubility. (1 mark)
(b) In an experiment to determine the solubilities of two salts X and Y at different temperatures, a candidate recorded her observations as shown below.

Temperature (°C)	0	10	20	30	40	50	60	70	80	90
Solubility of X in g/100 g of H_2O	14.3	17.4	20.7	25.0	28.5	33.3	40.0	47.0	55.0	64.0
Solubility of Y in g/100 g of H_2O	25.0	27.5	30.0	32.5	35.0	37.6	40.1	42.4	45.0	48.0

(a) On the same axes plot the solubility curves of X and Y. (4 marks)
(b) From your graph to determine;
(i) The solubility of X and Y at 47 °C
Solubility of X (1 mark)
Solubility of Y (1 mark)
(ii) The temperature at which the two salts are soluble in water. (1 mark)

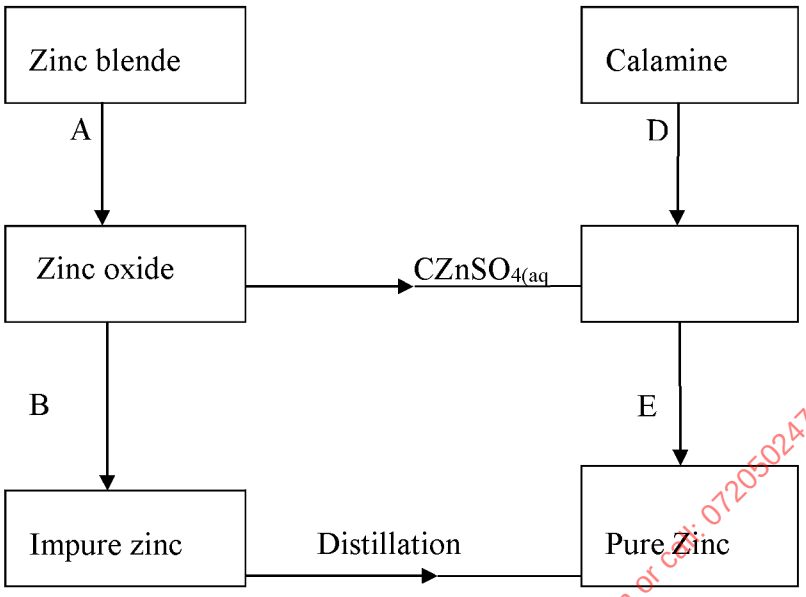
for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

(c) If 60g of X is dissolved in 100 g of water and heated to 90°C, calculate the amount of salt that crystallized out if cooled to 20 °C. (1 mark)

(d) State what would happen if a mixture salt X in 100 g of water and 30 g of Y in 100 g of water were cooled from 90 °C to 70 °C. (3 marks)

(e) State one application of solubility. (1 mark)

6. The flow chart below shows some processes in the extraction of zinc. Study it and answer the questions that follow.



(a) Name the processes represented by A and E. (2 marks)

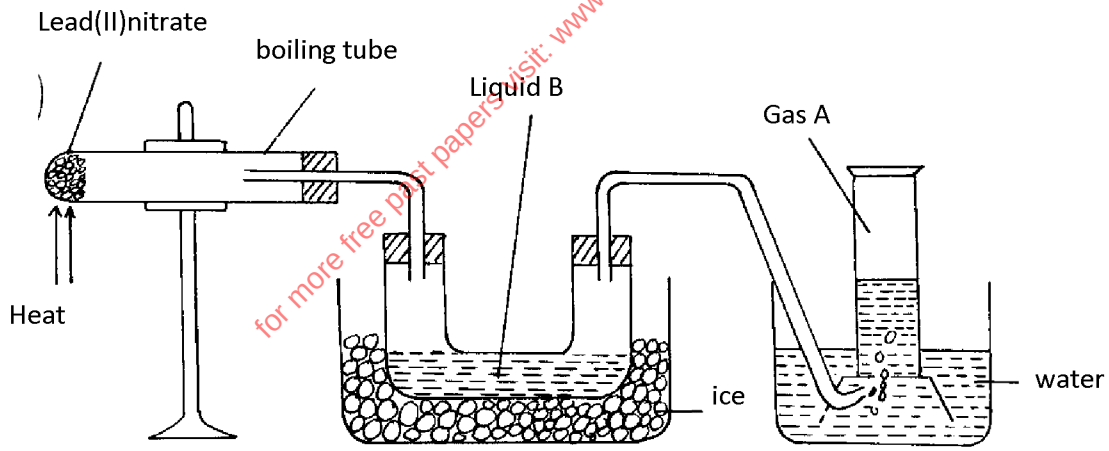
(b) State the reagents required for processes B, C and D. (3marks)

(c) Write a chemical equation of the reaction that occurs in process B. (1mark)

(d) With an aid of a diagram, explain how you would obtain a pure sample of zinc by process E (3 marks)

(e) State two commercial uses of zinc metal. (1 mark)

7. The diagram below shows a set-up of apparatus that can be used to prepare nitrogen (IV) oxide. Study it and use it to answer the questions that follow



(a) (i) Write the equation for the reaction that takes place in the boiling tube. (1 mark)

(ii) State the observations made in the boiling tube. (2 marks)

(iii) Explain why lead (II) nitrate is preferred over other metal nitrates in this experiment. (1 mark)

(iv) Describe how gas A can be identified. (1 mark)

(b) (i) Name liquid B (1 mark)

(ii) Write a chemical equation to show how liquid B is formed in this experiment. (1mark)

(c) (i) In another experiment, excess aqueous lead (II) nitrate solution was reacted with a solution which contained 2.34g of sodium chloride. Calculate the mass of precipitate formed in this reaction. (Pb = 207, Cl = 35.5, Na = 23) (3 marks)

(ii) Write an ionic equation for the reaction that takes place when nitrogen (IV) oxide reacts with aqueous sodium hydroxide. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KASSU JOINT EVALUATION TEST

CHEMISTRY
233/3
THEORY

CONFIDENTIALS

INSTRUCTIONS TO SCHOOLS

In addition to usual provisions and fitting in the science laboratory each candidate is expected to have the following.

- One pipette
- One burette
- One pipette filler
- About 100ml of solution M
- About 100ml of solution N
- Two 250ml conical flask
- One boiling tube
- 10ml measuring cylinders
- A stop watch
- 50ml solution W_I
- 500ml distilled water provided in wash bottle
- 100ml of 1M dilute hydrochloric acid (W_{II})
- One plane paper
- One 100ml glass beaker
- About 2.0g of solid P
- Metallic spatula
- Two filter papers
- One filter funnel
- Seven dry clean test tubes
- One dry boiling tube
- Acidified potassium chromate vi solution
- Bromine water
- Solid F (maleaic acid about 2g)

Access to:

- Source or means of heating
- 2M NaOH supplied with a dropper
- 2M NH_4OH supplied with a dropper
- 0.2M lead nitrate solution K supplied with a dropper
- 2M sulphuric cid supplied with a dropper
- Dilute nitric v acid
- Universal indicator solution

Notes

- Solution M is made by accurately weighing 3.95g of potassium Manganate (VII) and dissolving it in 400ml of 1M H_2SO_4 and making up to solution 10, 1litre mark.
- Solution N is prepared by dissolving 49.0g ammonium ferrous sulphate, $(NH_4)_2SO_4$. $FeSO_4.6H_2O$ and dissolving it in 400ml distilled water and making it up to 1litre mark.
- Solid P is a mixture of zinc chloride and magnesium carbonate in the ratio of 1;2
- Solution K is 0.2M lead nitrate solution.
- Substance W_I is prepared by dissolving 40.0g sodium Thiosulphate in 500ml distilled water and making it up to 1.0 litre of solution
- Solution (W_{11}) 1M HCl is prepared by dissolving 86ml conc HCl in 600ml distilled water and making solution to 1litre mark.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KASSU JOINT EVALUATION TEST - 2016
233/3
CHEMISTRY
PAPER 3
PRACTICAL
JUNE 2016
2 ¼ Hours

1. You are provided with:
Solution **M** containing 3.95g Potassium Manganate (vii), ($KMnO_4$) per litre of solution.
Solution **N**, containing 49.0g of ammonium Ferrous Sulphate $(NH_4)_2SO_4$. $FeSO_4.6H_2O$ per litre of solution.
You are required to determine the reacting mole ratio of manganate (VII) Ions, MnO_4 with Iron (II) ions Fe^{2+}.

PROCEDURE:

Using and pipette filter transfer 25.0cm^3 of solution N into a conical flask. Titrate with solution M in the burette. No indicator is required for this experiment. Record your results in the table below.
Repeat the procedure to obtain the accurate volumes.

Table I

	1st	2nd	3rd
Final burette readings cm^3			
Initial burette readings cm^3			
Volume of solution M used cm^3			

(4mk)

a) Determine the average volume of solution M used. (1mk)
b) Calculate:
i) The concentration of solution M in moles per litre. (K = 39, Mn = 55, O = 16) (1mk)
ii) The number of moles of solution M that reacted with N (2 mks)
iii) The concentration in moles per litre of solution N in moles per litre (1mks)
(Fe=56, S=32, N=14, H=1)
iv) The number of moles of solution N that reacted with solution M in this experiment (2mks)
c) Given that 1 mole of solution M gives 1 mole of Mno_4^- ions and 1 mole of solution N gives 1 mole of Fe^{2+} ions. Calculate the reaction mole ratio of Fe^{2+} ions to MnO_4 ions (3mks)

2. You are provided with:
Solution WI – containing 40g of substance Y per litre.
Solution WII – 1M hydrochloric acid solution.
You are required to investigate experimentally the rate of reaction of Y with hydrochloric acid. Y reacts with hydrogen ions in the hydrochloric acid to give a final yellow precipitate. You will in each experiment measure at room temperature, the time taken to produce a certain amount of precipitate that will make the cross on the white piece of paper just invisible.

PROCEDURE

On the white piece of paper, make a cross using a pen. Measure 10cm^3 of solution W_I using a 10cm^3 measuring cylinder provided and put into 100cm^3 glass beaker provided and place on the cross. The cross should be visible through the solution from a view point directly above the beaker. Using another measuring cylinder transfer 10cm^3 of the acid W_{II} to the beaker containing W_I and start the stopwatch immediately after the addition. Looking from above the beaker, stop the watch as soon as the cross becomes invisible. Enter the time taken in the table below. Repeat the experiment using the volumes indicated in the table below each time adding appropriate quantity of distilled water to make up the volume to 10cm^3 before adding 10cm^3 of solution W_{II}.

xpt. No	Vol. of W_I used cm^3	Vol. of water cm^3	Vol. of W_{II} cm^3	Time Seconds
1	10	0	10	
2	8	2	10	
3	6	4	10	
4	4	6	10	
5	2	8	10	

(4mks)

a) Plot a graph of volume W_I against time in seconds (provided graph paper) (3mks)
b) From your graph, state how the volume of W_I varies with time (1mk)
c) What time would 7.0cm^3 of W_I take to react with 10cm^3 of W_{II} (1mk)
d) State two factors which must be kept constant during the experiment (1mks)
e) Could the time taken for experiment be shorter or longer if temperature of reacting mixture was at (i) 50^{0}C? Sketch a graph on the same axis that would appear for this experiment. (3 mks)

visit more free past papers from www.freekcsepastpapers.com or call 0720502479

3. You are provided with solid F. Carry out the tests below. Record your observations and inferences in the spaces provided.

a) Place about half of solid F on a metallic spatula and burnt it using a non-luminous flame

Observations	inferences
(1mk)	(1mk)

b) Place the remaining solid F in a clean boiling tube and add about 10cm^3 of water and shake thoroughly.

i) To about 2cm^3 of the solution F, put the universal indicator solution provided.

Observations	inferences
(½ mk)	(½ mk)

ii) To about 2cm^3 of solution F, add 2cm^3 of acidified potassium dichromate (VI) and warm to boiling

Observations	inferences
(1mk)	(1mk)

iii) To about 2cm^3 of solution F, add three drops of bromine water

Observations	inferences
(1 mk)	(1mk)

You are provided with solid P. Carry out the tests below and record your results in the table.

1. (i) Place all solid P in a boiling tube. Add about 10 cm^3 of distilled water and shake vigorously, filter and keep both the residue and filtrate.

Observations	Inferences
(½ mk)	(½ mk)

(ii) To about 2 cm^3 of the filtrate add sodium hydroxide dropwise till in excess.

Observations	Inferences
(½ mk)	(½ mk)

2. (a) (i) To about 2 cm^3 of the filtrate add ammonia solution till in excess.

Observations	Inferences
(½ mk)	(½ mk)

(ii) To about 2 cm^3 of the filtrate add four drops of solution K (lead (II) Nitrate)

Observations	Inferences
(½ mk)	(½ mk)

(b) Carefully transfer the residue into a test tube and add 5 cm^3 of dilute niric (V) acid

(i) To about 2 cm^3 of the solution add a few drops of dilute sulphuric (VI) acid.

Observations	Inferences
(½ mk)	(½ mk)

(ii) T o about 2 cm^3 of the solution add ammonia solution drop wise till in excess.

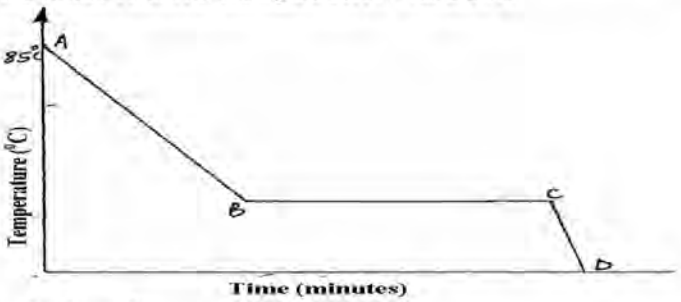
Observations	Inferences
(½ mk)	(½ mk)

for more free past papers visit: www.kneekcsepastpapers.com or call: 0720502419

KAMDARA JET - 2016

233/1
CHEMISTRY
(THEORY)
PAPER 1
JULY/AUGUST 2016
2 Hours

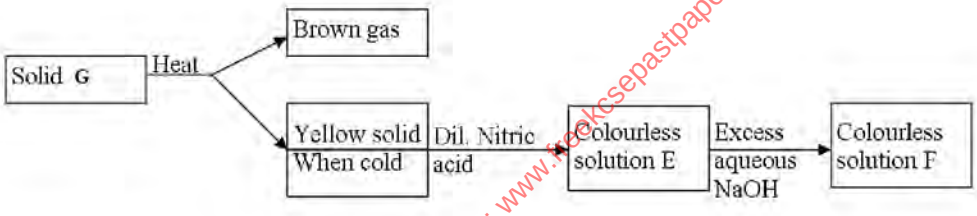
1. A Student in form four placed a thermometer in molten naphthalene at 85^{0}C and recorded the temperature and time until the naphthalene solidified. From the values obtained, the figure below was drawn.



(a) What name is given to such a figure? (1mk)
(b) Which part of the figure represents the change of state of naphthalene? (1mk)
(c) In terms of kinetic theory. Explain what happens to molecules along AB. (1mk)

2. In a certain reaction, 18.7cm^3 of a dibasic acid H_2X required 25cm^3 of 0.1M NaOH for complete neutralization.
(a) How many moles of Sodium hydroxide are contained in 25cm^3? (1mk)
(b) Calculate the molarity of the dibasic acid. (2mks)

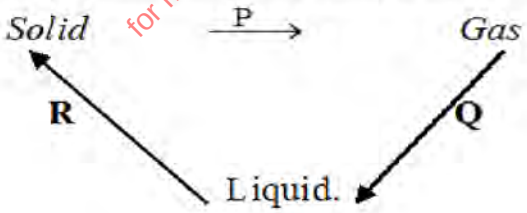
3. Study the flow chart below and answer the questions that follow.



(a) Identify solid G (1mk)
(b) Write a balanced chemical equation between the yellow solid and dilute nitric acid. (1mk)
(c) Write the formula of the complex ion in solution F (1mk)

4. Explain this observation:
When hydrogen chloride gas is dissolved in water, the solution conducts electricity while a solution of hydrogen chloride gas in methyl benzene does not conduct electricity. (2mks)

5. Matter exists in three states which can be related as shown in the diagram below.



(a) **Name** processes: P: (1mark)
R: (1mark)
(b) **Explain** whether process **Q** is exothermic or endothermic (1mark)

6. (a) What is meant by allotropy? (1mark)
(b) Name two allotropes of carbon. (1mark)
(c) Give one use of charcoal in the sugar refinery industry. (1mark)

7. (a) State Graham"s Law of Diffusion (1mark)
(b) A given volume of ozone (O_3) diffused from a certain apparatus in 96 seconds. Calculate the time taken by an equal volume of carbon(IV) oxide to diffuse under the same conditions. (C=12,O=16) (2marks)

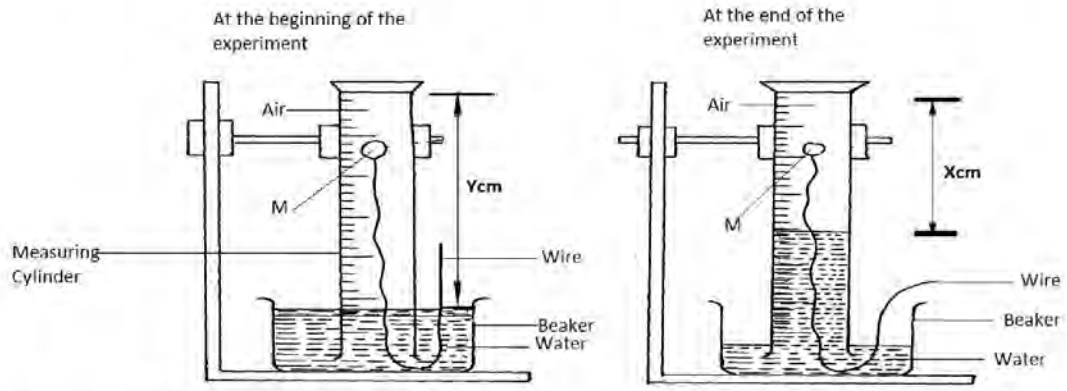
8. (a) Name two ores from which copper is extracted. (1mark)
(b) During the extraction of copper metal the ore is subjected to froth floatation. Give a reason why this process is necessary. (1mark)

for more free past papers visit: www.freekcsepastpapers.com or call 0720502479

(c) One of the alloys of copper is brass. State its two uses. (1mk)

9. Draw a dot (●) and cross (X) diagram to show bonding in sulphur (IV) oxide (1mk)

10. A form one class carried out an experiment to determine the active part of air. The diagram below shows the set-up of the experiment and also the observation made.

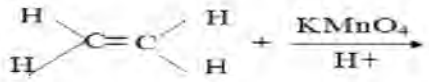


(a) Identify substance M (1mk)

(b) State two reasons for the suitability of substance M for this experiment (1mk)

(c) Write the equation for the reaction of substance **M** and the active part of air (1mk)

11. (a) Complete the following equation (1mk)



(b) Name the homologous series to which the following compounds belong?

(i) CH_3CCH (1mk)

(ii) $CH_3CH_2OOCCH_3$ (1mk)

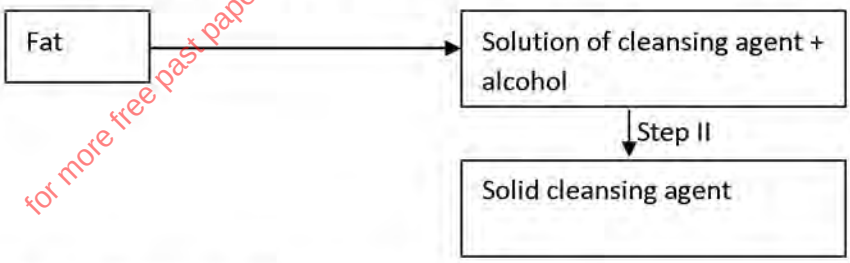
12. The table below shows the pH values of solutions J to N

Solution	J	K	L	M	N
pH	5	13	2	10	7

(a) Which solution contains the largest concentration of hydroxides ions?.....(1mk)

(b) Which solution is likely to be a solution of acetic acid?.....(1mk)

13. The scheme below was used to prepare a cleansing agent. Study it and answer the questions that follow.



i) What name is given to the type of cleansing agent prepared by the method shown in the scheme? (1mk)

ii) Name one chemical substance added in step II (1mk)

iii) What is the purpose of adding the chemical substance named in (ii) above. (1mk)

14. a) Define half – life of radio isotopes. (1mk)

b) Z grammes of a radioactive isotope take 100 days to decay to 20gms. If the half – life of the element is 25 days. **Calculate** the initial mass of Z of the radio- isotope. (2mks

15. Magnesium was burnt in air forming a white residue T. When put in a boiling tube with water effervescence was noticed and colourless gas D with a characteristic pungent smell was evolved. The gas turned a wet red litmus paper blue.

(a) Identify

(i) Residue **T** (1mk)

(ii) Gas D (1mk)

(b) **Write** an equation for liberation of gas D. (1mk)

16. Explain why the bleaching action of chlorine is permanent while bleaching by sulphur (IV) oxide is temporary. (2marks)

17. Explain how you would separate a mixture of nitrogen and oxygen gases given that their boiling points are -196°C and -183°C respectively. (3mks)

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

18 Hydrazine gas, shown below, burns in oxygen to form nitrogen gas and steam.

(a) Write an equation for the reaction (1mk)

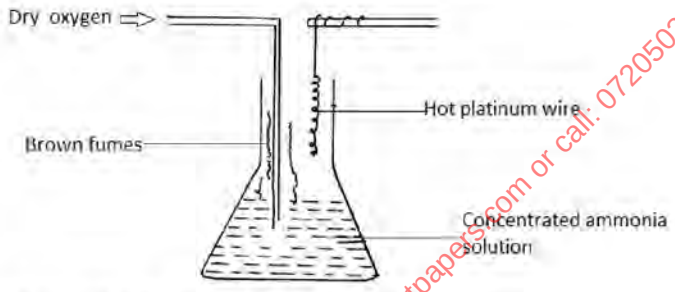
(b) Using the bond energies given below, calculate the enthalpy change for the reaction in (a) above (2mks)

Bond	Bond energy KJ per mole
N N	944
N N	163
N H	388
O O	496
H O	463

19 Using reagents provided only, explain how you could prepare solid Zinc carbonate. (2mks)

- Zinc powder
- Nitric (V) acid (dilute)
- Water
- Solid sodium carbonate

20 The apparatus below was set up to show the catalytic oxidation of ammonia.



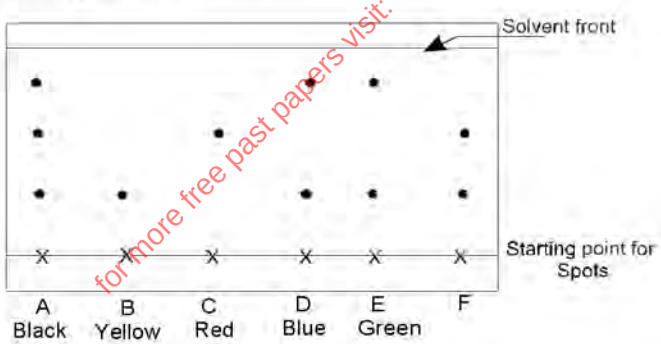
(a) Identify the brown fumes observed at the mouth of the conical flask. (1mk)

(b) Write down the equations of the reactions representing

(i) Catalytic oxidation of ammonia (1mk)

(ii) The formation of the brown fumes. (1mk)

21 Consider the chromatogram below.



A piece of chromatogram paper was spotted with colour inks obtained from pens labeled A to F. The diagram above shows the spots after the chromatograph was developed.

(a) Which two pens contained the same pigment? (1mk)

(b) According to the chromatogram which pigments are present in the inks of the pen number F (1mk)

(c) Describe how one could get a sample of yellow pigment (1mk)

22. Consider the following reaction at equilibrium.

$$PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$$

Complete the table below to show the effect of different factors on the position of equilibrium. (3mks)

Factor	Effect on the equilibrium position
(i) Decrease pressure	
(ii) Removing chlorine	
(iii) Adding Helium gas to mixture	

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

23. A student investigated the effect of an electric current by passing it through some substances. The student used inert electrodes and connected a bulb to the circuit. The table below shows the substances used and their states.

Experiment	Substance	State
1	Potassium carbonate	Solid
2	Copper (II) sulphate	Solution
3	Sugar	Solution
4	Lead (II) iodide	Molten

(a) In which experiments did the bulb not light? (1mk)

(b) Explain your answer in (a) above. (2mks)

24. Give a reason why the formula mass of NO_2 is sometimes 92 instead of 46. (1mk)

25. A compound contains only carbon, hydrogen and oxygen .Combustion of 1.068g of the compound produces 1.601g of carbon (IV) oxide and 0.437g of water. The molar mass of the compound is 176.1 / . What is the empirical and molecular formulae of the compound? (2mks)

26. (a) A sample of water in a beaker was found to boil at 102 at 1 atmospheric pressure. Assume that the thermometer was not faulty explain this observation (1mk)

(b) Study the information in the table below and answer the questions that follow.

Salt	Solubility (g/100g water)	
	At 40	At 60
$CuSO_4$	28	38
$Pb(No_3)_2$	79	98

A mixture containing 35g of $CuSO_4$ and 78g of $Pb(NO_3)_2$ in 100g of water at 60 was cooled to 40

(i) Which salt crystallized out? Give a reason. (1mk)

(ii) Calculate the mass of the salt that crystallized out. (1mk)

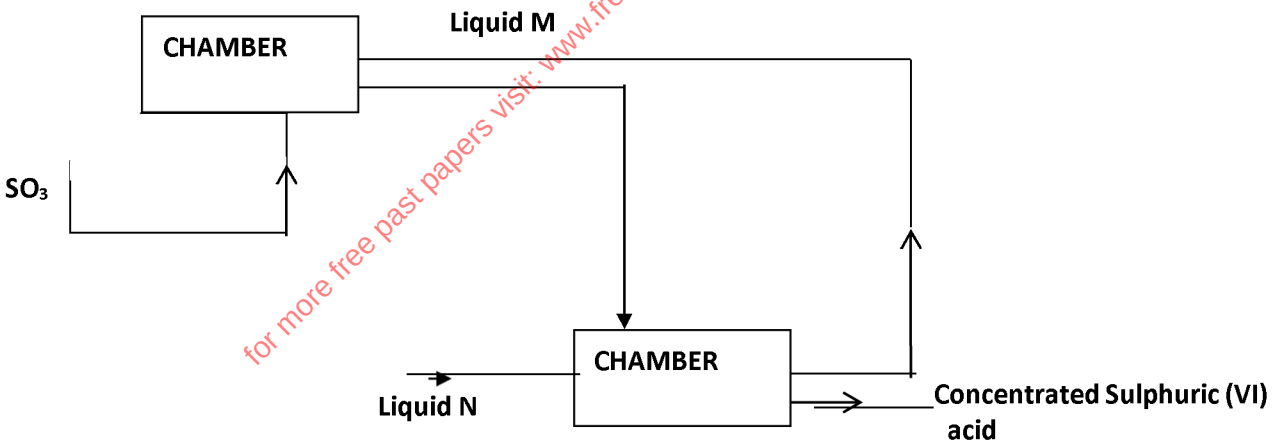
27. A student was asked to determine the percentage of zinc metal in a mixture of zinc metal and zinc oxide. He reacted the mixture with excess hydrochloric acid and accurately collected the gas evolved, which was then used to calculate the amount of zinc in the mixture.

(a) Name the gas that was evolved. (1 mark)

(b) Apart from the reaction liberating the gas write a balanced equation for the other reaction that took place. (1 mark)

(c) Why would dilute nitric acid not suitable for this reaction? (1 mark)

28. Below is part of the flow diagram of the contact process.



(a) Identify (i) Liquid **M** (1mk)

(ii) Liquid **N** (1mk)

(b) Write the equation for the reaction taking place in chamber **B**. (1mk)

29. Chlorine gas dissolved in distilled water to form chlorine water

(a) Name the compounds present in the chlorine water. (1mk)

(b) What would be observed if blue litmus paper is dipped in chlorine water? Explain. (2mks)

30. A fixed mass of gas occupies $105cm^3$ at -14 and 650mmHg pressure. At what temperature will it have a volume of $15cm^3$ if the pressure is adjusted to 690 mmHg pressure (2mks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502472

KAMDARA JET - 2016
233/2
CHEMISTRY
Paper 2
THEORY
JULY/AUGUST 2016
2 Hours

1. The grid below represents part of the periodic table. Study it and answer the questions that follow. The letters do not represent the actual symbols of the element.

				N		S		
K	Q		O			P	F	M
	R							

a) What name is given to the group of elements to which Q and R belong? (1 mark)
b) Write the formula of the compound formed when Q and P combine. (1 mark)
c) Name the type of bond formed in (b) above. (1 mark)
d) How does the atomic radii of O and P compare? Give a reason. (2 marks)
e) Draw a dot (.) and cross (x) diagram for the compound formed between N and F. (1 mark)
f) Explain how you would obtain a pure sample of the carbonate of K from its mixture with Lead carbonate powder. (2 marks)
g) Give one use of element M. (1 mark)
h) The melting point of M is -189°C lower than that of F -102°C. Explain this difference in their melting points. (2 marks)

2. The list below shows the formulae of some organic compounds. Use letters T1 to T6 to answer the questions that follow.
T_1 – $CH_3CH_2CH_2CH_2CH_3$
T_2 – $CH_3CH_2CH_2COOC_2H_5$
T_3 – $CH_3CH_2CH_2CH_2OH$
T_4 – $CH_3CH_2CH_2COOH$
T_5 – $CH_3CH_2CHCH_2$
T_6 – CH_3CCCH_3

(a) Select two compounds which:
(i) Are not hydrocarbons (1mk)
(ii) Would decolourise both bromine water and acidified potassium manganite (VII) (1mk)
(iii) Would produce hydrogen gas when reacted with potassium metal (1mk)
(b) Select a compound which would produce bubbles of a gas when reacted with sodium carbonate. (1mk)
(c) (i) Identify the compound that is likely to undergo polymerization. Give a reason for your answer. Using two molecules show how polymerization occurs.
I. Compound (1mk)
II. Reasons (1mk)
III. Polymerization (1mk)
IV Name the process by which compound T_2 is formed and identify the compounds that were used to form it.
I. Process (1mk)
II. Compounds (1mk)
(d) Compound T_3 can be converted to T_4 as shown by the equation below:
$C_4H_9OH_{(l)} + O_2(g) \rightarrow C_3H_7COOH_{(aq)} + H_2O_{(l)}$
Given the following information:
ΔH_c for C_4H_9OH = - 4910 kJ/mol
ΔH_c for C_3H_7COOH = - 4090 kJ/mol
Determine the heat change for the reaction above. (2mks)

3. a) What is meant by the term molar enthalpy of combustion? (1mks)
b) The enthalpies of combustion of carbon, hydrogen and ethanol are given below.
$C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$ $\Delta H = -393 kJmol^{-1}$
$H_{2(g)} + ½ O_{2(g)} \rightarrow H_2O_{(l)}$ $\Delta H = -286 kJmol^{-1}$
Enthalpy of combustion of ethanol $\Delta H = -1369 kJ/mol$
i) Draw an energy cycle diagram that links the enthalpy of formation of ethanol to enthalpies of combustion of Carbon, hydrogen and ethanol. (3 marks)
ii) Determine the enthalpy of formation of ethanol(1 marks)
c) An experiment was carried out where different volumes of dilute nitric acid (v) acid and aqueous potassium hydroxide both at 25°C were mixed and stirred with a thermometer.

for more free past papers visit www.kcsepastpapers.com or call 0720402479

The highest temperature reached by each mixture was recorded in the table below.

Volume of nitric (V) acid (cm^3)	4	8	12	16	20	24	28	32	36
Volume of potassium hydroxide cm^3	36	32	28	24	20	16	12	8	4
Highest temperature of mixture	19.8	22.2	24.6	27.0	27.0	25.0	23.0	21.0	19.0

Plot a graph of highest temperature (vertical axis) against volume of nitric acid. (horizontal axis) 3mks

Using your graph, determine the;

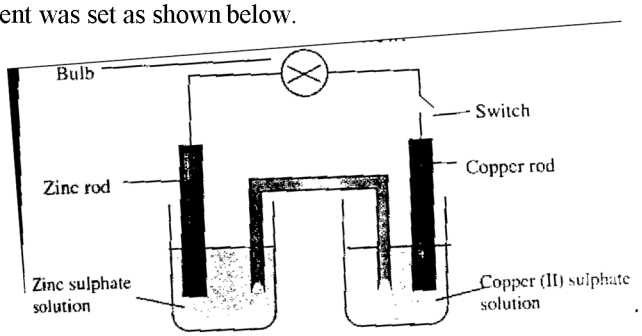
i) highest temperature reached (½ marks)

ii) The volume of the acid that reacted when the highest temperature is reached. (½ marks)

iii) The amount of heat liberated during the neutralization process
(Specific heat capacity is $4.2jg^{-1}K^{-1}$ and the density of solution is $1.0gcm^{-3}$ (2 marks)

d) The molar enthalpies of neutralization for dilute hydrochloric acid and dilute nitric (v) acid are -55 $KJmol^{-1}$.while that of ethanoic acid is -52.2kJ/mol. Explain this observation. (2 marks)

4. Experiment was set as shown below.



(a) What is observed on the bulb when the switch is closed? (1mk)

(b) Which electrode will be cathode? (1mk)

(c) Write down the half-cell equations for:

(i) Copper electrode. (1mk)

(ii) Zinc electrode. (1mk)

(d) Write the overall ionic equation for the electrochemical cell. (1mk)

(e) The table below shows the electrode potentials.

$Cu^{2+}(aq) + 2e^-$	→	Cu(s)	E = + 0.34V
$Zn^{2+}(aq) + 2e^-$	→	Zn(s)	E = – 0.76V

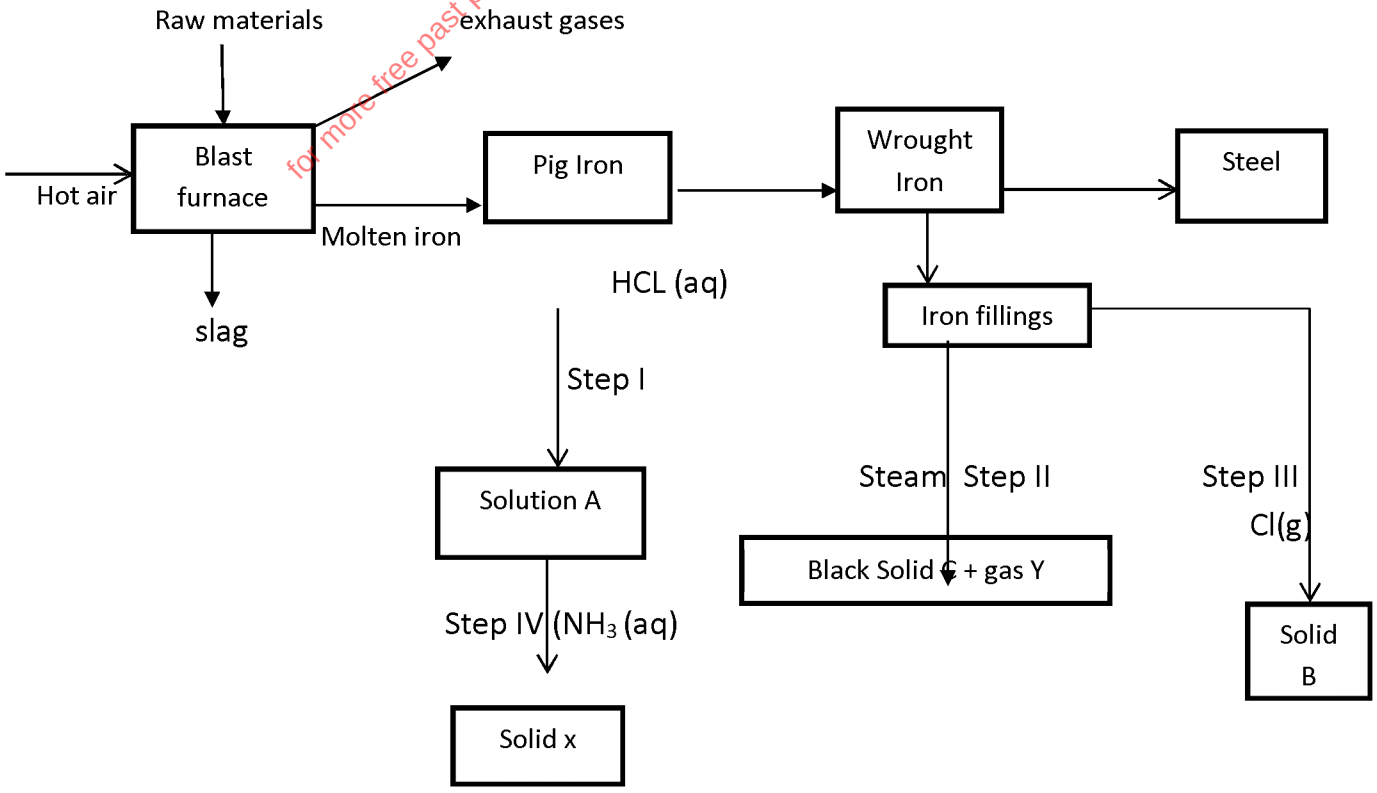
What is the value of the voltage of the cell? (2mks)

(f) The switch is kept closed. State and explain the observation expected after sometime on the

(i) The zinc rod. (2mks)

(ii) Copper (II) Sulphate solution. (2mks)

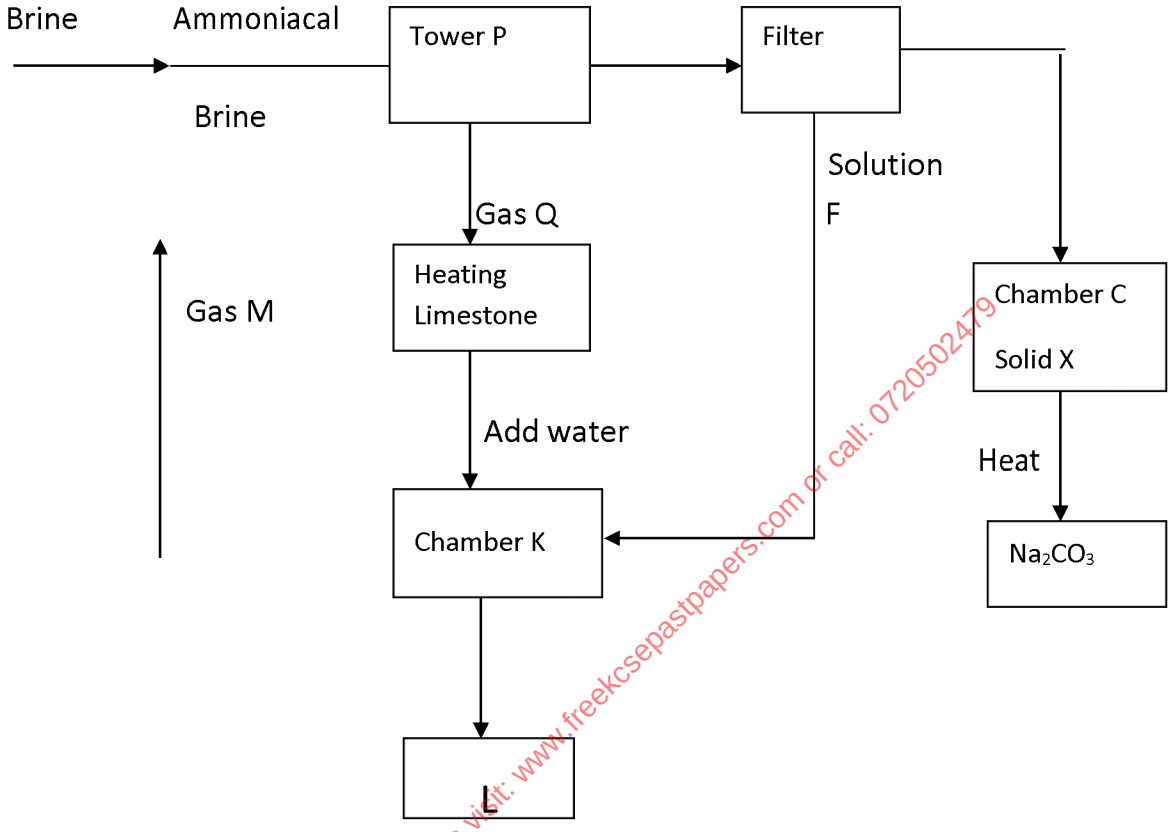
5. The chart below represents the extraction of iron and some of its uses.



for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

(a) Name the raw materials fed into the blast furnace. (2mks)
(b) Name 3 exhaust gases emitted from the blast furnace. (1½mks)
(c) (i) Why is it necessary to convert pig iron into wrought iron (1mk)
(ii) State one commercial use of iron. (1mk)
(d) Name substances A,B,C,X,Y (2½mks)
(e) i) Write equations for reactions in steps II and II
ii) Write an ionic equation for the reaction in step I. (1mk)
iii) What observations are made in steps Iand II? (2mks)

6. Study the flow chart below and answer the questions that follow.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

a) Name Gas M (1 mark)
b) Name solution F and solid X (1 mark)
Solution F -
Solid X -
c) Name the product L formed and give one of its uses (2 marks)
Product L -
Use -
d) Write equation of the reaction in the; (2 mark)
i) tower P -
ii) chamber K -
e) Name two raw materials required in the manufacture of Sodium carbonate (2 marks)
f) Write an equation of the reaction when solid x is heated. (1 mark)

7. The table below shows the volume of nitrogen (IV) Oxide produced when different volumes of 1M Nitric (V) acid – were each reacted with 4.14g of lead at room temperature.

Volume of 1 M Nitric (V) acid (cm^3)	Volume of Nitrogen (IV) oxide gas (cm^3)
10	120
30	360
50	600
70	840
90	960
110	960

(a) Explain how the rate of the reaction between lead and nitric (V) acid would be affected if the temperature of the reaction mixture was lowered. (1mks)
(b) On the grid provided below plot a graph of the volume of the gas produced (vertical axis) against volume of acid. (3mks)

(c) Using the graph, determine the volume of
  (i) Nitrogen (IV) oxide produced when 60cm^3 of 1M Nitric (V) acid were reacted with 4.14g of lead. (1mk)
  (ii) 1M Nitric (V) acid which would react completely with 4.14g of lead. (1mk)

(d) Using the answer in d(ii)above, determine
  (i) The volume of 1M Nitric (V) acid that would react completely with one mole of lead. (Pb = 207). (2mks)

(e) Calculate the number of moles of
  (i) 1M Nitric (IV) acid reacted with one mole of lead. (1mk)
  (ii) Nitrogen (IV) oxide produced when one mole of lead were reacted with excess nitric acid. (Molar gas volume is 24000cm^3). (1mk)

(f) Using the answers obtained in e(i) and e(ii) above; write the equation for the reaction between lead and nitric (V) acid given that one mole of lead (II) nitrate and two moles of water were produced. (1mk)

(g) Give a reason why nitric (V) acid is stored in dark bottles. (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KAMDARA JET - 2016

233/3
CHEMISTRY
Paper 3
(PRACTICAL)
July 2016
2¼ hours

1. You are provided with:

- **Solid P**
- 2.0M hydrochloric acid, **solution Q**
- 0.1M sodium hydroxide, **solution R**

You are required to determine the enthalpy change ΔH, for the reaction between solid P and one mole of hydrochloric acid.

Procedure I

Transfer 20.0cm^3 of 2.0M hydrochloric acid, **solution Q** in a 100ml.beaker using a burette. Measure the temperature of the solution after every half-minute and record the values in Table 1. At exactly **2½ minutes**, add all of **solid P** to the acid carefully. Stir the mixture gently with the thermometer. Measure the temperature of the mixture after every half-minute and record the values in Table 1. **(Retain the mixture for use in procedure II)**

Table 1

Time(min)	**0**	**½**	**1**	**1½**	**2**	**2½**	**3**	**3½**	**4**	**4½**	**5**
Temperature (^{o}C)						X					

(5 mks)

(i) Plot a graph of temperature (y-axis) against time. (3 mks)

(ii) Using the graph, determine the change in temperature ΔT. (1 mk)

(iii) Calculate the heat change for the reaction (Assume that the specific heat capacity of the mixture is 4.2 $Jg^{-1}K^{-1}$ and the density of the mixture is 1g/cm^3). (2 mks)

Procedure II

Rinse the burette thoroughly and fill it with sodium hydroxide. Transfer **all** the contents of the 100ml. beaker in procedure **I** into a 250ml. volumetric flask. Add distilled water to make up to the mark. Label this as solution **N**. Using a **pipette filler**, place 25.0cm^3 of solution **N** into a 250ml. conical flask. Add **two** or **three** drops of phenolphthalein indicator and titrate against **solution R**. Record your results in table 2. Repeat titration two more times and complete Table 2.

Table 2

	I	II	III
Final burette reading(cm^3)			
Initial burette reading(cm^3)			
Volume of **solution R** used (cm^3)			

(3 mks)

Calculate the:

(i) average volume of sodium hydroxide solution R. (1 mk)

(ii) the number of moles of :

I Sodium hydroxide solution R. (1 mk)

II hydrochloric acid in 25cm^3 of **solution N**. (1 mk)

III hydrochloric acid in 250cm^3 the of **solution N** (1 mk)

IV hydrochloric acid in 20.0cm^3 of **solution Q** (1 mk)

V hydrochloric acid that reacted with **solid P** (1 mk)

(c) Calculate the enthalpy of reaction between **solid P** and one mole of hydrochloric acid. (Show the sign of ΔH). (2 mks)

2 You are provided with **solid E**. Carry out the following tests and write your observations and inferences in the spaces provided.

a) Place all of **solid E** into a boiling tube. Add about 12cm^3 of distilled water and shake thoroughly. Filter the mixture and place the filtrate into another boiling tube. Dry the residue using pieces of filter paper.
Retain the filtrate for use in 2(b) below.

for more free past papers visit www.freekcsepastpapers.com or call: 0720602979

(i) Transfer **half** of the dry residue into a dry test tube. Heat the residue strongly and test any gas produced using a burning wooden splint.

Observations (2 mks)	Inferences (1 mk)

(ii) Place the **other half** of the residue in a dry test-tube. Add $4cm^3$ of 2M nitric acid. **Retain the mixture for test (iii) and (iv) below .**

Observations (1 mk)	**Inferences** (1 mk)

(iii) To $2cm^3$ of solution obtained from a(ii) above, add aqueous ammonia drop by drop until in excess.

Observations (½ mk)	**Inferences** (½ mk)

(iv) To $2cm^3$ of the other solution obtained in a(ii) above, add $2cm^3$ of potassium iodide solution

Observations (1 mk)	**Inferences** (1 mk)

(b) Divide the **filtrate obtained in 2(a) above** into 5 portions.

(i) To the first portion of the filtrate add aqueous ammonia drop by drop until in excess.

Observations (1 mk)	**Inferences** (1 mk)

(ii) To the second portion of the filtrate add 2 drops of sodium sulphate solution.

Observations (½ mk)	**Inferences** (½ mk)

(iii) To the third portion of the filtrate, add 2 drops of barium nitrate solution followed by about 2 cm^3 of nitric acid solution

Observations (1 mk)	**Inferences** (1 mk)

3. You are provided with **solid F**. Carry out the tests below and record your observations and inferences in the spaces provided.

(a) (i) Using a metallic spatula, heat half of **solid F** in a non-luminous Bunsen burner flame for some time then remove when it ignites.

Observations (1mk)	**Inferences** (1mk)

(b) Put a half spatula endful of **solid F** into a boiling tube. Add about $10cm^3$ of distilled water and shake vigorously. Divide the resulting solution into two portions.

(i) To the first portion, dip a piece of universal indicator paper and determine its pH

Observations (½ mk)	**Inferences** (½ mk)

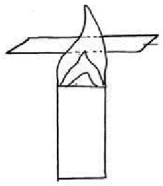
(ii) To the second portion, add two drops of acidified potassium manganate (VII) solution and shake vigorously.

Observations (1 mk)	**Inferences** (1 mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

NANDI EAST, NANDI SOUTH & TINDERET SUB-COUNTIES JOINT EVALUATION 2016
233/1
CHEMISTRY
PAPER 1
THEORY
JULY / AUGUST 2016
TIME: 2 HOURS

1. The diagram below represents a flame of the Bunsen burner.



Piece of white paper

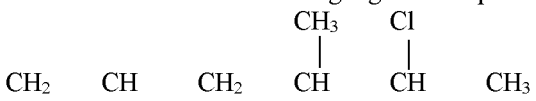
(i) A piece of paper is flipped over the flame as shown in the diagram. Draw a sketch to show the outcome. (1mk)
(ii) State **two** reasons why laboratory apparatus are made of glass. (1mk)

2. (a) Distinguish between atomic number and mass number. (1mk)
(b) An isotope M has 20 neutrons and a mass number of 37.
(i) Draw the atomic structure of M. (1mk)
(ii) To which group does M belong? Explain. (1mk)

3. Using relevant equations show that zinc oxide is an amphoteric oxide. (3mks)

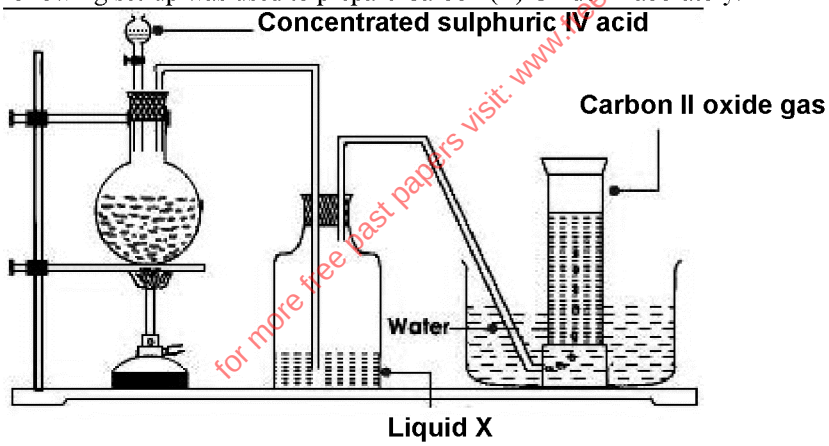
4. (a) State the Gay Lussac"s Law. (1mk)
(b) When 75cm^3 of a gaseous hydro-carbon CxHy burns in 250cm^3 of oxygen, 25cm^3 of oxygen is unused, 150cm^3 of carbon (IV) oxide is formed. Determine the volume of steam formed hence deduce the formular of the Hydro-carbon. (2mks)

5. (a) Give the name of the following organic compound. (1mk)



(b) 1 mole of HBr reacts with propene molecules. Draw the structure and name the compound formed. (2mks)

6. The following set-up was used to prepare Carbon (II) Oxide in laboratory.



(a) Name liquid X and state its value. (2mks)
(b) Explain why the gas is collected over water. (1mk)

7. Given that:

$C_{(S)} + O_{2(g)} \rightarrow CO_{2(g)} \quad \Delta H_c^o = -395\ kJMol^{-1}$

$H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)} \quad \Delta H_c^o = -286\ kJMol^{-1}$

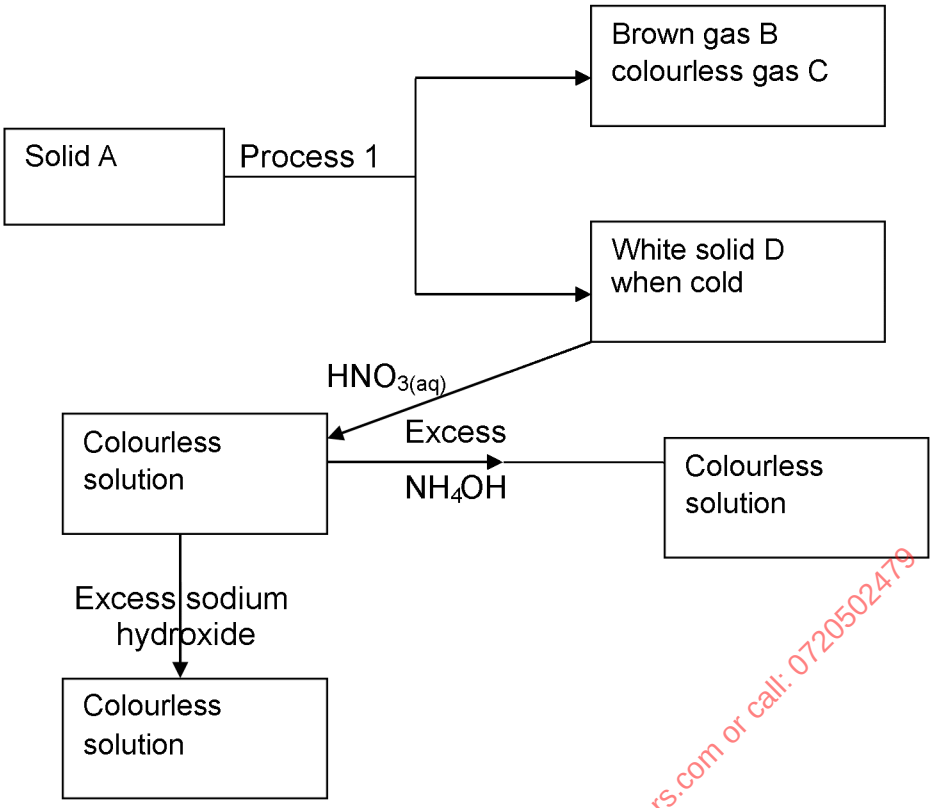
$C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 4H_2O_{(l)} \quad \Delta H_c^o = -2209\ kJMol^{-1}$

Calculate the enthalpy of formation of propane. (3mks)

8. State and explain the observations made when concentrated nitric (V) acid is added to copper turnings. (3mks)

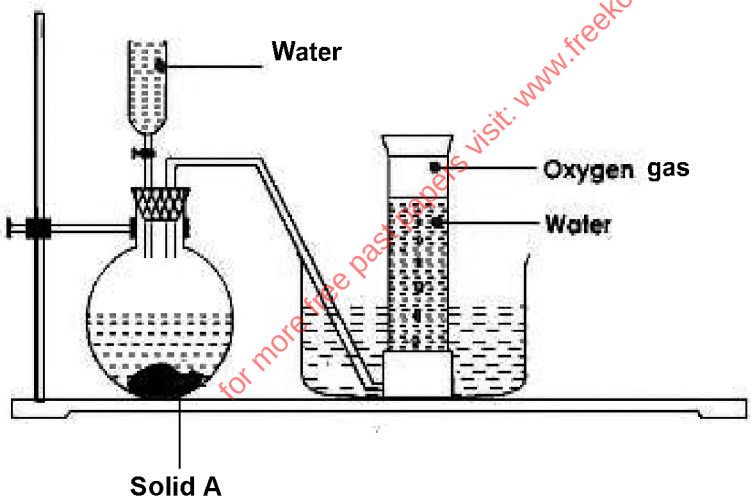
for more free past papers visit: www.kcsepastpapers.com or call: 0720502479

9. Study the Flow chart below and answer the questions that follow.



(i) Identify the cation and anion present in solid A. (1mark)
(ii) Identify substance: A and B (1 mark)

10. The diagram below represents a set-up for the laboratory preparation of oxygen gas.



(i) Name solid A. (1mk)
(ii) Write a balanced chemical equation for the reaction that took place. (1mk)

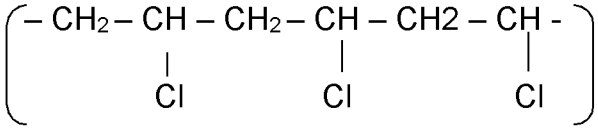
11. Explain why Hydrogen Sulphide is a gas at room temperature while water is liquid at room temperature. (2mks)

12. (a) During the extraction of Aluminium, the oxide of metal is dissolved in Molten cryolite before it is electrolysed. Explain. (1mk)

(b) Giving reasons, state **two** uses of Aluminium metal. (2mks)

13. State and explain the observation made when coloured flowers are placed into a gas jar full of chlorine gas. Use equations where possible. (3mks)

14. A section of a polymer has the following structure.



A sample of this polymer is found to have a molecular mass of 1500.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

Determine the number of monomers in the polymer (H = 1, C = 12, Cl = 35.5) (2mks)

15. (a) Zinc is extract from calamine, name another ore used to extract zinc. (1mk)
    (b) Name the reducing agent used in the furnace during extraction of zinc. (1mk)
    (c) Explain the effect of the by-product of roasting process of zinc ores on the environment. (1mk)
16. Xg of sodium hydroxide were dissolved in distilled water to make $100cm^3$ of solution $40cm^3$ of this solution required $25cm^3$ of 1M sulphuric (VI) acid. Determine the mass of X of solution of sodium hydroxide (Na = 23, O = 16, H = 1) (2mks)
17. Study the table below and answer the questions that follow.

Element / Ion	Electronic configuration
K^{-3}	2,8,8
L^{+1}	2,8

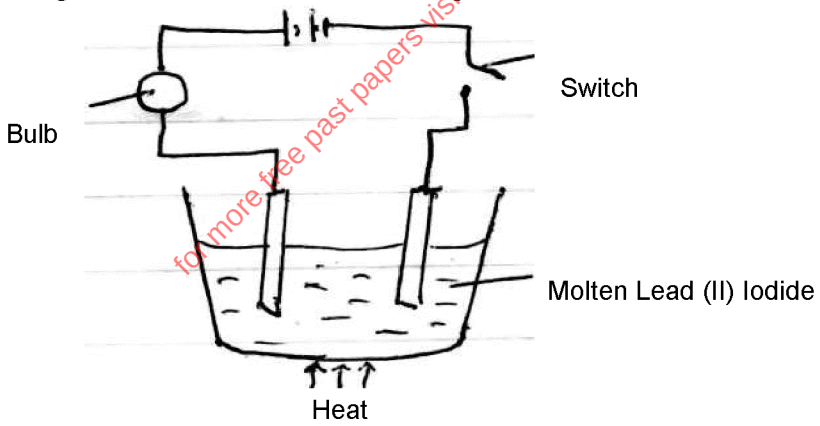
    (a) Write the formula of the chloride of element K. (1mk)
    (b) With reason(s) compare the melting point of the chlorides of element K to that of element L (2mks)
18. (a) State the Le Chateliars principle. (1mk)
    (b) Ammonia gas can be prepared as shown:

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)} \qquad \Delta H = -91kJ/mol.$$

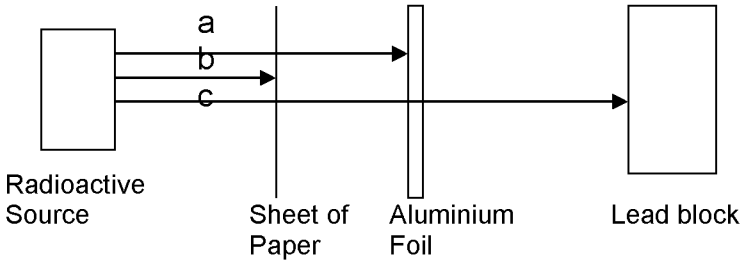
    State and explain the observations made if the pressure is increased in the system. (2mks)
19. During electrolysis of a sulphate of metal M, using M electrodes, a current of 0.5A was passed through the solution for 12 minutes, 52 seconds. The mass at the cathode increases from 2.40g to 2.44g. Determine the charge of metal M (1f = 96500C, M = 20). (3mks)
20. When hydrocarbon was completely burnt in air, 2.51g of carbon (IV) oxide and 1.28g of water were formed. Given that the compound has a relative molecular mass of 58, find its molecular formular (C = 12, H=1). (3mks)
21. (a) Nitrogen (II) oxide can be prepared by catalytic oxidation of ammonia. Name the catalyst used in the process. (1mk)
    (b) State **two** uses of ammonia. (2mks)
22. (a) Flower extracts are oftenly used as indicators in the laboratory. State one disadvantage of using flower extracts as indicators. (1mk)
    (b) Complete the table below.

Indicator	Colour in		
	Acid	Base	Neutral
Phenolphthalein		Pink	Colourless
Methyl orange	Pink		Orange

23. Study the diagram below and use it to answer the questions that follow.



    (a) Write the equations for the reactions taking place at the:
        I. Anode (1mk)
        II. Cathode (1mk)
    (b) Name **one** application of electrolysis. (1mk)
24. Alkaline earth metals are generally less reactive than alkali metals. Explain. (2mks)
25. The diagram below shows properties of radiations.

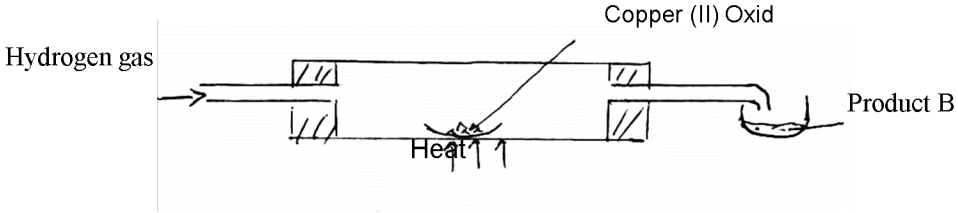


for more free past papers visit www.freekcsepastpapers.com or call: 0725508479

(a) Identify the particles labeled a and b. (1mk

(b) State **two** differences between chemical and nuclear reactions. (2mks)

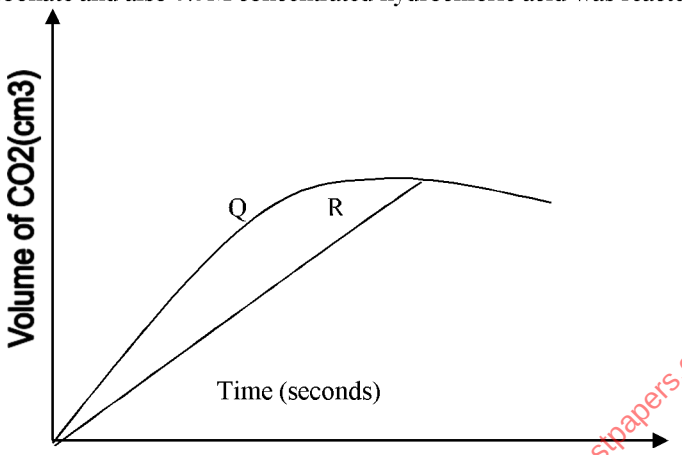
26. Study the diagram and use it to answer the question that follow.



(i) State the observations in the combustion tube. (1mk)

(ii) Describe the chemical test for product B. (1mk)

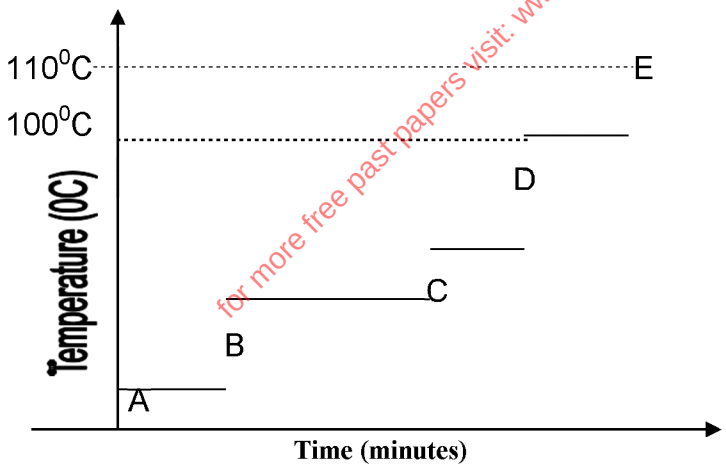
27. The curves below represent the volume of carbon (IV) oxide gas evolved when 1M concentrated hydrochloric acid and 60g of calcium carbonate and also 0.5M concentrated hydrochloric acid was reacted with the same quantity of the carbonate.



(a) Which of the curves represent the reaction of 1M concentrated hydrochloric acid with powdered calcium carbonate. Explain. (1mk)

(b) Explain why the curves flatters at the same level of production of carbon (IV) oxide. (1mk)

28. The diagram below shows heating curve of water in the laboratory.



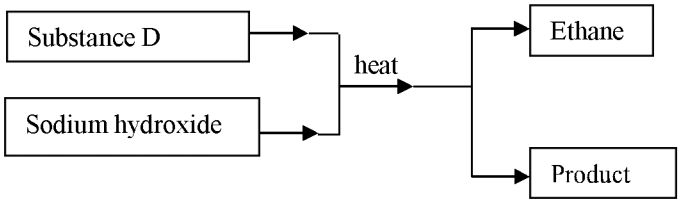
(i) At what temperature does the water boil? (½mk)

(ii) Giving reason(s) is this pure or impure water? (1½ mks)

(iii) State the effect of impurities on the boiling point of water? (1mk)

29. When 0.1g of a certain compound Q was burned and used to heat 150cm^3 of water, the temperature rose from 250C to 290C. Calculate the relative molecular mass of the compound given that 1 mole of the compound has an enthalpy of -1072kJ/mol. (S.h.C = 4.2J Kg^{-1}k^{-1}, density of water = 1g/cm^3) (2mks)

30. Study the flow chart below and answer the questions that follow.



Name the substances: C and D

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

NANDI EAST, NANDI SOUTH & TINDERET SUB-COUNTIES JOINT EVALUATION 2016

233/2
CHEMISTRY
PAPER 2
THEORY
JULY / AUGUST 2016
TIME: 2 HOURS

1. Use standard electrode potentials of elements A, B, C, D and F given below to answer the questions that follow. The letters do not represent the actual symbols of the elements.

	E^{θ} volts
$A^{2+}_{(aq)} + 2e^- \rightleftharpoons A_{(s)}$	-2.90
$B^{2+}_{(aq)} + 2e^- \rightleftharpoons B_{(s)}$	-2.38
$C^{+}_{(aq)} + 2e^- \rightleftharpoons \frac{1}{2}C_{2(g)}$	0.00
$D^{2+}_{(aq)} + 2e^- \rightleftharpoons D_{(s)}$	+0.34
$\frac{1}{2}F_{2(g)} + e^- \rightleftharpoons F^-_{(aq)}$	+2.87

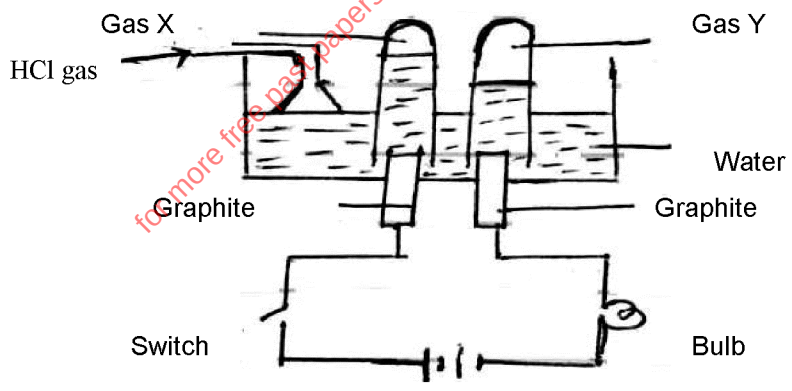
(i) Which element is likely to be hydrogen? Give a reason for your answer. (2mks)

(ii) What is the E^{θ} value of the strongest reducing agent? (1mk)

(iii) In the space provided, draw a labeled diagram of the electrochemical cell that would be obtained when half-cells of element B and D are combined. (3mks)

(iv) Calculate E^{θ} the value of the electrochemical cell constructed in (iii) above. (2mks)

(b) Study the diagram below and answer the questions that follow.



When some hydrogen chloride gas is allowed into water and the mixture stirred, the bulb lights and gases X and Y are formed.

(i) Name: Gas X (1mk)
Gas Y (1mk)

(ii) Explain why the bulb does not light before the hydrogen chloride gas is let into the water. (2mks)

2. (a) State how burning can be used to distinguish between ethane and ethyne. Explain your answer. (2mks)

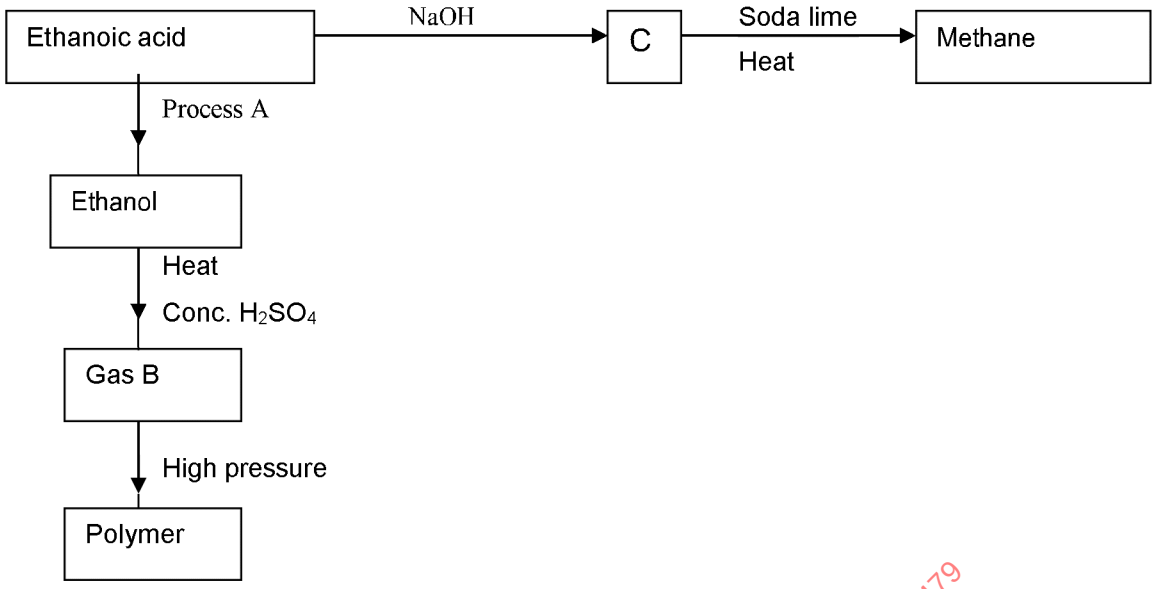
(b) Draw the structural formula of:

(i) Butyne (1mk)

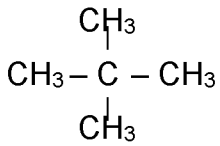
(ii) Propanoic acid (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(c) The flow chart below shows a series of reactions starting with ethanol. Study it and answer the questions that follow.



(i) Name
I. Process A (1mk)
II. Substances B and C (2mks)
(ii) Write an equation for the combustion of ethanol. (1mk)
(iii) Explain why it is necessary to use high pressure to change gas B into the polymer. (1mk)
(iv) State **one** use of methane. (1mk)
(d) Give the names of the following compounds:

(i)  (1mk)

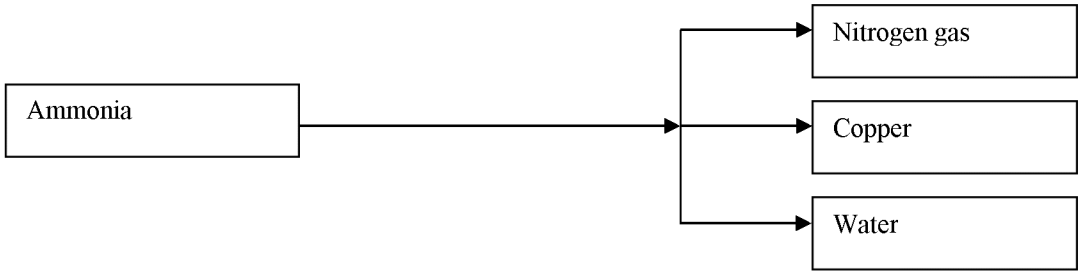
(ii) $CH_3C \equiv C\ CH_2\ CH_3$ (1mk)

3. (a) At 25^0C, 50g of potassium nitrate were added to 100g of water to make a saturated solution.
What is meant by a saturated solution? (1mk)
(b) The table below gives the solubilities of potassium nitrate at different temperatures.

Temperature ^{0}C	12	20	28	36	44	52
Solubility g/100g of water	22	31	42	55	70	90

(i) Plot a graph of the solubility of potassium nitrate (vertical axis) against temperature. (3mks)
(ii) Using the graph:
I. Determine the solubility of potassium nitrate at 15^0C. (1mk)
II. Determine the mass of potassium nitrate that remained undissolved given that 80g of potassium nitrate were added to 100cm^3 of water and warmed to 40^0C. (2mks)
(c) Determine the molar concentration of potassium nitrate at 150C. (Assume there is no change in density of water at this temperature) (K = 39.0; N = 14.0; O = 16.0) (2mks)
(d) Starting with aluminium sulphate, describe how a solid sample of aluminium hydroxide could be prepared. (3mks)

4. (a) Describe the process by which nitrogen is obtained from air on a large scale. (4mks)
(b) Study the flow chart below and answer the questions that follow.



for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

(i) Identify gas J. (1mk)
(ii) Using oxidation numbers, show that ammonia is the reducing agent in step VI. (2mks)
(iii) Write the equation that occurs in step V. (1mk)
(iv) Give **one** use of ammonium nitrate. (1mk)

(c) (i) The reaction between Lead (II) Nitrate and concentrated sulphuric (VI) acid starts but stops immediately. Explain. (2mks)

(ii) Name **one** suitable reagent that can be reacted with concentrated sulphuric (VI) acid to produce nitric (V) acid. (1mk)

5. Study the following part of periodic table chart and use it to answer the question that follow. The letters are of the actual symbols of the elements.

						A		
	S		C			D	E	
F	G							
							H	
	B							

(a) (i) Which elements form ions with charge of -2. Explain. (1mk)
(ii) Compare the ionic radius of C and E. Explain. (2mks)
(iii) Write the formular of the compound formed between element G and H. (1mk)
(iv) In terms of structure of bonding, explain why the oxides of D has a lower melting point than that of G. (1mk)

(v) Write an equation to show the action of heat on nitrates of F and G. (1mk)

(b) (i) What is electron affinity? (1mk)

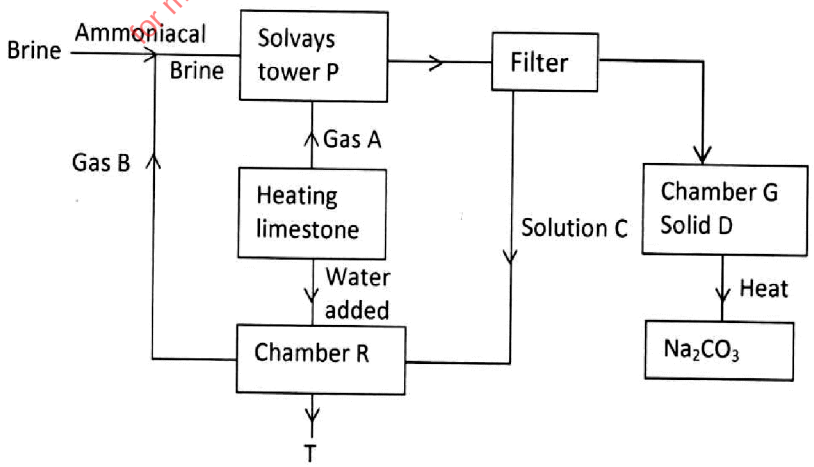
(ii) Elements E and H are in the same group in the periodic table. Which of these two elements is most reactive. Explain. (1mk)

(c) Study the table below and answer the questions that follow.

Substance	A	B	C	D	E	F
Mpt ^{0}C	801	119 113	139	-5	-101	1356
Bpt ^{0}C	1410	445	457	54	-36	2860
Electrical conductivity (solid)	Poor	Poor	Good	Poor	Poor	Poor
Electrical conductivity (liquid)	Good	Poor	Good	Poor	Poor	poor

(i) Identify a substance with:
(a) Giant metallic structure (1mk)
(b) Simple molecular structure (1mk)
(ii) Substance A and C conduct electric current in the liquid state. State how the two substances differ as conductors of electric current. (2mks)

6. The diagram below shows the process of manufacturing sodium carbonate using solvay process. Study it and answer the questions that follow.



(a) Name gases A and B. (2mks)
(b) Name liquid C and solid D. (2mks)
(c) Write equations of the reactions in: (2mks)
Tower P:
Chamber R:

For more free past papers visit: www.freekcsepastpapers.com or call: 0720092479

(d) Name the product T formed at chamber R and give **one** of its uses. (2mks)

(e) Explain using ionic equations how sodium carbonate is used to soften hard water. (2mks)

7. (a) Define the standard enthalpy of formation of a substance. (2mks)

(b) Use the thermo chemical equations below to answer the questions that follow.

1. $C_2H_6 + \frac{7}{2}O_2 \rightarrow 2CO_{2(g)} + 3H_2O_{(l)} : \quad \Delta H_1 = -1860\ kJ/mol$

2. $C_{graphite} + O_{2(g)} \rightarrow CO_{2(g)} : \quad \Delta H_2 = -394\ kJ/mol$

3. $H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)} \quad \Delta H_3 = -286\ kJ/mol$

(i) Name **two** types of heat changes represent by ΔH_3 (2mks)

(ii) Draw an energy level diagram for the reaction represented by equation 1. (2mks)

(iii) Calculate the standard enthalpy of formation of ethane. (2mks)

(c) When a sample of ethane was burnt, the heat provided raised the temperature of 500cm^3 of water by 21.5k (specific heat capacity of water = 4.2kJ/kg/k and density of water = 1g/cm^3.
Calculate the:

(i) Heat change for the reaction. (2mks)

(ii) Mass of ethane burnt (RFM of ethane = 30). (2mks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

NANDI EAST, NANDI SOUTH & TINDERET SUB-COUNTIES JOINT EVALUATION 2016
233/3
CHEMISTRY PRACTICAL
JULY / AUGUST 2016
CONFIDENTIAL INSTRUCTIONS TO SCHOOLS

Each student should have the following:-

1. $100cm^3$ of solution B.
2. $80cm^3$ of solution A.
3. Pipette (25ml)
4. Burette (50ml) in a retort stand.
5. Methyl orange indicator with a dropper.
6. Two conical flasks.
7. Filter funnel
8. Measuring cylinder (10ml)
9. Measuring cylinder (50ml)
10. Thermometer (-10 to 110^0C)
11. 100ml beaker preferably plastic.
12. Stopwatch / clock
13. 2 Labels
14. 100ml Hydrogen peroxide solution D
15. $50cm^3$ of solution C.
16. $50cm^3$ of solution E.
17. $30cm^3$ of starch solution K.
18. Liquid P (about 10ml ethanol)
19. Wooden splint
20. Solid M (1cm piece of magnesium ribbon)
21. Test tube rack
22. Six test tubes
23. Two boiling tubes
24. 6g of solid L (prepared by mixing ammonium sulphate and aluminium sulphate in the ratio 1:1 i.e. 2g of ammonium sulphate and 2g of aluminium sulphate)
25. Pieces of blue and red litmus paper.
26. Distilled water in a wash bottle.
27. A metallic spatula.
28. About 1g of sodium hydrogen carbonate.

Students should have access to:-

(a) Acidified potassium chromate (VI)
(b) Ethanoic acid
(c) 1M sulphuric (VI) acid with a dropper
(d) Source of heat
(e) 1M barium nitrate solution with a dropper
(f) 1M nitric acid
(g) 1M lead II nitrate with a dropper
(h) 1M ammonia solution with a dropper
(i) 1M potassium iodide solution with a dropper

NOTE: HOW TO PREPARE SOLUTIONS

- Hydrogen peroxide is prepared by measuring accurately using a clean measuring cylinder $100cm^3$ and 100 volume of hydrogen peroxide and add $900cm^3$ of distilled water to make a litre of solution.
- Potassium iodide is prepared by weighing accurately 8.3g and dissolve in $200cm^3$ of distilled water and make the mark to 1 litre of solution.
- Sodium thiosulphate (Na2S2O3) 0.1M is prepared by weighing accurately 15.8g and dissolve in $200cm^3$ of distilled water and make the mark to 1 litre.
- Solution B is 1M HCl.
- Starch solution is papred by dissolving 20.0g of starch powder in $100cm^3$ of distilled water.
- Solution A is prepared by mixing 53g of sodium carbonate and 42g of sodium chloride and dissolved in one litre of distilled water.
- Solution B is 1M hydrochloric acid.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

NANDI EAST, NANDI SOUTH & TINDERET SUB-COUNTIES JOINT EVALUATION 2016

233/3
CHEMISTRY
PAPER 3
PRACTICAL
JULY / AUGUST 2016
TIME: 2 ¼ HOURS

1. (I) You are provided with:-

- Solution A containing 95g of a mixture of sodium carbonate and sodium chloride per liter of solution.
- Solution B which is 1MHCl.

You are to determine the percentage of sodium carbonate in the mixture.

Proceed as follows:

Pipette 25.0cm^3 of solution A and transfer it to the conical flask. Titrate it with solution B from the burette using 3 drops of methyl orange indicator. Stop titrating when a permanent pink colour appears. Repeat the experiment and complete the table below.

TABLE I

	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of **B** used (cm^3)			

(4mks)

(a) Determine the average volume of solution B used. Show your workings. (1mk)
(b) Determine the number of moles of B used. (1mk)
(c) Determine the number of moles of the base used. (1mk)
(d) Calculate the concentration of sodium carbonate in mol dm^{-3}. (1mk)
(e) Determine the mass of sodium carbonate in 1 litre of the solution (Na = 23, C = 12, O = 16) (1mk)
(f) Determine the percentage of sodium carbonate in the mixture. (1mk)

(II) You are provided with the following:-

- Hydrogen peroxide labeled solution D
- Dilute Hydrochloric acid labeled solution B
- Sodium thiosulphate labeled solution C
- Potassium iodide labeled solution E
- Starch solution labeled solution K
- Distilled water in a wash bottle

You are required to determine how the rate of reaction of hydrogen peroxide with potassium iodide varies with the concentration of hydrogen peroxide.

Procedure

Experiment 1

Using a burette, place 25cm^3 of solution D into beaker 1. Into the same beaker, add 20cm^3 of solution B using a 50ml or 100ml measuring cylinder. Shake the contents of beaker 1.

Using a 10ml measuring cylinder, place 5cm^3 of solution C into beaker 2 followed by 5cm^3 of solution E then 2cm^3 of solution K. Shake the contents of beaker 2.

Pour the contents of beaker 2 into beaker 1 and start a stop clock / watch immediately.

Swirl the mixture and let it stand. Note the time taken for the blue colour to appear.

Record the time in the space provided for experiment 1 in the table below.

Clean beaker 1. Repeat the procedure with the volumes of water, solutions B, C, D, E and K as shown in the table for experiments 2 to 5.

(a) Complete the table by computing $\frac{1}{Time}$ Sec-1 (5mks)

Experiment	Volume of water(cm^3)	Volume of hydrogen peroxide, solution D (cm^3)	Volume of dilute sulphuric acid, solution B (cm^3)	Volume of sodium thiosulphate, solutionC (cm^3)	Volume of potassium iodide solution E (cm^3)	Volume of starch solution, solution K (cm^3)	Time (sec)	$\frac{1}{Time}$ Sec-1
1	0	25	20	5	5	2		
2	5	20	20	5	5	2		
3	10	15	20	5	5	2		
4	15	10	20	5	5	2		
5	20	5	20	5	5	2		

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(b) Plot a graph of $\frac{1}{Time}$ Sec-1 (y-axis) against volume of hydrogen peroxide used in solution A. (3mks)

(i) From your graph, determine the time that would be taken if the contents of beaker 1 were: 17.5cm^3 water, 7.5cm^3 solution D and 20cm^3 solution B. (2mks)

(ii) How does the rate of reaction of hydrogen peroxide with potassium iodide vary with the concentration of hydrogen peroxide? (1mk)

2. You are provided with liquid P. Carry out the tests on the liquid to determine its content.

(b) Place about 1cm^3 of P in a test tube; drop a piece of magnesium, solid M.

Observations	Inferences
(1mk)	(1mk)

(c) Place a drop of liquid P on the back of your hand and blow over it.

Observations	Inferences
(1mk)	(1mk)

(d) Divide the remaining liquid into two portions.

(i) To the first portion add three drops of acidified potassium chromate (IV). ($K_2Cr_2O_7$)

Observations	Inferences
(½mk)	(½mk)

(ii) To the 2nd portion, add equal volume of ethanoic acid followed by three drops of concentrated sulphuric (IV) acid and boil the mixture.

Observations	Inferences
(½mk)	(½mk)

3. You are provided with solid L. Carry out the tests and record your observations and inferences.

(a) Take a spatula full of solid in a clean dry boiling tube and heat gently then strongly.

Observations	Inferences
(1mk)	(1mk)

(b) Place the remaining solid L in a clean boiling tube and add about 10cm^3 of distilled water. Divide the resulting product into four portions.

Observations	Inferences
(½ mk)	(½ mk)

(i) To the first portion, add 1cm^3 barium nitrate solution.

Observations	Inferences
(1mk)	(1mks)

(ii) To the second portion, add 1cm^3 of nitric (V) acid followed by lead (II) nitrate.

Observations	Inferences
(1mk)	(1mk)

(iii) To the third portion, add excess ammonia solution.

Observations	Inferences
(½ mk)	(½ mk)

(iv) To the fourth portion, add 1cm^3 of potassium iodide solution.

Observations	Inferences
(½ mk)	(½ mk)

(v) To the fourth portion, add a spatula full of sodium hydrogen carbonate powder.

Observations	Inferences
(1mk)	(1mk)

for more free past papers visit: www.kcsepastpapers.com or call: 0720502479

MOKASA JOINT EXAMINATION
Kenya Certificate to Secondary Education
CHEMISTRY PAPER 1
233/1
CHEMISTRY
Paper 1
Time: 2 hours

1. Explain the following:
   (i) It is always advisable to scoop chemical substances using a clean spatula. (½ mark)
   (ii) Flammable substances should always be kept away from flames in the laboratory. (½ mark)
2. Name one reagent that can be used to distinguish between Al^{3+} and Zn^{2+} ions in solution and state what would be observed if each of the ions is treated with the reagent you have named. (3 marks)
3. Manganese sulphide reacts with acids according to the following equation.

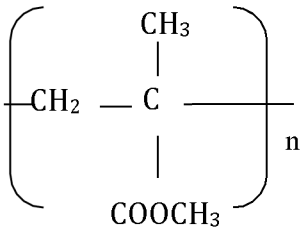
   ( ) ( ) ⇌ (aq) + ( ) ( )

   State, giving a reason what would happen to the equilibrium if;
   (i) Water is added to the equilibrium mixture. (1 ½ marks)
   (ii) Hydrogen chloride is bubbled into the equilibrium mixture. (1 ½ marks)

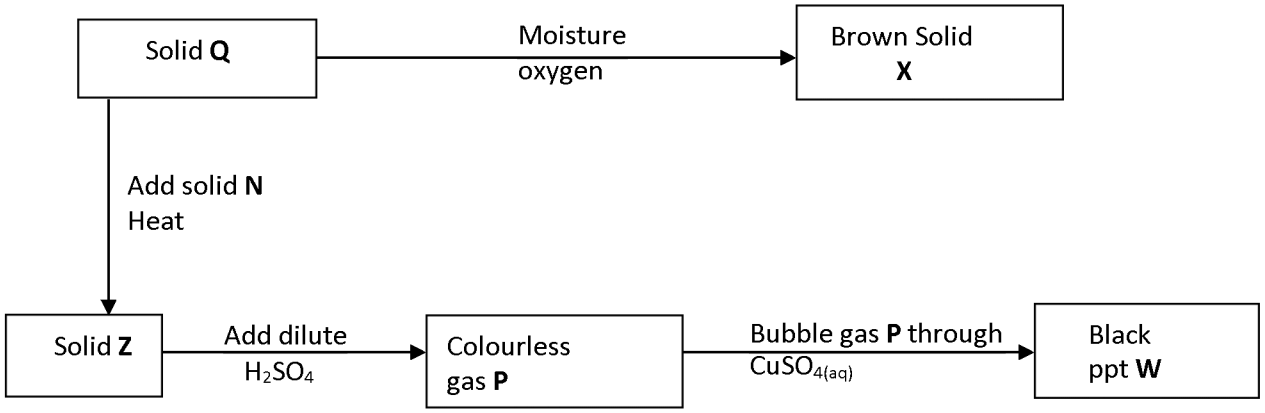
4. Use the thermochemical equations below to answer the questions that follow.

   − ( ) ( ) ( )
   ( ) ( ) ( )
   ( ) − ( )

   (i) Draw an energy cycle diagram to show the enthalpy of formation of ethane. (1 ½ marks)
   (ii) Calculate the enthalpy of formation of ethane. (1 ½ marks)
5. State the conditions under which copper reacts with sulphuric acid and give an equation for the reaction. (2 marks)
6. When 8.8g of hydrocarbon Z was burnt in excess air, 14.4g of water and 11.95 dm^3 of carbon (IV) oxide were obtained at s.t.p. Determine the empirical formula of Z. (3 marks)
7. Perspex is a synthetic polymer of formula



   (a) Write the structural formula of the monomer of Perspex. (1 mark)
   (b) State the type of polymerization involved in the formation of perspex. (1 mark)
8. When zinc granules are dropped into two separate solutions of dilute sulphuric (VI) and concentrated sulphuric (VI) acid, effervescence of a colourless gas occurs in each case. Give equations to represent the reactions that take place. (2 marks)
9. Study the chart below and answer the questions that follow.



   (a) Identity solid **X**. (1 mark)
   (b) Write an ionic equation for the reaction between P and copper (II) sulphide solution. (1 mark)
   c) State the observation made when gas P is bubbled through iron (III) chloride solution. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

10. Use the nuclear equations below to answer the questions that follow.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(i)

(ii)

(a) Give the actual names of particles X and Y. **(1 mark)**

(b) Give the name of a radiation whose emission does not change the mass number or the atomic number of a radioisotope. **(1 mark)**

11. The structures below represent two cleaning agents M and P.

M **P**

Which cleaning agent would be most suitable for use with water containing calcium sulphate. Give a reason. **(2 marks)**

12. You are given the following half equations:

( ) –

( ) ( )

( ) –

( ) ( )

(i) Obtain an equation of the cell reaction. **(1 mark)**

(ii) Calculate the value for the cell. **(1 mark)**

(iii) Give the oxidizing species. **(1 mark)**

13. Using dots (•) and crosses (×) to represent outermost electrons; draw diagrams to show bonding in:

(a) Aluminium chloride. **(1 ½ marks)**

(b) Sulphuric (IV) oxide. **(1 ½ marks)**

14. Use the information in the table below to answer the questions that follow.

Melting point	Element	Atomic number
97.8	R	11
660	S	13
1440	T	14
-40.1	U	17
63.1	V	19

(a) Write the electron arrangement of: **(1 mark)**

(i) ion of S

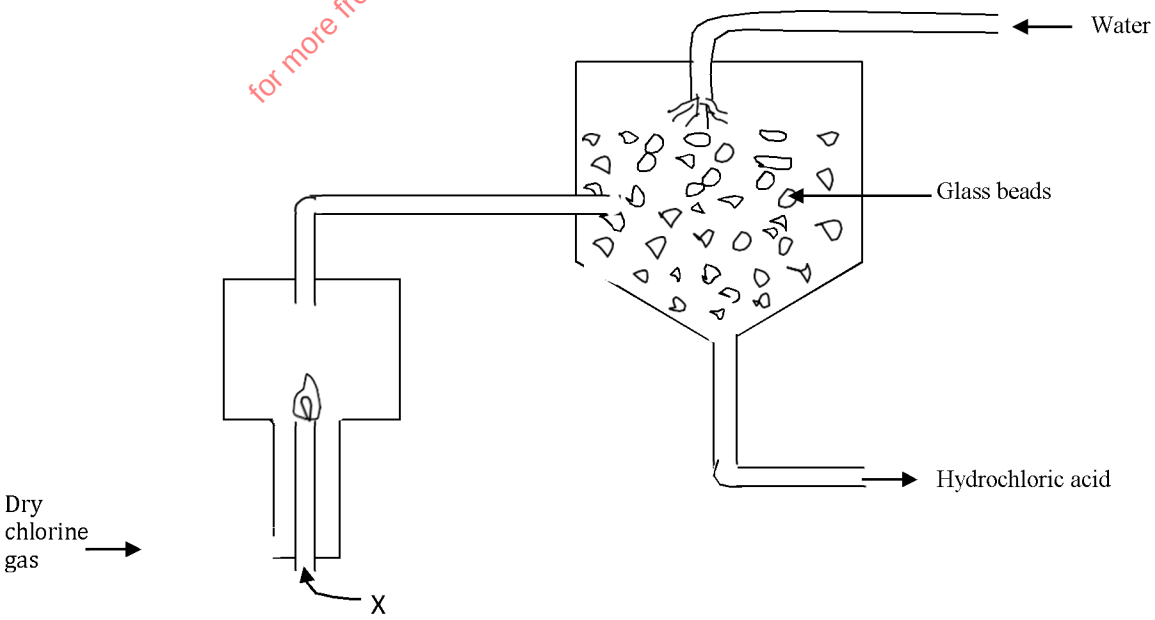
(ii) atom of T

(b) Explain why the melting point of T is higher than that of U. **(2 marks)**

15. Complete the table below. **(3 marks)**

Metal	**Aluminium**	**Lead**	**Sodium**
Chief ore	Bauxite		Rock salt
Chemical name			
Method of extraction		reduction	

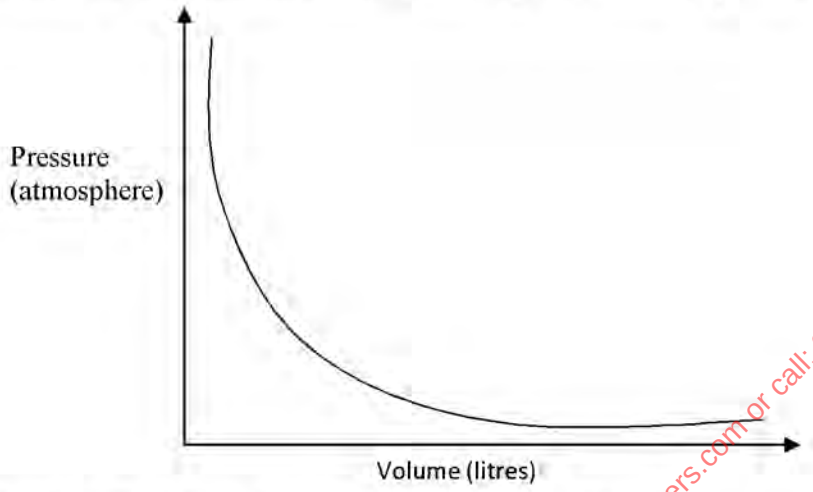
16. The diagram below represents a set up used for the large scale manufacture of hydrochloric acid.



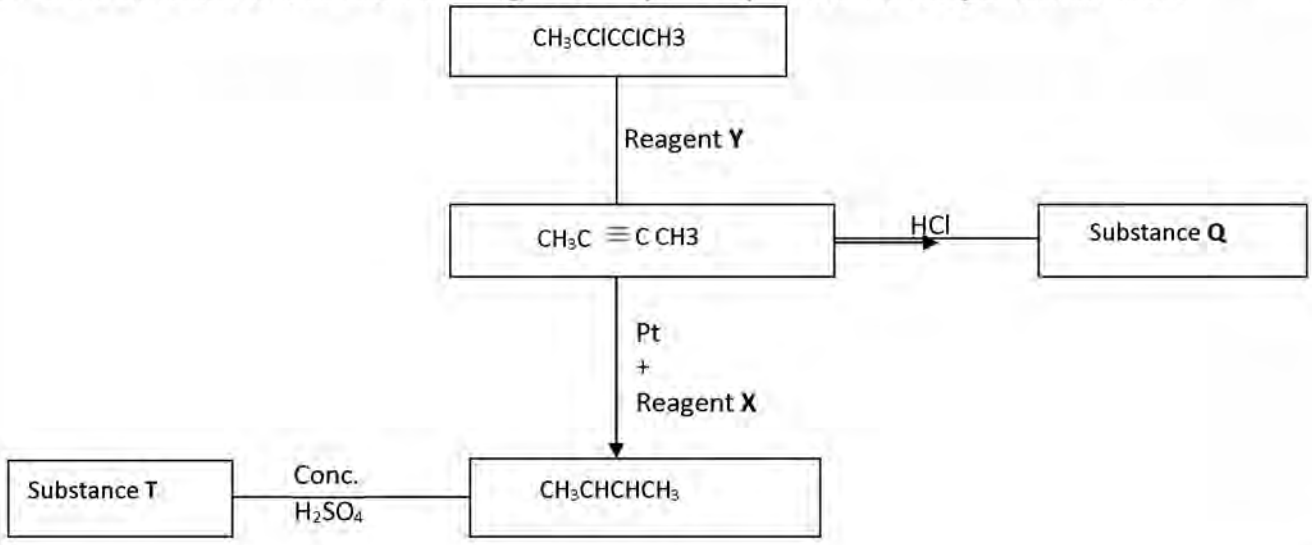
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(a) Name substance X. (1 mark)
(b) What is the purpose of the glass beads? (1 mark)
(c) Give one use of hydrochloric acid. (1 mark)

17. Calculate the volume of nitrogen (I) oxide produced when 38.2g of ammonium nitrate is completely decomposed by heating (at s.t.p). (N = 14, H = 1, O = 16) (3 marks)
18. Give equations to show the reactions that take place when;
(a) iron reacts with steam. (1 mark)
(b) Give one industrial use of the gas produced in the reactions in (i) and (ii) above. (1 mark)
19. (a) When magnesium metal is burnt in air, it reacts with both oxygen and nitrogen gases giving a white ash. Write two equations for the reactions that take place. (2 marks)
(b) Give the total number of atoms present in the gas produced when water is added to magnesium nitrate. (1 mark)
20. The graph below shows the behavior of a fixed mass of a gas at constant temperature.



(a) What is the relationship between the volume and the pressure of the gas? (1 mark)
(b) 60 cm^3 of oxygen gas diffused through a porous partition in 50 seconds. How long would it take 60cm^3 of sulphur (IV) oxide gas to diffuse through the same partition under the same conditions? (S = 32.), O = 16.0) (3 marks)
21. State and explain the observation made when a moist red litmus paper is put in a gas jar of dry chlorine gas. (2 marks)
22. (a) When extingishing a fire caused by burning kerosene, charbon (IV) oxide is preferred to water. Explain. (2 marks)
(b) Write the formula of the oxide of carbon which is "silent killer". (1 mark)
23. Explain why chlorine is a gas while iodine is a solid at room temperature. (2 marks)
24. Apart from their location, state any two differences between a proton and an electron. (2 marks)
25. What term is given to: The amount of energy given out when a neutral atom in gaseous state gains an electron? (1 mark)
26. A certain fertilizer is suspected to be containing nitrate ions. Describe how the presence of nitrate ions can be determined in such fertilizer. (3 marks)
27. Write balanced chemical equations to show the action of heat on the following nitrates.
(a) Lead (II) nitrate (1 mark)
(b) Silver nitrate (1 mark)
28. What is an amphoteric oxide? (1 mark)
29. Starting with zinc carbonate solid describe how zinc hydroxide can be prepared in the laboratory. (3 marks)
30. Below is a scheme of some reactions starting with but-z-yne. Study it and answer the questions that follow.

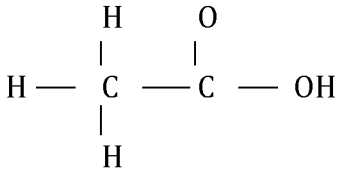


for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

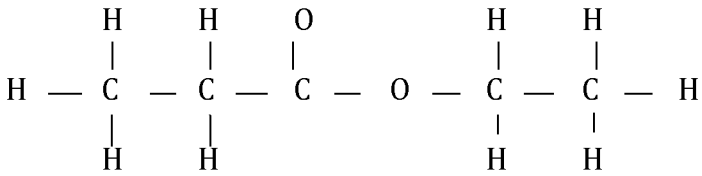
(a) Name Y, X and T (1 ½ marks)

(b) Give the name of the following organic compounds. (½ mark)

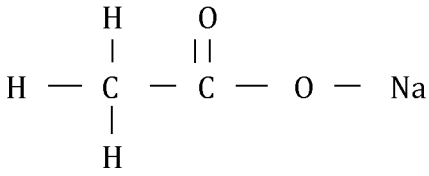
(i)



(ii)



(iii)



31. The following results were obtained during an experiment to determine the solubility of potassium nitrate in water at 30^0C. Mass of dish = 15.86g, mass of dish + saturated solution at 30^0C = 26.86g, mass of dish + solid KNO_3 after evaporation to dryness = 16.7g. Calculate the mass of saturated solution containing 60.0g of water at 30^0C. **(3 marks)**

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

MOKASA JOINT EVALUATION EXAM
K. C. S. E. (Kenya Certificate of Secondary Education)

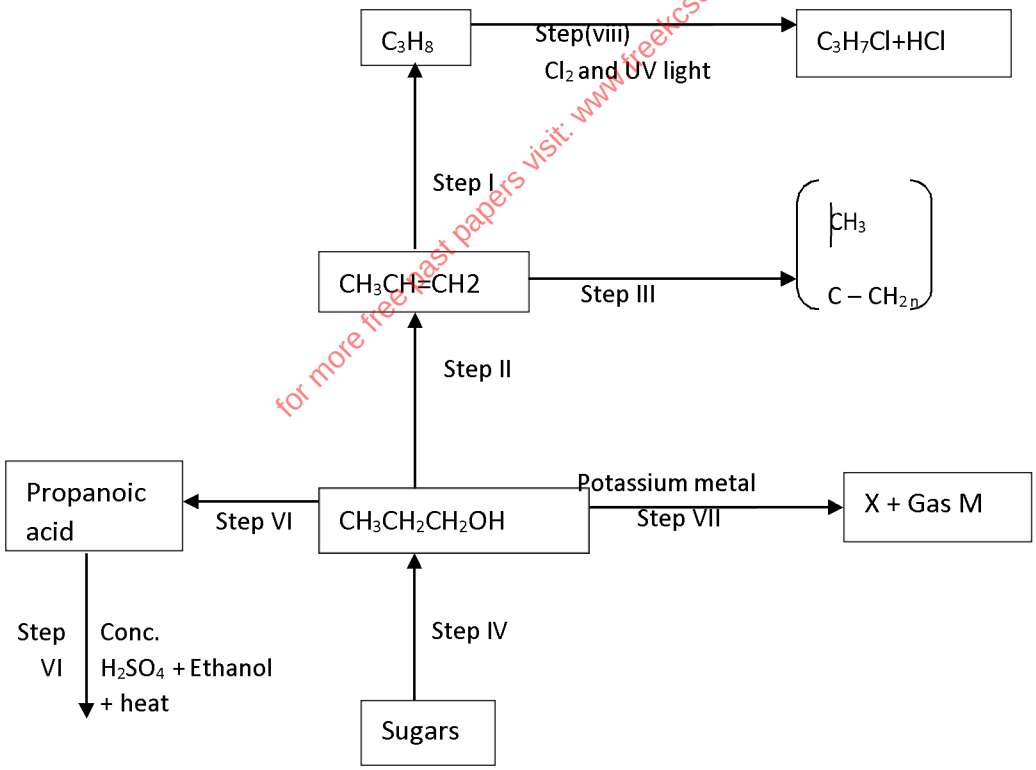
233/2
CHEMISTRY
Paper 2
Time: 2 Hours

1. The grid below shows part of the periodic table. Use it to answer the questions that follow. (The letters do not represent the actual symbols.)

						S	U	
P	R					T		W
Q								

a) Which of the above elements has the largest atomic radius? Explain? (1 mark)
b) Identify the most reactive non-metal. Explain (1 mark)
c) Write the electron configuration of **ions** of;
(i) Element S (½ mark)
(ii) Element Q (½ mark)
d) Compare the atomic radius of P and R (1 mark)
e) Write the formula of one stable cation with an electron arrangement of 2:8 (1 mark)
f) Given that the atomic mass of W is 40 write down the composition of its nucleus (1 mark)
g) Write the formula of the compound formed when P and S react (1 mark)
h) Give the family to which element R belong (1 mark)
i) Element X forms an ion with the fomula X^{3-} with electron configuration of 2.8. On the grid above, show the position of element X (1 mark)
j) Compare the electrical conductivity of the compound formed between P and U and element Q (2 marks)

2. Study the flow chart below and answer the questions that follow.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

a) i) Name the type of reaction in the following steps
Step I (1 mark)
Step IV (1 mark)
ii) Name the important reagents and conditions in;
Step I: (½ mark)
Reagent

Condition.
Step V: (½ mark)
Reagent (½ mark)
Condition (½ mark)

b) Name and draw the structure of compound L (2 marks)
c) Write an equation for the reaction in Step VII (1 mark)
d) State the homologous series to which the compound C_3H_8 belongs (1 mark)
e) State one industrial application of the process in Step I (1 mark)
f) Explain how one can distinguish between the compounds C_3H_8 and C_3H_6 using a chemical test (2 marks)

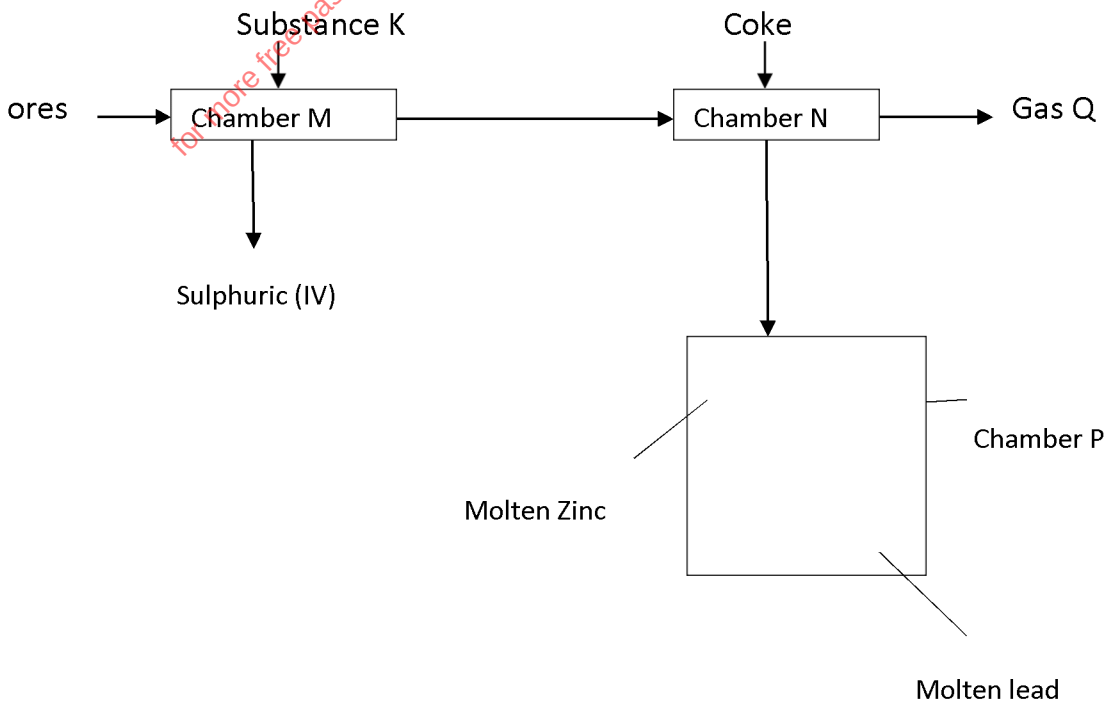
3. The following information show standard electrode potentials for some half reactions. Use it to answer the questions that follow.

			$E^{\ominus}$/Volts
Ce^{4+} -		$^{3+}$	
$Fe^{3+}{}_{(aq)} + e^-$	→	$Ce_{2+\,(aq)}$	+1.61
$_{(aq)} + e$	→	$Fe_{\,(aq)}$	+0.77
$I_{2(aq)} + 2e^-$	→	$2I^-_{(aq)}$	+0.54
Fe^{2} $Zn^{2+}{}_{(aq)} + 2e^-$	→	$Fe_{(s)}$	-0.44
$J^{3+}{}_{(aq)} + 2e$	→	$Zn_{(s)}$	-0.76
$_{(aq)} + 3e$		$J_{(s)}$	X

a) Identify the strongest reducing agent (1 mark)
b) Which substance in the table is suitable to oxidize iodide ions to iodine? (1 mark)
c) Study the cell representation below and answer the questions that follow.
$Zn_{(s)}/Zn^{2+}{}_{(aq)}$ // KNO_3 $Fe^{2+}{}_{(aq)}/Fe_{(s)}$
(i) Identify the anode and the cathode
Anode: (1 mark)
Cathode: (1 mark)
(ii) If the two half cells in c(i) above are connected externally, write an equation taking place in zinc half cell (1 mark)
iii) Calculate the e.m.f. of the cell (1 mark)
iv) State the role of KNO_3 (1 mark)
v) Explain what happens when $KCl_{(aq)}$ is used instead of KNO_3 in a case where $Pb_{(s)}/Pb^{2+}{}_{(aq)}$ is one of the half cells (2 marks)

vi) Draw an electrochemical cell to represent the cell in c(ii) above (2 marks)
vii) If the e.m.f. of the cell $J_{(s)}/J^{3+}{}_{(aq)}//I_{2(s)}/2I^-_{(aq)}$ is +1.32V, calculate the value of $J^{3+}{}_{(aq)}/J_{(s)}$ (1 mark)

4. The flow diagram shows the extractions of lead and zinc metals. Study it and answer the questions that follow.



a) i) Name the chief ores used in the extraction of;

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

Zinc (½ mark)
Lead (½ mark)

ii) Identify substances K and Q
iii) State the function of coke in chamber N (1 mark)
iv) Write a chemical equation for the reaction between gas Q and calcium hydroxide solution (1 mark)
v) What property makes it possible to separate the two metals (1 mark)
vi) Explain why zinc is preferred for coating iron to copper (1 mark)

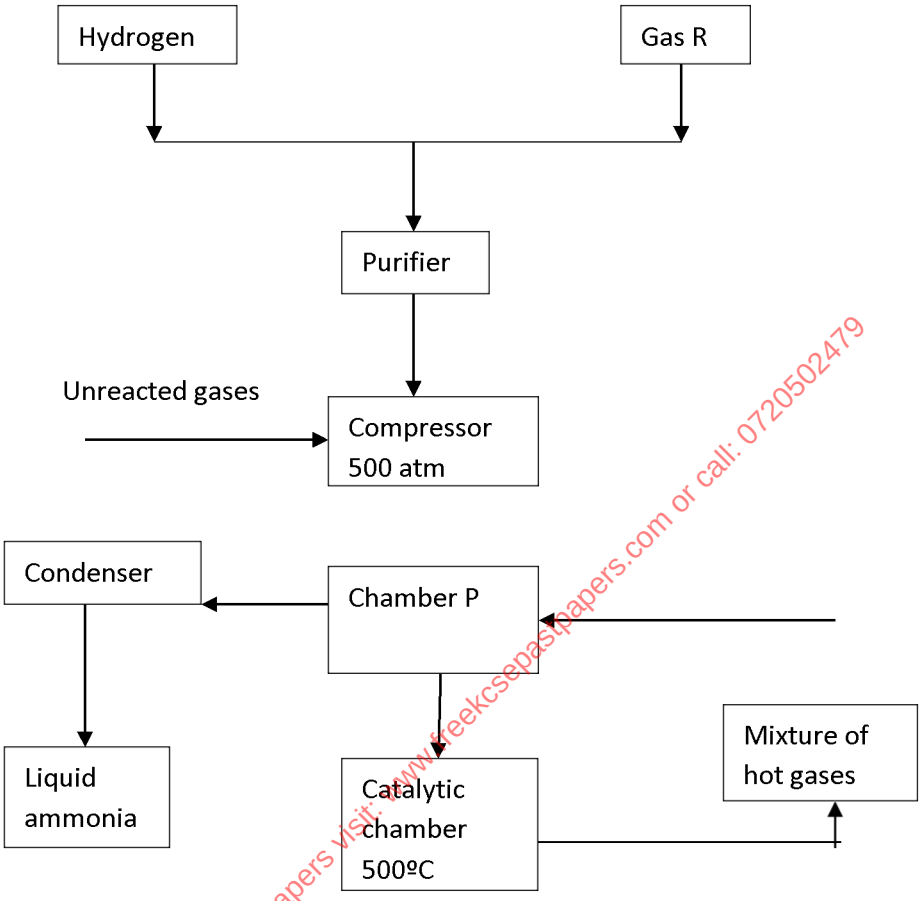
---

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

vii) State two effects that this process would have on the environment (2 marks)
viii) Give one use of zinc (1 mark)

b) The process of obtaining pure zinc is by electrolytic method.
(i) Name the electrolyte used in the electrolytic method (1 mark)
(ii) Describe an experiment carried out to determine the presence of zinc metal in a sample of soil using dilute Sulphuric (vi) acid and aqueous ammonia (2 marks)

5. The flow chart below show the large scale manufacture of ammonia by haber process. Study it and answer the questions that follow.



For more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

a) Identify gas R (1 mark)
b) i) Name two sources of hydrogen gas used in the process (2 marks)
ii) Explain the reason why the mixture of hydrogen gas and gas R are passed through the purifier (2 marks)
iii) Name a suitable catalyst used in the catalystic chamber (1 mark)
c) i) Identify chamber P (½ mark)
ii) Explain why mixture of hot gases is passed through chamber P (1 mark)
iii) Write an equation for the main reaction in the catalytic chamber (1 mark)
d) Explain using equations the following observation
Hot platinum wire glows on coming into contact with fumes of Ammonia (2 marks)
e) State two industrial uses of ammonia (1 mark)

6. a) Define the term molar heat of formation (1 mark)
b) Use the following standard enthalpies of combustion to answer the questions that follow.
ΔH^{e} (carbon) = -393kJmol^{-1}1
$\Delta H^{e}_{c}(H_{2g})$ = -286kJmol^{-1}
$\Delta H_c(C_4H_{10})$ = -1290kJmol^{-1}
(i) Write the equation for the formation of butane (1 mark)
(ii) Draw an energy level diagram that links heat of formation of butane with its heat of combustion and the heats of combustion of carbon and hydrogen (3 marks)
(iii) Calculate the standard heat of formation of butane (2 marks)
c) Determine the heating value of butane (1 mark)

d) Use the bond energies below to calculate the enthalpy change for the formation of chloromethane from methane gas and chlorine gas

Bond	Bond energy in $kJmol^{-1}$
H-Cl	431
Cl-Cl	242
C-H	413

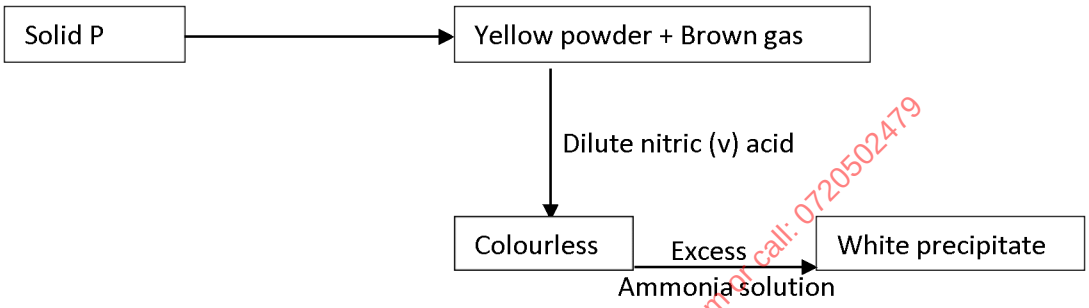
(3 marks)

7. I. The solution in grams of sodium nitrate in 100g of water is given for various temperature in degree celcius

Temperature	0	10	20	30	40	50	60	80	90	100
Solubility	73	80	88	96	104	114	124	148	162	180

a) Draw a graph of solubility of sodium nitrate against temperature (3 marks)
b) From the graph determine the solubility of sodium nitrate at 70°C (1 mark)
c) 100 grams of a saturated solution of sodium nitrate at was cooled from 80°C to 10°C. What mass will crystallize out (2 marks)

II Study the flow chart below and answer the questions that follow.



(i) Write the chemical formula of;

a) Solid P (1 mark)
b) The white precipitate (1 mark)

III Starting with copper(II) carbonate, describe how a solid sample of copper (II) sulphate crystals would be prepared (3 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

MOKASA JOINT EVALUATION EXAM
233/3
CHEMISTRY PRACTICAL
MOKASA 2016

CONFIDENTIAL INSTRUCTIONS TO SCHOOLS

A part from other laboratory apparatus and fittings each student is expected to have the following.

- A burette
- A 25 ml pipette
- 3 volumetric flasks
- Distilled water in a wash bottle
- Solution R – 0.1M MCl
- Stiring rod
- A 250ml volumetric flask
- A 250ml beaker
- A label
- About 2g solid Q
- Methyl orange indicator supplied with a dropper
- Solution C
- Solution D
- 1 – 50ml measuring cylinder
- 1 – 10ml measuring cylinder
- 1 stop watch
- About 1.0g solid K
- About 1.0g solid Z
- Litmus papers

Access to:

1. Sodium hydroxide solution
2. 1M Lead (II) nitrate
3. 1M Barium nitrate
4. Bunsen burner
5. Acidified potassium manganate VII
6. Sodium carbonate

NB:
Solution C – 0.1M $Na_2S_2O_{3(aq)}$
Solution D – 2.0M $HCl_{(aq)}$
Solid K – NH_4Cl
Solid Z – Maleic acid

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

MOKASA JOINT EXAMINATION - 2016
Kenya Certificate of Secondary Education

233/3
CHEMISTRY
Paper 3
PRACTICAL
Time: 2 ¼ hours

1. You are provided with;

- Solid Q, 2.0g of impure sodium carbonate (contaminated with sodium chloride).
- Solution R, hydrochloric acid solution, containing 2.07g of the acid in 500 cm^3 of solution.

You are required to determine the percentage impurity in solid Q.

Procedure:

(i) Place all solid Q in a beaker and add 100cm^3 of distilled water. Stir well a glass rod.
(ii) Transfer the solution into a 250 cm^3 volumetric flask and top it up to the mark with distilled water. Shake well and label as solution Q.
(iii) Fill a burette with solution R.
(iv) Pipette 25.0 cm^3 of solution Q into a conical flask. Add three drops of methyl orange indicator.
(v) Titrate solution Q against solution R from the burette. Record the results in the table below.
(vi) Repeat the titration two more times and complete the table.

Table I

(a)	I	II	II
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution I used (cm^3)			

(4marks)

(a) Determine the average volume of solution R used. **(1 mark)**
(b) Calculate the concentration of solution R in moles per litre. **(2 marks)**
(H = 1.0, Cl = 35.5)
(c) Calculate the number of moles of the acid in solution R that reacted. **(1 mark)**
(d) Write an equation for the reaction that occurs. **(1 mark)**
(e) Calculate the number of moles of sodium carbonate in 25 cm^3 of solution Q that reacted. **(1 mark)**
(f) Calculate the mass of sodium carbonate in 250 cm^3 of solution Q. **(2 marks)**
(C = 12.0, O = 16, Na = 23)
(g) Find the percentage of mass of the impurity, sodium chloride, in solid Q. **(2 marks)**

2. Your are required to investigate the effect of change in concentration on the reaction rate between sodium thiosulphate solution C and dilute hydrochloric acid solution D. When hydrochloric acid is added to sodium thiosulphate sulphur is deposited.

( ) ( ) ( ) ( ) ( ) ( )

The time taken for sulphur to reach a certain amount can be used to indicate the rate of the reaction. Solution C contains 0.08 moles of sodium thiosulphate in one litre of solution.

Procedure:

(i) Measure 40 cm^3 of solution C and pour it into a 100 cm^3 glass beaker.
(ii) Mark a cross (X) on a white paper. Place the beaker containing solution C over the cross on the paper.
(iii) Measure 10 cm^3 of solution D add it to the solution C in the beaker. Start the stopwatch immediately. Observe the cross on the white paper from the top of the beaker and record the time taken for it to be obscured (to disappear from view).
(iv) Repeat the experiment using different volumes of solution C as indicated in the following table and in each case water is added to make a total of volume of 40 cm^3. The same volume of hydrochloric acid is added in each case.

Complete the table below. **(5 marks)**

Volume of HCl used (cm^3)	Volume of $Na_2S_2O_3$ used cm^3 solution	Volume of water added	Time taken (s)	$\frac{1}{(\ )}$
10	40	0		
10	30	10		
10	25	15		
10	20	20		
10	10	30		

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

I. On the grid provided plot a graph of the reciprocal of time $\frac{1}{(\quad)}$ y-axis against volume of solution C used. **(3 marks)**

II. From the graph determine the time taken for the cross to disappear if 35 cm^3 of solution C was used. **(1mark)**

III. Explain the shape of the graph in terms of rates of reaction. **(1 mark)**

3. **I.**

(a) You are provided with solid K. Carry out the tests below. Write your observations and inferences in the spaces provided. Place all of solid K in a boiling tube, add about 10cm^3 of distilled water and shake until all the solid dissolves. Divide the solution into 4 portions.

(i) To the first portion in a test-tube, add a few drops of sodium hydroxide until in excess. Retain the mixture for procedure (b).

Observations	**Inferences**
(1mark)	(1mark)

(i) Warm the mixture in (a) above and test any gases produced using red and blue litmus papers.

Observations	**Inferences**
(1 mark)	(1 mark)

(iii) To the third portion, add about equal volume of freshly lead (II) nitrate solution followed by a few drops of dilute nitric (V) acid.

Observations	**Inferences**
(1 mark)	(1mark)

(iv) To the fourth portion add Barium nitrate solution.

Observations	**Inferences**
(1mark)	(1mark)

II. You are provided with substance Z. Carry out the tests below. Write your observations and inferences in the spaces provided.

(a) Scoop a little of solid Z using a clean spatula and burn it in a Bunsen burner flame.

Observations	**Inferences**
(1 mark)	(1 mark)

Divide the remaining amount into two portions.

(b) To the first portion, add water and shake.

Observations	**Inferences**
(1 mark)	(1 mark)

(c) To the second portion, add potassium manganate (VII) and warm.

Observations	**Inferences**
(1 mark)	(1 mark)

(d) To a little amount of Z, add sodium carbonate.

Observations	**Inferences**
(1 mark)	(1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

MOKASA JOINT EXAMINATION - 2016
Kenya Certificate of Secondary Education

CHEMISTRY
Paper 3
PRACTICAL
Time: 2 ¼ hours

1. You are provided with;

Table I

(a)	I	II	II
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution I used (cm^3)			

(a) Determine the average volume of solution R used. **(1 mark)**

(b) Calculate the concentration of solution R in moles per litre. **(2 marks)**
(H = 1.0, Cl = 35.5)

MM of HCl

= 1 + 35.5

= 36.5

2.07g → 500cm³

= 4.14g/l

= 0.1134M

(c) Calculate the number of moles of the acid in solution R that reacted. **(1 mark)**

1000cm³ = 0.1134 moles

Av. =

(d) Write an equation for the reaction that occurs. **(1 mark)**

(e) Calculate the number of moles of sodium carbonate in 25 cm^3 of solution Q that reacted. **(1 mark**

Mole ratio
1 : 2

(f) Calculate the mass of sodium carbonate in 250 cm^3 of solution Q. **(2 marks)**
(C = 12.0, O = 16, Na = 23)

Mass = moles x MM

106

(g)

2.

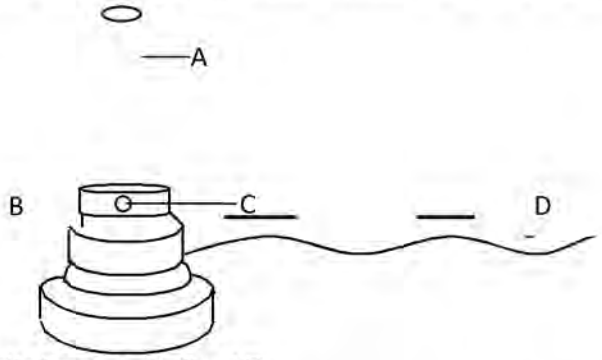
Volume of HCl used (cm^3)	Volume of $Na_2S_2O_3$ used cm^3 solution	Volume of water added	Time taken (s)	
10	40	0		
10	30	10		
10	25	15		
10	20	20		
10	10	30		

I. On the grid provided plot a graph of the reciprocal of time y-axis against volume of solution C used.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KUWED EXAMINATION COUNCIL 2016
233/1
CHEMISTRY
PAPER 1
(THEORY)
JULY/AUGUST 2016
TIME: 2 HOURS.

1. The figure below shows part of a Bunsen burner. Study it and answer the questions that follow



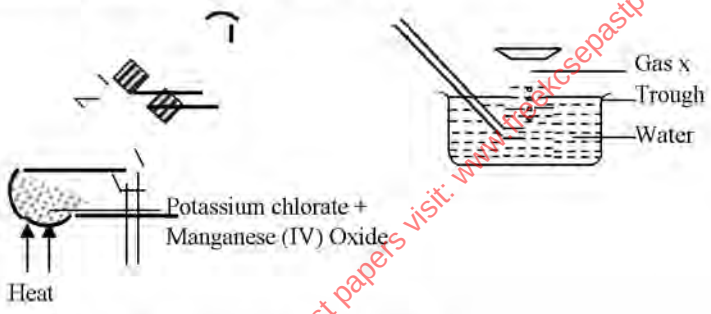
(a) Name labelled parts A, B, C and D. (2 marks)
(b) State the function of the part labelled B. (1 mark)

2. A mixture contains ammonium chloride, silver chloride and lead (II) chloride. Describe how each of the substance can be obtained from the mixture. (3 marks)

3. (a) State the Graham"s law. (1 mark)

(b) A volume of 80cm^3 of nitrogen gas diffused through an oriffice in 40 seconds. How long will 170cm^3 of carbon (IV) oxide take to diffuse through the same oriffice? (N = 14, C = 12, O = 16) (2 marks)

4. The diagram below was used to prepare gas X.



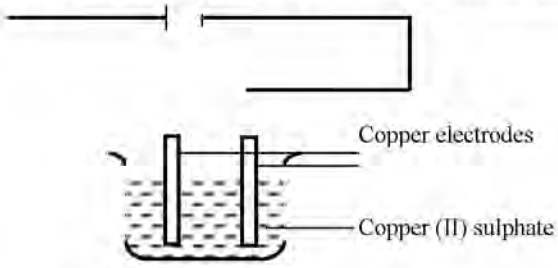
(a) Identify gas x. (1 mark)
(b) Write an equation for the reaction that took place. (1 mark)
(c) Identify the method of gas collection above. (1 mark)

5. The table below represents elements P, Q, R and S. Study it answer the questions that follow. (The letters are not the actual symbols of the elements.

Element	Atomic number	Atomic radius (nm)	Ionic radius (nm)
P	13	0.121	0.061
Q	14	0.101	0.043
R	17	0.099	0.181
S	18	0.023	—

(a) Explain why the atomic radius of element P is greater than that of element R. (1 mark)
(b) Explain why the atomic radius of element R is less than its ionic radius. (1 mark)
(c) Using dots (•) and crosses (X) show bonding in the compound formed between elements Q and R. (1 mark)

6. The diagram below was used in the electrolysis of aqueous copper (II) sulphate using copper electrodes.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

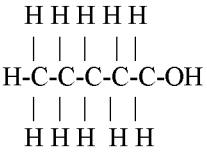
(a) Label the electrodes above. (1 mark)
(b) Give the observation made at the cathode. (1 mark)
(c) Write the half-equation for the reaction at the anode. (1 mark)

7. A 2.0g of limestone was allowed to react with 200cm^3 of 0.2MHCl acid. The excess acid required 49.6cm^3 of 0.1M NaOH solution. Calculate the percentage of calcium carbonate in the limestone. (Ca = 40, C = 12, O= 16) (3 marks)

8. (a) Give the IUPAC name of the following compound. (3 marks)

(i) $CH_3C(CH_3)_2CH_3$

(ii) $CH_3C(=O)-O-CH_2CH_2CH_3$

(iii)


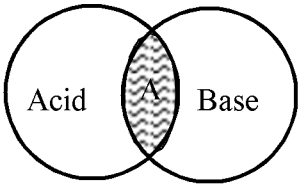
(b) Describe a chemical test that can be used to distinguish between compound (i) and (iii) (1 mark)

9. (a) State any two differences between a chemical reaction and a nuclear reaction.

Chemical reaction	Nuclear reaction
(i)	
(ii)	

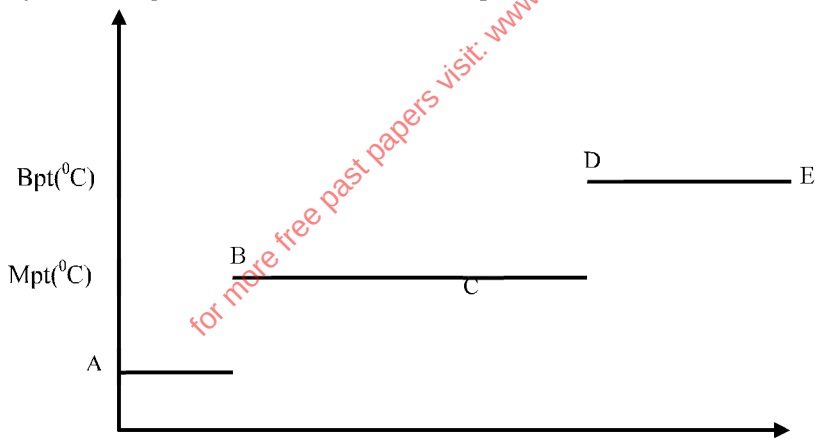
(b) State two uses of radioactivity in Agriculture. (1 mark)

10. (a) What are acid-base indicators. (1 mark)
(b) Substance A reacted with both an acid and a base as shown below.



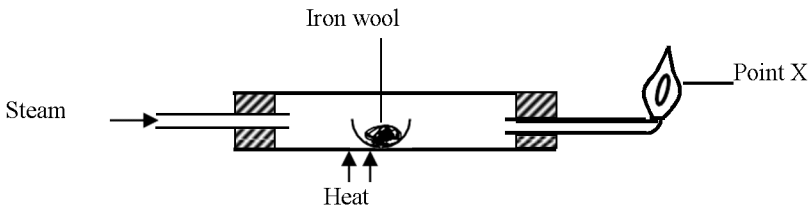
(i) State the nature of A (1 mark)
(ii) Name any two oxides of A (1mark)

11. (a) Differentiate between endothermic and exothermic reaction. (1 mark)
(b) Study the heating curve below and answer the questions that follow.



(i) Identify the process taking place between B and C (1 mark)
(ii) Is the process you have named above endothermic or exothermic? Explain (1 mark)

12. Steam was passed over heated iron wool as shown below.



(i) What is the precaution taken before lighting the gas at point X. (1 mark)
(ii) Write the chemical equations taking place.
I. In the combustion tube (1 mark)
II. At point X

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

13. The following table shows the effect of heat on three metal nitrates P, Q and R.

Metal nitrate	Product on heating
P	Metal oxide + Oxygen + Nitrogen (IV) Oxide
Q	Metal nitrite + Oxygen
R	Metal + Oxygen + nitrogen (IV) Oxide

(a) Arrange the metals P,Q and R in order of decreasing reactivity. (1 mark)

(b) Name a metal that is likely to be

(i) R (½ mark)

(ii) Q (½ mark)

14. Given the equation.

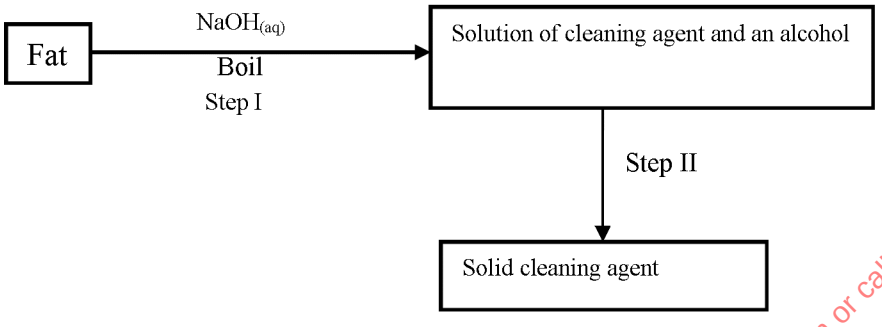
$H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}\ \Delta = -20kJ\ mol^{-1}$

Explain what will happen to the yield of hydrogen iodide if:-

(i) Temperature is increased (1 mark)

(ii) Pressure is reduced (1 mark)

15. Study the flow chart below and answer the questions that follow.



(i) Name the type of cleaning agent prepared in the scheme above. (1mark)

(ii) Name the chemical substance added in step II and state its function. (1 mark)

(iii) Give one advantage of using the cleansing agent above. (1 mark)

16. A compound of carbon hydrogen and oxygen contains 57.15% carbon, 4.76% hydrogen and rest oxygen. If its relative molecular mass is 126, find its molecular formula. (C = 12, H = 1, O = 16) (3 mks)

17. A student from Ikerege Secondary School poured accidentally concentrated sulphuric acid on his brown sugar.

(i) State and explain the observation made. (1 mark)

(ii) Write the chemical reaction that took place. (1 mark)

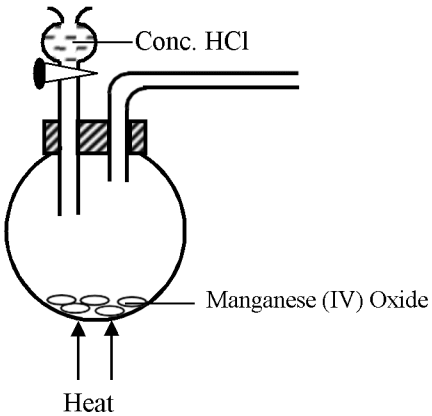
18. (a) What are allotropes? (1 mark)

(b) Below are allotropes of carbon.

(i) Identify allotrope A and B (2 marks)

(ii) With a reason, identify the allotrope that can be used in the making of pencil. (1 mark)

19. The following diagram shows how chlorine gas can be prepared in the laboratory.



(a) Complete the diagram to show how a dry sample of chlorine gas can be collected. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(b) Apart from manganese (IV) oxide, give the formula of any two compound that can be used in the preparation of chlorine. (1 mark)

(c) Give one industrial use of chlorine gas (1 mark)

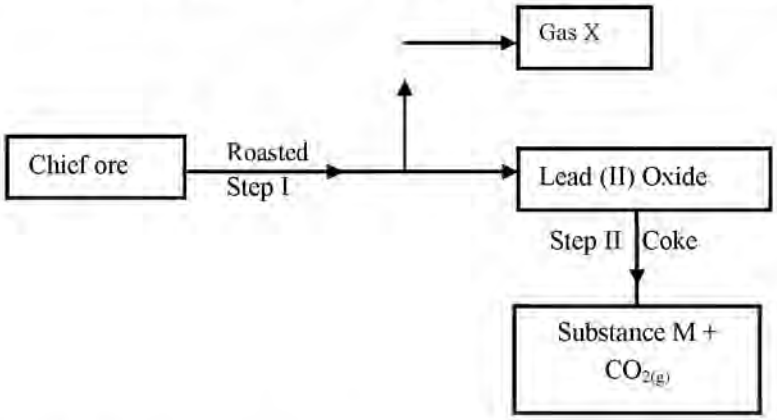
20. (a) Define second ionisation energy (1 mark)

(b) Explain why the second ionization energy is higher than the first ionization energy. (1 mark)

21. (a) What is a saturated solution? (1 mark)

(b) A saturated solution of a salt Y at 30^0C weighing 76g yielded 34g of solid when evaporated to dryness. What is the solubility of the salt at 30^0C. (2 marks)

22. The flow chart below shows the extraction of lead metal. Study it and answer the questions that follow.

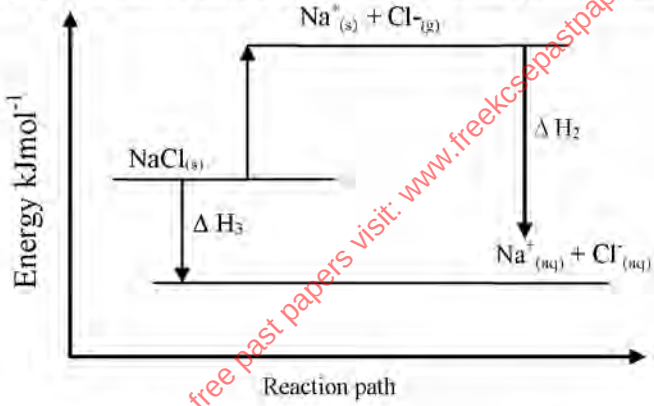


(a) Give the name of the chief ore. (1 mark)

(b) Identify gas X (1 mark)

(c) Write the chemical reaction taking place in step II. (1 mark)

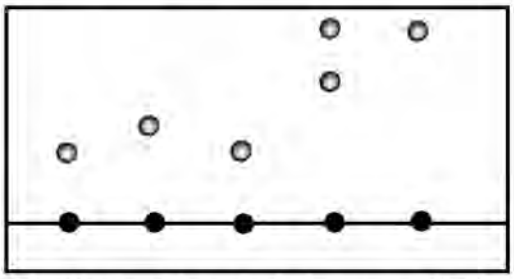
23. Study the energy level diagram below and use it to answer the questions that follow.



(a) Identify the heat change ΔH_1 and ΔH_2 (1 mark)

(b) Given that the heat change for ΔH_1 is -1224kJmol and $\Delta H2$ is -1050kJmol-1. Calculate the heat change for the reaction $\Delta H3$. (2 marks)

24. The diagram below shows a chromatogram that was used to identify athletes M and N who had consumed illegal substances A, B, C. Use it to answer the questions that follow.

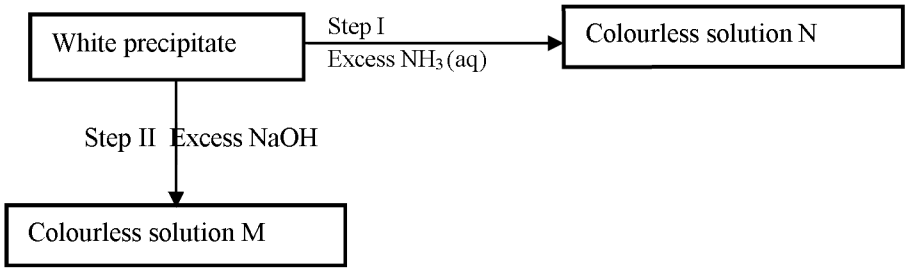


(i) Identify the athlete who had consumed the illegal substance. (1 mark)

(ii) Which of the three drugs was less absorbed? (1 mark)

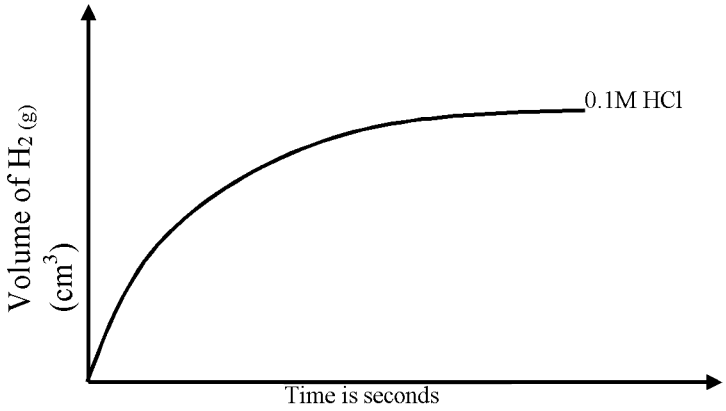
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

25. Study the flow chart below carefully.



(a) Identify the cation in the colourless solution N. (1 mark)
(b) Write ionic equations for the reactions in Step I. (1 mark)

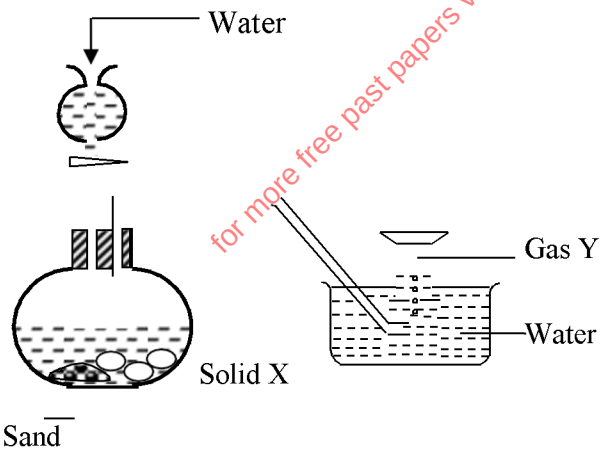
26. The sketch of the graph below shows a reaction between magnesium ribbon and dilute hydrochloric acid.



(a) On the graph indicate the curve for 0.05M HCl (1 mark)
(b) Other than change in concentration, name two other factors that can affect the rate of reaction above. (1 mark)

27. $80cm^3$ of ethane reacted with $150cm^3$ of oxygen forming carbon (IV) oxide and water.
Calculate:
(i) The volume of carbon (IV) oxide formed (1 mark)
(ii) The residual air. (1 mark)

28. The set up below was used to prepare a hydrocarbon.



(a) Define a hydrocarbon. (1 mark)
(b) Name solid X (1 mark)
(c) Give a reason why sand is placed at the bottom of the flask. (1 mark)
(d) Write a balanced equation for the reaction taking place in the flask. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KEWED EXAMINATION COUNCIL 2016
233/2
CHEMISTRY
PAPER 2
(THEORY)
JULY/AUGUST 2016
TIME: 2 HOURS.

1. Below is a grid which represents part of the periodic table. Use it to answer the questions that follow. The letters do not represent the actual symbols of the elements.

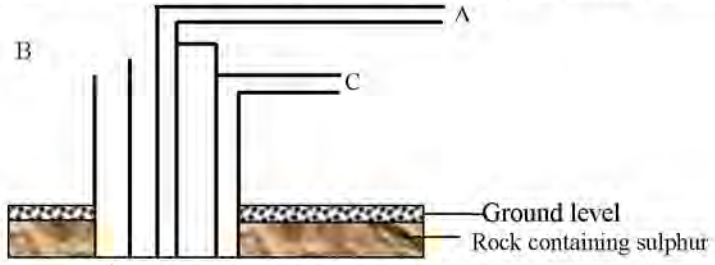
A							A	
J				N	O		Q	S
K	L							

(a) Briefly explain why element A is placed in the two positions in the table. (1 mark)
(b) What name is given to the group of elements to which L belongs? (1 mark)
(c) What name is given to the element that occupy the shaded region? (1 mark)
(d) 1.3g of L reacts completely with 1.21dm^3 of Q when heated at s.t.p (Molar gas volume = 22.4dm^3). Using the actual symbols, write a balanced chemical equation for the reaction between L and Q. (2 marks)
(e) How would the boiling points of element A and Q compare? Explain. (2 marks)
(f) Give one use of element S (1 marks)
(g) Identify the strongest reducing agent. (1mark)
(h) Study the data in the table below and answer the questions that follow. (The letters do not represent actual symbol of the element)

Element	Atomic No.	MP (^{0}C)	BP(0C)	Ionic radii
C	11	98	890	0.095
D	12	650	1110	0.065
E	13	660	2470	0.050
F	14	1410	2360	0.041
G	15	44.2	280	0.034
H	16	113	445	0.184
I	17	-101	-35	0.181
J	18	-189	-186	-

(i) Using dots and crosses, draw, the structure of chloride of element D. (2 marks)
(ii) Explain why there is an increase in boiling points from C to E. (1 mark)

2. (a) Define allotropy (1 mark)
(b) Graphite is an allotrope of carbon, which conducts electricity although carbon is a non-metal. Explain. (2 marks)
(c) Carbon reacts with hot concentrated sulphuric (VI) acid.
(i) Write an equation for the reaction that occurs. (1 mark)
(ii) What property of carbon is shown in this reaction? (1 mark)
(d) Sodium carbonate can be produced from trona, a double salt, whose formula is $NaCO_3.NaHCO_3.2H_2O$. What is meant by a double salt? (1 mark)
(e) Sulphur is extracted from underground deposits by the process shown below.

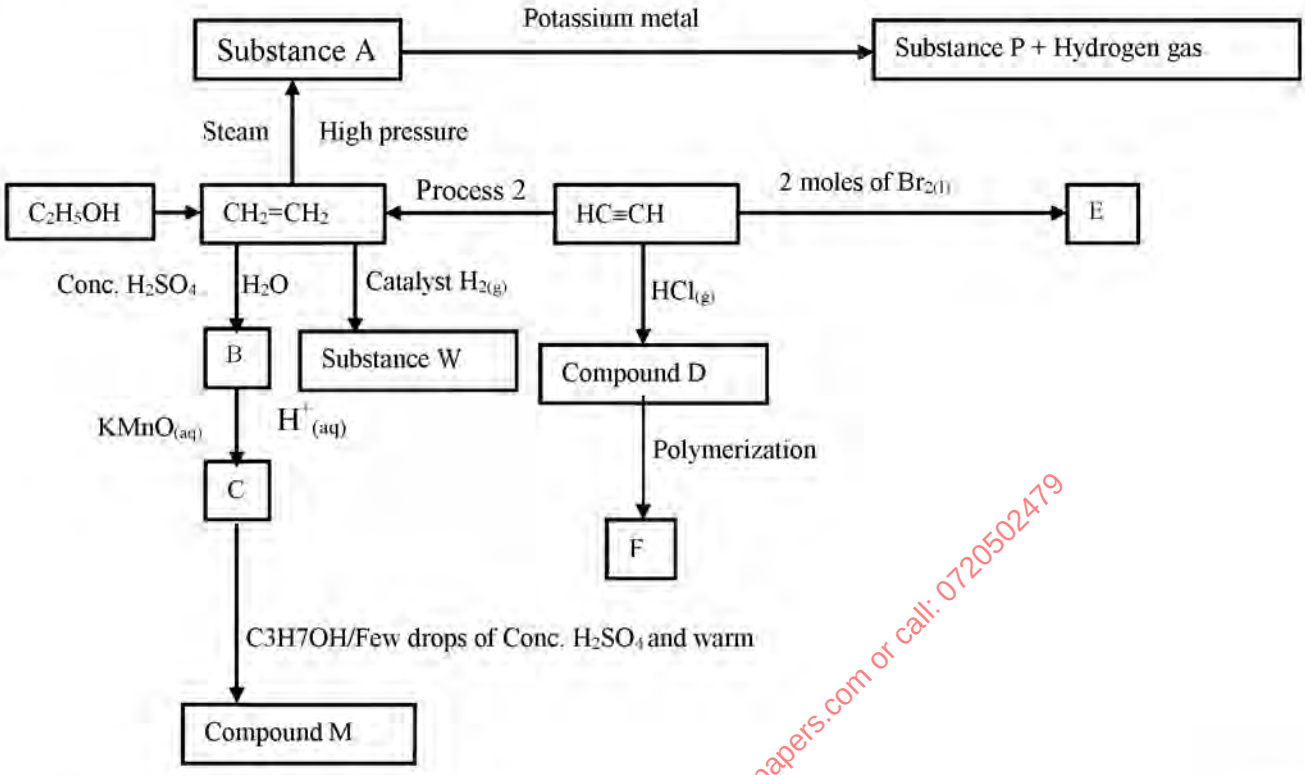


(i) Water at 170^{0}C is pumped down the outer pipe. Explain how it is possible to obtain water with temperature of 170^{0}C. (1 mark)
(ii) Name the substances passed through;
(a) Pipe A (1 mark)
(b) Pipe B (1 mark)
(f) When excess chlorine gas is bubbled through dilute sodium hydroxide, the resulting solution bleaches flower petals.
(i) Write an equation for the reaction between chlorine and dilute sodium hydroxide solution. (1 mark)
(ii) Explain how the resulting solution bleaches flower petals. (2 marks)

3. (a) In which homologous series do the following compound belong.
(i) CH_3CCH (1 mark)

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

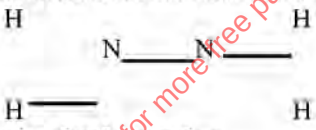
(ii) $CH_3CH_2CH_2OH$ (1 mark)
(iii) Give the IUPAC name of the compound in part (ii) above. (1 mark)
(b) Study the flow chart below and answer the questions that follow;



(i) Identify substance; A,W,D and P
(ii) Write an equation for the formation of substance E. (1 mark)
(iii) State the condition and reagent that are required in process 2.
Condition_____ (1 mark)
Reagent _____ (1 mark)

(iv) Draw the structural formula of compound F showing two repeat units of compound F. (1 mark)
(c) The organic compound E was found to contain 12.5% carbon, 2.4%b hydrogen and the remaining bromine. If its relative molecular formula was found to be 188, determine its molecular formula. (C = 12, H = 1, Br = 80) (3 marks)

4. Hydrazine gas whose structural formula shown below burns in oxygen to form nitrogen gas and steam.



(a) Write an equation for the reaction. (1 mark)
(b) Using the bond energies given below, calculate the enthalpy change for the reaction in (a) above.

Bond	Bond energy ($kJmol^{-1}$)
N≡N	944
N-N	163
N-H	388
O=O	496
H-O	463

(c) (i) What is meant by the term "enthalpy of formation"? (1 mark)
(ii) The enthalpies of combustion of carbon, methane and hydrogen are indicated below.

$C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$ $\Delta H = -393kJmol^{-1}$
$H_{2(g)} + \frac{1}{2} O_2 \rightarrow H2O$ $\Delta H = -286kJmol^{-1}$
$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(l)}$ $\Delta H = -890kJmol^{-1}$

I. Draw an energy cycle diagram that links the enthalpy of formation of methane to combustion of carbon, hydrogen and methane. (1 mark)
II. Determine the enthalpy of formation of methane. (2 marks)

(d) (i) Work out the oxidation number of Mn in MnO (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(ii) The following table gives the standard electrode potentials for some half reactions.

Half reaction	E^{θ} volts
$Zn^{2+}_{(aq)} + 2e^- \rightarrow Zn_{(s)}$	-0.76
$Fe^{2+}_{(aq)} + 2e^- \rightarrow Fe_{(s)}$	-0.44
$I_{2(aq)} + 2e^- \rightarrow 2I^-_{(aq)}$	+0.54
$Fe^{3+}_{(aq)} + 2e^- \rightarrow Fe^{2+}_{(aq)}$	+0.77

With reference to the above table, which is the strongest oxidizing agent? (1 mark)

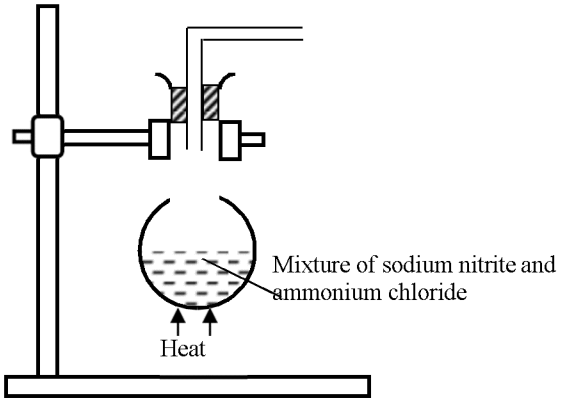
(iii) Study the cell diagram below and answer the questions that follow.

$Fe_{(s)}/ Fe^{2+}_{(aq)}$, 1M//$Fe^{3+}_{(aq)}$ 1M, $Fe^{2+}_{(aq)}$ 1M/Pt

I. In which half cell would reduction take place. (1 mark)

II. Calculate Eθ values for the cell represented in d (iii) above. (2 marks)

5. The set-up below is an incomplete diagram that was used to prepare and collect nitrogen gas, in the laboratory.



(a) Complete the diagram above to show how nitrogen gas is collected. (2 marks)

(b) Using an equation, describe how nitrogen gas is formed in the flask. (2 marks)

(c) Nitrogen is inert. State one use of the gas based on this property. (1 mark)

(d) The equation below shows a dynamic equilibrium between nitrogen gas and hydrogen gas.

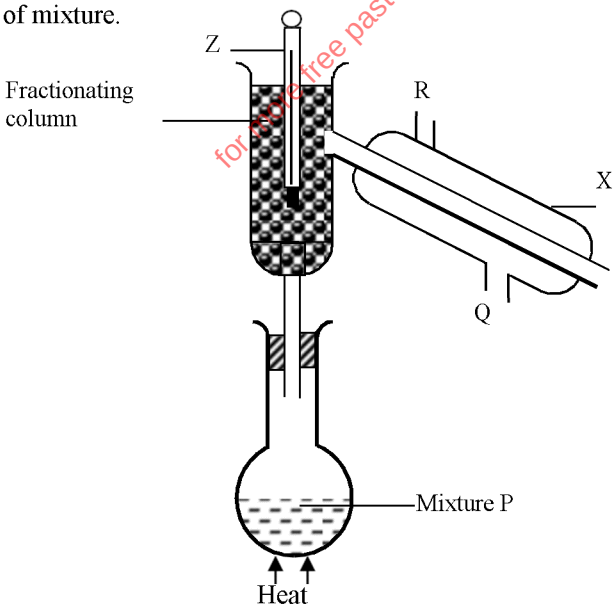
$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ ΔH = -ve

(i) How would the yield of $NH_{3(g)}$ be affected if the pressure is decreased? Explain. (2 marks)

(ii) How would the use of a catalyst affect the yield of ammonia? (2 marks)

(iii) Name the type of reaction shown in the equation above. (1 mark)

6. (I) Study the diagram below and answer the question that follow. The diagram shows the method of separating components of mixture.



(a) Name apparatus X. (1 mark)

(b) State the function of the fractionating column? (1 mark)

(c) Name the above method of separating mixtures. (1 mark)

(d) Using letters R and Q, identify the water inlet and water outlet. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

II. In an experiment to determine the solubility of two salt M and N at different temperatures, as the student recorded his observation as shown below.

Temperature (^{0}C)	0	10	20	30	40	50	60	70	80	90
Solubility of M in g/100g of H_2O	14	17	20	25	28	33	40	47	55	64
Solubility of N in g/100g of H_2O	25	27	30	32	35	37	40	42	45	48

(a) Define the term solubility. (1 mark)

(b) On the same axes, plot the solubility of M and N. (4 marks)

(c) Determine;

(i) the solubility of N at 65^0C. (1 mark)

(ii) the temperature at which the two salts are equally soluble in water. (1 mark)

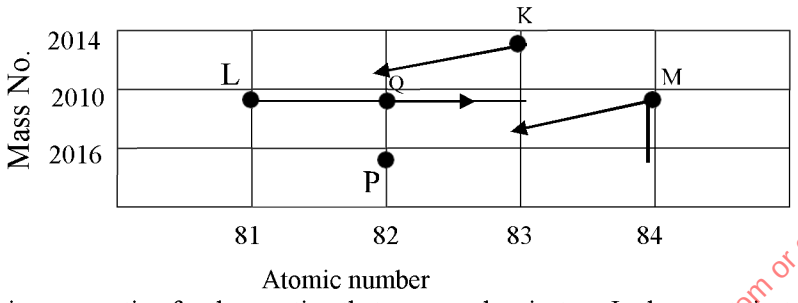
(d) If 60g of M is dissolved in 100g of water and heated to 90^0C, calculate the amount of salt that crystallized out if it is collected to 20^0C. (1 mark)

7. (a) A radioactive substance emits three different particles. Give the symbol of the particle with the highest mass.

(b) (i) Find the values of Z_1 and Z_2 in the nuclear equation below.

$\rightarrow$

(c) The graph below represents a radioactive decay series for isotope K. Study it and answer the questions that follow.



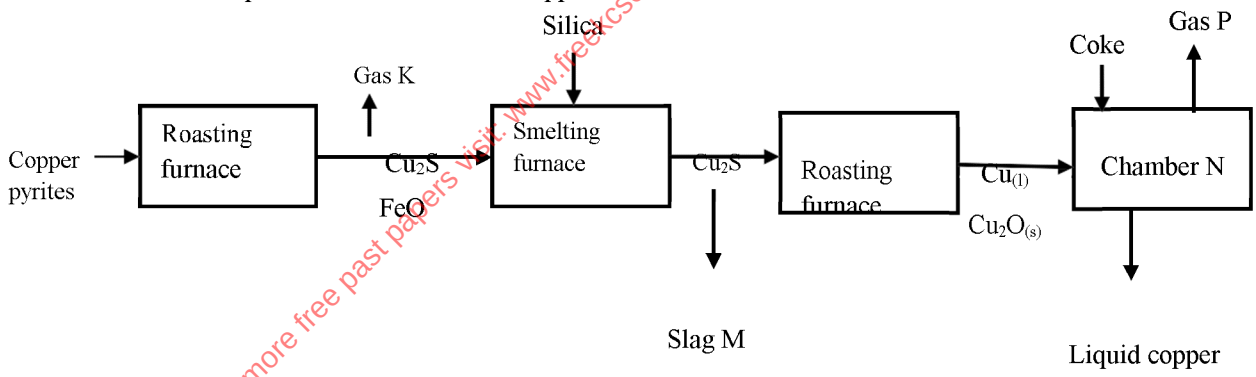
(i) Write an equation for the reaction that occurs when isotope L changes to isotope Q. (2 marks)

(ii) Name the type of radiation emitted when isotope K changes to isotope L. (1 mark)

(iii) Identify a pair of isotopes of an element in the decay series. (1 mark)

(d) (i) Name one copper ore. (1 mark)

(ii) The flow chart below represents the extraction of copper.



for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

I. Name gas K. (1 mark)

II. Write an equation for the reaction that takes place in the first roasting furnace. (1 mark)

III. Write the formula of cation present in the slag M. (1 mark)

IV. Identify gas P. (1 mark)

KUWED EXAMINATION COUNCIL 2016
233/3
CHEMISTRY
PAPER 3
PRACTICAL
JULY/AUGUST 2016
TIME: 2_HOURS

1. You are provided with:-
   - ✓ Solution R containing 5.3g per litre of anhydrous sodium carbonate.
   - ✓ Solution L, hydrochloric acid.
   - ✓ Methyl orange indicator
   - ✓ Phenolphthalein indicator.

   You are required to standardize the hydrochloric acid.

   Procedure I

   Fill the burette with solution L. Pipette 25.0cm^3 of solution R into a conical flask. Add three drops of phenolphthalein indicator and titrate with solution L. DO NOT pour out the contents of the conical flask. Repeat the procedure two more times to complete table 1 below, each time keeping the contents of the conical flask for procedure II.

   Table 1 (Using phenolphthalein indicator) (4 marks)

	1	2	3
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Titre t_1 (cm^3)			

   (a) Determine the average titre t_1 (cm^3) (1 mark)

   PROCEDURE II

   Add three drops of methyl orange indicator to the contents of the conical flasks and continue titrating with solution L. Record the readings in table II below. Repeat the procedure to complete the table below.

   Table II (Using methyl orange indicator) (4 marks)

	1	2	3
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Titre t_2 (cm^3)			

   (b) Determine the average titre t_2 (cm^3) (1 mark)
   (c) Calculate the total volume of solution L used (1mark)
   Total volume = $t_1 + t_2$
   (d) Calculate the concentration of solution R in moles per litre (1 mark)
   (Na = 23, C = 12, O = 16)
   (e) Calculate the moles of sodium carbonate in 25cm^3 of solution. (1 mark)
   (f) Calculate the number of moles of hydrochloric acid in the total volume used. (1 mark)
   (g) Calculate the molarity of hydrochloric acid. (1 mark)

2. You are provided with:-
   - ✓ Magnesium ribbon labelled solid T.
   - ✓ 2M hydrochloric acid labelled solution Q.
   - ✓ Stopwatch

   You are required to determine the rate of reaction between magnesium and hydrochloric acid at different concentrations.

   Procedure

   i. Place five test tubes on a test tube rack and label them 1, 2, 3, 4 and 5. Using 10cm^3 measuring cylinder, measure out the volumes of 2M hydrochloric acid, solution Q as shown in the table below, and pour them into corresponding test tubes. Wash the measuring cylinder and use it to measure the volumes of water as indicated in the table below and pour into the corresponding test tubes.
   ii. Cut out five pieces each of exactly 1cm length of magnesium ribbon, solid T.
   iii. Transfer all of the solution in test tube 1 into a clean 100cm^3 empty clean beaker, place one piece of magnesium into the beaker and start a stopwatch immediately. Swirl the beaker continuously ensuring that magnesium is always inside the solution.
   Record in the table the time taken for the magnesium ribbon to disappear. Wash the beaker each time.
   iv. Repeat procedure III for each of the solutions in test tubes 2,3,4 and 5 and complete the table below. (5 marks)
   (a) A

Test tube number	1	2	3	4	5
Volume of solution Q (cm^3)	10	8	6	4	2
Volume of water (cm^3)	0	2	4	6	8
Time taken (seconds)					
Rate of reaction = ___ ( )					

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(b) On the graph below, plot the rate of reaction ___ (y – axis) against the volume of solution Q (3marks)

(c) Use your graph to determine the time that would be taken for 1cm length of magnesium ribbon to disappear if the volume of the acid, solution Q used was 7.5cm^3. (1 mark)

(d) In terms of rate of reaction, explain the shape of your graph. (1 mark)

3. (a) You are provided with solid M. Carry out the tests below on solid M and record your observations and inferences in the spaces provided.

(i) Observe the appearances of solid M

Observations	Inferences
(½ mark)	(½ mark)

(b) Put all the solid M into a boiling tube then add 8cm^3 of distilled water and shake well. Divide the solution into four portions.

(i) To the first portion, add 1cm^3 of hydrogen peroxide and shake well. To the resulting mixture, add aqueous sodium hydroxide dropwise until in excess.

Observations	Inferences
(1 mark)	(1 mark)

(ii) To the second portion, add 3 drops of aqueous ammonia until in excess.

Observations	Inferences
(1 mark)	(1 mark)

(iii) To the third portion, add four drops of solution Q, (2M hydrochloric acid)

Observations	Inferences
(1 mark)	(1 mark)

(iv) To the fourth portion, add 3 drops of aqueous lead (II) nitrate and warm.

Observations	Inferences
(1 mark)	(1 mark)

(c) You are provided with liquid F. Carry out the following tests and record your observation and inferences in the spaces provided.

(i) Place five drops of liquid F on a clean and dry watch glass and ignite it.

Observations	Inferences
(1 mark)	(1 mark)

(ii) Place about 2cm^3 of liquid F in a clean dry test – tube, add all the sodium hydrogen carbonate provided.

Observations	Inferences
(1 mark)	(1 mark)

(iii) Place about 2cm^3 of liquid F in a test tube, add about 1cm^3 of acidified potassium dichromate (VI) and warm the mixture.

Observations	Inferences
(1 mark)	(1 mark)

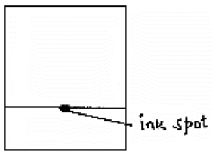
for more free past papers visit www.freekcsepastpapers.com or call. 0720502479

KAHURO/MURANG'A EAST JOINT EXAMINATION – 2016 233/1

CHEMISTRY
PAPER 1
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

1. A given sample of ink is a mixture of red dye, blue dye and orange dye. The blue dye is least absorbed than the rest and the red dye is most sticky.

(a) Complete the paper chromatogram below showing their separation. (1½mks)



(b) The above dyes are soluble in water. Describe how a pure sample of blue dye can be obtained. (1mk)

(c) Name the solvent used in paper chromatography. (½mk)

2. Excess iron was allowed to rust in 2dm³ of most air and the volume of air remaining was measured at 1 atmospheric pressure each day. The results were as follows.

Day	0	1	3	4	5	6	7	8
Volume (cm³)	2000	1900	1720	1660	1620	1600	1600	1600

(i) Write an equation for the formation of rust. (1mk)

(ii) On which day was the reaction complete. Explain. (1mk)

(iii) What is the percentage volume of oxygen in air. Show your working. (1mk)

3. State **two** properties of copper that make it suitable for making ornaments. (2mks)

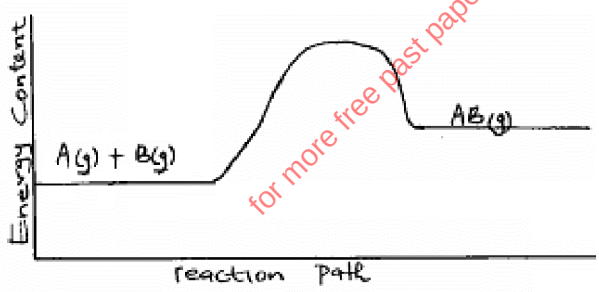
4. Give the IUPAC name of the following: (1mk)

(i) $CH_3CH_2COOCH_2CH_3$

(ii) Give the name of the homologous series to which the compound belongs. (1mk)

(iii) Name and draw the alcohol that formed the compound in 4(i) above. (1mk)

5. Consider the following equation.



On the same axis, sketch the graph when a catalyst is added and label all the essential parts. (2mks)

6. A radioactive isotopes of lead undergoes radioactive decay in two stages are shown below.

$$^{216}_{85}Pb \xrightarrow{(i)} {}^{212}_{83}X \xrightarrow{(ii)} {}^{212}_{84}Y$$

(a) Identify the particle emitted at each stage. (2mks)

(b) State **one** use of radioactive isotopes. (1mk)

7. Aluminium chloride solution changes blue litmus paper red. Explain this observations. (2mks)

8. Nitric (V) acid may be prepared in the laboratory by the action of concentrated sulphuric (VI) acid on a suitable nitrate and distilling OFF the nitric (V) acid.

(a) Why is the apparatus consisting of glass desirable? (1mk)

(b) Pure nitric (V) acid is colourless but the products in the laboratory preparation is usually yellow. Explain. (2mks)

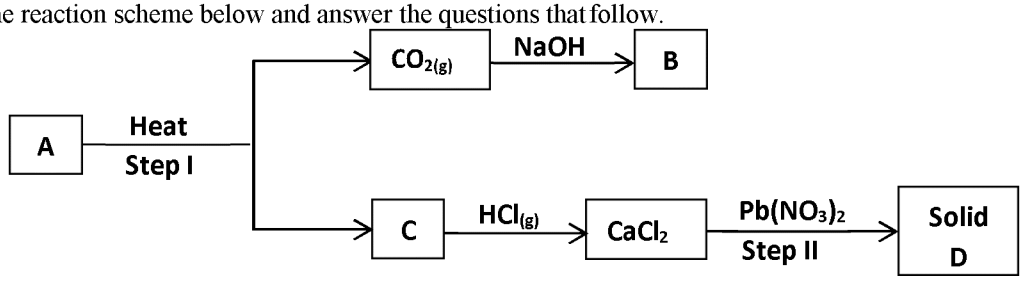
9. Describe how a solid sample of barium sulphate can be prepared starting with copper (II) oxide. (3mks)

for more free past papers visit www.freekcseastpapers.com or call: 0720502479

10. The results of an experiment to determine the solubility of potassiumchlorate in water at 30°C were as follows.
    Mass of dish = 15.86g.
    Mass of dish + saturated solution at 30°C = 26.8g.
    Mass of dish + solid potassium chlorate after evaporation to dryness = 16.86g.
    Calculate the mass of saturated solution containing 60g of water at 30°C. (3mks)
11. The melting point of phosphorous trichloride is -91°C while that of sodium chloride is 801°C. In terms of structure and bonding explain the difference in the melting point. (3mks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

12. Study the reaction scheme below and answer the questions that follow.



(i) Identify substances. A ,B , C, D (2mks)

(ii) Write chemical equation for the reaction taking place in Step **(II)**. (1mk)

13. (i) Explain why the ability of temporary hard water to conduct electricity falls when water is boiled, but it does not fall when temporary hardness is removed by addition of washing soda. (2mks)

(ii) Name the ions that causes water hardness. (1mk)

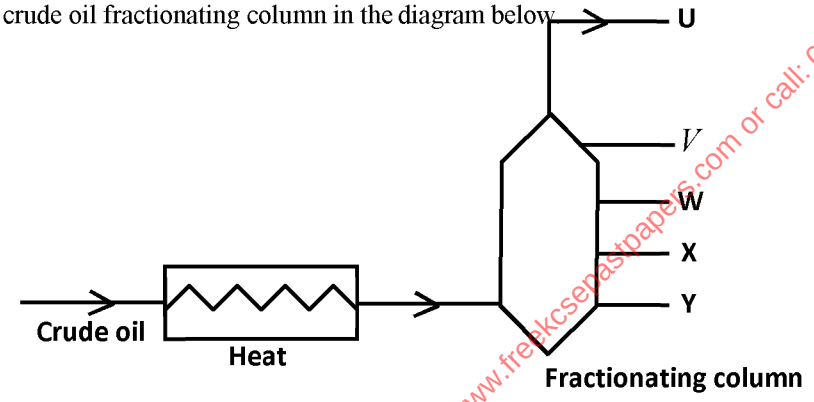
14. (i) State the Gay-Lussac's Law. (1mk)

(ii) 15cm³ of a gaseous hydrocarbon reacted completely with 45cm³ of oxygen. 30cm³ of carbon (IV) oxide were formed. Determine the formula of the hydrocarbon given that all volumes of gases were measured under the same conditions of temperature and pressure. (2mks)

15. (i) State the observation made when hydrogen sulphide gas is bubbled through aqueous lead (II) nitrate solution. (1mk)

(ii) Write an ionic equation for the reaction above. (1mk)

16. Study the crude oil fractionating column in the diagram below.



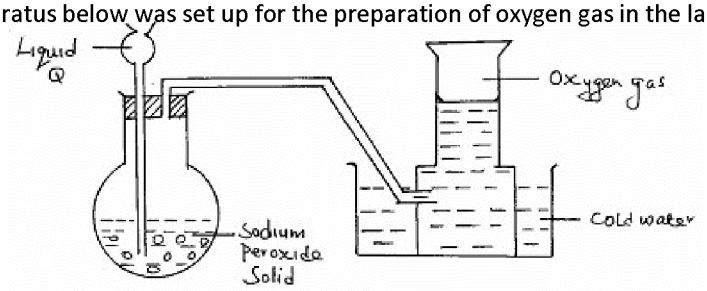
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(i) How would you expect the temperature to vary from U to Y? (½mk)

(ii) For each fraction given below, state at what position **U**, **V**, **W**, **Z** and **Y** it will be collected. (2½mks)

Compound with	Position collected
$C_{15} \rightarrow C_{25}$ atoms	……
$C_4 \rightarrow C_{15}$ atoms	……
$C_{20} \rightarrow$ Upwards	
$C_8 \rightarrow C_{16}$ atoms	
$C_1 \rightarrow C_4$ atoms	

17. The apparatus below was set up for the preparation of oxygen gas in the laboratory.



(a) Name liquid **Q**. (1mk)

(b) Write a balanced chemicals equation for the reaction that takes place in the reaction flask. (1mk)

(c) Give a reason why it is preferred to use warm water to cold water when collecting oxygen gas. (1mk)

18. 25cm³ of a solution of ammonium iron (II) sulphate $(NH_4)_2 SO_4$. $FeSO_4 nH_2O$ with concentration of 19.6g/l was titrated with 12.5cm³ of 0.02M acidified potassium manganate (VII). Given the equation.

$$5Fe^{2+}_{(aq)} + MnO^{-}_{4\,(aq)} + 8H^{+}_{(aq)} \rightarrow Mn^{2+}_{(aq)} + 5Fe^{3+}_{(aq)} + 4H_2O_{(l)}$$

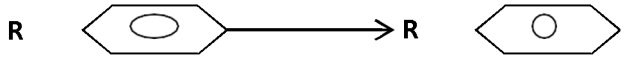
19. Sulphur (IV) oxide and nitrogen (IV) oxide reacts as shown in the equation below.
$SO_2 + NO_2 \rightarrow SO_{3(g)} + NO_{(g)}$
(a) Using oxidation numbers show that this is a redox reaction. (2mks)
(b) Identify the reducing agent. (1mk)

20. Zinc can be extracted through reduction then purified by electrolytic process.
(i) Name **two** ores from which zinc can be extracted. (1mk)
(ii) Name a substance that can be used as reducing agent in the furnace during extraction of zinc by reduction. (1mk)

21. A student was provided with 1.5g of XCO_3. He reacted it with $50cm^3$ of 1M HCl which was excess. Determine the volume of CO_2 produced at S.T.P.
(R.F.M of x CO_3 = 100) molar gas volume at S.T.P = $22400cm^3$. (2mks)

22. Explain how a catalyst affects the following in a chemical reaction.
(i) The enthalpy change. (1mk)
(ii) The activation energy. (1mk)
(iii) Chemical equilibrium. (1mk)

23. The scheme below represents the manufacture of a cleansing agent G.



$SO_3H + NaOH \rightarrow$ Cleansing agent G

(i) Draw the structure of G and state the type of cleansing agent in which **G** belongs. (2mks)
(ii) State **one** advantage of using G is as cleansing agent. (1mk)

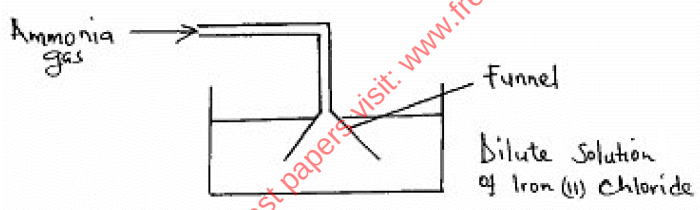
24. The equation below represent equilibrium reaction between chromate ions and dichromate ions.

$$2CrO_4^- + 2H^+ \rightleftharpoons Cr_2O_{7(aq)}^{2-} + H_2O$$

(Yellow) (Orange)

(a) What is meant by the term dynamic equilibrium? (1mk)
(b) State and explain the observation made if dilute sulphuric (VI) acid is added to the equilibrium mixture. (2mks)

25. Below is a set up of apparatus used to react ammonia gas with iron (II) chloride?



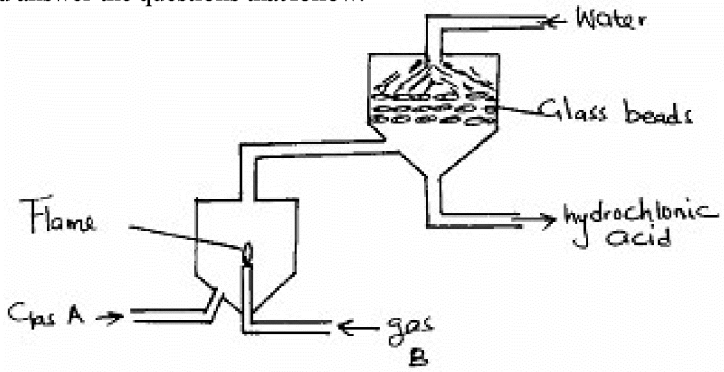
(a) State observation made in the beaker. (1mk)
(b) Give a reason for using a funnel to deliver the ammonia into the beaker. (2mks)

26. Your lab technician noted that the reagent bottles of sodium carbonate, sodium chloride and sugar have lost their labels. Your chemistry teacher requested you to prepare and test aqueous solutions of each sample as shown below.

Bottle	PH	Electrical conductivity	
1	7	Conducts	
2	7	Does not conduct	
3	10	Conducts	

Complete the table by filling the correct label for each bottle. (3mks)

27. The diagram below represent large scale manufacture of hydrochloric acid.
Study it and answer the questions that follow.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502179

(a) Identify. (1mk)

(i) Gas **A** ……

(ii) Gas **B** ……

(b) Write the chemical equation for the reaction between gas **A** and **B**. (1mk)

(c) State the role of glass beads in the process. (1mk)

28. (a) Using electrons in the outermost energy level, draw (•) and cross (x) diagram for H_3O^+ and C_2H_4 (H = 1, C = 6, O = 16)

(i) C_2H_4 (1mk)

(ii) H_3O^+ (1mk)

(b) What would be the effect of dipping litmus paper in aqueous solution of H_3O^+? (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KAHURO/MURANG'A EAST JOINT EXAMINATION – 2016 233/2

CHEMISTRY
PAPER 2
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

1. The grid below shows part of the periodic table. Use it to answer questions that follow. The letters do not represent the actual symbols of the elements.

						S	U	V
P	R					T		W
Q								

(a) (i) Which of the element has the lowest ionization energy? (1mk)

(ii) Explain your answer in a(i) above. (1mk)

(b) (i) Identify the most reactive non-metal. (1mk)

(ii) Explain your answer in b(i) above. (1mk)

(c) Give the electronic configuration of element.

(i) **S** …….. (½mk)

(ii) **Q** …….. (½mk)

(d) Compare the atomic radius of **P** and **R**. Explain. (2mks)

(e) The mass number of W is 40. Write down the composition of its nucleus. (1mk)

(f) Write formula of oxides of P. (1mk)

(g) (i) What is the name given to elements found in the shaded region. (1mk)

(ii) Which elements can be used to provide an inert environment? (1mk)

2. (a) In which homologous series do the following compounds belong.

(i) CH_3 CCH. …… (1mk)

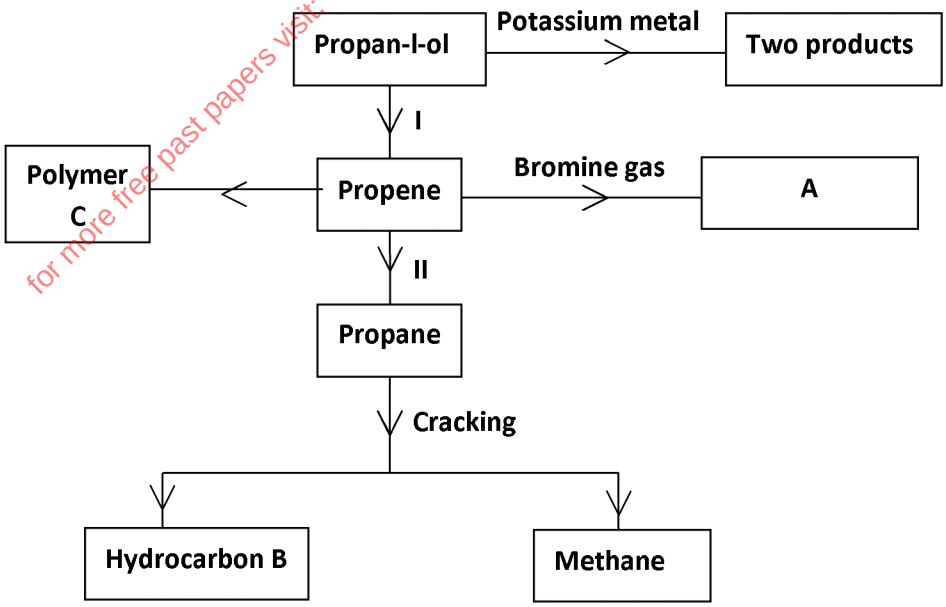
(ii) CH_3 CH_2 COOH …….. (1mk)

(b) Raw rubber is heated with sulphur in the manufacture of natural rubber.

(i) What name is given to the process? (1mk)

(ii) Why is the process necessary? (1mk)

(c) Study the scheme given below and answer the questions that follow.



(i) Write an equation for the reaction between propan-l-ol and potassium metal. (1mk)

(ii) Name process **I** and **II**.

(iii) Identify the products **A** and **B**.

(iv) Name **one** catalyst used in Process **II**. (1mk)

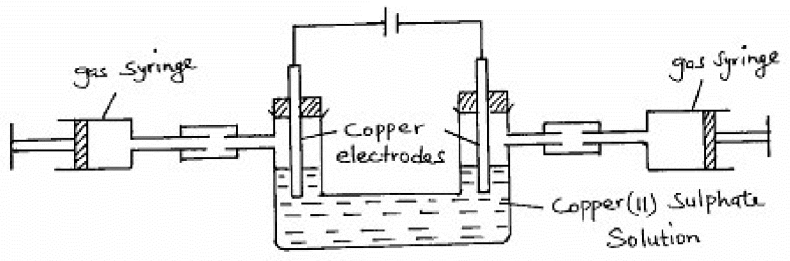
(v) Draw the structural formula of the repeating unit in the polymer **C**. (1mk)

(d) State **two** industrial uses of methane. (1mk)

(e) Write the structural formula of 2, 3-dichloropropene. (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

3. Aqueous copper (II) sulphate was electrolysed using the set up represented by the diagram below.



(a) Apart from copper (II) ions and sulphate ions identify the ions in copper (II) sulphate solutions. (1mk)

(b) Write an equation for the reaction at the:

(i) Anode …….. (1mk

(ii) Cathode …….. (1mk)

(c) Using an arrow (→) indicate the direction of flow of electrons on the diagram. (1mk)

(d) If in the above set up copper electrodes were replaced with inert electrodes. Write an equation for the reaction which would occur at the anode. (1mk)

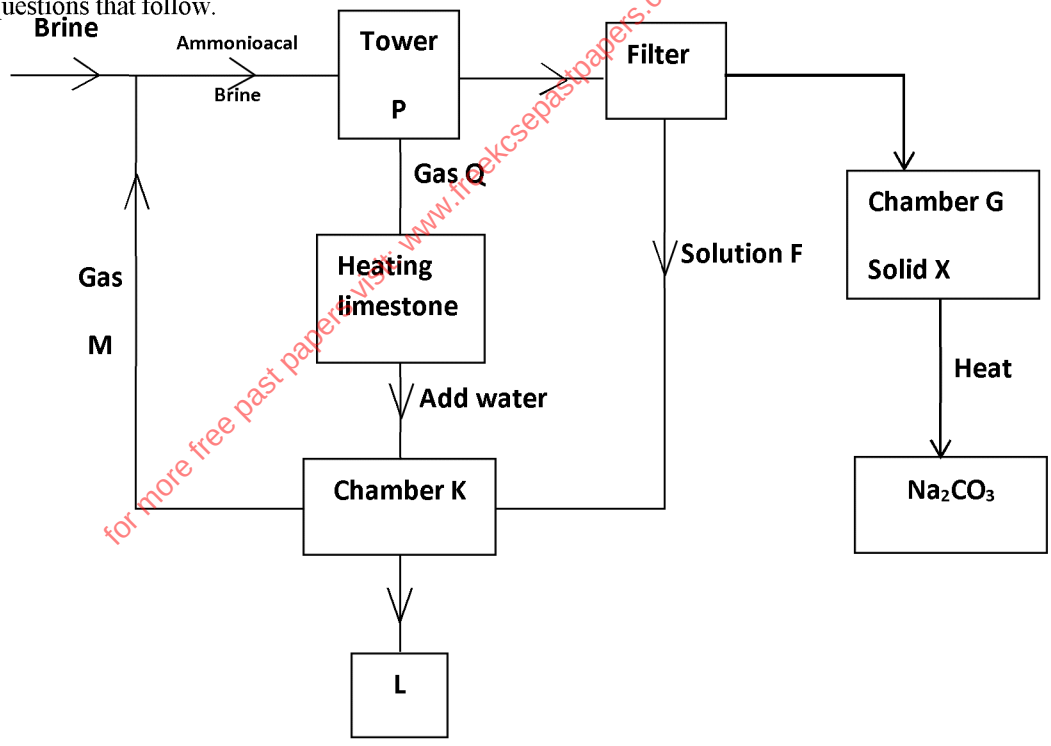
(e) An iron spoon was to be electroplates with silver. Draw a well labelled diagram of the set-up of apparatus that could be used to carry out the process. (3mks)

(f) The table below shows ammeter readings obtained where different electrolytes of the same concentration were tested.

Electrolyte	**Ammeter reading**
Copper (II) sulphate solution	4.4
Ethanoic acid	1.2

Explain why ethanoic acid gave a lower ammeter reading the copper (II) sulphate solution. (2mks)

4. I The flow chart below is for the manufacture of sodium carbonate using Solvay process. Use it to answer the questions that follow.



for more free past papers visit www.freekcsepastpapers.com or call: 0720502419

(a) Name:

(i) Gas **M**…… (1mk)

(ii) Solution **F** …… (1mk)

(iii) Solid X …… (1mk)

(iv) The product **L**…… (1mk)

(b) Write an equation for the reaction in chamber **K**. (1mk)

(c) Name **two** raw materials used in Solvay process. (2mks)

(d) (i) Name **one** substance recycled in Solvay process.

(ii) Give **two** reasons why carbon (IV) oxide is used as fire extinguisher. (2mks)

(iii) Explain why lead carbonate is not reacted with dil. H_2SO_4 in preparation of carbon (IV) oxide in the laboratory. (2mks)

5. In order to determine the molar heat of neutralization of 1M potassium hydroxide, 200cm³ of 1M hydrochloric acid both at the same temperature were mixed and stirred continuously with a thermometer. The temperature of the resulting solution was recorded after every 30 seconds until the highest temperature of the solution was attained.

(a) (i) Why was it necessary to stir the mixture of the two solutions? (1mk)

(ii) Define the term molar heat of neutralisation. (1mk)

(iii) Write an ionic equation for the reaction. (1mk)

(b) The initial temperature for both solution was 24.5°C and the highest temperature attained by the mixture was 30.9°C. Calculate the

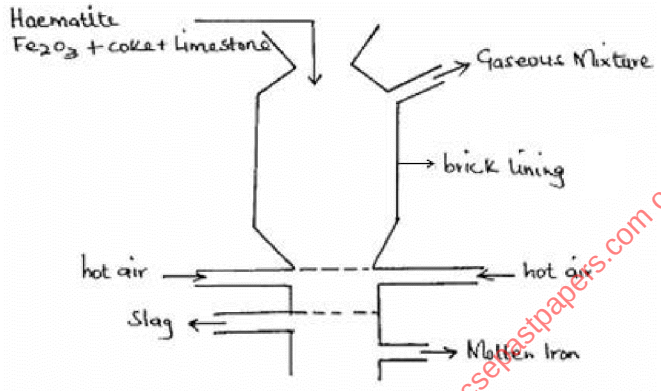
(i) heat change for the reaction.
(Specific heat capacity of the solution is $4.2Jg^{-1}K^{-1}$, Density of the solution is $1.0gcm^{-3}$).
The volume of KOH used was 200cm³. (2mks)

(ii) molar heat of the neutralisation. (2mks)

(c) If ammonium hydroxide was used instead of potassium hydroxide the heat of neutralization would be different from the one obtained in b(ii) above.
Explain the difference. (3mks)

(d) Draw an energy level diagram for the reaction between potassium hydroxide and hydrochloric acid. (3mks)

6. I The extraction of iron from its ores takes place in the blast furnace. Below is a simplified diagram of a blast furnace. Study it and answer the questions that follow.



for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

(a) Name

(i) **One** substance in the slag.

(ii) Another iron ore material used in the blast furnace.

(b) Describe the processes which lead to the formation of iron in the blast furnace. (3mks)

(c) What is the use of limestone in the blast furnace? (1mk)

(d) Give a reason why the melting point of the iron obtained from blast furnace is 1200°C while that of pure iron is 1535°C. (1mk)

(e) State **two** uses of steel. (1mk)

II (a) Write the formula of compound formed when iron reacts with dil hydrochloric acid.

(b) Name a compound of iron which sublimes on heating. (½mk)

7. The table below gives the volumes of the gas produced when different volumes of 2M hydrochloric acid were reacted with 0.6g of magnesium powder at room temperature.

Volume of 2M HCl (cm³)	Volume of the gas (cm³)
0	0
10	240
20	480
30	600
40	600
50	600

(a) Write an equation for the reaction between magnesium and hydrochloric acid. (½mk)

(b) On the grid provided plot a graph of the volume of the gas produced (vertical axis) against volume of acid added. (Note that before the reaction comes to completion, the volume of gas produced is directly proportional to the acid added. (3mks)

(c) From the graph, determine

(i) the volume of gas produced if 12.5cm³ of 2M HCl had been used. (½mk)

(ii) The volume of 2M HCl acid which reacted completely with 0.6g of magnesium powder. (1mk)

(d) State and explain the effect on the rate of production of the gas if

(i) 0.6g of magnesium ribbon was used. (2mks)

(ii) 2M hydrochloric acid at 15°C was used instead of room temperature.

(e) Given that one mole of the gas occupies 24000cm³ at room temperature.
Calculate the relative atomic mass of magnesium. (3mks)

233/3

CHEMISTRY
PAPER 3 (PRACTICAL)
CONFIDENTIAL
KAHURO/MURANG'A EAST JOINT EXAMINATION – 2016

In addition to the common apparatus and fittings found in a Chemistry laboratory, each candidate should be provided with;

- Solid A (Six pieces of 1cm long magnesium ribbon)
- 1 boiling tube.
- Distilled water in a wash bottle.
- 1 filter funnel.
- 1 filter paper.
- 1 label.
- Solid B (1g).
- Solid W (1g).
- Universal indicator paper and a pH chart.
- About 60cm^3 of solution Y 0.4M sodium carbonate solution.
- About 120cm^3 of solution X 2M hydrochloric acid.
- A pipette (25ml).
- A burette.
- 10ml measuring cylinder.
- A stop watch.
- 100ml beaker.
- Stirring rod.
- Sodium hydrogen carbonate (About 1g).

ACCESS TO:

- 2M NaOH solution.
- Ammonia solution (2M).
- Bunsen burner.
- Lead (II) nitrate solution.
- Acidified potassium manganate (VII) solution.
- Methyl orange indicator.
- Dilute nitric (V) acid.
- Sodium chloride solution.

NB:

- Solid B is a mixture of sodium sulphate and lead (II) carbonate in a ratio of 1: 1. Prepare solid B for each candidate separately.
- Solid W is maleic acid.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KAHURO/MURANG'A EAST JOINT EXAMINATION – 2016

233/3
CHEMISTRY
PAPER 3
(PRACTICAL)
JULY/AUGUST, 2016
TIME: 2¼ HOURS

1. You are provided with:
- 2M hydrochloric acid solution X.
- Magnesium ribbon.
- 0.4M sodium carbonate solution Y.
- Solid A (six pieces of 1cm long magnesium ribbon).

You are required to determine:-
(i) The rate of reaction between hydrochloric acid and magnesium.
(ii) The mass of 1cm of magnesium ribbon.

PROCEDURE I

Using a measuring cylinder, measure 20cm³ take 1 piece of 2M hydrochloric acid, solution X and place it in a clean 100ml beaker. Cut a 1cm piece of magnesium ribbon and place it in the 100ml beaker containing 2M hydrochloric acid and immediately start the stop clock/watch; measure and record the time taken for the magnesium ribbon to react completely with 2M hydrochloric acid in the table below. Retain the resultant solution by transferring it into a 100ml measuring cylinder then adding distilled water to make 100ml of solution, label this solution Z. Reserve solution Z for use in procedure II.
Measure 18cm³ of hydrochloric acid accurately, add 2cm³ of distilled water to make the total volume 20cm³. Transfer the contents into the 100ml beaker,place another piece of 1cm length magnesium ribbon in the beaker then swirl and record the time taken for it to completely react. Repeat this procedure by measuring the volumes of the acid and distilled water as in table I below.
Retain the remaining solution X for question 2.

TABLE I

Experiment	Volume of 2M hydrochloric acid (cm³)	Volume of water (cm³)	Time taken for magnesium ribbon to react completely (sec)	$\frac{1}{Time}$ (sec^{-1})
1	20	0		
2	18	2		
3	16	4		
4	14	6		
5	12	8		

(6mks)

(a) Plot a graph of $\frac{1}{Time}$ against volume of the acid. (3mks)

(b) From the graph determine the time taken for the ribbon to react completely with 17cm³ of 2M hydrochloric acid. (2mks)

PROCEDURE II

Fill the burette with solution Y. Pipette 25cm³ of solution Z into a conical flask.
Add 2 drops of methyl orange indicator. Titrate solution Z with solution Y to complete the titration table II below.
(4mks)

TABLE II

	I	II	III
Final burette reading			
Initial burette reading			
Volume of solution Y used.			

Calculate:
(i) Average volume of solution Y. (1mk)
(ii) Number of moles of solution Y used. (1mk)
(iii) Number of moles of hydrochloric acid in 25cm³ of solution Z. (1mk)
(iv) Number of moles of hydrochloric acid present in 100cm³ of solution Z. (1mk)
(v) Number of moles hydrochloric acid present in 20cm³ solution X. (1mk)
(vi) Number of moles of hydrochloric acid that reacted with 1cm of magnesium ribbon. (1mk)
(vii) Mass of magnesium present in 1cm length of magnesium ribbon. (Mg = 24). (1mk)

2. You are provided with solid B. Use it to carry out the tests below. Write your observations and inferences in the spaces provided. Place all solid B in a boiling tube, add about 10cm³ of distilled water and shake thoroughly. Filter the mixture

for more free past papers visit: www.freekcsepastpapers.com or call 0729002179

obtained. Retain the residue for tests (b) below. Divide the filtrate into 2 portions.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(a) (i) To portion (i), insert a clean stirring rod and place it on a non-luminous flame of a Bunsen burner.

Observation	Inference
(1mk)	(1mk)

ii) To portion (ii), add about 3 drops of lead (II) nitrate solution, then warm.

Observation	Inference
(1mk)	(1mk)

(b) Dissolve the residue in about 8cm³ of dilute nitric (V) acid solution and divide the resulting solution.

Observation	Inference
(1mk)	(1mk)

(i) To portion (i), add sodium hydroxide solution, dropwise, then in excess.

Observation	Inference
(1mk)	(1mk)

(ii) To portion (ii), add sodium chloride solution and then warm.

Observation	Inference
(1mk)	(1mk)

3. You are provided with solid W. Place it in a boiling tube and about 10cm³ of distilled water and shake. Divide the resulting solution into 3 portions.

Observation	Inference
(1mk)	(1mk)

(i) Use the first portion to determine the pH of the solution.

Observation	Inference
(1mk)	(1mk)

(ii) To the second portion, add about half spatula of sodium hydrogen carbonate.

Observation	Inference
(1mk)	(1mk)

(iii) To the third portion, add about 3 drops of acidified potassium manganate (VII).

Observation	Inference
(1mk)	(1mk)

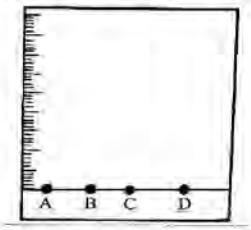
for more free past papers visit www.freekcsepastpapers.com or call: 0729502479

GATUNDU SOUTH FORM FOUR EVALUATION EXAMINATION

Kenya Certificate of Secondary Education
233/1
CHEMISTRY
PAPER 1
THEORY
JULY / AUGUST 2016
2 HOURS

1. (a) Distinguish between ionization energy and electron affinity. (2 marks)
   (b) The atomic number of Q and R are 9 and 17 respectively. Compare the electron affinity of Q and . Explain. (1 mark)
2. The relative atomic mass of an element is 10.28, it has two isotopes $^{10}_{5}R$ and $^{11}_{5}R$.

   Calculate the relative percentage abundance of each isotope. (3 marks)
3. The diagram below shows spots of pure substances A, B and C on a chromatography paper. Spot D is that of a mixture. After development A, B and C were found to have moved 9cm, 4cm and 7cm respectively D has separated into two spots which moved 7cm and 9cm.



   (a) On the diagram
   (i) Using 5 units in the alongside scale to represent 1cm Show the position of all the spots after development. (2 marks)
   (ii) Identify the substances present in mixture D. (1 mark)
4. Describe how solid Aluminium chloride can be separated from a solid mixture of sodium chloride and ammonium chloride. (3 marks)
5. The number of protons and neutrons of atoms W, X, Y and Z are shown in the table below.

Atom	No. of protons	No. of neutrons
W	6	6
X	12	12
Y	6	8
Z	17	20

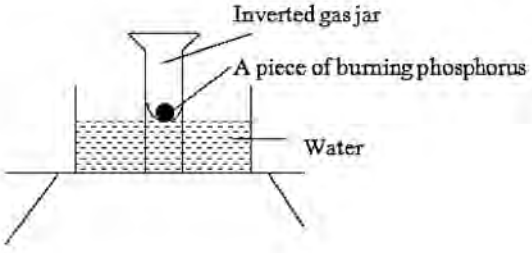
   (a) Write down the electronic configuration of X. (1 marks)
   (b) (i) Which one of the atoms is of an element in group (VII) of the periodic table.
   (ii) Name the type of bond which is formed when X and Z reacts. (1 mark)
6. The table below gives the solubility of potassium bromide and potassium sulphate at 0^0C and 80^0C.

Substance	0^0C	80^0
Potassium bromide	58 g/100g water	77 g/100g water
Potassium sulphate	18 g/100g water	20 g/100g water

   When an aqueous mixture containing 60g of potassium bromide and 7g of potassium sulphate in 100g of water was cooled from 80^0C to 0^0C, some crystals were formed.
   (a) Identify the crystals. (1 mark
   (b) Determine the mass of crystals formed. (1 mark)
   (c) Name the method used to obtain the crystals. (1 mark)
7. What is the colour of the following. (2 marks)

Metal oxide	Colour when hot	Colour when cold
Zinc (II)oxide		
Lead (II) oxide		

8. The diagram below represents a set up that was used to show that part of air which is used during burning.

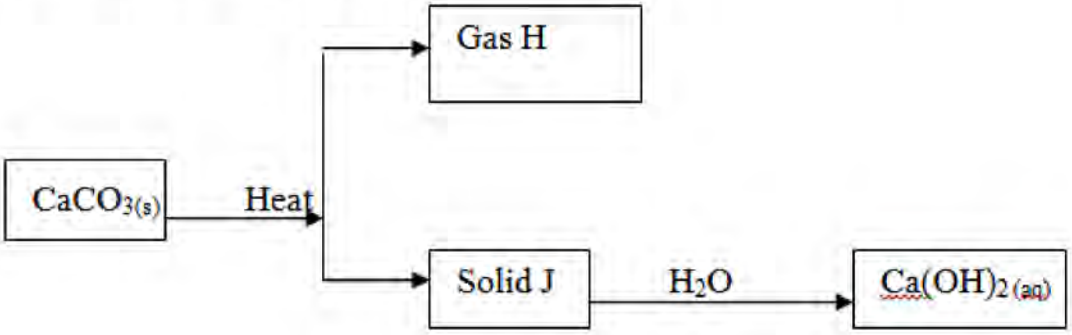


for more free past papers visit: www.freekcsepastpapers.com or call 0720502479

(a) If excess phosphorus was used in the set up. Draw a diagram of the set up at the end of the experiment when there was no further observable change. (2 marks)

(b) Suggest one modification that should be made on the apparatus if the percentage of the air used is to be determined. (1 mark)

9. Use the scheme below to answer the questions that follow.



(a) Identify the substances H and J.

(b) State one commercial use of solid J. (1 mark)

10. Sulphur exists in two crystalline forms

(a) Name one crystalline form of sulphur. (1 mark)

(b) Give any two uses of sulphur. (2 marks)

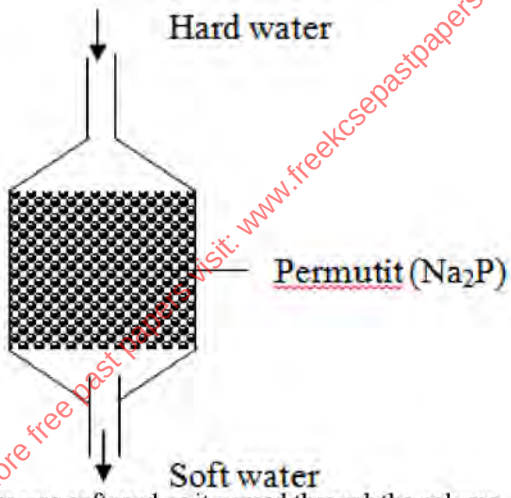
11. (a) The equation below represents a redox reaction.

$2FeCl_{2(aq)} + Cl_{2(g)} \rightarrow 2FeCl_{3(aq)}$

Identify the oxidizing agent. Give a reason. (2 marks)

(b) What is the oxidation number of chlorine in ClO^-_4 ? (1 mark)

12. The column below was used to soften water

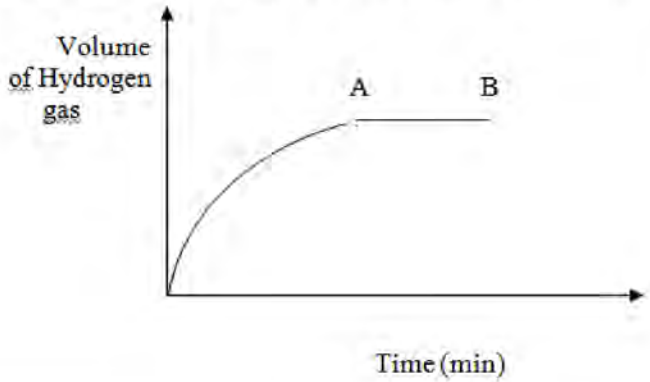


(a) Explain how the hard water was softened as it passed through the column. (1 mark)

(b) After some time the material in the column is not able to soften hard water.
How can the material be reactivated? (1 mark)

(c) State one advantage of using hard water for domestic purposes. (1 mark)

13. In an experiment magnesium ribbon was reacted with dilute sulphuric (VI) acid and the volume Of hydrogen gas produced with time noted. The graph below shows the volume of gas produced with time



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

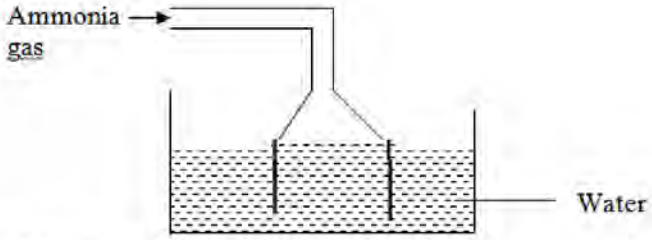
Explain the following observations.

(i) The curve of the graph is steepest at the beginning. (1 mark)

(ii) The curve of the graph completely flattens at region AB. (1 mark)

(iii) On the same axis plot the curve that would be obtained if the acid used was ethanoic acid. Label it ethanoic acid (1 mark)

14. Ammonia gas was passed into water as shown below.



(a) What is the use of the inverted funnel. (1 mark)

(b) Explain why the pH of the solution is above 7. (1 mark)

(c) Explain why hydrochloric acid displays acidic properties when dissolved in water, while in methylbenzene, the acid does not display the acidic properties. (1 mark)

15. $60cm^3$ of oxygen gas diffused through a porous partition in 50 seconds. How long will it take $120cm^3$ of sulphur (IV) oxide gas to diffuse through the same partition under the same conditions. (3 marks)

16. The data below was recorded when metal K was completely burnt in air. K is not the actual symbol of the metal.
(R.A.M; K = 56, O = 16)
Mass of empty crucible and lid = 10.240g
Mass of crucible, lid and metal K = 10.352g
Mass of crucible, lid and metal oxide = 10.400g

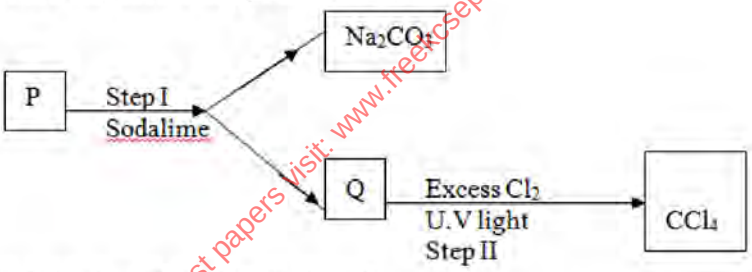
(a) Determine the mass of

(i) Metal K (½mark)

(ii) Oxygen (½ mark)

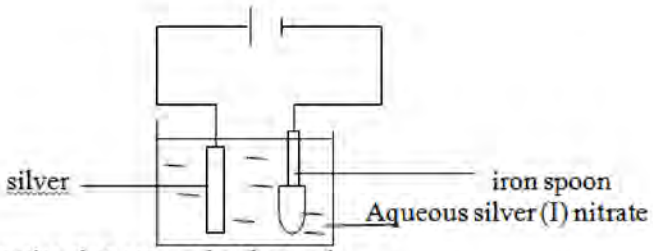
(b) Determine the empirical formula of the metal oxide. (2 marks)

17. Study the flow chart below and answer the question that follow.



(b)What name is given to the type of reaction in step 2 ? (1 mark)

18. The set –up below was used to electroplate a metallic spoon. Study it and answer the questions that follow .



(a) Write an equation for the reaction that occurred at the anode. (1 mark)

(b) State and explain what happened to the cathode. (2 marks)

19. The structures below represents two cleansing agents

(A) $R - COO^- Na^+$

(B) $R - OSO_3^- Na^+$

(a) In the table below, give one advantage and one disadvantage of using each of them. (2 marks)

	Advantage	Disadvantage
$R - COO^- Na^+$		
$R - OSO_3^- Na^+$		

(b) Which of the two cleaning agents is the better for washing. Explain. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

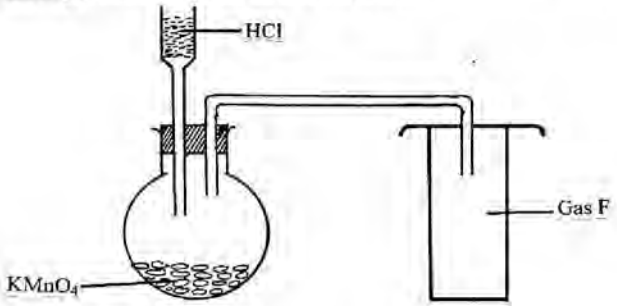
20. The table below shows the observations made on tests carried out on a colourless liquid sample.

Exp	Test	Observation
(i)	Addition of excess $NaOH_{(aq)}$	White precipitate soluble in excess
(ii)	Addition of dilute $H_2SO_{4(aq)}$	White precipitate
(iii)	Addition of $AgNO_{3(aq)}$	White precipitate

(a) Identify (i) Cation in the sample _____ (1 mark)
(ii) Anion in the sample _____ (1 mark)

(b) Write the ionic equation for the reaction taking place in experiment (III). (1 mark)

21. An experiment was set as shown below



(a) Name the gas F (1 mark)
(b) State one physical characteristic of gas F. (1 mark)
(c) What would be observed if a litmus paper was put in a solution of gas F. (1 mark)

22. At 20^0C NO_2 ; N_2O_4 gases exist in equilibrium as shown in the equation below.

$2NO_{2(g)}$ ⇌ $N_2O_{4(g)}$ ΔH = -ve
(Brown) (pale yellow)

(a) What is the significance of the negative sign as in the equation above. (1 mark)
(b) State and explain the observations that would be made when
(i) a syringe containing the mixture was immersed in warm water. (1 mark)
(ii) The volume of the gaseous mixture in the syringe was increased. (1 mark)

23. (a) Explain why its not advisable to use woodash for cleaning aluminium utensils. (1 mark)
(b) Aluminium metal is a good conductor and its used for over-head cables. State any other two properties that makes aluminium suitable for this use. (2 marks)

24. Study the information in the table below and answer the questions that follow.

Bond	Bond energy
C – H	414
Cl – Cl	244
C – Cl	326
H – Cl	431

Calculate the enthalpy change of the reaction: (3 marks)

$$CH_{4(g)} + 2\,Cl_{2(g)} \xrightarrow[\text{Light}]{\text{U.V}} CH_2Cl_{2(g)} + 2\,HCl_{(g)}$$

25. Urea $(NH_2)_2CO$ is prepared by the reaction between ammonia and carbon (IV) oxide gas.

$2NH_{3(g)} + CO_{2(g)} \rightarrow (NH_2)_2\,CO_{(aq)} + H_2O_{(l)}$

In one process, 620kg of ammonia were reacted with excess carbon (IV) oxide gas.
Calculate the mass of the urea that was formed.
(H = 1.0, C =12.0, N = 14,O = 16 and RMM of ammonia is 17) (3 marks)

26. Below is a list of oxides.
MgO, N_2O, K_2O, CaO and Al_2O_3
From the above list select
(a) A neutral oxide. (1 mark)

(b) An oxide that can react with both potassium hydroxide and dilute hydrochloric acid. (1 mark)
(c) What property is exhibited by the reaction in b above. (1 mark)

27. a) The electronic configuration of an ion P^{2-} is 2.8.8.. Draw the structure of the atom just above element P in the periodic table. (2 marks)

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

28. State one use of a luminous flame. (1mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

GATUNDU SUB-COUNTY EVALUATION EXAMINATION

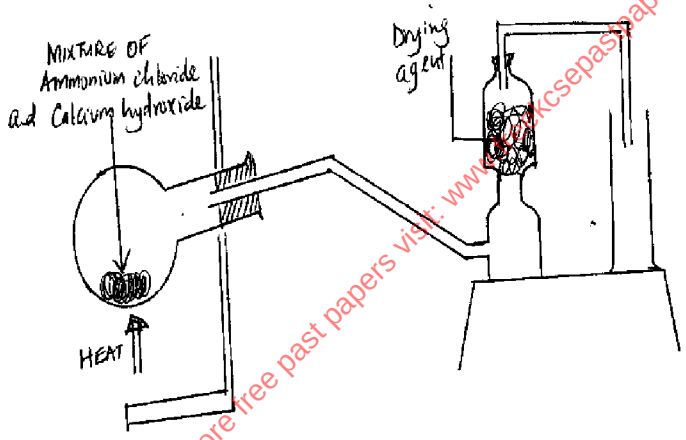
233/2
CHEMISTRY
Paper 2
(THEORY)
July/Aug 2016
2HOURS

1. The grid below represents part of the periodic table. Study it and answer the questions that follow.
The letters do not represent the actual symbols of the elements.

				Q				
O						R	S	
	T						U	
V							Z	

a) (i) Which element will require the least amount of energy to remove one of its outermost electrons, explain. (1mark)
(ii) Select the most reactive non-metal (1mark)
(iii) What name is given to the family of elements to which T belong? (1mark)
(iv) Between S and R, which element has a smaller atomic radius, explain. (2marks)
(v) Which of the elements have a tendency of forming covalent bonds? Explain. (1mk)
(vi) Write the formula of the compound formed when U reacts with T, state the type of body formed.
Formula (1mark)
Bond (2marks)

2. (a) A student set up the apparatus as shown in the diagram below to prepare and collect dry ammonia gas.



for more free past papers visit: www.kcsepastpapers.com or call: 0720502419

(i) Identify one mistake in the set-up and give a reason. (2marks)
(ii) Name a suitable drying agent for ammonia. (1mark)
(iii) Write an operation for the reaction that occurred when a mixture of ammonium chloride and calcium hydroxide was heated. (1mark)
(iv) Describe one chemical test for ammonia gas. (2 marks)

(b) The first step in the industrial manufacture of nitric (v) acid is the catalytic oxidation of ammonia gas.
(i) What is the name of the catalyst used? (1mark)
(ii) Write the equation for the catalytic oxidation of ammonia gas. (1mark)
(iii) Nitric (v) acid is used to make ammonium nitrate, state two uses of ammonium nitrate. (1mk

(c) Nitrogen forms many compounds in which its oxidation state varies:
(i) What is meant by oxidation state? (1mark)
(ii) What is the oxidation state of nitrogen in Ca_3N_2. (1mark)

3. (a) Chlorine gas can be prepared in the laboratory by reacting Potassium Manganate (vii) with concentrated hydrochloric acid. `
(i) Name another suitable reagent that can be used (1mark)
(ii) State the conditions necessary for (i) above. (1mark)
(iii) State and explain what would happen if a dry piece of red litmus paper was dropped in a gas jar of dry chlorine. (2marks)

(b) Chlorine is a strong oxidizing agent. Write down an equation for the reaction of Chlorine with
(i) Hydrogen sulphide gas. (1mark)
(ii) with iron (ii) chloride (1mark)
(c) Hydrogen Chloride gas is a colourless gas which dissolves readily in water forming hydrochloric acid.
(i) At room temperature and pressure, 1.00dm^3 of water dissolves 432 dm^3 of hydrogen chloride gas. How many moles of hydrogen chloride dissolves in 1dm^3 water (1 mole at r.t.p. occupies 24.0dm^3) (2marks)
(ii) The hydrochloric acid formed has a volume of 1.40 dm^3; calculate the concentration of the acid in mol/dm^3. (1mark)
(iii) In the solution, the molecules ionize as below

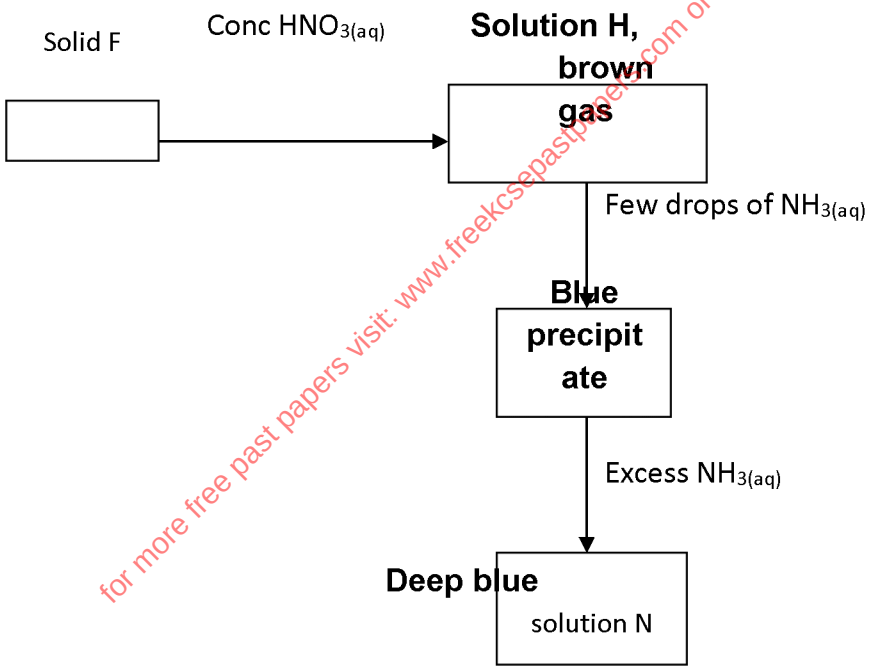
$HCl_{(ag)} \rightarrow H^+_{(ag)} + Cl^-_{(ag)}$

Describe a simple test to confirm presence of Cl^- ions in the solution. (2marks)

4. (a) Describe how a solid mixture of Zinc sulphate and lead (ii) Sulphate can be separated into Solid samples. (3marks)
(b) The table below shows the tests that were carried out on three portions of a compound and the results obtained. Study it and answer the questions that follow.

	Test	Observation
1.	Addition of few drops of ammonium hydroxide to the first portion until in excess	White precipitate soluble in excess
2.	Addition of few drops of acidified barium nitrate to the second portion	White precipitate formed
3.	Addition of few drops of Lead (ii) nitrate to the third portion.	White precipitate formed.

(i) Identify the cation and anions present in the compound;
(ii) Write an ionic equation for the reaction in the third portion. (1mark)
(c) Consider the flow chart below; use it to answer the questions that follow.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(i) State the most likely identity of solid F. (1mark)
(ii) Write the chemical equation for the reaction between solid F and concentrated nitric (v) acid. (1mk)
(iii) Name
(A) Solution N (1mark)
(B) Solution H (1mark)
(iv) Write the formula of solution N. (1mark)

5 (a) (i) What is an electrolyte? (1mark)
(ii) State how the following substances conduct electricity
I Molten Calcium Chloride (1mark)
II Graphite (1mark)
(b) the standard electrode potentials for certain half cell reactions are shown below.

$W^{2+(aq)} + 2e^- \rightarrow W_{(s)}$ – 0.76V
$X^{2+}_{(aq)} + 2e^- \rightarrow X_{(s)}$ – 0.23V
$Y^+_{(aq)} + e \rightarrow Y_{(s)}$ + 0.80v
$Z^{2+(aq)} + 2e^- \rightarrow Z_{(s)}$ + 0.34v

(i) Identify the strongest oxidizing agent. (1 Mk)
(ii) Write the cell equation for a cell formed by connecting W and X cells. (1 mark)
(iii) Calculate the e.m.f of cell in a(ii) above. (1 Mk)
(c) During electrolysis of silver nitrate, a current of 0.5A was passed through the electrolyte for 3 hours.
(i) Write the equation for the reaction which took place at the anode. (1 Mk)
(ii) Calculate the mass of silver deposited. (Ag = 108, IF = 96500C) (2 Mks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(iii) Give two reasons why it is necessary to electroplate iron with silver. (2 Mks)

6.

Volume of NaOH	0	5	10	15	20	25	30	35
Volume of acid + NaOH mixture in cm^3	20	25	30	35	40	45	50	55
Temperature (^oC)	21.0	22.0	23.0	24.0	25.0	25.0	24.0	23.0

(a) Plot a graph of temperature (y-axis) against volume of sodium hydroxide. (3 marks)

(b) From the graph determine the:

(i) Highest temperature reached. (1 mark)

(ii) Lowest temperature. (1 mark)

(iii) Change in temperature (ΔT) (1 mark)

(c) Determine the volume of sodium hydroxide required to neutralize $20cm^3$ of 0.5M ethanoic acid. (1 mark)

(d) Calculate the heat change given specific heat capacity = 4.2KJ/g/K and the density of solution mixture = $1g/cm^3$. (2 marks)

(e) Calculate the number of moles of ethanoic acid used in the experiment. (2 marks)

(f) Calculate the molar heat of neutralisation for the above reaction. (2 marks)

7. (a) Draw the structural formula of the following compounds:-

(i) 2 – melthylhex –l-ene (1 marks)

(ii) Butan –l-ol (1 Mk)

(b) Two methods of preparing alkenes are shown by the following general equations.

(i) Alkanol $\xrightarrow{Al_2O_3,\ 400^oC}$ Alkene

(ii) Alkane $\xrightarrow[\text{heat}]{\text{Catalyst}}$ Alkene

What type of reactions are described by equations;

(i) and (ii) (2 marks)

(c) Which of the two methods is used on a large scale. (1 Mark)

(d) Pentanoic acid reacts with butan – 1 – 0l to form an organic compound.

(i) Write an equation to show the above reaction. (1 Mark)

(ii) What is the name given to the above type of reaction? (1 Mark)

(iii) A few drops of a certain catalyst must be added to the mixture to increase the rate of the reaction.

(A) Name the catalyst. (1 Mark)

(B) Explain the role of the catalyst in the above reaction. (1 Mark)

(e) Draw the structure of;

(i) Soapless detergent. (1 Mark)

(ii) Soapy detergent. (1 Mark)

(f) Differentiate between a monomer and polymer. (2 Marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

GATUNDU SUB-COUNTY
SECONDARY SCHOOL JOINT
EXAMINATION

CHEMISTRY
CONFIDENTIAL

In addition to the fittings and chemicals found in a chemistry laboratory, each candidate will require the following:

1. About 120cm^3 of solution K
2. About 150cm^3 of solution N.
3. About 90cm^3 of solution B.
4. Solid D about 0.5g
5. About 1.0g of solid E.
6. About 0.2g of solid sodium hydrogen carbonate.
7. 100ml measuring cylinder.
8. Two 100ml beakers.
9. Plain paper.
10. Stop watch.
11. 10ml measuring cylinder.
12. 250ml volumetric cylinder.
13. About 500ml of distilled water.
14. One label.
15. One 0-50ml pipette.
16. One 25ml pipette.
17. One pipette filler.
18. Two 250ml conical flasks.
19. Phenolphthalein indicator.
20. 6 dry test tubes.
21. One boiling tube.
22. Two filter paper.
23. Filter funnel.
24. Metallic spatula.

Access to:-

1. Bunsen burner.
2. 2M sodium hydroxide solution supplied with a dropper.
3. 2Mammonia solution supplied with a dropper.
4. 2M sodium sulphate solution supplied with a dropper.
5. 2M Nitric (v) acid supplied with a dropper.
6. Acidified potassium dichromate (vi) solution.
7. Acidified potassium manganate (vii) solution.

PREPARATIONS

1. Solution k is prepared by dissolving 20g of sodium thiosulphate in 700cm^3 of distilled water and diluting to 1 litre.
2. Solution B is prepared by dissolving 8g of sodium hydroxide in 800cm^3 of distilled water and diluting to one litre.
3. Acidified potassium manganate (vii) is prepared by dissolving 6.0g of potassium manganate (vii) in about 100cm^3 of 2M sulphuric (vi) acid, adding 800cm^3 of distilled water and diluting to one litre of solution.
4. Solid D is a mixture of $ZnCO_3$ and $Al(NO_3)_3$ in the ratio 2 : 1
5. Solid E is about 0.5g maleic acid
6. Solution N is 2M HCl

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

GATUNDU SUB-COUNTY SECONDARY SCHOOL JOINT EXAMINATION 233/3

CHEMISTRY
PAPER 3
PRACTICAL
JULY/AUGUST 2016
2 ¼ HOURS

1. You are provided with:-
- Solution K
- A monobasic acid solution N.
- Sodium hydroxide solution B prepared by dissolving 8g of sodium hydroxide in 1 litre of distilled water.

You are required to determine:-
- The rate of reaction between solution N and solution K
- The molarity of the monobasic acid solution N.

PROCEDURE 1
Using a measuring cylinder, measure 20cm^3 of solution k into an empty 100cm^3 beaker.
Place it on a mark 'X' on a white plain paper.
Rinse the measuring cylinder and use it to measure another 20.0cm^3 of solution N.
Add solution N into solution K and start off the stop watch.
Then record the time taken for the mark 'X' to become invisible from above.
Repeat the procedure by measuring 17.5cm^3 of solution N and adding 2.5cm^3 of water and complete the table 1

Table 1

Experiment	1	2	3	4	5
Volume of solution K (cm^3)	20	20	20	20	20
Volume of solution N (cm^3)	20.0	17.5	15.0	12.5	10.0
Volume of water (cm^3)	0.0	2.5	5.0	7.5	10.0
Time taken for x to become invisible(sec)					
1/time (sec $^{-1}$)					

(5 Marks)

(a) Draw a graph of reciprocal of time (1/t) against volume of solution N. (3 Marks)
(b) From the graph:
(i) Determine the time taken for the cross 'X' to be invisible at 16.5cm^3 of solution N (2marks)
(ii) Determine the rate of reaction when 16.5cm^3 of solution N is used. (1Mark)

PROCEDURE 11
Measure 50cm^3 of solution N into a 250ml volumetric flask. Add more distilled water to make 25.0cm^3 of solution. Label this as solution J. Fill a burette with solution J. Using a pipette and pipette filler, place 25.0cm^3 of solution B in to a 250ml conical flask. Add two to three drops of phenolphthalein indicator. Titrate solution B against solution J until the pink colour disappears. Record your results in table 2 below. Repeat the titration two more times and complete the table.

Table 2.

	I	II	III
Final burette reading			
Initial burette reading			
Volume of solution J used (cm^3)			

(4 Marks)

(a) Determine the average volume of solution J used. (1 Mk)
(b) Determine the number of moles of;
(i) Sodium hydroxide in 25.0cm^3 of solution B. (1Mark)
(ii) The monobasic acid solution J in the average titre. (1 Mark)
(iii) The monobasic acid solution J in 250.0cm^3 of the solution. (1 Mark)

2. You are provided with solid D. Carry out the following tests and write your observations and inferences in the spaces provided.

(a) Place all of solid D in a boiling tube. Add about 6.0cm^3 of distilled water and shake thoroughly. Filter the mixture into a test tube. Dry the residue using pieces of filter papers. Retain the residue for use in test 2 (b) below. Divide the filtrate into three portions

for more free past papers visit www.freekcsepastpapers.com or call: 0726502479

(i) To 2cm^3 of the filtrate, add sodium hydroxide solution drop wise until in excess.

Observations	Inferences
(1mk)	(1mk)

(ii) To 2cm^3 of the filtrate, add one to two drops of sodium sulphate solution.

Observations	Inferences
(1mk)	(1mk)

(iii) To 2cm^3 of the filtrate, add aqueous ammonia drop wise until in excess.

Observations	inferences
(1mk)	(1mk)

(b) (i) Put a spatula end full of the residue obtained in (a) above in a test tube. Add about 6cm^3 of nitric (v) acid into the test tube. Retain the mixture for tests b(ii) and (iii) below.

Observations	inferences
(1mk)	(1mk)

(ii) To 2cm^3 of the mixture obtained in b(i) above, add aqueous sodium hydroxide drop wise until in excess.

Observations	inferences
(1mk)	(1mk)

(iii) To 2 cm^3 of the mixture obtained in b(i) above, add aqueous ammonia solution drop wise until in excess.

Observations	inferences
(1mk)	(1mk)

3. You are provided with solid E. Use it to carry out the tests below. Write your observations and inferences in the spaces provided.

(a) Place one third of solid E on a metallic spatula and burn it using a Bunsen burner.

Observations	Inferences
(1mk)	(1mk)

(b) Place the remaining solid E in a test-tube. Add about 6cm^3 of distilled water and shake the mixture.

(i) To 2cm^3 of the mixture, add a spatula end full of solid sodium hydrogen carbonate.

Observations	inferences
(1mk)	(1mk)

(ii) To 2cm^3 of the mixture, add 2cm^3 of acidified potassium dichromate (vi) and warm.

Observations	inferences
(1mk)	(1mk)

(iii) To 2cm^3 of the mixture add two drops of acidified potassium manganate (vii) and shake well.

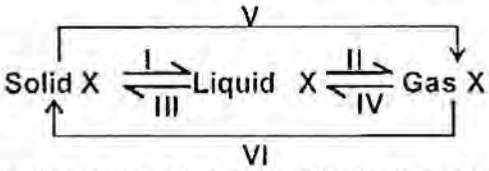
Observations	inferences
(½mk)	(½mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KERICHO SUB – COUNTY JOINT EVALUATION. 233/1

(THEORY)
JULY/ AUGUST 2016
CHEMISTRY
PAPER 1

1. a) The figure below shows some changes in state for a substance X. Study the diagram and answer the questions.

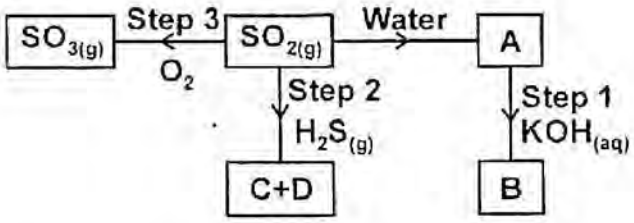


Each of the changes can be speeded up by heating or by cooling. Which changes are speeded up by cooling and which ones by heating. (2marks)

b) Magnesium sulphate may be used as a laxative. What does this term laxative mean? (1mark)

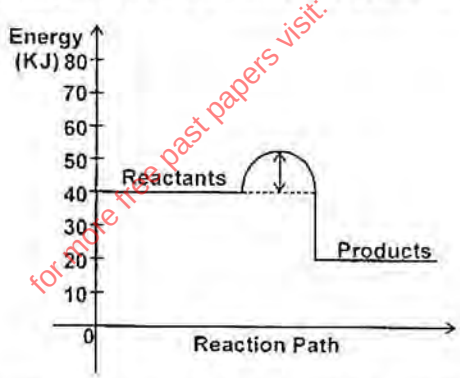
2. Both molten sodium chloride and molten sodium metal conducts electricity. Explain how each of these conducts electricity
(i) Molten sodium chloride (1mark)
(ii) Molten sodium metal (1mark)

3. Study the flow chart below and answer the questions that follow.



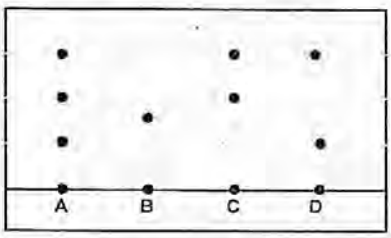
(a) Name the substance (1mark)
(i) A
(ii) B
(b) State the property of S02 exhibited in step 2. (1mark)

4. Study the energy level diagram below and answer the questions that follow.



(i) State and explain whether the reaction represented is endotherrnic or exothermic. (1 mark)
(ii) From the diagram, determine
I. the activation energy (1 mark)
II. enthalpy of reaction (1 mark)

5. The following chromatogram was obtained in an experiment to investigate the components present in certain dyes.



a) Which two dyes when mixed would produce A? (1 mark)
b) Which dye is pure? (1 mark)

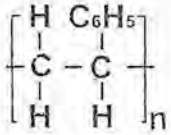
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

c) Indicate on the diagram the solvent front. (1 mark)

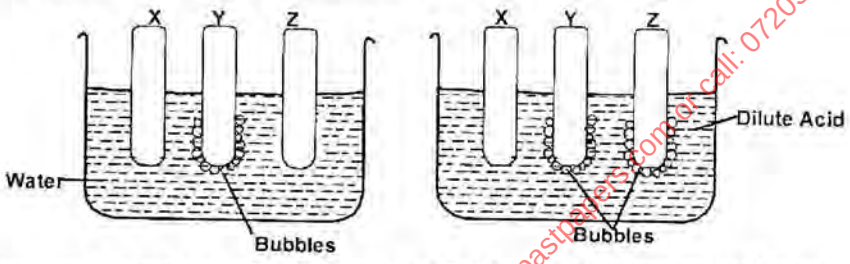
6. Two elements X and Y are represented as shown below
$_{17}X$ and $_{20}Y$
i) Write the formula of the compound formed when X and Y react. (1mark)
ii) State the family name to which element X belongs. (1mark)
iii) Element Y has a mass number of 40, how many neutrons are present in its nucleus? (1mark)

7. a) State Graham's law of diffusion. (1mark)
b) If it takes 30 seconds for $100cm^3$ of carbon IV oxide to diffuse across a porous plate, how long will it take $150cm^3$ of nitrogen IV oxide to diffuse across the same plate under similar conditions? (C = 20, N=14, O=16) (2marks)

8. a) Give the IUPAC names of the following compounds (2marks)
i) $CH_3(CH_2)OH$
ii) $CU_3CH_2CH(CH_3)COOH$
b) Given the following polymer, draw the structure of the monomer. (1 mark)



9. In an experiment, rods of metal X, Y, Z were cleaned with sand paper and placed in a beaker containing water. Another set of rods was also placed in a beaker containing dilute acid. After placing the rods in the two liquids, bubbles of gas were seen around some of the rods as shown in the diagram below.



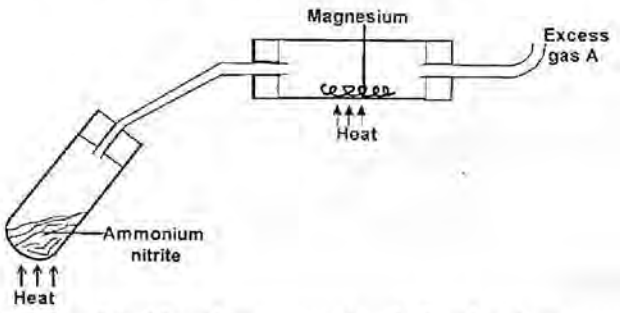
a) Why is it necessary to clean the rods with sand paper before dipping them into the liquid. (1 mark)
b) Arrange the three metals in order of their reactivity starting with the most reactive. (2 marks)

10. The grid below is part of periodic table. Use it to answer the questions that follow. (The letters do not represent the actual symbols of the elements)

						R	S	
N	Q						T	U
P								

a) Indicate in the grid the position of an element represented by letter V, whose atomic number is 14. (1mk)
b) Select a letter which represents a mono atomic gas. (1 mark)
c) Write an equation for the reaction between Q and T. (1 mark)

11. The set up below shows how gas A, was prepared and reacted with heated magnesium



a) Give a reason why it is not advisable to heat magnesium before heating ammonium nitrite. (1 mark)
b) i) Identify gas A. (1mark)
ii) Write a chemical equation for the reaction between gas A and magnesium. (1mark)

For more free past papers visit: www.freecsepastpapers.com or call: 0720502479

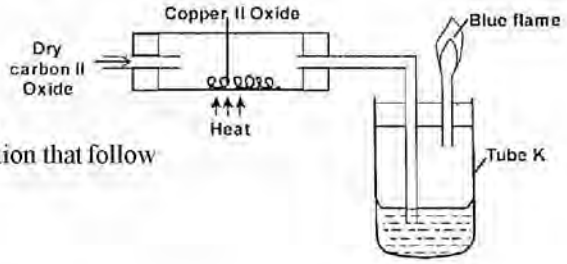
12. Radioactive polonium - 216 decays as shown below.

$$^{216}_{84}Po \longrightarrow {}^{208}_{82}Pb + m + n\beta$$

Determine the value of m and n. (1 ½ marks)

b) The table below gives the rate of decay of a radioactive element Y.

Number of days	Mass in g
0	48
270	**1.5**



Calculate the half-life of the radioactive element Y. (1 ½ marks)

13. Study the table below and use it to answer the question that follow

Solution	PH
A	3.5
B	14
C	8.5

i) In which of the solution will phenolphthalein indicator be colourless. (1mark)

ii) Which of the solutions could be used to relieve heartburn ? Explain. (2marks)

14. Given the following reagents; solid sodium carbonate, solid lead (II) nitrate, water. Describe how a sample of lead (II) carbonate can be prepared in the laboratory.(3 marks)

15. The table below shows the tests carried out on separate sample of water drawn from a well and the results.

Test	Results
i) Addition of excess aqueous ammonia	White precipitate
ii) Addition of a few drops of dilute sulphuric VI acid	No precipitate formed
iii) Addition of dilute hydrochloric acid followed by few drops of barium chloride	White precipitate

a) Identify the possible cations and anions present in the water. (2marks)

Write an ionic equation for the reaction which takes place in test tube (iii). (1mark)

16. a) A mass of 40g of a saturated solution of Potassium Chlorate at 25^{0}C yields 14 of Potassium Chlorate when evaporated to dryness. Calculate the solubility OF Potassium Chloride at 25^{0}C

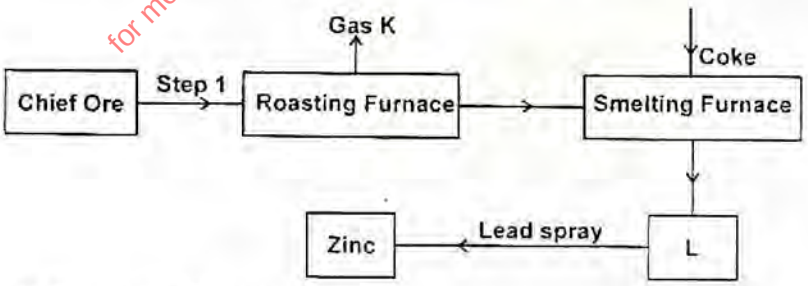
b) State one advantage of hard water. (1mark)

17. a) Why is air considered as a mixture rather than a compound ? (1mark)

b) State one similarity between rusting and combustion of iron. (1mark)

c) Explain why iron nails rust faster in sodium chloride solution than in tap water. (1mark)

18. The flow chart shows the extraction of zinc metal from its chief ore. Study the flow chart and answer (he questions that follow



a) Name the chief ore used in the process. (½ mk)

b) Write equation for the reaction in the roasting furnace? (1mk)

c) State the functions of the lead spray. (1mk)

d) Give one use of zinc. (½ mk)

19. The apparatus shown below was used to investigate the effect of carbon II oxide on copper IIoxide.

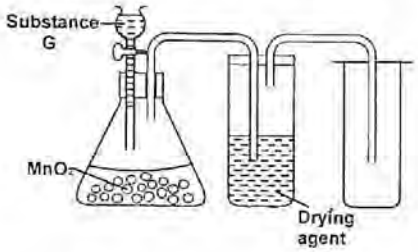
for more free past papers visit www.kcseksepastpapers.com or call: 0729502479

a) State the observation that was made in the combustion tube by the end of the experiment. (1 mark)
b) Write an equation for the reaction that took place in the combustion tube. (1mark)
c) Why is it necessary to burn gas coming out of tube K ? (1mark)

20. When lOg of a mixture of potassium chloride and anhydrous sodium sulphate is dissolved in water and excess barium chloride solution added. 6.9g of Barium sulphate is precipitated. Calculate the composition of the mixture. (K .= 39. Cl = 35.5, Na=23, O =16, Ba=137) (3marks)

21. When bismuth III Chloride is added to water, a reaction occurs and a white precipitate forms as shown below.
$BiCl_{3(aq)} + H_20_{(l)} \quad BiOCl_{(s)} + 2HCl_{(aq)}$
What would be the effect on the amount of the precipitate formed if sodium hydroxide solution is added to the equilibrium mixture ? Explain your answer. (2 marks)

22. The set up below was used to investigate some properties of chlorine gas.

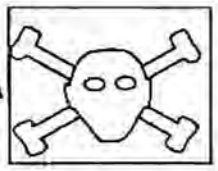


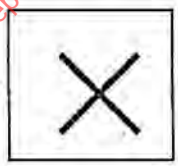
a) Name :
i) Substance G (1 mark)
ii) A suitable drying agent. (1mark)
b) What property of chlorine make it possible for it to be collected as shown in the diagram? (1 mark)

23. What volume of oxygen gas at r.t.p will be liberated at the anode when a current of 3 amperes is passed through magnesium sulphate solution for 45 minutes and 30 seconds. (Molar gas volume at r.t.p = 24000cm^3, Faraday constant = 96500 Coulombs) (3marks)

24. a) What is air pollution ? (1 mark)
b) State four gaseous substances present in unpolluted air. (2marks)

25. The labels of two reagent bottles contained the following safely symbols.

Bottle A 

Bottle B 

a) What do the symbols mean ? Explain. (2 marks)
b) Which of the reagent is more harmful ? (1 mark)

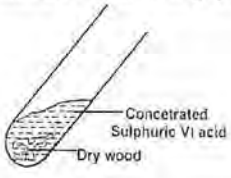
26. The table below shows properties of some chlorides. Study it and answer the questions that follow.

Chloride	Mp(°C)	BP (°C)	Electrical conductivity in aqueous solution	PH of solution
Al	-	183	Good	3
Na	860	1420	Good	7
P	32	75	Good	3
H	-146	-29	Good	1

a) Explain the high melting and boiling points of sodium chloride. (1mark)
b) Write an equation for the reaction between PC15 and water. (1mark)
c) Draw the dot (•) and cross (x) diagram to show bonding in NaCl. (1 mark)

27. The cell convention for and electrochemical cell is shown below.
$Zn_{(s)} / Zn^{2+}{}_{(aq)} // Pb^{2+}{}_{(aq)} / Pb_{(s)}$
(a) Name two substances that can be used as electrolytes in the above cell. (1mark)
(b) Which of the electrodes is the negative in the cell above ? Explain. (2marks)
(c) Excess concentrated sulphuric VI acid was mixed with pieces of dry wood as shown.

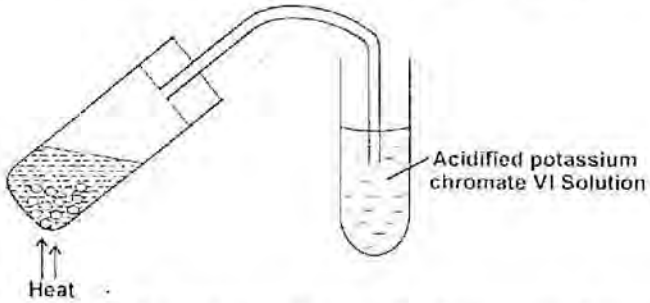
28. Excess Concetrated Sulphuric Vi acid with pieces of dry wood as shown



for more free pastpapers visit: www.freekcsepastpapers.com or call 0720502479

a) State the observation made in the tube. (1 mark)

b) When the reaction was complete, the mixture was heated gently, then strongly and set up adjusted as shown below.



State and explain the observation made on acidified potassium chromate VI solution. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KERICHO SUB – COUNTY JOINT EVALUATION. 233/2

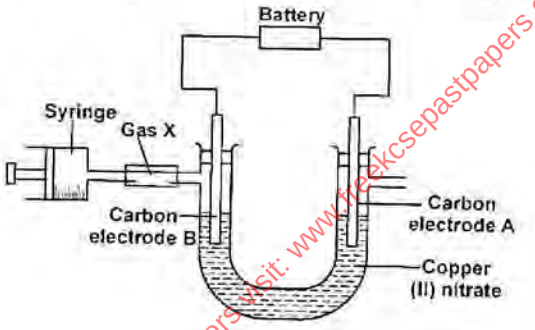
(THEORY)
JULY/ AUGUST 2016
CHEMISTRY
PAPER 2

1. Study the table below and answer the questions that follow. The letters do not represents the actual symbols of the elements

Formula of ion	Electron configuration
A^{2+}	2.8
B^{3+}	2.8
C-	2.8.8
D-	2.8
E^{2+}	2

a) Select elements found in:
i) The same group (1 mark)
ii) Period three (1 mark)
iii) What is the family name given to the group to which elements identified in a(i) above belongs. (1 mark)
- How does the atomic radius of element B and A compare. Explain. (2 marks)
- State two industrial use of element **B.** (2 marks)
- With reason, compare the reactivity of C and D. (2 marks)
- Write the formula of compound formed when A and D react. (1 mark)
- What type of bond is formed when element E react with oxygen. Give a reason for your answer. (2 marks)

2. The diagram below represents a set up that was used for electrolysis of aqueous copper (II) nitrate.



a) A gas that relights a glowing splint was produced at electrode A.
i) Which electrode is the cathode ? Explain. (2 marks)
ii) State another suitable method for collecting gas X. (1 mark)
iii) Write ionic equations to show reactions that take place at the:
Anode (1 mark)
Cathode (1 mark)
iv) Explain how the identity of the product at the cathode of this electrolysis can be confirmed. (2 marks)
v) Calculate the mass of copper deposited if a constant current of 5 A was passed for 3 hours. (Cu = 63.5, IF = 965000) (2 marks)

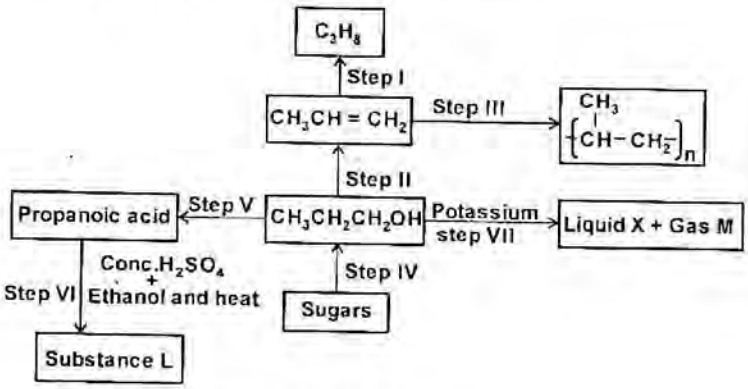
2.the following are standard electrode potentials for some electrodes. The letters do not represent the actual symbols of the elements.

Element			E° (volts)
$A^{2+}(aq) + 2e^-$	$\rightleftharpoons$	$A_{(s)}$	-2.93
$B^{2+}(aq) + 2e^-$	$\longleftarrow$	$B_{(s)}$	-2.38
$C^{2+}(aq) + 2e^-$	$\rightleftharpoons$	0.00	
$D^{2+}(aq) + 2e^-$		+0:3 4 V	
$E^{+}(aq) + e^-$	$\longleftarrow$	+2.87V	

i) Which is the strongest reducing agent ? Explain. (2 marks)
ii) Write the cell representation for the electrochemical cell obtained by combining the half cell of B and D. (1 mark)
iii) Calculate the e.m.f of the cell in (ii) above. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502418

3. Study the flow chart below and answer the questions that follow.



a) i) Name the type of reaction in the following steps :
I. Step III (½ mark)
II. Step IV (½ mark)
ii) Name the important reagents and conditions in :
Step I: Reagent (1 mark)
Condition
Step II: Reagent (1 mark)
Condition
Step V: Reagent (1mark)
Condition

b) i) Write a balanced equation for the reaction taking place in :
Step VI (1 mark)
Step VII (1 mark)
ii) Give the systematic name of liquid X and substance L
Liquid X (½ mark)
Substance L (½ mark)

d) i) If the relative molecular mass of compound formed in step III is 42.000, determine the value of n in the compound. (C = 12.0, H = 1.0) (2 marks)
ii) State one disadvantages of continued use of items made from the compound formed in d(i) above. (1 mark)

4. a) Define the following terms :
i) Atomicity (1 mark)
ii) Molar gas volume (1 mark)

b) i) State Gay – Lussac's law (1 mark)
ii) A sample of $10cm^3$ of hydrogen sulphide was burned in $40cm^3$ of oxygen. Calculate the volume and composition of residual gas (assume all volumes are measured at s.t.p) (2 marks)

c) i) Calculate the mass of sodium carbonate contained in $200cm^3$ of 0.02M sodium carbonate solution. (2 marks)
ii) 0.239g of copper (II) oxide was placed in a conical flask. Calculate the volume of 0.1 M solution of hydrochloric acid that would completely react with copper (II) oxide in the conical flask.
(0= 16.0, Cu = 63.5, H= 1.0, Cl = 35.5) (2 marks)

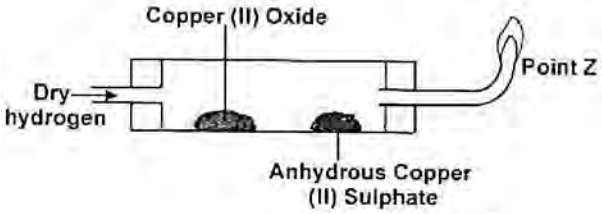
d) Find the mass of 5.2×10^{25} atoms of sodium. (Na = 23.0, L = 6.023×10^{23}) (2marks)

5. a) Starting with lead (II) carbonate, describe how a solid sample of lead sulphate can be prepared. (3 marks)

b) Water Was added to lead (II) nitrate by a student. She divided the resulting solution into four, state the observation made after subjecting them to the following tests:
i) To the first portion she added sodium hydroxide dropwise until in excess. (1 mark)
ii) To the second portion she added ammonia solution dropwise until in excess. (1mark)
iii) the third portion she added hydrochloric acid and warm. (1 mark)
iv) To the last portion she added sodium iodide solution. (1 mark)
v) Write an ionic equation for the reaction in test (iv) above. (1 mark)

c) State two commercial uses of sodium carbonate obtained in Solvay process. (2 marks)

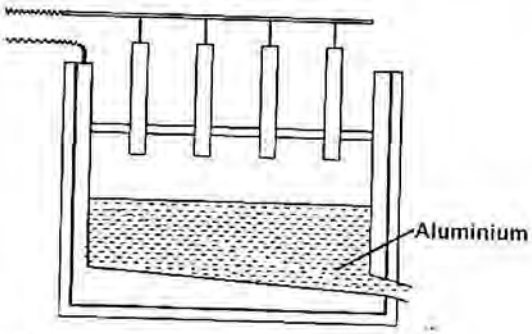
6. The following diagram was used to study a property of hydrogen gas. Study it and answer the questions that follow.



for more free past papers visit: www.keekcspastpapers.com or call: 0720502479

a) Name the missing condition in the above set up. (1 mark)
b) Explain why the combustion tube is clamped in a slanting position. (1 mark)
c) Before lighting the gas at the end of delivery tube, hydrogen must be let to pass through until all the air is driven out. Explain. (1 mark)
d) State three observations that occur in the combustion tube. (3 marks)
e) Why was hydrogen gas burnt at point **Z.** (1 mark)
f) Why should the supply of hydrogen gas be continued while the apparatus cool. (1mark)
g) What would be observed if the experiment was repeated using lead (II) oxide. (1 mark)
h) Other than the property investigated above, name two other chemical properties of hydrogen gas. (2 marks)
i) State two industrial use of hydrogen gas. (2 marks)

7. The extraction of aluminium from its ore takes place in two stages; purification stage and electrolysis stage. The diagram below shows the set up for electrolysis stage.



a) i) Name the ore from which aluminium is extracted. (1 mark)
Name one impurity which is removed at the purification stage. (1 mark)
b) i) Label bn the diagram each of the following
I. Anode
II. Cathode
III. Region containing the electrolyte (3 marks)
ii) The melting point of aluminium is 2054°C but electrolysis is carried out between 800-900°C.
I. Why is electrolysis not carried out at 2054°C (1 mark)
II. What is done to lower the temperature? (1 mark)
iii) The aluminium which is produced is tapped off as a liquid. What does this suggest about its melting point? (1 mark)

for more free past papers visit: www.geekcsepastpapers.com or call: 0720502479

KERICHO SUB – COUNTY JOINT EVALUATION 233/3

(PRACTICAL)
JULY/ AUGUST 2016
CHEMISTRY
PAPER 3

1. You are provided with :
   - solution A, 0.15M solution thiosulphate
   - solution B, 2M hydrochloric acid
   - solution C, a solution of basic solution (0.2M X $(OH)_n$)

You are required to determine the rate of reaction between hydrochloric acid solution B at different concentrations of sodium thiosulphate solution A.

Procedure 1

Draw a cross (x) on a piece of white paper using a pencil. Measure 30cm^3 of a solution A using a' measuring cylinder and put it into a 100ml glass beaker placed over a white piece of paper drawn above.

Measure 10cm^3 of hydrochloric acid solution B using a 10ml measuring cylinder and add to the beaker, start the stopwatch. Immediately swirl the mixture.

View the cross from above the mixture in the beaker. Stop the clock when the cross just disappears. Record the time taken in the table below.

Repeat the above procedure using volumes of solution A, water and in the table below.

TABLEI

Experiment	Volume of solution A (cm^3)	Volume of water (cm^3)	Volume of solution B (cm^3)	Concentration of solution A (moldnV^3)	Time for X to disappear (seconds)	Rate = ___(S^{-1})
1	30	0	10			
2	25	5	10			
3	20	10	10			
4	15	15	10			
5	10	20	10			
6	5	25	10			

(5 marks)

a) Plot a graph ("I rate ($S^{'1}$) against volume of solution A (cm^3) (3 marks)
b) From the graph determine :
i) The rate of reaction when 19cm^3 of solution A was used. (1 mark)
ii) The time taken for X to disappear when 12cm^3 of solution A was used. (1 mark)
iii) Determine the time taken for X to disappear if 3cm^3 of water was used. (1 mark)
c) How does the rate of reaction relate to the concentrations of reagents ? (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

Procedure II

Using a clean 100ml measuring cylinder measure exactly 25cm^3 of solution B into a 250cm^3 volumetric flask. Add distilled water upto the mark. Labe this as solution D. Fill a burette with solution D.

Using a pipette and a pipette filler place 25cm^3 of solution C into a 250ml conical flask. Add two drops of methyl orange indicator and shake. Titrate it with solution D and record your results in table

II. Repeat the titration two more times and complete the table.

Table II

	1	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution D added (cm^3)			

a) Determine the :
i) average volume of solution D used. (1 mark)
ii) moles of hydrochloric acid in solution D used. (2 marks)
iii) moles of the alkaline solution C used. (1 mark)
b) Find the mole ratio for the reaction between solution A and solution C. (1 mark)
c) Hence determine the oxidation state of metal x (1 mark)

2. You are provided with substance M for this question. Transfer the substance into a clean boiling tube. Add about $10cm^3$ of distilled water and stir. Pour the mixture into four clean test tubes of about $2cm^3$

Observations	Inferences
1 mk	1 mk

a) To the first portion of the solutions, add sodium hydroxide solution dropwise until inexcess.

Observations	Inferences
1 mk	1 mk

b) Dip a clean stirring rod/ glass rod/ nichrome wire into the second portion and then place into the side of a blue Bunsen flame.

Observations	Inferences
1 mk	1 mk

c) To the third portion, add 2-3 drops of barium nitrate solution followed by excess hydrochloric acid.

Observations	Inferences
1 mk	1 mk

d) To the fourth portion, add 2-3 drops of acidified potassium manganate (VII) Observations

Observations	Inferences
1 mk	1 mk

3. You are provided with substance W for tests in this question.

a) Place 3 drops of substance W on a clean dry watch glass and ignite it.

Observations	Inferences
1 mk	1 mk

b) Place about $2cm^3$ of substance W in a clean dry test tube, then add all the sodium hydrogen carbonate provided.

Observations	Inferences
1 mk	1 mk

c) Place about $2cm^3$ of substance W in a test tube then add about $1cm^3$ of acidified potassium manganate (VII) and warm the mixture.

Observations	Inferences
1 mk	1 mk

d) Place about 2cnr of substance W in a test tube then add 2-3 drops ofbromine water.

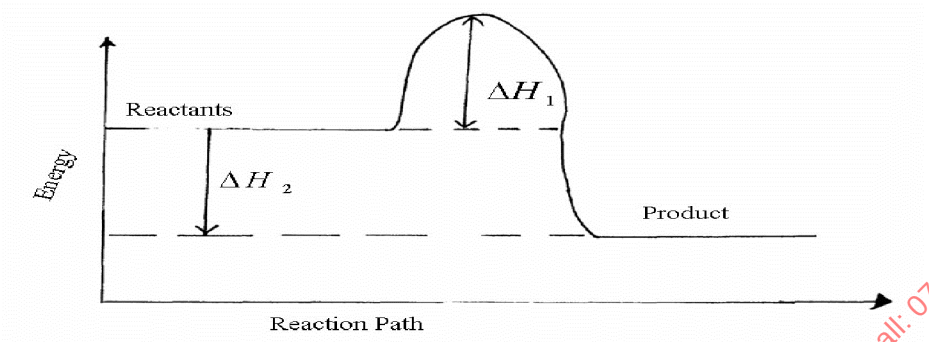
Observations	Inferences
(1 mk)	(lmk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KEIYO SOUTH FORM FOUR JOINT EXAMINATIONS 2016 233/1

CHEMISTRY
PRE – MOCK
Paper 1
(THEORY)
2 hours

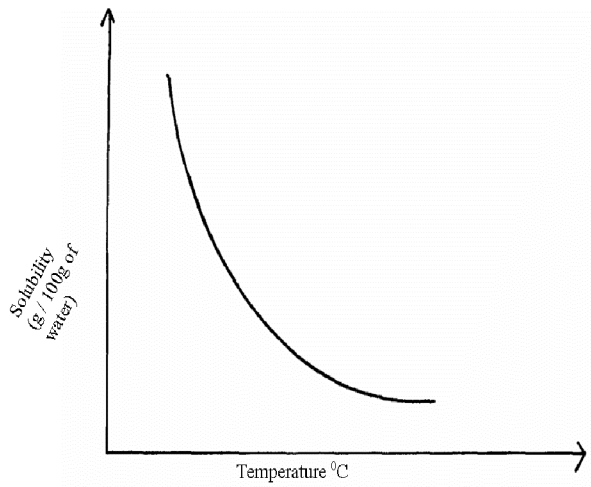
1. When Iron (III) chloride is exposed to the atmosphere, it forms a solution.
   (a) Name the process that takes place. (1 mark)
   (b) State one use of the process named in 1(a) above. (1 mark)
2. Study the energy level diagram for the reaction shown below and **use it to** answer the questions that follow.
   $2SO_{2\,(g)} + O_{2\,(g)} \rightarrow 2SO_{3\,(g)}$



   (i) State and explain two ways of increasing the yield of SO_3 per unit time from the diagram. (2 marks)
   (ii) What do the following represent?
   ΔH_1 (½ mark)
   ΔH_2 (½ mark)
3. A student burnt magnesium ribbon in a gas jar full of sulphur (IV) oxide gas.
   i) State two observation made in the gas jar. (1 mark)
   ii) Write the equation for the reaction which took place (1 mark)
4. The table below shows ammeter reading recorded when 2M Sulphuric (VI) acid and 2M ethanoic acid were tested separately.

Electrolyte	Current (A)
2M Sulphuric acid	8.1
2M Ethanoic acid	2.5

   Explain the difference in the ammeter readings. (2 marks)
5. (a) Using electrons in the outermost energy level, draw a dot (.) and cross (X) diagram for the ion of PH_4^+ and compound B_2O_3. (P=15, H=1, B=5, O= 16)
   (i) PH_4 (1 mark)
   (ii) B_2O_3 (1 mark)
   (b) The formula of the compound formed when Aluminum and chlorine react is Al_2Cl_6. Name the types of bonds that exist in the compound. (1mark)
6. The graph below represents the solubility curve of a gas in water.



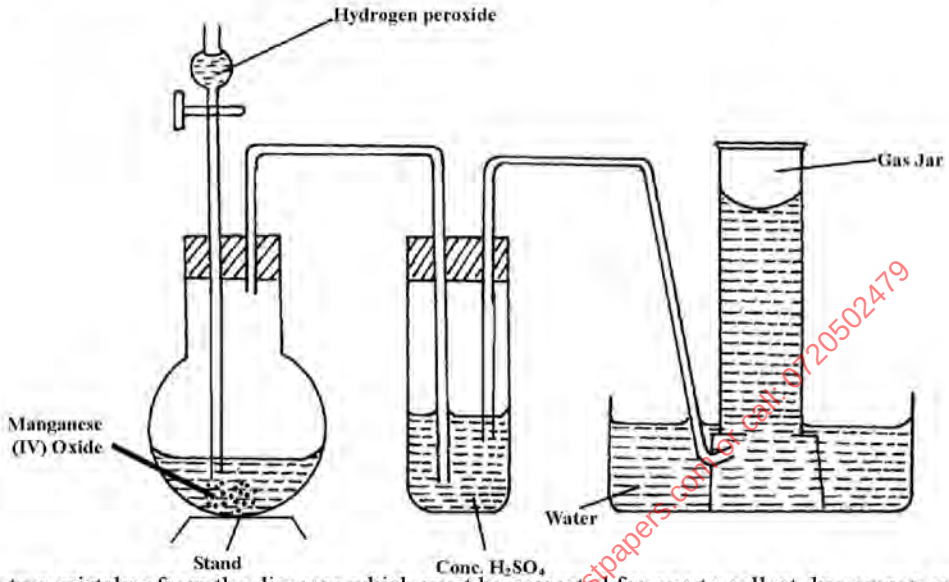
for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

State and explain the conclusion that can be drawn from this curve about the solubility of the gas. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

(b) The solubility of salt T at 80°C is 40g / 100g of water. What mass of T will saturate 65g of water at 80°C? (2mark)

7. State the conditions under which ammonia gives the following products when heated
   (i) Nitrogen and hydrogen. (1 mark)
   (ii) Nitrogen and water. (1 mark)
   (iii) Nitrogen (II) oxide and water. (1 mark)
8. Name the method of separation that can most suitably be used to separate the following mixtures
   a) Gasoline from petroleum. (1mark)
   b) Benzoic acid and potassium carbonate. (1mark)
   c) Oil from cashew nuts. (1mark)
9. The diagram below shows the set-up that can be used to prepare and collect oxygen gas. Study it and answer the questions that follow.



   a) Identify two mistakes from the diagram which must be corrected for one to collect dry oxygen gas. (2marks)
   b) What property of oxygen gas makes it possible to be collected over water. (1mark)
10. The table below gives information about some reactions of metals A,B, C and D and their rates.

METAL	Reaction with acid	Reaction with water	Action of heat on its nitrate
A	Hydrogen evolved	No reaction	Oxide formed
B	NO reaction	No reaction	Metal formed
C	Hydrogen evolved	Hydrogen evolved	Oxide formed
D	NO reaction	NO reaction	Oxide formed

Arrange the metals in order of decreasing activity. (2marks)

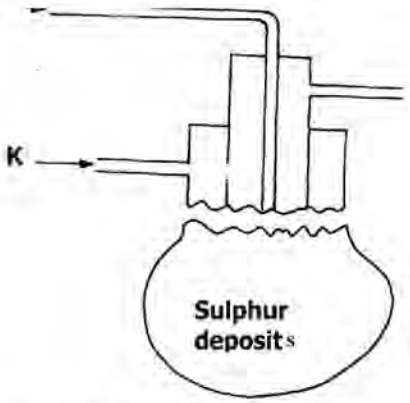
11. The table below gives information on four elements by letters K, L, M and N. Study it and answer the questions that follow. The letters do not represent the actual symbol of the elements.

Element	Electron arrangement	Atomic radius (nm)	Ionic radius(nm)
K	2.8.2	0.136	0.065
L	2.8.7	0.099	0.181
M	2.8.8.1	0.203	0.133
N	2.8.8.2	0.174	0.099

   a) Which <u>two</u> elements have similar properties? Explain. (2marks)
   b) What is the most likely formula of the oxide of L? (1mark)
   c) Which element is a non – metal? Explain. (1mark)

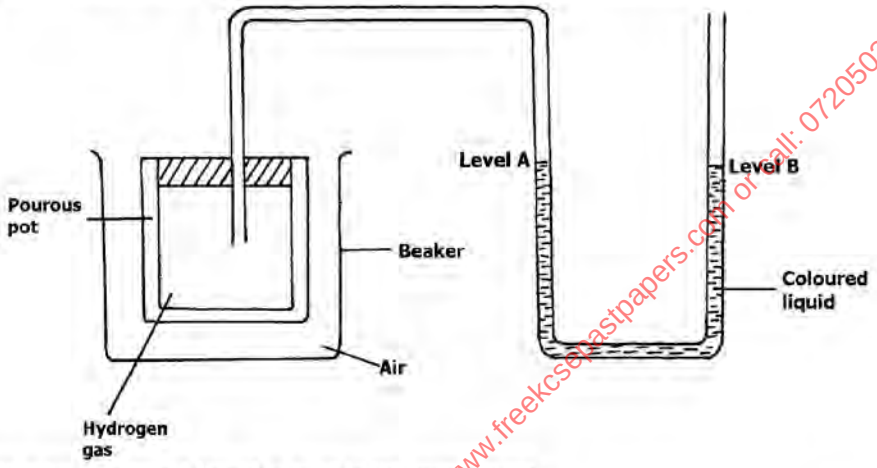
for more free past papers visit: www.freecsepastpapers.com or call: 0720502479

12. Sulphur is extracted from underground deposits by a process in which three concentric pipes are sank down to the deposits as shown below.



a) Name the process represented above. (1mark)
b) What is passed down pipe J? (1mark)
c) Name **two** allotropes of sulphur (1mark)

13. The set- up below was used to investigate the rate of diffusion of different gases.



a) Explain why a coloured liquid is used in this experiment. (1mark)
b) State and explain the observation made after 20 minutes. (2marks)

14. 25.0cm^3 of 0.12M potassium hydroxide solution required 30.0cm^3 of a solution of a dibasic acid (H_2R) for complete neutralization. The acid contained 3.15g per 300cm^3 solution Calculate:
a) The molarity of the acid solution. (1½marks)
b) The relative formula mass of the acid. (1½ marks)

15. Methane gas reacts with chlorine gas as shown in the equation below.

$$CH_{4(g)} + Cl_{2(g)} \xrightarrow[\text{light}]{\text{u.v}} CH_3Cl_{(g)} + HCl_{(g)}$$

Use the bond energies in the table below to calculate the enthalpy for the above reaction.(3marks)

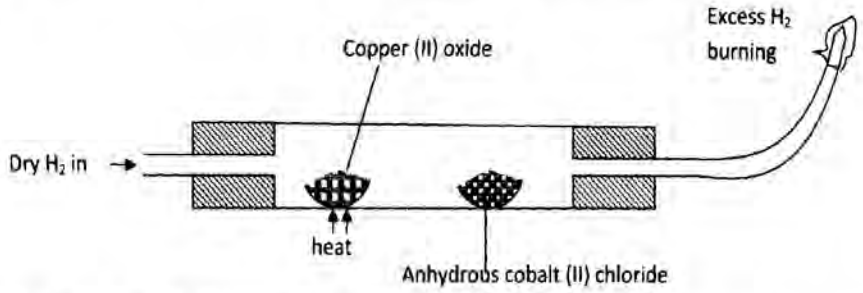
Bond	Bond energy kJ/ mol
C – H	413
Cl – Cl	242
C – Cl	346
H – Cl	431

16. A student dissolved some ammonium nitrate salt in water in a glass beaker. The solution formed felt very cold.
a) Explain why the temperature of the resultant solution dropped (1mark)
b) Represent the above information on an energy level diagram
b) What general name is given to such reactions (1 mark)

17. When a grey powder P, which has no action on cold water, is placed into a salt solution of Q, a brown solid R isdeposited. The blue solution of Q, fades giving way to a green solution.
a) Name the type of reaction that takes place. (1 mark)
b) Identify solids P and R (1 marks)
c) Write an equation for the reaction leading to formation of the brown solid. (1mark)

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

18. The set-up below was used to investigate the effect of dry hydrogen gas on hot copper (ii) oxide powder.

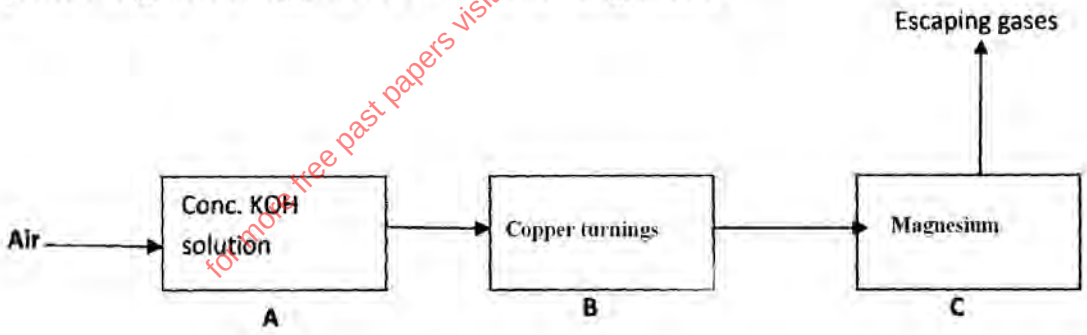


Explain what is observed in the combustion tube during the experiment.

19. (a) Potassium manganate (VII) reacts with chloride salts to produce chlorine. Both chlorine and potassium manganate (VII) are strong oxidizing agents. Which one of the two is the stronger oxidizing agent? Explain your answer (2marks)
    b) Chlorine and sulphur (IV) oxide are bleaching agents; explain the difference in their bleaching action. (1mark)
20. Calculate the number of molecules of water of crystallization in oxalic acid crystals, $H_2C_2O_4.xH_2O$, from the following data: 5g of the crystals were made up to 250cm^3 of this solution required 15.9cm^3 of 0.5M sodium hydroxide to neutralize it. (H=1, C=12, 0 16, H_20= 18) (3marks)
21. Two carbon electrodes were placed in a flask containing 50cm^3 of 0.1 M barium hydroxide solution and connected in series with the 12 volt supply of direct current electricity and a lamp.
    1.0M sulphuric acid was slowly run into the solution from a burette until neutralization occurred.
    a) What would you see in the flask when the first few drops of acid are added? (1 mark)
    b) At the neutrality point, the lamp ceases to glow, explain why? (1 mark)
    c) What would you see if more 1.0 M sulphuric acid were now added? (1 mark)
22. Study the information in the diagram below and answer the questions that follow. (the letters do not represent the actual symbols of the elements)

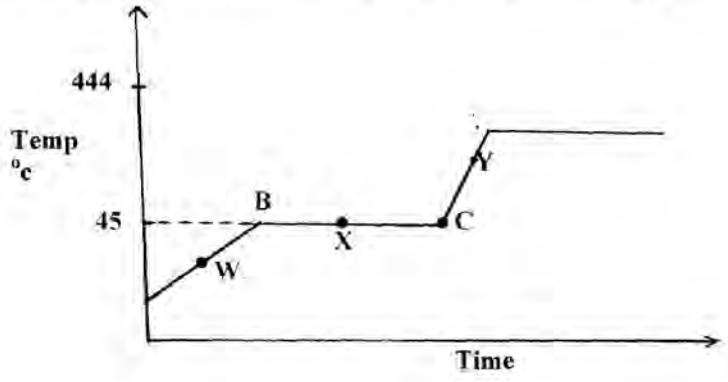
Element	Electronic configuration	Ionization energy KJ/Mol
P	2.1	519
Q	2.8.1	494
R	2.8.8.1	418

    a) What is the general name given to the group in which elements P, Q and R belong? (1 mark)
    b) What is meant by ionization energy? (1 mark)
    c) Explain why element P has the highest ionization energy (1 mark)
23. Air is passed through several reagents as shown in the flow diagram below



Name one gas which escapes from chamber C. Give a reason for your answer (3marks)

24. The diagram below shows the heating curve of a pure substance. Study it and answer the questions that follow.



for more free past papers visit www.freekcsepastpapers.com or call: 0720509479

(a) What are the physical states of the substances at points W and Y. (1marks)
(b) Explain why the temperature remains constant between points B and C. (2marks)

25. The equations show some reactions. Use the equations to answer the following questions.

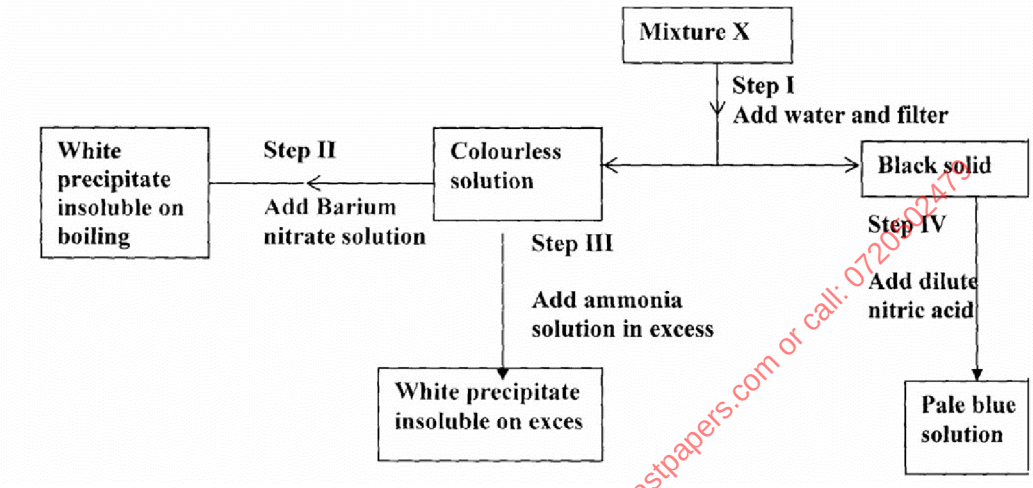
$CH_3CH_2OH \xrightarrow{\text{Step I}} CH_2{=}CH_2 \xrightarrow{\text{Step II}} CH_3CH_3$

(a) Name the type of reaction in step I and II. (2marks)
(b) Explain why ethene burns with a more smoky flame than ethane. (1mark)

26 (a) Graphite is a non- metal most commonly used as an electrode. State two properties that makes it suitable for use as an electrode. (2marks)
(b) Graphite is an allotrope of carbon. Distinguish between allotropes and isotopes. (1marks)

27. When solid Zinc carbonate was added to a solution of hydrogen chloride in methylbenzene, there was no observable change. On addition of some water to the mixture there was effervescence. Explain these observations. (2marks)

28. Study the chart below and answer the questions that follow.



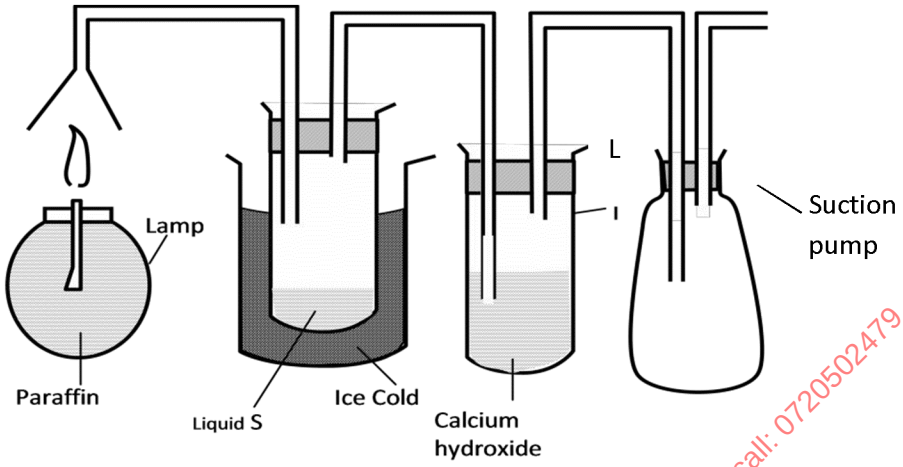
for more free past papers visit: www.freekcsepastpapers.com or call: 0720-002417

(a) Name:
(i) Cations present in mixture X. (1mark)
(ii) Anions present in the solution. (1mark)
(b) Write an equation to show how the white precipitate in step III is formed. (1mark)

KEIYO SOUTH JOINT
EXAMINATION 233/2

Chemistry
Paper 2
PRE - MOCK
2 Hours

1. Study the set-up of apparatus below and answer the questions that follow.

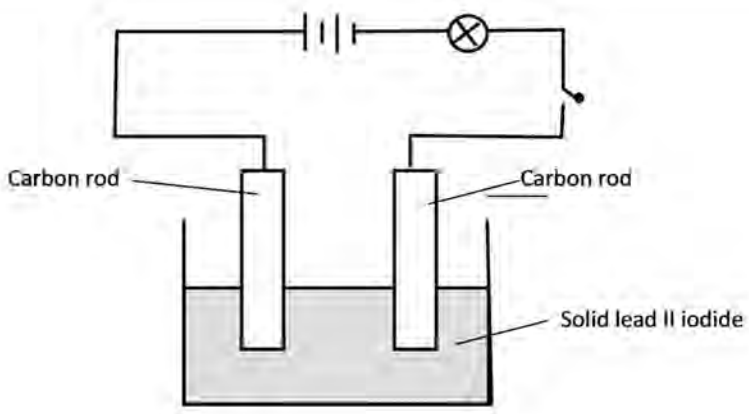


a) State and explain the observation that would be made in tube L as the experiment progresses in the first few minutes.
Observation. (1mark)
Explanation. (1mark)
b) How would the observations in the tube L change if the experiment is carried out for a long time. Explain using a chemical equation.
Observation. (1mark)
Equation. (1mark)
c) State three observations made when liquid S is reacted with sodium metal. (3marks)
d) State the use of the suction pump in this experiment. (1mark)
e) Diamond and graphite are allotropes of carbon. Graphite conducts electricity and diamond does not. Explain this phenomenon. (2marks)
f) State two uses of carbon (IV) oxide. (2marks)
2. Study the information in the table below and answer the question that follow, letters do not represent actual symbols of the element.

Element	Atomic No.	Melting point	Boiling point	Atomic radii	Ionic Radii
L	3	-179	1340	0.108	0.100
M	9	-220	-188	0.101	0.105
N	11	98	890	0.135	0.132
P	12	650	1110	0.126	0.124
Q	13	660	2470	0.125	0.120
R	15	442/590	280	0.111	0.119
S	16	113/119	445	0.103	0.109
T	17	-101	-3	0.109	0.120
U	19	63.5	-775	0.167	0.160

a) Write the electronic configuration of an ion of elements T and U. (1marks)
b) Why do the elements represented by R and S have two values of melting point. (1mark)
c) Select an element:
i) Which is the most electronegative. (1mark)
ii) That belongs to period 4, explain. (2marks)
d) Explain why:
i) Ionic radius of R is bigger than its atomic radius. (1mark)
ii) The atomic radius of L is bigger than that of R yet they are in the same period. (1mark)
e) Using dots (.) and cross (x) to represent outermost electron show bonding in the compound formed between L and M. (2marks)
f) Write an equation for the reaction that occurs between U and water. (2marks)
g) Describe how a solid mixture of the sulphate of element N and lead (II) sulphate can be separated into solid sample of dry lead (II) sulphate. (2marks)
3. The arrangements below shows a set-up to investigate the effect of an electric current on molten lead (II) iodide.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479



a) Identify two mistakes in the set-up. (2marks)
b) State three observations made after correcting the mistakes. (2marks)
c) What particles are responsible for electrical conductivity? (1mark)
d) Write the equations for the reactions taking place at the electrodes.
e) Indicate on the diagram direction of flow of electric current. (1mark)
f) State two industrial applications of electrolysis process. (2marks)

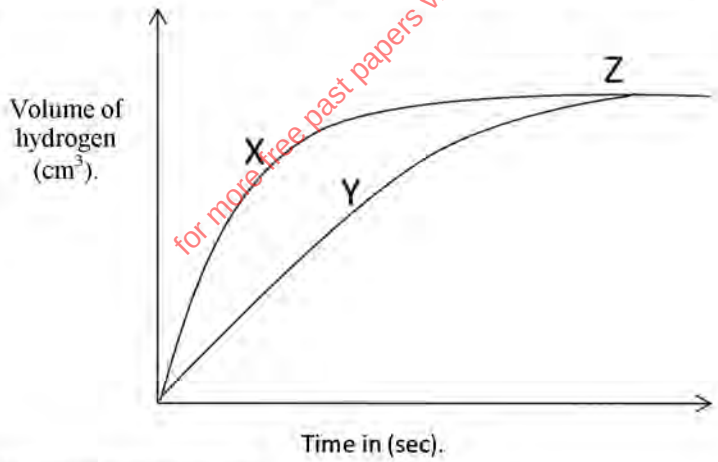
4. a) State Boyle's law. (1mark)
b) The table below shows the relationship between the pressure and volume of a fixed mass of ozone gas.

Pressure (K pa)	1	4	8	16	20	160
Volume (cm^3)	140	40	20	10	8	1
Inverse of volume 1/v (cm^{-3})						

(3marks)

i) Complete the table by filling the inverse of volume.
ii) Draw a graph of pressure against the reciprocal (inverse) of volume. (3marks)
iii) Using the graph determine the volume of ozone if pressure is 12K pa. (2marks)

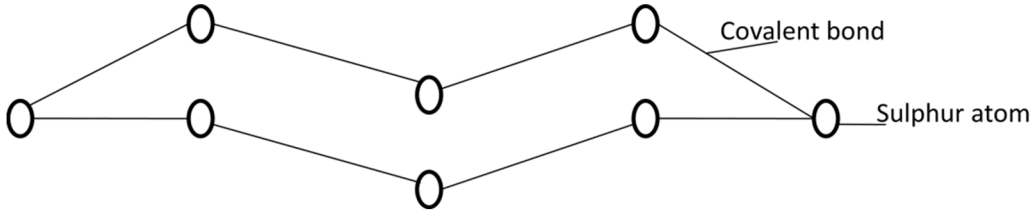
5. Equal masses of magnesium ribbon were reacted separately with equal volumes of 1M hydrochloric acid and 1M methanoic acid. The results were plotted on a graph as shown below. Two curves X and Y were obtained.



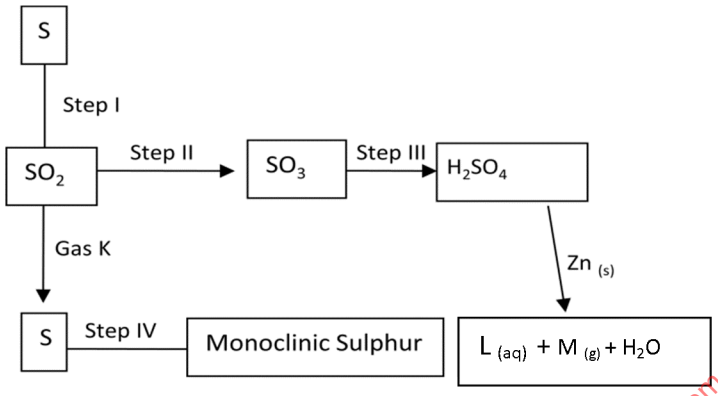
a) Explain which curves represents:
i) 1M hydrochloric acid. (1marks)
ii) 1M Methanoic acid. (1marks)
b) State the significance of point Z. (1mark)
c) On the same axes, sketch the curve you would obtain if the same mass of powdered magnesium were reacted with same quantity of IM hydrochloric acid. Mark the curve w. (2marks)
d) Write ionic equation for the reaction between magnesium and dilute hydrochloric acid. (1mark)
e) Calculate the maximum mass of the gas that would be liberated if 1.2g of magnesium reacted with excess hydrochloric acid. (Mg = 24, H =1).(2mks)
f) Calculate the volume of the gas produced in (e) above at r.t.p (molar gas volume at r.t.p) = $24dm^3$. (3marks)

for more free past papers visit www.freekcsepastpapers.com or call 0720502479

6. Study the structure below and answer questions that follow



a) What observation is made when the molecule above is heated to a temperature of 113 C (2marks)
b) Write an equation for the reaction of atom of the above structure with hydrogen. (1mark)
c) Study the scheme below and answer questions that follow.



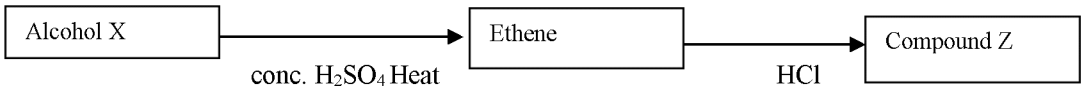
i) Name
Gas K (1mark)
Gas M (1mark)
ii) State observation made in
Step I (1mark)
Step II (1mark)
iii) State the conditions necessary for step II to occur. (2marks)
d) Write an equation to show how pollution effect of sulphur (IV) oxide is controlled in contact process. (2marks)
e) Explain the role of sulphur in vulcanization of rubber. (2marks)

7. a) Study the table below and answer the questions that follows

Formula of hydrocarbon	Boiling points (K)
C_2H_4	-104
C_3H_6	-47.7
C_4H_8	-62
C_5H_{10}	30
C_6H_{12}	63.9

i) What name is given to a series of organic compounds like the ones in the table? (1mark)
ii) To what class of organic compounds does the above hydrocarbon belongs? (1mark)
iii) Select one hydrocarbon that would be a gas at room temperature (298K) given a reason for your answer. (2marks)
iv) Give the formula of the seventh member of the above series. (1mark)
v) What is the relationship between the boiling point and the relative molecular masses of the hydrocarbons in the table above? Explain your answer. (2marks)

b. Study the flow chart below and answer the questions that follow



Process Y
i. Write the formula of Alcohol X, Compound Z and name process Y. (3marks)
ii. Propane and Chlorine react as shown below :
$CH_3CH_2CH_3 \longrightarrow CH_3CH_2CH_2Cl+HCl$
a) Name the type of reaction that takes place. (1mark)
b) State the condition under which this reaction takes place. (1mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KEIYO SOUTH FORM FOUR JOINT EXAMINATIONS 2016 233/3 CHEMISTRY PRACTICALS

CONFIDENTIAL
PRE - MOCK

In addition, to the common laboratory apparatus and fittings, each candidate should be provided with:

- About 80cm^3 of solution R
- About 100cm^3 of solution Q
- About 70cm^3 of solution B
- About 50cm^3 of solution X
- 1.06g of solid A accurately weighed
- About 1g of solid E
- 25ml pipette
- 50ml burette
- 250ml volumetric flask
- 100ml plastic beaker
- Three conical flask
- Labels
- 50ml measuring cylinder
- Thermometer
- Metallic spatula
- Filter funnel
- Filter paper
- source of heat
- boiling tube
- six dry test tubes

Access to

- 2M sodium hydroxide solution
- 2M aqueous ammonia
- Acidified Barium nitrate solution
- Barium nitrate solutiom
- Lead (II) nitrate solution
- Methyl orange indicator
- Dilute nitric (V)acid
- Sodium sulphate solution

NOTES

- Solid **E** is mixture of calcium chloride and Lead(II) carbonate in the ratio of 1:1
- Solution **B** is 1M nitric acid prepared by adding 64cm^3 of concentrated acid to 700cm^3 of water and making up to 1 litre.
- Solution **X** is 1M sodium hydroxide solution prepared by adding 40g of sodium hydroxide pellets in 500cm^3 of water and making it up to 1 litre.
- Solution **R** is 2M hydrochloric acid prepared by adding 172cm^3 of concentrated acid in 600cm3 and making up to 1 litre.
- Solution **Q** is 0.4M sodium hydroxide solution prepared by dissolving 16g of sodium hydroxide pellets in 200cm^3 of water and making it up to 1 litre.
- Solid **A** is anhydrous sodium carbonate

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KEIYO SOUTH FORM FOUR JOINT EXAMINATIONS 2016
233/3 CHEMISTRY PRACTICAL
PRE – MOCK
TIME: 2 ¼ HOURS

1. You are provided with:
-2M Hydrochloric acid labeled as solution **R**
-0.4M Sodium hydroxide solution labeled **Q.**
-1.06g accurately weighed anhydrous carbonate X_2CO_3 labeled solid **A**
You are required to determine atomic mass **X** in one mole of X_2CO_3
Procedure
i) Using a clean measuring cylinder, measure 50cm^3 of solution **R** and transfer in 100cm^3 plastic beaker.
ii) Add all **solid A** at once into the contents of the beaker, stir until effervescence stops.
iii) Transfer this solution into a 250cm^3 volumetric flask and add distilled water up to the mark. Label this solution as solution **S**.
iv) Fill the burette with solution **Q**
v) Using a pipette and pipette filler, place 25cm^3 of solution **S** into conical flask. Add 2 drops of methyl orange indicator.
vi) Titrate solution **S** against solution Q.
vii) Record your results in the table below.
viii) Repeat the titration two more times and complete table I below.
TABLE I

	I	II	III
Final burette reading			
Initial burette reading			
Volume of solution Q used (cm^3)			

(4marks)

a) Calculate the;
i) Average volume (1mark)
ii) Number of moles of hydrochloric in 25cm^3 of solution S (1mark)
iii) Number of moles hydrochloric acid in 250cm^3 of solution **S**, (1mark)
iv) Number of moles of hydrochloric acid in 50cm^3 of solution **R** (1mark)
v) Number of moles of hydrochloric acid that reacted with 1.06g of **A** (1mark)
vi) Number of moles of carbonate that reacted with solution **R** (1mark)
vii) Relative atomic mass of X in one mole of X_2CO_3 (C=12,0=16) (1mark)

2. You are provided with
- Solution **B** (1M HNO_3)
- Solution **X** (1M NaOH).
You are required to determine the heat of reaction per mole of **B** used using the procedure below
Procedure
i) Fill the burette with solution **B**
ii) Using a measuring cylinder, put 20cm^3 of solution **X** into a plastic beaker. Note its steady temperature.
iii) Add 4cm^3 of solution **B** from the burette and determine the highest temperature attained
iv) Continue adding 4cm^3 portions of solution **B** and every time determining the highest temperature attained
v) Fill the highest temperature attained in table II below

TABLE II

Volume of solution **B** (cm^3)	0	4	8	12	16	20	24	28	32
Temperature attained (^{0}c)									

(4marks)

a) Plot a graph of temperature against volume of solution B. (3marks)
b) i) From the graph determine the volume of solution B that reacts completely with 20cm^3 of solution X (1mark)
ii) Determine the temperature change when solution X is completely reacted with solution B (1mark)
c) Determine the heat evolved when the reaction is complete (2marks)
(Density of solution =1g/cm^3, Specific heat capacity=4.2J/g/K)
d) Determine the heat of reaction per mole of solution B used (2marks)
e) Draw an energy level diagram for the reaction above. (2marks)

3. You are provided with solid **E**. Carry out the following tests on E and record your observations and inference in the spaces provided.
(a) Place a spatula of solid **E** into a boiling tube and add 10cm^3 of distilled water. Shake the mixture thoroughly. Filter the mixture and divide the filtrate into four portions. Keep the residue for use in part (b).

Observation	Inference
(1mk)	(½ mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

ii) To portion one, add sodium Hydroxide solution drop wise until in excess.

Observation	Inference
(½ mk)	(1mk)

iii) To portion two, add Ammonia solution drop wise until in excess.

Observation	Inference
(½ mk)	(½ mk)

iv)To portion three, add four drops of Lead (II) Nitrate Solution.

Observation	Inference
(½ mk)	1mk

iv) To portion four, add four drops of Barium Nitrate solution

Observation	Inference
(½ mk)	(1mk)

b.i) Place a small amount of residue in metallic spatula and heat strongly in a non-luminous flame.

Observation	Inference
(1mk)	(½ mk)

ii) Place the remaining solid in a boiling tube and add dilute nitric (v) acid little by little until all the solid dissolves. Divide the solution into two parts.

Observation	Inference
(½ mk)	(½ mk)

iii) To part one, add sodium Hydroxide solution drop wise until in excess.

Observation	Inference
(½ mk)	(1mk)

iv) To part two, add Ammonia solution drop wise until in excess.

Observation	Inference
(½ mk)	(1mk)

(iii) To portion three, add 3 drops of sodium sulphate solution.

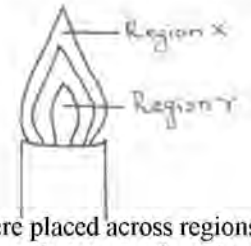
Observation	Inference
(½ mk)	(1mk)

for more free pastpapers visit: www.freekcsepastpapers.com or call: 0725502479

GITHUNGURI SUB-COUNTY EXAMINATION

233/1
CHEMISTRY
PAPER 1
(THEORY)
2016
TIME: 2 HOURS

1. (a) The diagram below shows a non-luminous flame. Use it to answer the questions that follow:



Two wooden splints were placed across regions **X** and **Y** respectively. Draw labelled diagrams to show the effects observed on the wooden splint placed across each region. (2 marks)

(i) Region **X**.

(ii) Region **Y**.

(b) It is advisable to leave your flame in the luminous state when not in use. Give a reason why. (1mark)

2. Explain the change in mass expected when each of the following substances is heated in an open crucible.
   (a) Copper metal. (1 mark)
   (b) Copper (II) nitrate. (2 marks)

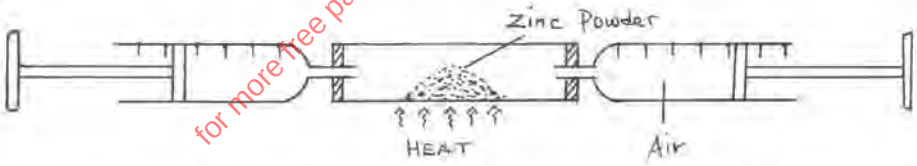
3. The table below shows PH values of solutions **A**, **B**, **C** and **D**.

Solution	PH
A	3.0
B	13.0
C	8.5
D	7.0

   (a) Identify a solution which is
      (i) Strongly acidic. _____ (½ mark)
      (ii) Strongly basic _____ (½ mark)

   (b) Which to solutions would react with lead (II) oxide? Explain. (2 marks)

4. In an experiment a certain volume of air was repeatedly passed between two syringes over heated zinc powder as shown below.



The same experiment was repeated using magnesium turnings instead of zinc powder. In which of the two experiments was the overall change in volume greater? Explain. (3 marks)

5. The grid below is part of the periodic table. Study it and answer the questions that follow. The letters are not actual symbols of elements.

A			D	E			H	I
B	C		M		F	G		J

   (a) What is the name given to the chemical family of element **C**? (1 mark)
   (b) Would element **B** react with **J**? Explain. (1 mark
   (c) Compare the melting points of **B** and **M**. (1 mark)

6. The atomic numbers of nitrogen, oxygen and sodium are 7, 8 and 11 respectively.
   (a) Write the electron arrangements of their ions, N^{3-}, O^{2-} and Na^{+}. (1 mark)
   (b) Arrange the 3 ions in increasing order of size. Give a reason for your answer. (2 marks)

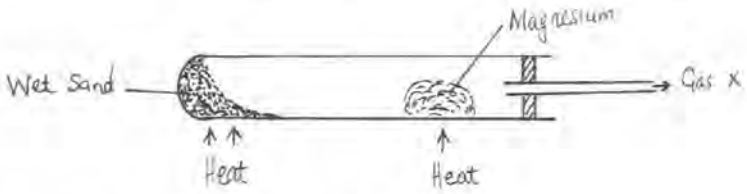
7. The melting point of phosphorous (III) chloride is -91°C while that of magnesium chloride is +715°C. In terms of structure

for more free past papers visit: www.freekcsepastpapers.com or call: 0720002479

and bonding explain the difference. (3 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

8. The diagram below illustrates how magnesium would react with steam. Study it then answer the questions that follow.

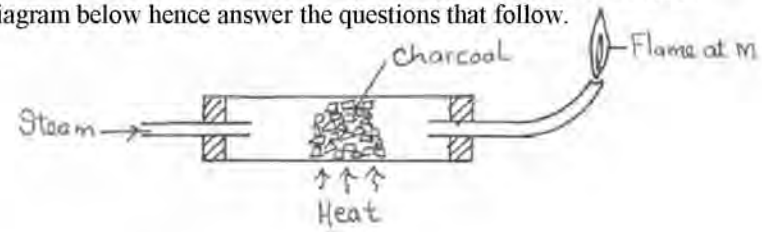


(a) Write the equation for the reaction that takes place. (1 mark)
(b) Explain why this experiment cannot be carried out with potassium in the same way as shown. (1 mark)

9. Explain why graphite is used as a lubricant in moving machine parts where a lot of heat is produced. (2 mark)

10. Calculate the volume of carbon (IV) oxide that would be produced if 15g of calcium carbonate reacted with 100cm³ of 2.0M hydrochloric acid (C = 12.0, O = 16.0, Ca = 40.0) molar gas volume = 24000cm³. (3 mark)

11. (a) Study the diagram below hence answer the questions that follow.



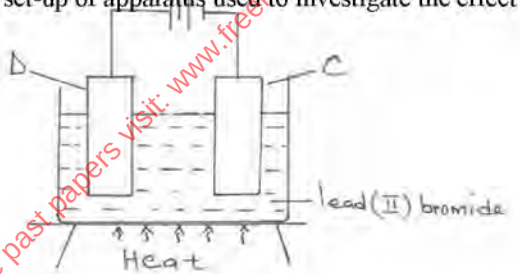
(i) Explain why it is necessary to have the flame at **M**. (1 mark)
(ii) Write down the equation for the reaction inside the combustion tube. (1 mark)
(c) Explain potassium hydroxide is not a suitable reagent for testing carbon (IV) oxide. (1 mark)

12. The table below contains information regarding a species of helium.

Species	Number of electrons	Number of neutrons
$_{2}^{3}He^{2+}$		

Complete the table by indicating the numbers of electrons and neutrons. (2 marks)

13. (a) The diagram below represents a set-up of apparatus used to investigate the effect of electric current on lead (II) bromide.

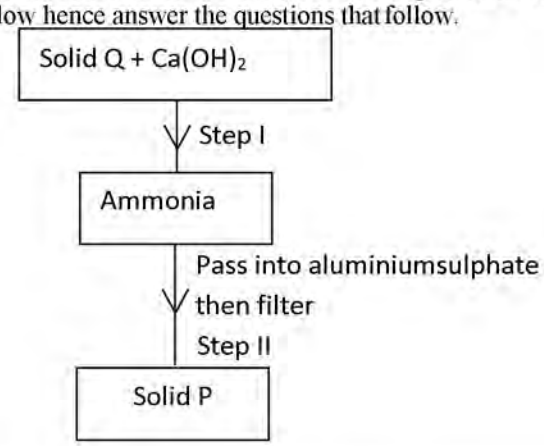


Describe what is observed at electrode C. (1 mark)

(b) A current of 2.5A was passed through a cell containing N^{2+} ions for 25 minutes. The mass of the cathode increased by 0.36g. Determine the R.A.M of N. ($F = 9.65 \times 10^{4} Cmol^{-1}$). (2 marks)

14. When aluminium chloride is dissolved in water, the resulting solution has a PH of 3. Explain. (3 marks)

15. Study the scheme below hence answer the questions that follow.



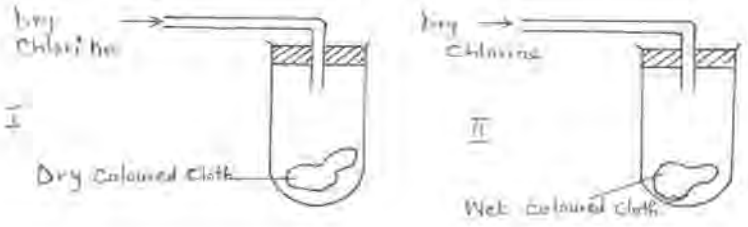
(a) Identify solid **Q**._____ (1 mark)
(b) Write an ionic equation for the reaction in Step **II**. (1 mark)

for more free past papers visit: www.freecbcpastpapers.com or call: 0720502479

(c) State the condition necessary for Step **I**. (1 mark)

16. When sulphur is heated in a boiling tube in the absence of air, the yellow crystals melt into a golden yellow mobile liquid at 113°C. The liquid turns into a dark brown viscous mass at 180°C. At 400°C the brown liquid becomes less viscous and flows easily. Explain these observations. (3 marks)

17. Study the diagrams below.



(a) State the observations made at I and II

(b) Write the equation to show the reactions at II if dry sulphur (IV) oxide was used in place of dry chlorine. (2 marks)

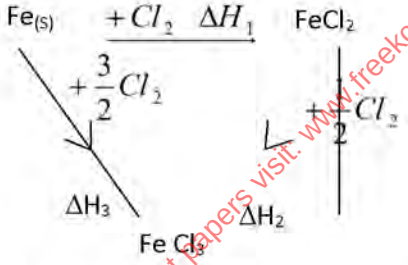
18. In an experiment soap solution was used against 3 separate samples of water. Each sample was later boiled and soap added. Each water sample was 1000cm³. The results are tabulated below.

Volume of soap used to form lather	Sample		
	I	II	III
Before boiling (cm³)	27	3	10.6
After boiling (cm³)	27	3	3

(a) Which sample was likely to be soft water? Explain. (2 marks)

(b) State the cause of change in volume of soap used to form lather in sample **III**. (1 mark)

19. Study the cycle below hence answer the questions that follow.



(a) What is ΔH_3? (1 mark)

(b) Show the relationship connecting ΔH_1, ΔH_2 and ΔH_3 (1 mark)

20. When bromine gas reacts with aqueous sodium hydroxide an equilibrium is established as shown below.

$Br_{2(aq)} + 2OH_{(aq)} \rightleftharpoons Br_{(aq)} + OBr_{(aq)} + H_2O_{(l)}$

(Brown) (Colourless)

What observation would be made if a few drops of dilute sulphuric (VI) were added to the equilibrium mixture? Explain. (2 marks)

21. (a) Aqueous sodium sulphate was electrolysed using platinum. Name the products at each electrode. (1 mark)

I Cathode_____

II Anode_____

(b) Explain why it is not advisable to use potassium chloride as salt bridge in the cell shown below.

$Pb_{(S)} / Pb^{2+}_{(aq)} \; // \; Cu^{2+}_{(aq)} / Cu_{(S)} \quad E = +0.47V$ (1 mark)

22. A compound has empirical formula C_3H_6O and relative formula mass of 116. Determine it's molecular formula. (C = 12, H = 1, O = 16). (2 marks)

23. (a) State the law of combining volumes of gases. (1 mark)

(b) What volume of methane would remain if a burner containing 40cm³ of methane burns in 40cm³ of enclosed air (assuming that oxygen is 20% of air)? (2 marks)

24. The molecular formula of compound T is C_3H_8O. T reacts with acidified potassium manganate (VII) to form another compound U whose formula $C_3H_6O_2$. T also reacts with sodium metal to produce hydrogen gas and T is neutral to litmus.

(a) Suggest the homologous series to which T belongs. (1 mark)

(b) Name the type of reaction leading to the formation of U in the reaction described above. (1 mark)

(c) Write the structural formula of U. (1 mark)

for more freekcsepastpapers visit: www.freekcsepastpapers.com or call: 0720502479

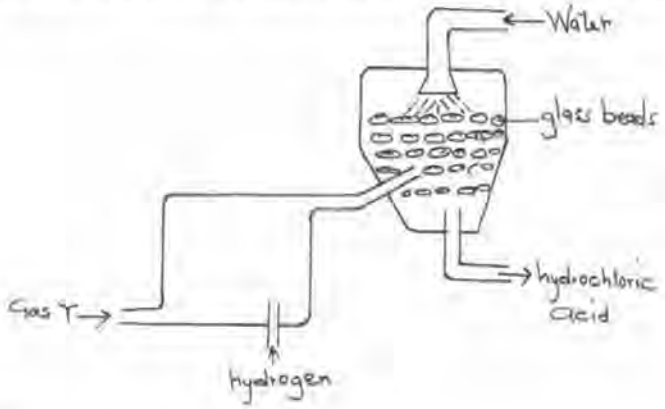
25. Potassium has two isotopes $^{39}_{19}K$ and radioactive $^{40}_{19}K$.

(a) State how the two isotopes differ. (1 mark)

(b) The half-life of $^{40}_{19}K$ is 1.3×10^9 years. Determine how long it would take for 4g of the isotope to decay to 1g. (1 mark)

(c) $^{39}_{19}K$ undergoes beta decay to form an isotope of calcium. Write the equation for this decay. (1 mark)

26. The diagram below represents a section of the hydrochloric acid manufacturing plant.



(a) Name **Y**. (1 mark)

(b) State the role played by glass beads. (1 mark)

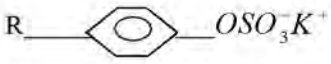
(c) Chlorine reacts with hydrogen sulphide gas according the equation shown below:

$H_2S_{(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)} + S_{(S)}$

From the equation identify the oxidizing agent. (1 mark)

27. The formulae below belong to 2 cleansing agents.

I $RCOO^- K^+$

II 

(a) Which of the two cleaning agents would lather readily with hard water? (1 mark)

(b) State **one** disadvantage of the continued use of cleansing agent II. (1 mark)

(d) Write the formula of the compound formed when cleansing agent I is used with water containing Mg^{2+} ions. (1 mark)

28. Starting with solid lead (II) carbonate, briefly describe how a sample of lead (II) chloride can be prepared. (3 marks)

29. (a) State Boyle's law. (1 mark

(b) $60cm^3$ of oxygen gas diffused through a porous hole in 50 seconds. How long will it take $80cm^3$ of sulphur (IV) oxide to diffuse through the same hole under the same conditions (S = 32, O = 16). (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

GITHUNGURI SUB-COUNTY
EXAMINATION 233/2

CHEMISTRY
Paper 2
(THEORY)
2016

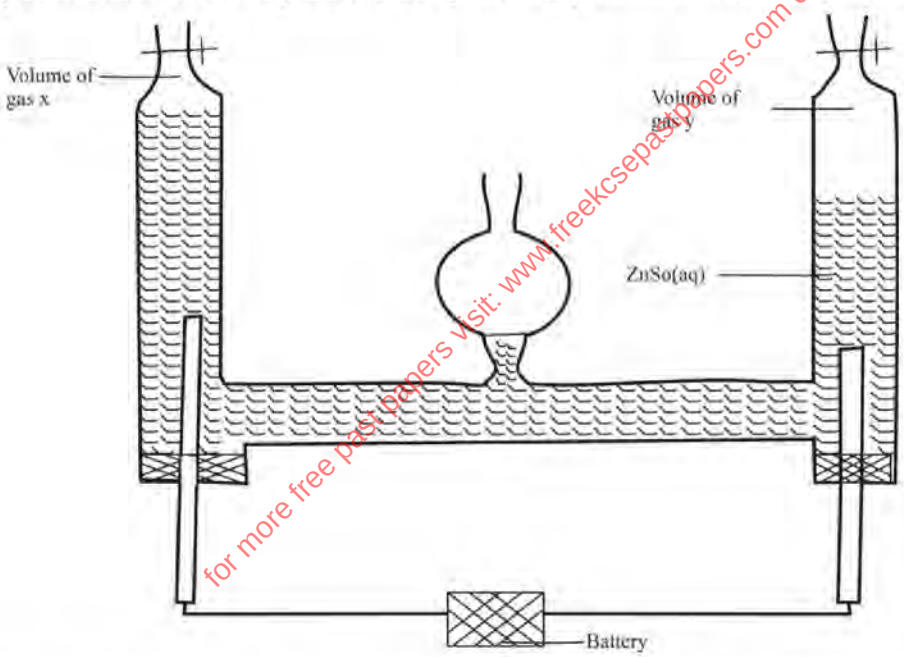
TIME 2 HOURS

1. The table below shows elements, atomic numbers and their melting points. The letters do not represent actual symbols of the elements. Study it and answer the questions.

Elements	Atomic numbers	Melting point
J	11	98°c
K	16	115°c (119°c)
L	15	44°c
M	14	1410°c
N	12	650°c

(a) Write the formula of the oxide of **M** (1 mark)
(b) Choose an element that would give a basic oxide when burned in air. Give a reason. (2 marks)
(c) Element **K** has two melting points. Explain why? (2 marks)
(d) The melting point of element **M** is 1410°c. What is the possible structure of element **M**. (1 mark)
(e) Compare the reactions of **J** and water to that of **N** and water (2 marks)
(f) Choose an element that would form only covalent compounds. Explain (2 marks)
(g) Write an equation for reaction of **L** and oxygen (1 mark)

2. An aqueous solution of zinc sulphate is electrolysed using platinum electrodes as shown below in the set up.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

a) (i) Write down the ionic equation for the reaction taking place at electrode producing gas **X**(1 mark)
(ii) Identify the gas produced at **Y**; give a reason (2 marks)
b) 0.22 g of metal g is deposited by electrolysis when a current of 0.06 amperes flows for 99 minutes. (G=184, IF = 96500C)
(i) Find the number of moles of metal deposited (1mark)
(ii) Find the number of moles of electrons passed (3 marks)
(iii) Determine the value of **n** in the metallic ion G^{n+} (2 marks)
c) The following are half-cell reactions and their reduction potentials

	E^{θ} (volts)
$A^{2+} + 2e \longrightarrow A_{(s)}$	-0.76
$B^{2+}_{(aq)} + 2e \longrightarrow B_{(s)}$	-0.13
$C_{(aq)} + e \longrightarrow C_{(s)}$	+0.80
$D^{2+}_{(aq)} + 2e \longrightarrow D_{(s)}$	+0.30

(i) Write the cell representation for the electrochemical cell that would give the highest E^{θ} value. (2 marks)
(ii) Give one industrial use of electrolysis (1 mark)

3. (a) State Hess's law (1mark)

(b) Using the following thermochemical equations draw an energy cycle diagram. (3 marks)

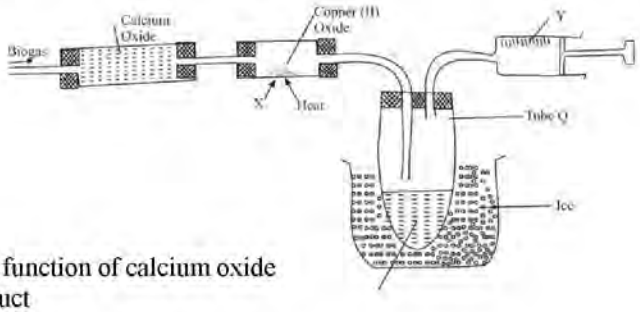
A.	$2C_{(s)} + H_{2(g)} \longrightarrow C_2H_{2(g)}$	$\Delta H = +227$ Kj/mol
B.	$C_{(s)} + 0_{2(g)} \longrightarrow CO_{2(g)}$	$\Delta H = -394$ Kj/mol
C	$H_{2(g)} + \frac{1}{2} O_{2(g)} \longrightarrow H_20_{(g)}$	$\Delta H = -286$ Kj/mol

(c) Name the heat of change represented by thermochemical equation **A** (2 marks)

(d) Using thermochemical equations **A, B, C.** Calculate the molar heat of combustion of ethyne (3 marks)

(e) Give **3** factors considered for choosing a good fuel (3 marks)

4. Biogas is made from natural organic waste. A from four student set –up the apparatus below to investigate the composition of the gas. He passed it over heated copper (II) oxide. After that he obtained two products. One was cooled in a boiling tube while the other was collected using a syringe.



(a) What is the function of calcium oxide (1 mark)

(b) Name product

i) P

ii) **Y** (2marks)

(c) Give the two observations made in tube **X** (2 marks

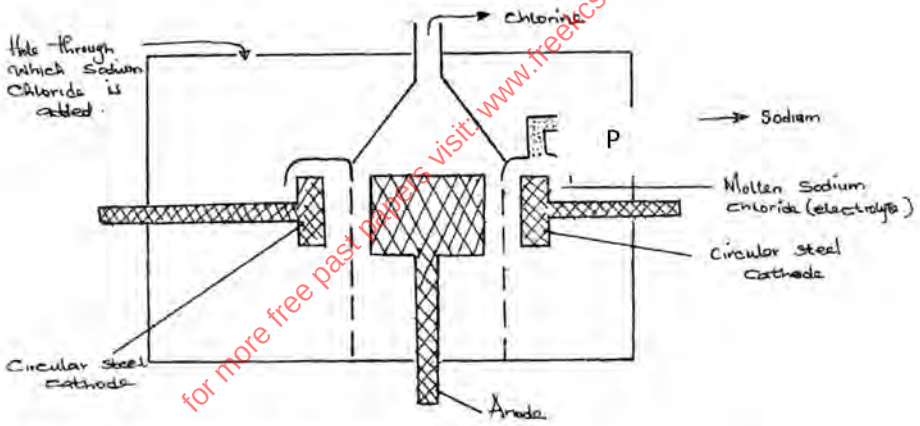
(d) i) Name the type of reaction taking place in tube **X** (1 mark)

ii) Write the equation for the reaction above in (d)(i) (1 mark)

(e) What elements are present in biogas (2 marks)

(f) Explain why one tube in boiling tube **Q** is longer than the other (2 marks)

5. **Below** is a simplified diagram of the Downs cell used for the manufacture of sodium. study it and answer the questions that follow:



(i) Explain why the anode is not made of steel. (2 marks)

(i) What precaution is taken to prevent chlorine and sodium from recombining? (1 mark)

(ii) Write an ionic equation for the reaction that took place at the : (2marks)

(I) Anode.

(II) cathode

(b) (i) In the Downs process calcium chloride salt is added to sodium Chloride. Explain why? (2 marks

(ii) In Down's process liquid calcium metal may also be formed alongside liquid sodium metal. Explain how the two can be separated. (1 mark)

(c) Explain why aqueous sodium chloride is not suitable as an electrolyte for the manufacture of sodium in the Downs process. (2 marks)

(b) Sodium reacts with water to form sodium hydroxide and hydrogen gas.

(i) Write the equation for the reaction. (1 mark)

(ii) Explain **two** observations made on placing a piece of sodium metal in water (2marks)

(I) Sodium melts into a silvery ball.

(II) Solution turns methyl orange yellow.

6. (a) Production of Nitrogen(II) oxide follows the equation below represented by the equation

$N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$ $\Delta H = +180$ kJ /mol.

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

(h) What is meant by the word **equilibrium** (2 mark)

(b) With reasons explain what would happen when

(i) Pressure is increased in the system in (a) above (2 marks)

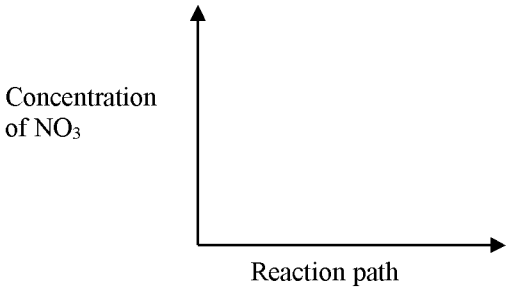
(ii) Temperature is increased (2 marks)

(iii) Nitrogen (II) Oxide is removed (2 marks)

(c) An equilibrium exists between

$2NO_{2(g)} \rightleftharpoons N_2O_{4(g)}$

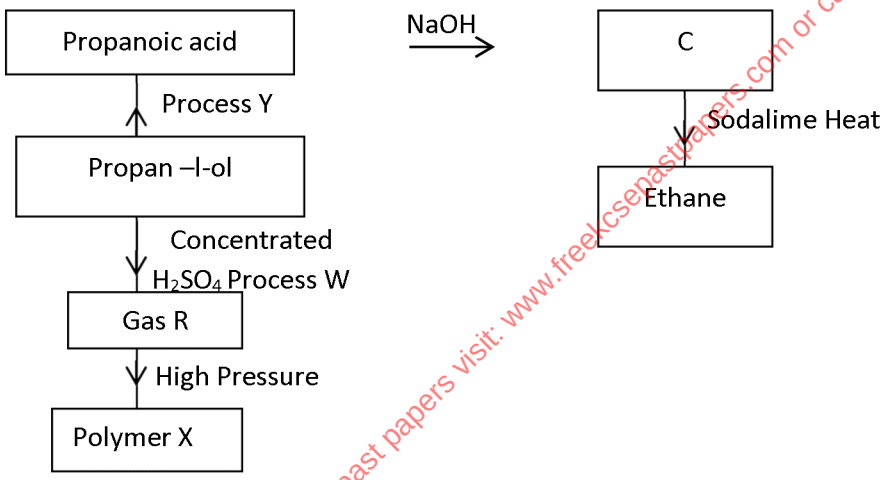
On the grid below sketch how the concentration of NO_2 varies with the reaction path (3 marks)



7. (a) State how burning can be used to distinguish between prepane and propyne. Explain your answer. (3marks)

(b) Draw the structural formular of the 4th member of the homologous series in which propyne is a member (1mark)

(c) The flow chart below shows a series of reactions starting withpropan-l-ol. Study it and answer the questions that follow.



(i) Name:

I. Process **Y**…….. (1mark)

II. Substances **R** and **C**

III. Process **W**…… (1mark)

IV. Polymer X…… (1mark)

(ii) Write a balanced chemical equation for the combustion of propane. (1mark)

(iii) State **one**use of polymer **X** (1mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0729502479

GITHUNGURI SUB-COUNTY
EXAMINATION 233/3

CHEMISTRY
FORM FOUR
PRACTICAL
Paper 3
TIME: 2¼ HOURS

1. You are provided with
- 10g of solid **A** which is a mixture of sodium carbonate and sodium chloride.
- 0.2 M HCl solution **B**

You are required to

- Determine the concentration of sodium carbonate in the mixture.
- Percentage of sodium chloride in the mixture.

Procedure

Transfer the entire solid into a 250 Ml volumetric flask. Add about 100cm^3 of distilled water. Shake to dissolve. Top up with more distilled water to make up to the mark. Label this solution **A2.** Using a pipette and a pipette filler, transfer 25 cm^3 of this solution into a conical flask. Repeat the procedure two more times to complete table **1**

Table 1

	I	II	III
final burette reading (cm^3)			
initial burette reading(cm^3)			
volume of solution B used (cm)^3			

(a) Calculate
(i) The average volume of solution **B** used (1mark)
(ii) The number of moles of HCl in the average titre (1 mark)
(b) Write an equation for the reaction (1mark)
(c) calculate the number of
(i) Moles of sodium carbonate in 25cm^3 of solution **A2** **(1 mark)**
(ii) The moles of sodium carbonate in 250 cm^3 of solution A2 (1 mark)
(d) Determine the mass of sodium carbonate in solid A (1 mark)
(Na=23, C = 12.0, H=1.0 , O= 16)

(e) Calculate the percentage of sodium chloride in solid A (1 mark)

2. You are provided with
- Solution **D,** 2MHCl
- Solution **C** 2 M NaOH

You are required to determine the heat of neutralization

Procedure

Wrap a plastic beaker with tissue paper and secure it with a rubber band.
Use a measuring cylinder to transfer 20cm^3 of solution C into a plastic beaker.
Take its initial temperature and record it in table 2 below.
Using a clean measuring cylinder, measure 5 cm^3 of solution **B** and add it to solution *C*. Stir the mixture immediately with a thermometer and record the highest temperature in table 2
Continue adding 5 cm^3 portions of solution every time record the highest temperature attained to complete the table

Table 2

Volume of **D** add cm^3	0	5	10	15	20	25	30
Volume of **A+D** cm^3	20	25	30	35	40	45	50
Temperature of mixture °C							

(4 marks)

Plot a graph of volume of solution **D** (X-axis) against highest temperature (3 marks)

(a) From the graph:
(i) Determine the volume of solution **D** that reacts completely with solution **C**. (1mark)
(ii) The highest temperature changeΔ T (1 mark
(b) (i) Calculate the amount of heat evolved by the reaction (assume specific heat of capacity = 4.2Jg^{-1} K^{-1}, density of solution = 1 g/cm^3) (1 mark)
(ii) Calculate the number of moles of HCl used (1 mark)
(iii) Calculate the molar heat of neutralization of HCl (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

3. (a) You are provided with solid **E**. Carry out the following tests and write your observations and inferences in the spaces provided.

(i) Place one third of solid **E** on a metallic spatula and ignite using a Bunsen burner flame

observation	Inferences
(1 mark)	(1 mark)

(ii) Place all the remaining solid in a boiling tube. Add 5cm^3 of distilled water. Shake to dissolve and divide it into 4 portions

(I) to the first portion add three drops of acidified potassium manganate (VII)

observation	Inferences
(1 mark)	(1 mark)

(II) To the second add three drops bromine water.

observation	Inferences
(1 mark)	(1 mark)

(III) To the third portion add all the sodium hydrogen carbonate provided

observation	Inferences
(1 mark)	(1 mark)

(b) You are provided with solid **F**. Carry out the tests below and record your observations and inferences in the spaces provided. Place all the solid **F** in a boiling tube. Add 10cm^3 of distilled water. Divide into four portions.

observation	Inferences
(1 mark)	(1 mark)

(i) To the first portion, add aqueous hydroxide drop wise until in excess.

observation	Inferences
(1 mark)	(1 mark)

(ii) To the second portion add 5 drops of barium nitrate solution, followed by 3 drops of dilute nitric acid.

observation	Inferences
(1 mark)	(1 mark)

(iii) To the third portion add 3 drops of acidified sodium dichromate (VI) solution

observation	Inferences
(1 mark)	(1 mark)

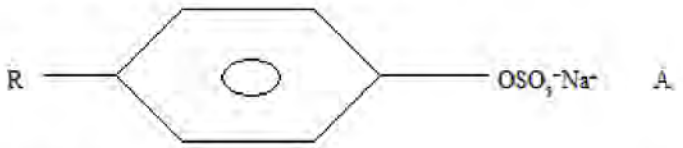
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2016

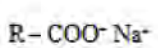
Kenya National Examination Council

233/1
CHEMISTRY
PAPER 1 (THEORY)
TIME: 2 HOURS
JULY/AUGUST 2016

1. a) Three isotopes of Magnesium has mass numbers 24, 25 and 26. What is the mass number of the most abundant isotope of Magnesium? Explain. (2mks)
   b) Define the term isotope. (1mk)
2. a) Define hard water. (1mk)
   b) The structure below represents two cleansing agents.



A



B

Which of the above cleansing agent would be suitable for washing in hard water? Give a reason.

(2mks)

3. The heat of neutralization of a strong acid is usually 57.4kJmol^{-1}, whereas that of a weak acid is less than 57.4kJmol^{-1}. Explain (2mks)
4. When an electric current of 0.5A was passed through a molten chloride of J for 32 minutes and 10 seconds, a mass of 0.44g of J was deposited at cathode.
   1F = 96500C
   a) Calculate the quantity of electricity used. (1mk)
   b) Determine the value of x if the ion of metal J is represented as J^{x+} (2mks)
5. Your friend's clothes have caught fire. Inorder to extinguish the fire you decide to cover with a damp blanket. What is the purpose of the clamp blanket? (1mk)
6. Calculate the number of Calcium atoms in 10g of calcium.
   (Ca = 40, Avogadro number = 6.0×10^{23}) (1mk)
7. The table below shows the pH values of some solutions.

Solution	J	K	L	M	N
pH	6	13	2	10	7

   a) Which solution is likely to be:
   i) Potassium hydroxide (1mk)
   ii) Lemon juice (1mk)
   b) Explain why a solution of hydrogen chloride gas in methyl benzene was identified as N. (1mk)
8. A piece of burning magnesium ribbon was placed in a gas jar full of nitrogen gas. The product Q formed was then reacted with water.
   a) Write the chemical formula for the product Q. (1mk)
   b) Write the equation for the reaction between product Q and water. (1mk)
   c) Using dot (•) and cross (X) diagrams to represent electrons, draw the structure to show bonding in a nitrogen molecule. (N = 14) (1mk)
9. How would the following pair of compounds be chemically distinguished? CH3COOH and CH_3CH_2OH.
   (2mks)
10. Name the products of electrolysis of fused copper (II) chloride using carbon electrodes.
    Anode (½ mk)
    Cathode (½ mk)
    Explain (1mk)
11. Zinc metal can be used in the laboratory to prepare hydrogen gas from an appropriate mineral acid while copper metal cannot. Explain. (1mk)
12. a) State one factor that can determine stability of an atom. (1mk)
    b) Radioactive polonium -216 decays as shown below.

$$^{216}_{84}Po \longrightarrow {}^{216}_{82}Pb + M\alpha + N\beta\beta$$

for more free past papers visit www.freecsepastpapers.com or call: 0720502479

Find the value of M and N. (2mks)

c) If after 112 days $^{1}/_{16}$ of Polonium remained, calculate the half-life of polonium. (2mks)

13. When bromine gas reacts with aqueous sodium hydroxide an equilibrium is established as shown below.

$$Br_{2(aq)} + 2OH^-_{(aq)} \rightleftharpoons Br^-_{(aq)} + OBr^-_{(aq)} + H_2O_{(l)}$$

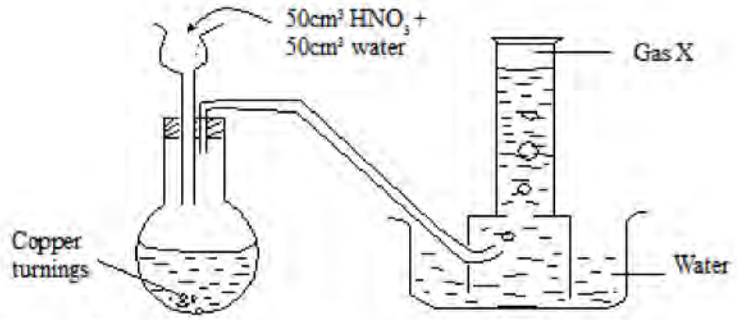
(Brown) Colourless

What observation would be made if a few drops of dilute sulphuric (VI) acid were added to the equilibrium mixture? Explain. (2mks)

14. One compute combustion of 0.5g of an organic compound P (containing only carbon, hydrogen and oxygen) 0.733g of carbon (IV) oxide and 0.3g of water were produced.
Determine the empirical formula of P. (3mks)

15. Compare the atomic sizes of sodium and magnesium. Explain. (2mks)

16.

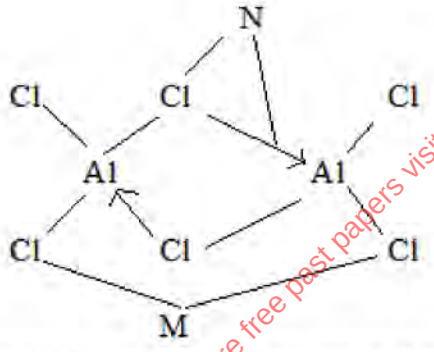


a) Name gas X. (½ mark)

b) Write an equation for production of gas x in the set-up. (1mk)

c) It's hat to test whether gas x supports burning using a glowing splint. Explain. (2mks)

17. When solid M is dissolved in water, it dissolves to form a blue solution. Addition of ammonia solution forms a blue precipitate which dissolves in excess to form a deep blue solution. Write the formula and name of the ion responsible for the deep blue solution. (2mks)



18. The diagram below represents the structure of aluminium chloride.

a) Identify the bonds labelled

M (½ mark)

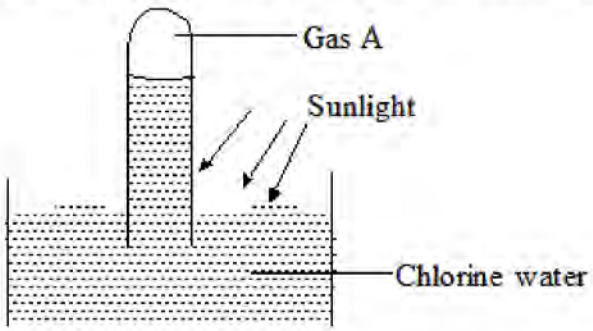
N (½ mark)

b) What is the difference between bonds M and N? (1mk)

19. a) Define hydration energy. (1mk)

b) Given that hydration energies of Ca^{2+} and Cl^- are -1891kJmol^{-1} and - 384kJmol^{-1} respectively and that the lattice energy of calcium chloride is +2237kJmol^{-1}, calculate the molar enthalpy change of solution of calcium chloride. (3mks)

20. The diagram below shows an experiment involving chlorine water.

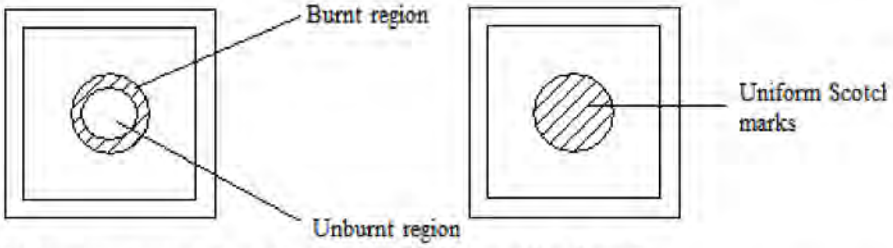


for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

a) State and explain the observations made after 24 hours. (2mks)
b) Write an equation to show the formation of gas A. (1mk)
c) State one use of chlorine gas. (1mk)

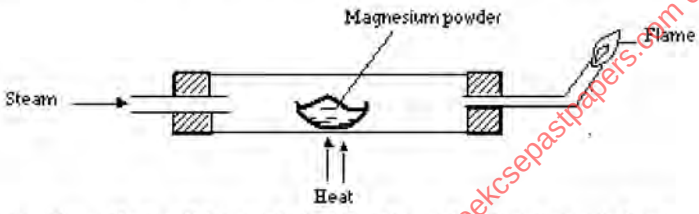
21. The solubility of salt Y at 60^0C is 40g/100g of water and 48/100g of water at 100^0C.
a) How much salt Y would saturate 190g of water at 100^0C. (1½ mark)
b) 150g of a saturated solution of Y is 100^0C is cooled to 60^0C. Calculate the mass of Y that crystallizes. ($1\frac{1}{2}$mks)

22. The diagram below shows the appearance of two pieces of paper placed in different parts of a non-luminous flame of a Bunsen burner and removed quickly before they caught fire.



a) What do the experiments show about the outer region of the flame? (1mk)
b) From the above experiment, which part of the flame is better for use in heating? Give a reason. (2mks)

23. Steam is passed over heated magnesium as shown in the diagram below.



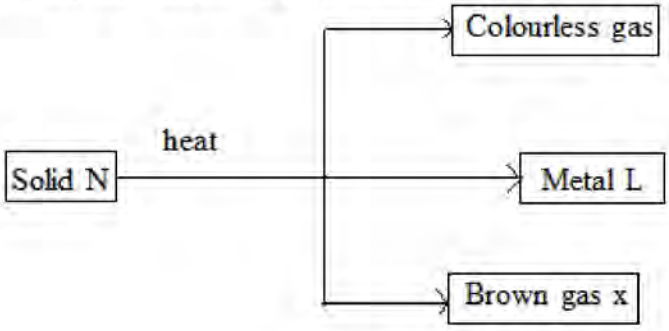
a) State one observations that will be made in the tube as heating is carried out. (1mk)
b) What substance is being burnt at A? (1mk)
c) Write a balanced chemical equation to show the reaction which takes place in the combustion tube. (1mk)

24. The volume of a given mass of a gas is 250cm^3 at 27^0C and 720mmHg pressure. What will be the volume of the gas at s.t.p. (3mks)

25. Given the equation $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ DH= -92kJmol^{-1}
Explain what happens to the position of the equilibrium when
a) Temperature is raised. (1mk)
b) Pressure is changed. (2mks)

26. State and explain the observations made when a few drops of concentrated sulphuric (IV) acid is added to
a) Hydrated Copper (II) sulphate. (2mks)
b) Sugar (2mks)

27. Study the flow chart below and answer the questions that follow.



a) Given that solid N burns in air with a red flame. Identify:-
i) Cation present in solid N (½ mark)
ii) Metal oxide L (½ mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

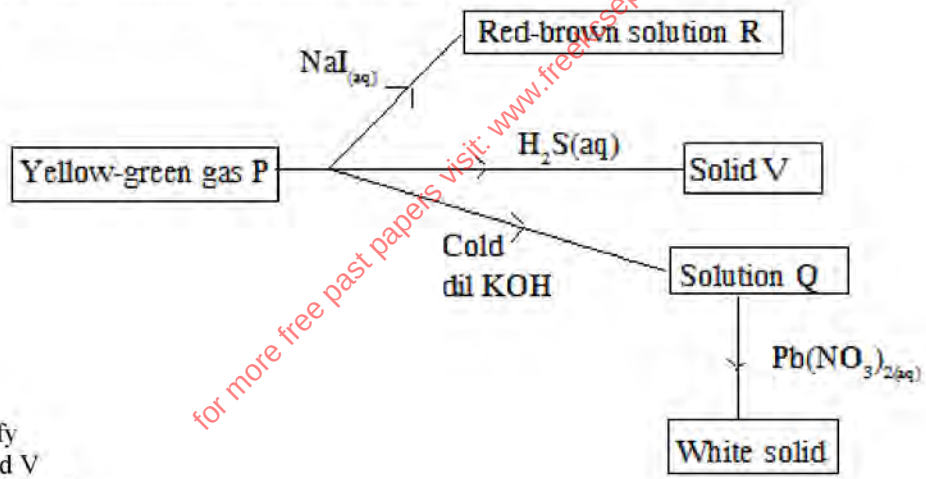
KIGUMO SUB-COUNTY CLUSTER
EXAMINATION 2016
Kenya National Examination Council

233/1
CHEMISTRY
PAPER 1 (THEORY)
TIME: 2 HOURS
JULY/AUGUST 2016

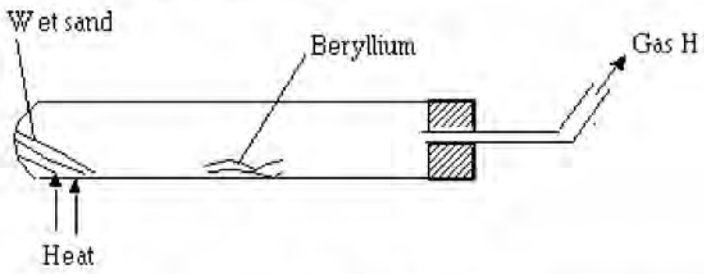
SECTION A
Answer ALL the questions on the spaces provided.

1. a) What is meant by term Isomerism. (1mk)

   b) Draw an Isomer of pentene. (1mk)
2. Consider the metals copper and zinc.
   a) Name one ore for each metal
   Copper:
   Zinc:
   b) Apart from copper being a good conductor of heat and electricity, state any other physical property of copper.(1mk)
3. a) Define the term fuel. (1mk)
   b) State two factors to consider when choosing a fuel. (1mk)
4. a) State Graham's Law of diffusion. (1mk)
   b) A compound contains 29.1% sodium, 40.5% sulphur and the rest is oxygen. Find the empirical formulae. (Na = 23, S = 32, O = 16) (2mks)
5. a) Calculate the maximum volume of oxygen, measured at s.t.p., that can be obtained by heating a solution containing 8.8g of hydrogen peroxide. (2mks)
   b) What is a standard solution. (1mk)
6. a) State two methods of removing permanent hardness in water only. (1mk)
7. Study the flow chart below and answer the question that follows.



   Identify
   i) Solid V (1mk)
   ii) Solution R (1mk)
   iii) Solution Q (1mk)
8. Crystals of hydrated sodium carbonate ($Na_2CO_3.10H_2O$) left in open air and changed to a white powder.
   i) Explain what happens and give the relevant equation. (1mk)
   ii) Give the name of the process shown above. (1mk
9. A student used the set-up shown in the diagram below inorder to study the reactions of some metals with steam. The experiment was carried out for ten minutes.



   a) What observation would be made if gas H was ignited. (1mk)
   b) When the experiment was repeated using lead powder instead of Beryllium very little of gas H was obtained. Give reason for this observation. (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call 0720502419

c) Name another gas which is used together with hydrogen in welding. (1mk)

10. Compare the reactivity of chlorine and bromine. (2mks)

11. The table below shows the electrical conductivity of substances A, B and C.

Substance	Solid State	Molten state	Aqueous solution
A	Conducts	Conducts	Not soluble
B	Doesn't conduct	Conducts	Conducts
C	Doesn't conduct	Doesn't conduct	Not soluble

a) Give the type of structure and bonding that is present in substance A. (1mk)

b) Which substance is likely to be sodium chloride. Explain. (2mks)

12. Hydrogen Iodide is a product formed when hydrogen reacts with Iodine according to the equations.

$$H_{2(g)} + H_{2(g)} \rightleftharpoons 2HI_{(g)} \qquad \text{Đ}H = +52.0\text{KJ/mole}$$

Explain how the following would affect the yield of Hydrogen Iodide.

a) Increase the temperature. (1mk)

b) A decrease in pressure of the system. (1mk)

c) State the Le Chatelier's principle. (1mk)

13. Explain the following observation made by a form three student.

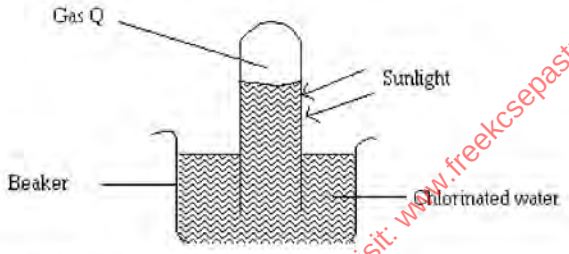
a) Dilute hydrochloric acid does not react with copper metal, but dilute nitric acid does. (1mk)

b) Describe briefly how one can distinguish Nitrogen (I) oxide from Nitrogen (II) oxide. (1mk)

14. a) Noble gas are usually unreactive. Explain this phenomena. (1mk)

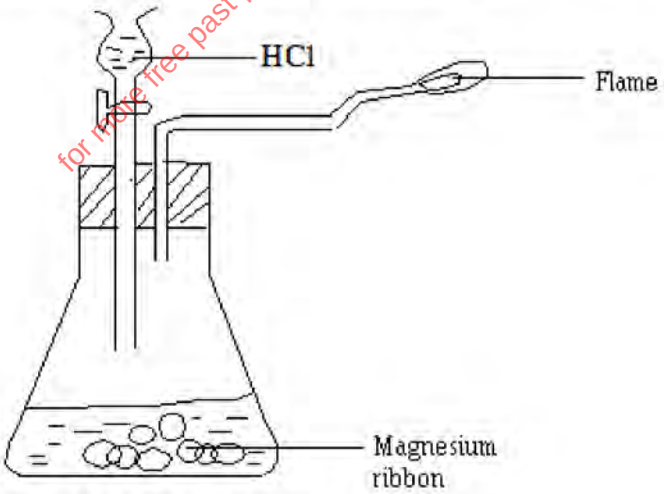
b) Explain the meaning of the term ductility a property found in metals. (1mk)

c) Study the diagram below.



Write down the equation for production of gas Q. (1mk)

15. The diagram below was used by a student to prepare a certain gas.

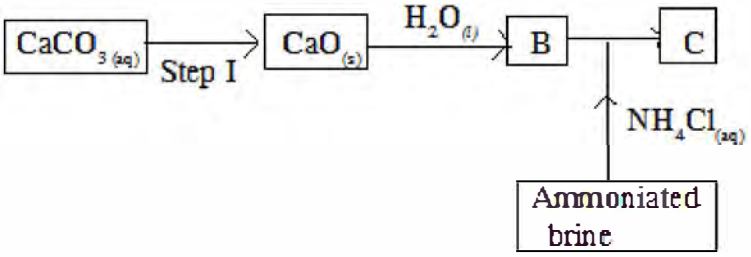


a) Write equation taking place in the experiment. (2mks)

b) State why it is advisable to burn the gas. (1mk)

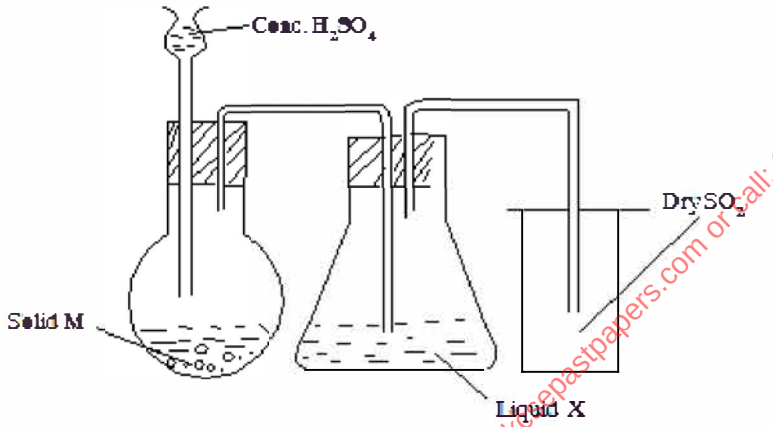
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

16. Study the flow chart given below.



a) Name substance B. (1mk)
b) Give one us of product C. (1mk)
c) Write the equation between substance B to form substance C. (1mk)

17. The diagram below was used to prepare and collect Sulphur (IV) oxide gas.



a) Identify solid M. (1mk)
b) State two properties of SO_2 that makes possible to be collected in the method shown. (1mk)
c) What are the optimum conditions of conversion of SO_2 to SO_3. (1mk)

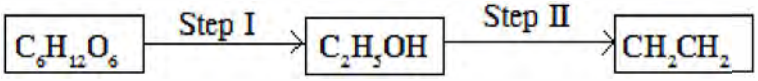
18. During an electrolysis of Zinc sulphate using inert electrodes, a current of 0.5A was passed for 40 minutes on a steady current.
a) Write down the equation at the cathode. (1mk)
b) Calculate the volume produced at the cathode given that 1F = 96,500c, MGV = 22.4 litres. (2mks)

19. a) Half-life of a radio-active elements is 30 days. Calculate the time required for its activity 37.5 counts perminute. (2mks)
b) Differentiate between an alpha and beta particles. (1mk)

20. a) What type of bond is formed when Beryllium and oxygen react. (1mk)
b) Explain why water fetched in rocky areas tend to boil at higher temperature than distilled water. (2mks)

21. a) Copper (II) Sulphate crystals were placed in a beaker containing water. State and explain the observations made after two days. (2mks)
b) Describe how you can differentiate between Lead (II) ions and Calcium ions using Sodium chloride. (1mk)

22. Ethanol obtained from glucose can be converted to ethene as shown below.



a) Name and describe the processes that take place in step I and step II. (2mks)
b) State the importance of producing biodegradable plastics and detergents. (1mk)

23. The table below is a part of the periodic table. The letters are not the actual symbols of the element. Study it and answer the questions that follows.

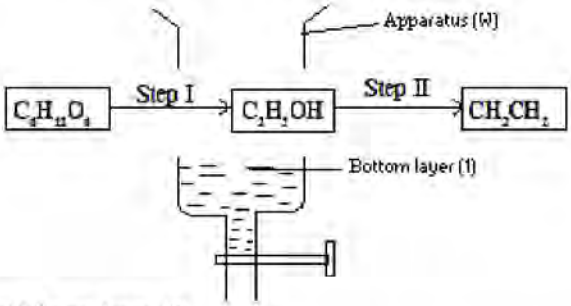
P					
	T	Q	R		S

	M	N	O	

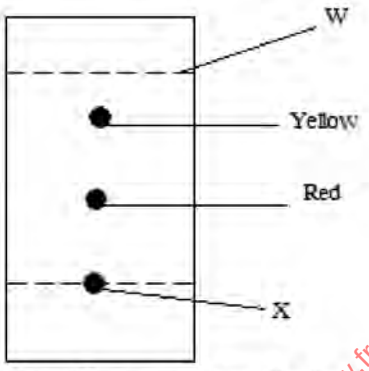
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

a) Select an element which is the most reactive. (1mk)
b) How do the ionic radius of T and S compared? Explain. (2mks)

24. A mixture of substance K (density 0.626g/cm^3) and Z (density 0.85g/cm^3) was allowed to settle in a container as shown below.

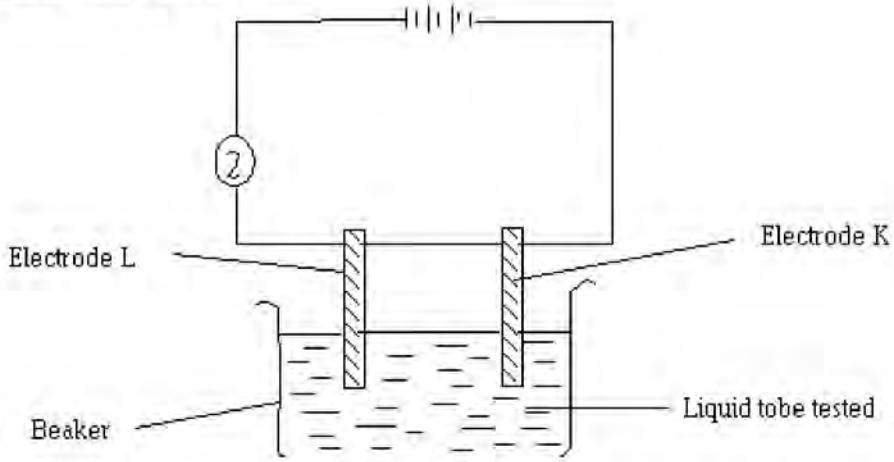


a) Which liquid forms layer (I) (1mk)
b) Explain your answer in (a) above. (1mk)
c) The chromatogram below shoes the constituents of a flower extract. Study it and answer the question that follows.



Give a reason to explain the different positions of red and yellow pigments. (1mk)

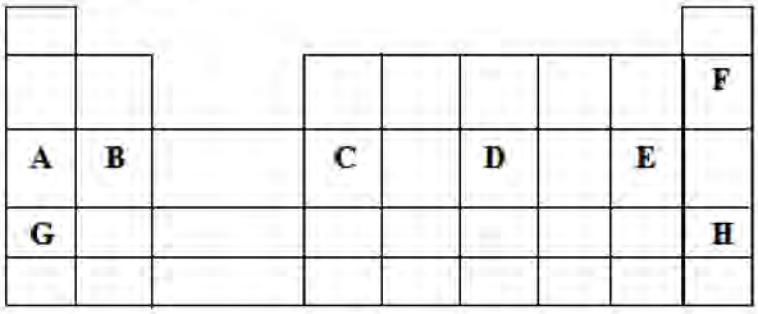
25. A student was given a mixture of Lead carbonate and sodium carbonate powders. Explain how you would obtain solid sodium carbonate. (3mks)
26. A compound was analysed and found to contain 24.27% carbonate, 4.08% hydrogen and the rest is chlorine. If the molar mass of the compound is 99.0, calculate the molecular formula.
(C = 12, H = 1, Cl = 25.5) (3mks)
27. a) Write down the equation between burning magnesium and carbon (IV) oxide. (1mk)
b) Carbon (IV) oxide does not support combustion yet burning magnesium continues to burn;
Explain. (2mks)
28. Draw the following structure;
i) 2-bromo-4-methylpent-2-ene (1mk)
ii) Two hydrocarbons compounds are represented by the formulae C_4H_8 and C_4H_{10}
Which of the compounds is saturated;
Explain (2mks)
29. The diagram below illustrates an experiment to investigate the conduction of electricity in liquids. Study it and answer the questions that follows.



For more free past papers visit www.freekcsepastpapers.com or call: 0720502479

GATANGA FORM FOUR END OF TERM II
EXAMINATION 2016 233/2
CHEMIS TRY (THEORY)
PAPER 2

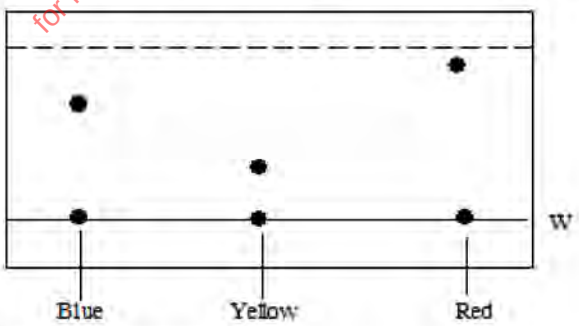
1. The table below shows elements in the periodic table. Use it to answer the questions that follow. The letters are not the actual symbols of the elements.



a) i) Write the electron arrangement of elements; B and A
ii) Write the formula of the compound formed between the elements B and E. (1mk)
b) Element K has atomic number 14. Indicate by use of tick ( ) the position of this element in the table above. (1mk)
c) i) he ionization energy of A is higher than that of G. Explain. (1mk)
ii) The atomic radius of C is larger than that of D. (1mk)
iii) Compare the reactivity of elements A and B.
Explain your answer. (2mks)
d) i) State the name of the group to which elements F and H belong. (1m
ii) Give one use of any of the elements of in group in d(i) above. (1mk)
e) The chloride of B is ionic, while the chloride of C is covalent. Explain this observation. (2mks)
2. (a) A student wrongly categorised air as a compound and not as a mixture. Give two reasons as to why the student was wrong. (2mks)
(b) The table below shows the results obtained when four solvents were used to separate a dye. Study the results and use them to answer the questions that follow.

Solvent	Number of Solute components
A	5
B	1
C	0
D	2

i) Identify the most suitable solvent for this separation. Give a reason for your answer. (2mks)
ii) What does the result of the solvent C tell us about the dye? (1mk)
c) The chromatogram below was obtained from a plant extract. Use it to answer the questions that follow.



i) Name line W (1mk)
ii) What does the dotted line represent? (1mk)
iii) State with a reason the least soluble dye in the moving solvent. (1mk)
d) Below is a list of major component of crude oil and their boiling points.

Component	*Boiling point (^0C)*
Bitumen	Above 400
Lubricating oil	350 - 400
Petrol	40 - 175
Gases	Below 40

i) What is the name of the process by which the constituents of crude oil can be separated? (1mk)

for more freekcsepast papers visit: www.freekcsepastpapers.com or call: 0720502479

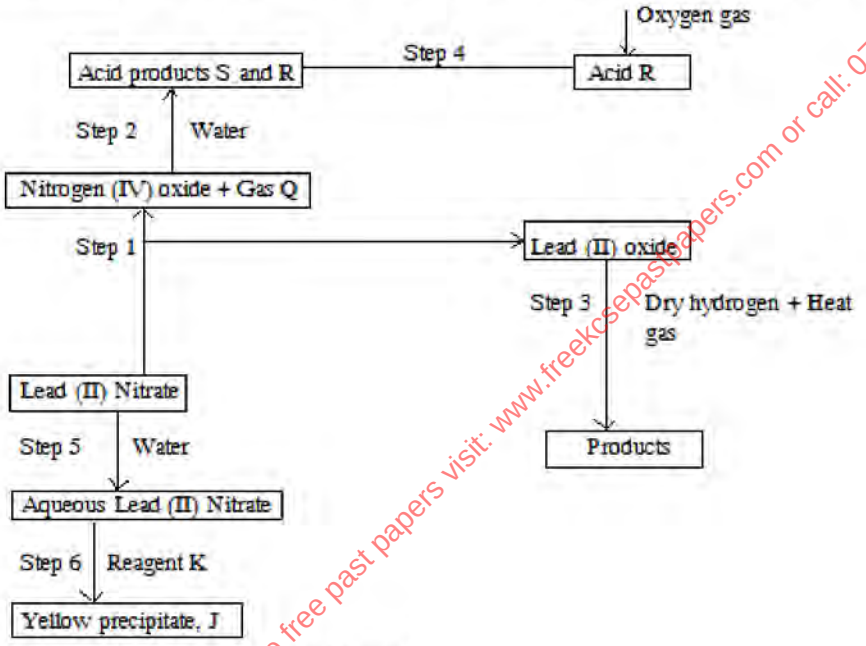
ii) Give one use of the gases component. (1mk)
iii) Give the order by which the components are obtained from the mixture, starting with the first. (1mk)

3. An impure solid of magnesium carbonate weighing 9.5g was placed in a beaker containing 50cm^3 of dilute nitric (V) acid. The volume of carbon (IV) oxide evolved was recorded at 20 seconds interval in the table below.

Time from start of Reaction (sec)	0	20	40	60	80	100	120
Volume of CO_2 at s.t.p (cm^3)	0	650	900	1070	1100	1120	1120

3. a) Write the equation for the reaction between magnesium carbonate and nitric (V) acid. (1mk)
b) i) Plot a graph of volume of carbon (IV) oxide (y-axis) against time. (3mks)
ii) From the graph; calculate the rate of reaction between
I 20 seconds and 40 seconds interval. (2mks)
II 40 seconds and 60 seconds interval. (2mks)
c) Explain the difference in the reaction rates in I and II. (1mk)
d) Why was there no further increase in the volume of carbon (IV) oxide gas after 100 seconds? (1mk)
e) How many moles of carbon (IV) oxide were in the maximum volume produced from this reaction? (Molar gas volume at s.t.p. = 22.4 litres) (1mk)
f) What mass of magnesium carbonate will have reacted with the acid after 100 seconds. (Mg = 24, C= 12, O = 16) (2mks)
g) Determine the percentage purity of magnesium carbonate. (2mks)
h) Calculate the original concentration of the nitric (V) acid in moles per litre. (2mks)

4. The flow chart below shows some reactions starting with lead (II) nitrate. Study it and answer the questions that follow.



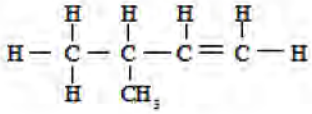
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

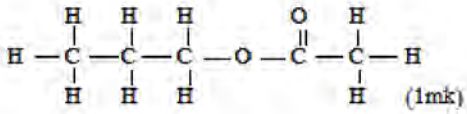
a) i) State the condition necessary in step 1. (1mk)
ii) Identify;
I Gas Q (1mk)
II The acid products S and R (2mks)
b) Write the balanced chemical equations for the reactions in:
i) Step3 (1mk)
ii)Step 4 (1mk)
c) i) The reaction between lead (II) nitrate and dilute sulphuric (IV) acid starts but stops almost immediately. Explain this observation. (2mks)
ii) Name a suitable reagent that can be reacted with concentrated sulphuric (IV) acid to produce Nitric (V) acid. (1mk)
d) In the industrial extraction of lead metal, the ore is first roasted in a furnance. The solid mixture obtained is then fed into another furnance together with coke, limestone and scrap iron. State the function of each of the following in this process:
a) Coke (1mk)
b) Limestone (1mk)
c) Scrap Iron (1mk)

5. a) Candle wax is mainly a hydrocarbon. What is a hydrocarbon? (1mk)

b) Name the following compounds.

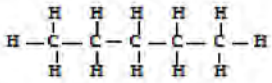
i)





(1mk)

ii)

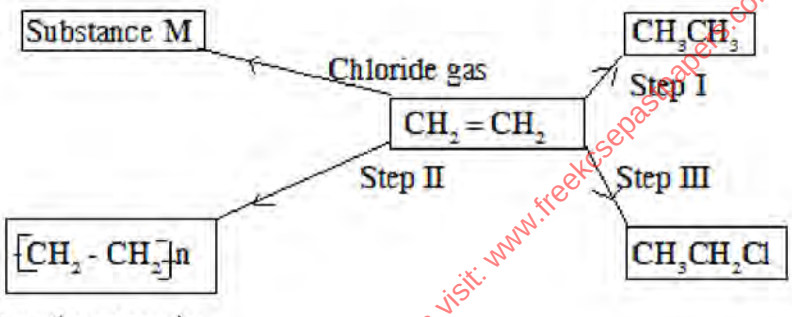


c) Castor oil extracted from castor seeds is found to change the colour of acidified potassium managanate (VII) .

i) State the colour change. (1mk)

ii) Explain why castor oil reacts with acidified Potassium mangate (VII) to cause the colour change. (1mk

d) Study the reaction scheme below and use it to answer the questions that follow.



ii) Name the process in;

Step I (1mk)

Step II (1mk)

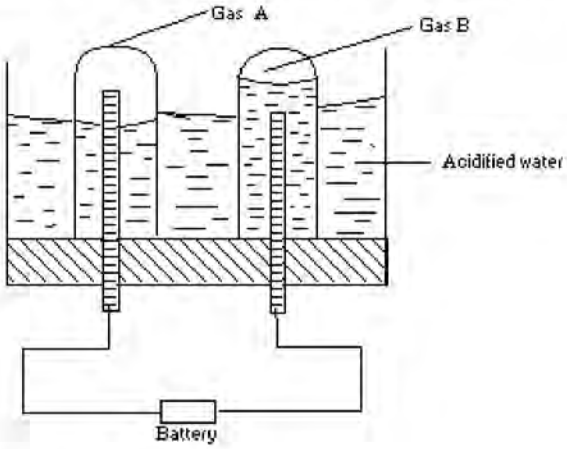
ii) State the reagent necessary for the process in

Step II (1mk)

Step III (1mk)

iii) Name the type of reaction taking place in step III (1mk)

6. The set up below was used during the electrolysis of acidified water using inert electrodes.



a) Why is the water acidified (1mk)

b) What material are the electrodes made of? (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

GITHUNGURI SUB-COUNTY
EXAMINATION 233/3

CHEMISTRY
FORM FOUR
PRACTICAL
Paper 3
TIME: 2¼ HOURS

1. You are provided with
- 10g of solid **A** which is a mixture of sodium carbonate and sodium chloride.
- 0.2 M HCl solution **B**

You are required to

- Determine the concentration of sodium carbonate in the mixture.
- Percentage of sodium chloride in the mixture.

Procedure

Transfer the entire solid into a 250 Ml volumetric flask. Add about 100cm^3 of distilled water. Shake to dissolve. Top up with more distilled water to make up to the mark. Label this solution **A2.** Using a pipette and a pipette filler, transfer 25 cm^3 of this solution into a conical flask. Repeat the procedure two more times to complete table **1**

Table 1

	I	II	III
final burette reading (cm^3)			
initial burette reading(cm^3)			
volume of solution B used (cm)^3			

(a) Calculate
(i) The average volume of solution **B** used (1mark)
(ii) The number of moles of HCl in the average titre (1 mark)
(b) Write an equation for the reaction (1mark)
(c) calculate the number of
(i) Moles of sodium carbonate in 25cm^3 of solution **A2** **(1 mark)**
(ii) The moles of sodium carbonate in 250 cm^3 of solution A2 (1 mark)
(d) Determine the mass of sodium carbonate in solid A (1 mark)
(Na=23, C = 12.0, H=1.0 , O= 16)

(e) Calculate the percentage of sodium chloride in solid A (1 mark)

2. You are provided with
- Solution **D,** 2MHCl
- Solution **C** 2 M NaOH

You are required to determine the heat of neutralization

Procedure

Wrap a plastic beaker with tissue paper and secure it with a rubber band.
Use a measuring cylinder to transfer 20cm^3 of solution C into a plastic beaker.
Take its initial temperature and record it in table 2 below.
Using a clean measuring cylinder, measure 5 cm^3 of solution **B** and add it to solution *C*. Stir the mixture immediately with a thermometer and record the highest temperature in table 2
Continue adding 5 cm^3 portions of solution every time record the highest temperature attained to complete the table

Table 2

Volume of **D** add cm^3	0	5	10	15	20	25	30
Volume of **A+D** cm^3	20	25	30	35	40	45	50
Temperature of mixture °C							

(4 marks)

Plot a graph of volume of solution **D** (X-axis) against highest temperature (3 marks)

(a) From the graph:
(i) Determine the volume of solution **D** that reacts completely with solution **C**. (1mark)
(ii) The highest temperature changeΔ T (1 mark
(b) (i) Calculate the amount of heat evolved by the reaction (assume specific heat of capacity = 4.2Jg^{-1} K^{-1}, density of solution = 1 g/cm^3) (1 mark)
(ii) Calculate the number of moles of HCl used (1 mark)

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

(iii) Calculate the molar heat of neutralization of HCl (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

3. (a) You are provided with solid **E**. Carry out the following tests and write your observations and inferences in the spaces provided.

(i) Place one third of solid **E** on a metallic spatula and ignite using a Bunsen burner flame

observation	Inferences
(1 mark)	(1 mark)

(ii) Place all the remaining solid in a boiling tube. Add 5cm^3 of distilled water. Shake to dissolve and divide it into 4 portions

(I) to the first portion add three drops of acidified potassium manganate (VII)

observation	Inferences
(1 mark)	(1 mark)

(II) To the second add three drops bromine water.

observation	Inferences
(1 mark)	(1 mark)

(III) To the third portion add all the sodium hydrogen carbonate provided

observation	Inferences
(1 mark)	(1 mark)

(b) You are provided with solid **F**. Carry out the tests below and record your observations and inferences in the spaces provided. Place all the solid **F** in a boiling tube. Add 10cm^3 of distilled water. Divide into four portions.

observation	Inferences
(1 mark)	(1 mark)

(i) To the first portion, add aqueous hydroxide drop wise until in excess.

observation	Inferences
(1 mark)	(1 mark)

(ii) To the second portion add 5 drops of barium nitrate solution, followed by 3 drops of dilute nitric acid.

observation	Inferences
(1 mark)	(1 mark)

(iii) To the third portion add 3 drops of acidified sodium dichromate (VI) solution

observation	Inferences
(1 mark)	(1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2016

Kenya National Examination Council

233/1

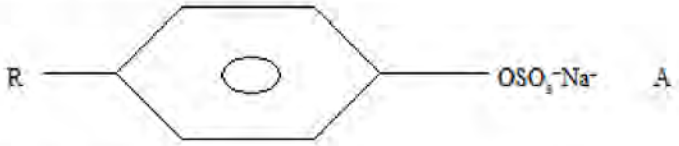
CHEMISTRY
PAPER 1 (THEORY)
TIME: 2 HOURS
JULY/AUGUST 2016

1. a) Three isotopes of Magnesium has mass numbers 24, 25 and 26. What is the mass number of the most abundant isotope of Magnesium? Explain. (2mks)

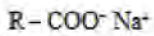
b) Define the term isotope. (1mk)

2. a) Define hard water. (1mk)

b) The structure below represents two cleansing agents.



A



B

Which of the above cleansing agent would be suitable for washing in hard water? Give a reason. (2mks)

3. The heat of neutralization of a strong acid is usually 57.4kJmol^{-1}, whereas that of a weak acid is less than 57.4kJmol^{-1}. Explain (2mks)

4. When an electric current of 0.5A was passed through a molten chloride of J for 32 minutes and 10 seconds, a mass of 0.44g of J was deposited at cathode.
1F = 96500C

a) Calculate the quantity of electricity used. (1mk)

b) Determine the value of x if the ion of metal J is represented as J^{x+} (2mks)

5. Your friend"s clothes have caught fire. Inorder to extinguish the fire you decide to cover with a damp blanket. What is the purpose of the clamp blanket? (1mk)

6. Calculate the number of Calcium atoms in 10g of calcium.
(Ca = 40, Avogadro number = 6.0×10^{23}) (1mk)

7. The table below shows the pH values of some solutions.

Solution	J	K	L	M	N
pH	6	13	2	10	7

a) Which solution is likely to be:

i) Potassium hydroxide (1mk)

ii) Lemon juice (1mk)

b) Explain why a solution of hydrogen chloride gas in methyl benzene was identified as N. (1mk)

8. A piece of burning magnesium ribbon was placed in a gas jar full of nitrogen gas. The product Q formed was then reacted with water.

a) Write the chemical formula for the product Q. (1mk)

b) Write the equation for the reaction between product Q and water. (1mk)

c) Using dot (•) and cross (X) diagrams to represent electrons, draw the structure to show bonding in a nitrogen molecule. (N = 14) (1mk)

9. How would the following pair of compounds be chemically distinguished? CH3COOH and CH_3CH_2OH. (2mks)

10. Name the products of electrolysis of fused copper (II) chloride using carbon electrodes.
Anode (½ mk)
Cathode (½ mk)
Explain (1mk)

11. Zinc metal can be used in the laboratory to prepare hydrogen gas from an appropriate mineral acid while copper metal cannot. Explain. (1mk)

12. a) State one factor that can determine stability of an atom. (1mk)

b) Radioactive polonium -216 decays as shown below.

$$^{216}_{84}Po \longrightarrow {}^{216}_{82}Pb + M\alpha + N\beta\beta$$

Find the value of M and N. (2mks)

for more free past papers visit www.freecsepastpapers.com or call: 0720502479

c) If after 112 days $^{1}/_{16}$ of Polonium remained, calculate the half-life of polonium. (2mks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

13. When bromine gas reacts with aqueous sodium hydroxide an equilibrium is established as shown below.

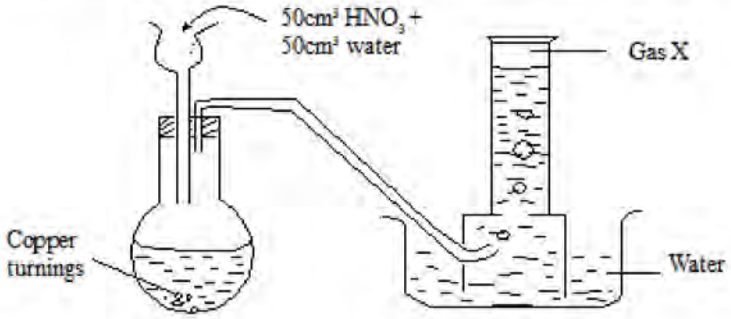
$$Br_{2(aq)} + 2OH^-(aq) \rightleftharpoons Br^-(aq) + OBr^-(aq) + H_2O(l)$$
(Brown) Colourless

What observation would be made if a few drops of dilute sulphuric (VI) acid were added to the equilibrium mixture? Explain. (2mks)

14. One compute combustion of 0.5g of an organic compound P (containing only carbon, hydrogen and oxygen) 0.733g of carbon (IV) oxide and 0.3g of water were produced.
Determine the empirical formula of P. (3mks)

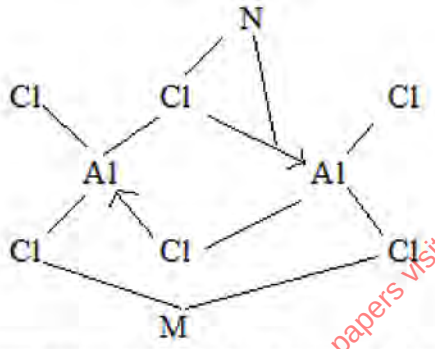
15. Compare the atomic sizes of sodium and magnesium. Explain. (2mks)

16.



a) Name gas X. (½ mark)
b) Write an equation for production of gas x in the set-up. (1mk)
c) It"s hat to test whether gas x supports burning using a glowing splint. Explain. (2mks)

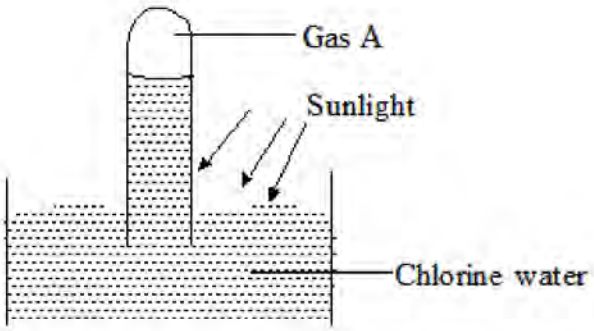
17. When solid M is dissolved in water, it dissolves to form a blue solution. Addition of ammonia solution forms a blue precipitate which dissolves in excess to form a deep blue solution. Write the formula and name of the ion responsible for the deep blue solution. (2mks)



18. The diagram below represents the structure of aluminium chloride.
a) Identify the bonds labelled
M (½ mark)
N (½ mark)
b) What is the difference between bonds M and N? (1mk)

19. a) Define hydration energy. (1mk)
b) Given that hydration energies of Ca^{2+} and Cl^- are -1891kJmol^{-1} and - 384kJmol^{-1} respectively and that the lattice energy of calcium chloride is +2237kJmol^{-1}, calculate the molar enthalpy change of solution of calcium chloride. (3mks)

20. The diagram below shows an experiment involving chlorine water.



a) State and explain the observations made after 24 hours. (2mks)
b) Write an equation to show the formation of gas A. (1mk)
c) State one use of chlorine gas. (1mk)

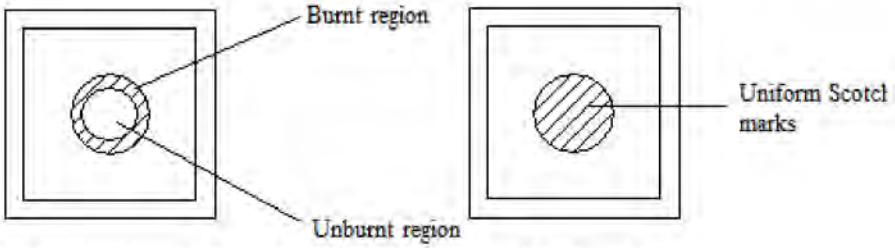
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

21. The solubility of salt Y at 60^0C is 40g/100g of water and 48/100g of water at 100^0C.

a) How much salt Y would saturate 190g of water at 100^0C. (1½ mark)

b) 150g of a saturated solution of Y is 100^0C is cooled to 60^0C. Calculate the mass of Y that crystallizes. (1 ½ mks)

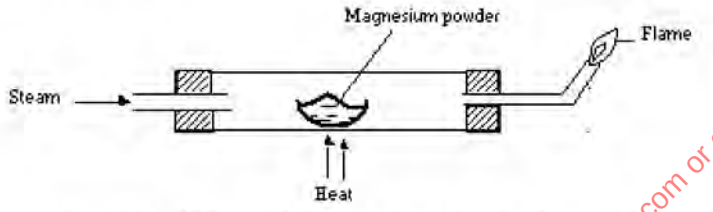
22. The diagram below shows the appearance of two pieces of paper placed in different parts of a non-luminous flame of a Bunsen burner and removed quickly before they caught fire.



a) What do the experiments show about the outer region of the flame? (1mk)

b) From the above experiment, which part of the flame is better for use in heating? Give a reason. (2mks)

23. Steam is passed over heated magnesium as shown in the diagram below.



a) State one observations that will be made in the tube as heating is carried out. (1mk)

b) What substance is being burnt at A? (1mk)

c) Write a balanced chemical equation to show the reaction which takes place in the combustion tube. (1mk)

24. The volume of a given mass of a gas is $250cm^3$ at 27^0C and 720mmHg pressure. What will be the volume of the gas at s.t.p. (3mks)

25. Given the equation $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ $DH = -92kJmol^{-1}$

Explain what happens to the position of the equilibrium when

a) Temperature is raised. (1mk)

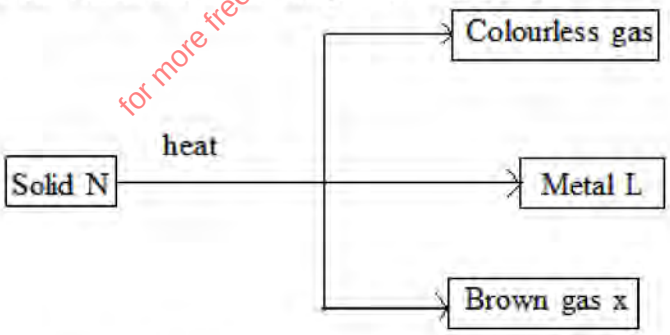
b) Pressure is changed. (2mks)

26. State and explain the observations made when a few drops of concentrated sulphuric (IV) acid is added to

a) Hydrated Copper (II) sulphate. (2mks)

b) Sugar (2mks)

27. Study the flow chart below and answer the questions that follow.



a) Given that solid N burns in air with a red flame. Identify:-

i) Cation present in solid N (½ mark)

ii) Metal oxide L (½ mark)

iii) Gas X (½ mark)

b) Write down the formula of the anion present in solid N. (½ mark)

28. Determine the volume of 2.0M NaOH which when diluted to $250cm^3$ would produce a 0.8M NaOH solution. (2mks)

29. Explain how you would obtain pure ammonium chloride from a mixture of lead sulphate and ammonium chloride? (2mks)

30. a) Carbon exhibits allotropy. Name one element other than carbon that has the same characteristic. (1mk)

b) In terms of structure explain why graphite conducts electricity while diamond does not? (2mks)

c) Define allotropy. (½ mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION
2016
Kenya National Examination Council

233/2
CHEMISTRY
PAPER 1 (THEORY)
TIME: 2 HOURS

1. Study the periodic table below and answer the questions that follow. The letters do not represent the actual symbols of the elements.

A								B
C		Transition		D		X	E	F
G	H	Elements	I	J	K	L	M	N
O	P			Q			R	S

a) Name the chemical family to which the following elements belong
i) C, G, O (½ mk)
ii) B, F, N, S (½ mk)
b) Classify elements H and M as either metals or non-metals.
H - (½ mk)
M - (½ mk)
c) State one use of element.
A (1mk)
N - (1mk)
d) Compare the atomic radius of G and H. (2mks)
e) Ionic radius of R is larger than its atomic radius. Explain. (2mks)
f) Write down the formula of the compound formed when element I reacts with element X. (1mk)
g) Identify the strongest oxidising agent. Explain. (2mks)
h) Write down the electron arrangement of:-
i) Element P (½ mk)
ii) Ion of E
i) Identify an element with a charge of +2. (½ mk)
j) Compare the first and second ionisation energies of element H. (2mks)

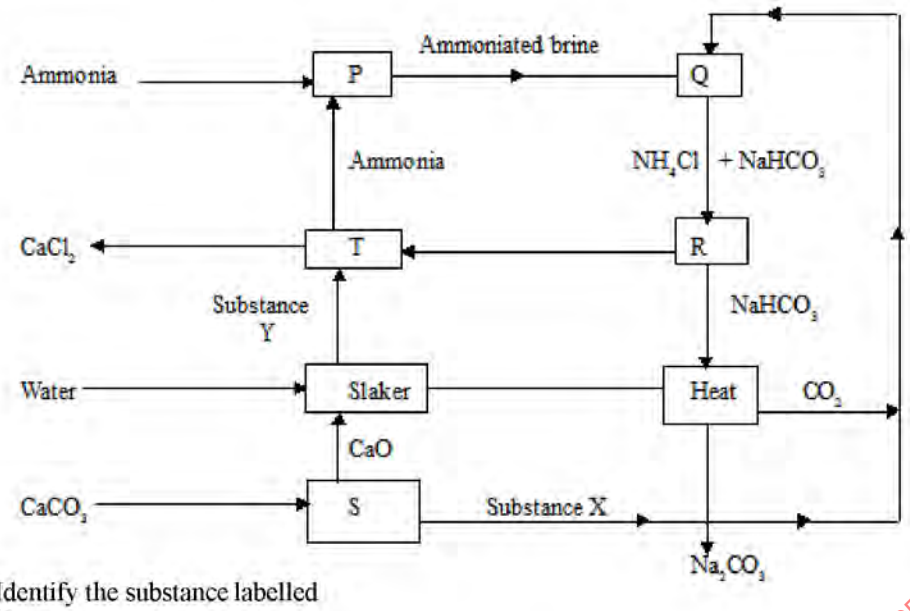
2. i) Define a binary electrolyte. (1mk)
ii) The following are half-cell equations for some elements. The letters do not represent the actual symbols. Use the information to answer the questions that follow.

			$E^{\ominus}V$
$M^{2+}(aq) + 2e^-$	→	M(s)	+0.34
$L^{2+}(aq) + 2e^-$	→	L(s)	+0.84
$K^{2+}(aq) + 2e^-$	→	K(s)	-0.13
$J^{2+}(aq) + 2e^-$	→	J(s)	-0.76
$2V^{+}(aq) + 2e^-$	→	$V_{2(g)}$	0.000

a) Write down the E^{θ} value of the strongest reducing agent. (1mk)
b) Select two half-cells that would produce the highest emf of a cell. (1mk)
c) Calculate the emf of the cell in (b) above. (1mk)
d) Give the cell diagram notation for the cell in (c) above. (1mk)
e) What is element V? Explain. (2mks)
f) State two functions of a salt bridge. (2mks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

3. Use the flow chart below to answer the questions that follow.



a) Identify the substance labelled
X - (1mk)
Y - (1mk)

b) Name two substances being recycled in the process represented by the flow chart. (2mks)

c) Name the process that take place in
S- (1mk)
R - (1mk)

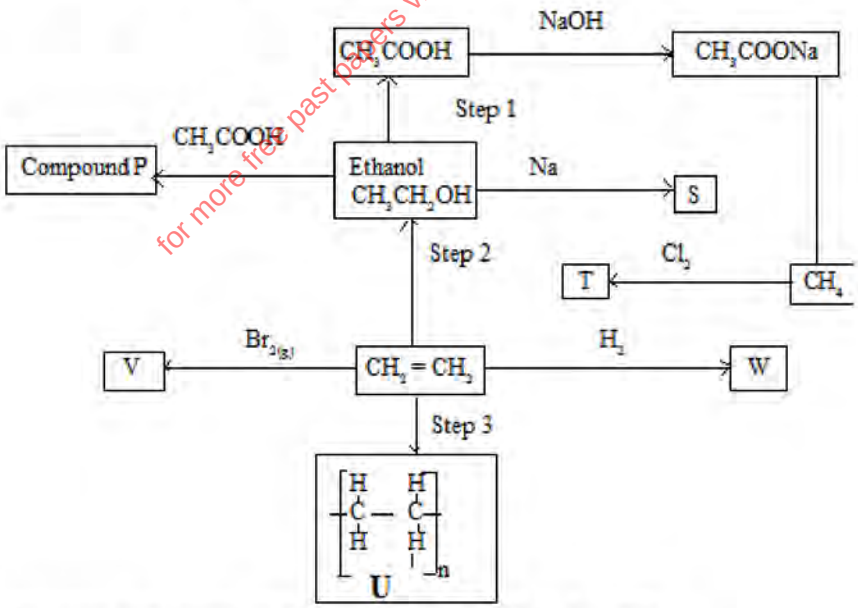
d) Give one uses of calcium chloride. (1mk)

e) Write down balanced chemical equations for the reactions that takes place in chambers
Q - (1mk)
T - (1mk)

f) Using ionic equations, explain how sodium carbonate can be used to soften hard water. (2mks)

g) Other than softening of hard water, give one other use of sodium carbonate. (1mk)

4. The flow chart below shows some chemical reactions.
i) Use it to answer the questions that follow.



a) Write the name and formula of the organic compounds P, V and W

i) Name P (½ mk)
Formula (½ mk)

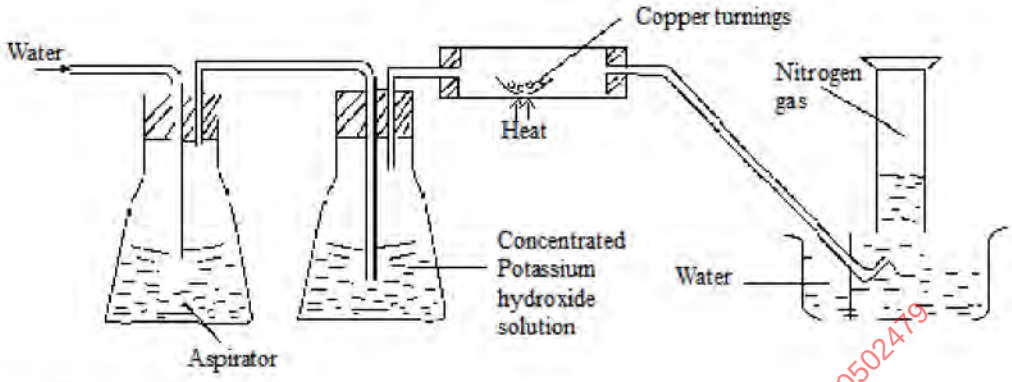
ii) Name V (½ mk)
Formula (½ mk)

iii) Name W (½ mk)
Formula (½ mk)

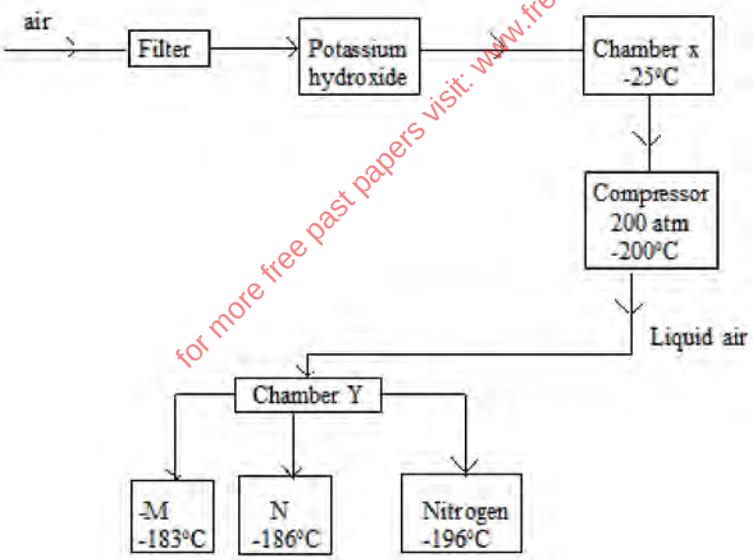
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

b) Write the name of the process that leads to the formation of substance (s) V, T, P (½ mk)
c) Give one necessary condition for the formation of compound P. (1mk)
d) If the relative molecular mass of compound U is 84.000 units, determine the value of n.
C = 12 O = 1.0 (2mks)
e) Write the equation for the reaction leading to the formation of substance S. (1mk)
f) State and explain the observation made when substance W and C_2H_4 are burnt in excess air. (2mks)
g) Explain why an organic compound with formula C_3H_6 burns with a more sooty flame than C_3H_8. (2mks)

5. Nitrogen gas can be obtained from air as shown below.



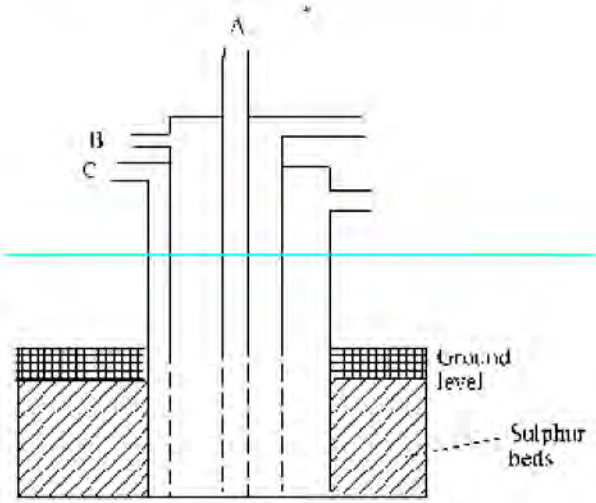
a) What is the purpose of the following
i) Potassium hydroxide solution? (1mk)
ii) Copper turnings?
(1mk)
b) Why should water be pumped into the aspirator? (1mk)
c) Name another substance that can be used in place of potassium hydroxide. (1mk)
d) The nitrogen gas obtained above is not pure. Identify one gaseous impurity in the gas. (1mk)
e) The flow chart below shows how pure nitrogen gas is obtained.



i) What is the functions of the following chambers?
Filter (1mk)
Chamber X (1mk)
ii) Name the process that takes place in chamber Y. (1mk)
iii) Identify
M - (½ mk))
N (½ mk)
g) State two uses of nitrogen gas. (2mks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

6. The diagram below shows the extraction of sulphur.



a) i) What name is given to the process above. (1mk)
ii) State the uses of the pipes
A (1mk)
B (1mk)
C (1mk)
b) Give two crystalline allotropes of sulphur. (1mk)
c) Write an equation for the combustion of sulphur. (1mk)
d) Name the product formed when a mixture of sulphur and iron dust is heated. (1mk)
e) Give two uses of sulphur. (2mks)
f) 6.0dm^3 of sulphur (IV) oxide were oxidised by oxygen to sulphur (VI) oxide. (2mks)
Write the equation for the reaction. (1mk)

7. 0.6g of Manganese (IV) oxide was placed in a flask and 25cm^3 of hydrogen peroxide added. The volume of oxygen gas produced was recorded after every 10 seconds. The results obtained were recorded in the table below.

Time (s)	0	10	20	30	40	50	60	70	80
Volume (cm^3)	0	13.5	25	34.5	42.5	49	53	55	55

a) Plot a graph of volume (cm^3) against time (sec). (3mks)
b) From the graph, determine the volume of oxygen gas produced. (1mk)
c) The experiment was repeated using more concentrated hydrogen peroxide.
On the same axis; sketch the curve that was obtained. (2mks)
d) Write an equation for catalytic decomposition of hydrogen peroxide. (1mk)
e) Give the test for oxygen gas. (1 mk)
f) State two uses of oxygen gas. (2 mk)

for more free papers visit: www.freekcsepastpapers.com or call: 0720502479

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2016

Kenya National Examination Council

233/3
CHEMISTRY
PAPER 3 (practical)
TIME: 2 HOURS

Confidential

1. Solution A, 60cm^3 of 2.5M HCl
2. Solution B, 100cm^3 of 0.05M NaOH
3. Solution C, 10cm magnesium ribbon
4. 10ml measuring cylinder
5. 25ml pipette
6. 50ml burette
7. Complete stand
8. Stop watch
9. 2 labels
10. Distilled water
11. 6 test-tubes
12. 0.5g sodium hydrogen carbonate
13. 5cm^3 ethanol
14. 1-14 pH chart
15. Solid R, 1g Oxalic acid
16. Solid Q, Mixture of $(NH_4)_2SO_4$ and $Al_2(SO_4)_3$ ratio 1 : 1
17. Pipette filler
18. Phenolphthalein indicator
19. 250ml conical flasks - 2
20. 250ml volumetric flask
21. 1 - boiling tube
22. 1 Spatula

ACCESS TO:
23. Universal indicator solution
24. Acidified Potassium Manganate (VII) solution
25. Bromine water
26. Conc. Sulphuric (VI) acid
27. Means of heating
28. 2M lead (II) nitrate solution
29. 2M dilute nitric (V) acid solution
30. 0.5M Barium nitrate solution
31. 2M sodium hydroxide solution
32. 2M Aqueous ammonia
33. 2M hydrochloric acid

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2016

Kenya National Examination Council

233/3
CHEMISTRY
PAPER 3 (practical)
TIME: 2 HOURS

---

1. You are provided with
   - Solution A, dilute hydrochloric acid
   - Solution B, made by dissolving 0.5g of sodium hydroxide in water and made up to 250cm^3 of solution
   - Solid C, magnesium ribbon
   - Phenolphthalein indicator

   Your are required to:

i) Standardise solution A.
ii) Determine the rate of reaction between solution A and magnesium

PROCEDURE I

i) Measure exactly 10cm^3 of solution A using a burette and transfer into a 250ml volumetric flask. Top up to the mark using distilled water. Label this solution D.
ii) Drain the remaining solution A in the burette, rinse the burette thoroughly and fill it with solution D.
iii) Pipette 25cm^3 of solution B into a conical flask. Add three drops of Phenolphthalein indicator.
iv) Titrate solution D with solution B. Record your results in the table below. Repeat the procedures (iii) to (iv) to complete the table.

	1	2	3
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume used			

(4mks)

(a) Calculate the average volume used. (1mk)
(b) i) Calculate number of moles of solution B used. (1mk)
ii) Number of moles of solution D in 250cm^3 of solution. (1mk)
iii) Molarity of solution A. (1mk)

PROCEDURE II

i) Cut solid C into equal parts each 2cm.
ii) Using a burette, measure 12cm^3 of solution A, into a clean boiling tube.
iii) Drop one piece of solid C into the boiling tube containing solution A and start the stop watch immediately. Stop the stopwatch when all solid C has just reacted.
Record your results in the table below.

v) Repeat steps (ii) and (iii) above using 10cm^3, 8cm^3, 60cm^3 and 4cm^3 of solution A. Top up each with distilled water to make 12cm^3 of solution and complete the table below.

solution A(cm^3) (mole/litre)	distilled water (cm^3)	of solution A		
12	0			
10	2			
8	4			
6	6			
4	8			

(6mks)

a) Plot of a graph of $^1/_t$ (y-axis) against the concentration of solution A. (3mks)
b) From the graph, determine the time taken for the reaction to reach completion when 1.5 moles of solution A are used. (2mks)
c) Comment on the shape of the graph. (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KIGUMO SUB-COUNTY CLUSTER EXAMINATION 2016

Kenya National Examination Council

233/1

CHEMISTRY
PAPER 1 (THEORY)
TIME: 2 HOURS
JULY/AUGUST 2016

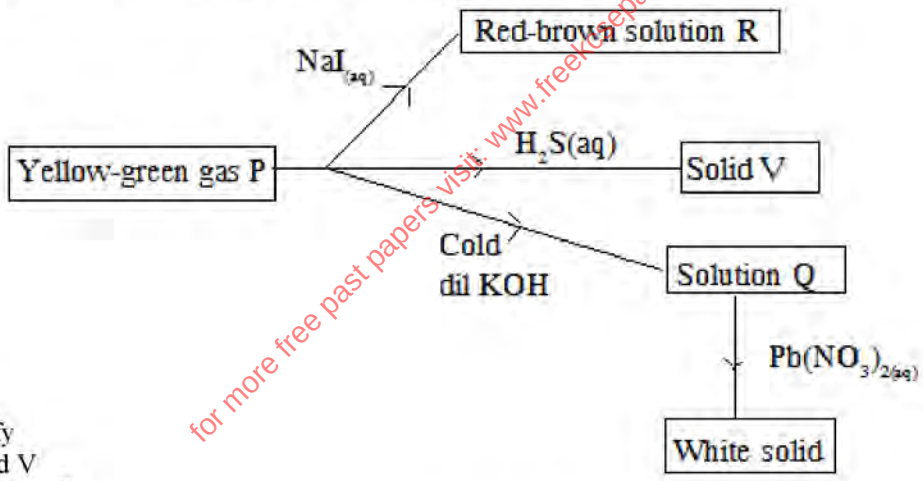
SECTION A

Answer ALL the questions on the spaces provided.

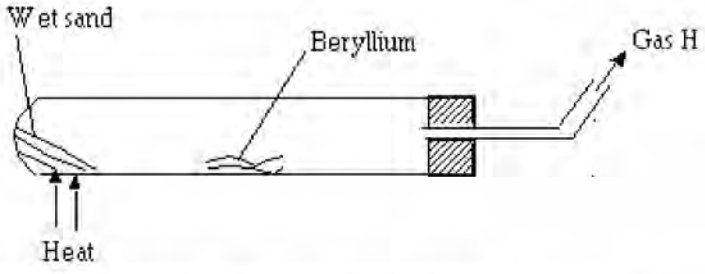
1. a) What is meant by term Isomerism. (1mk)

   b) Draw an Isomer of pentene. (1mk)

2. Consider the metals copper and zinc.
   a) Name one ore for each metal
   Copper:
   Zinc:
   b) Apart from copper being a good conductor of heat and electricity, state any other physical property of copper. (1mk)
3. a) Define the term fuel. (1mk)
   b) State two factors to consider when choosing a fuel. (1mk)
4. a) State Graham"s Law of diffusion. (1mk)
   b) A compound contains 29.1% sodium, 40.5% sulphur and the rest is oxygen. Find the empirical formulae. (Na = 23, S = 32, O = 16) (2mks)
5. a) Calculate the maximum volume of oxygen, measured at s.t.p., that can be obtained by heating a solution containing 8.8g of hydrogen peroxide. (2mks)
   b) What is a standard solution. (1mk)
6. a) State two methods of removing permanent hardness in water only. (1mk)
7. Study the flow chart below and answer the question that follows.



   Identify
   i) Solid V (1mk)
   ii) Solution R (1mk)
   iii) Solution Q (1mk)
8. Crystals of hydrated sodium carbonate ($Na_2CO_3.10H_2O$) left in open air and changed to a white powder.
   i) Explain what happens and give the relevant equation. (1mk)
   ii) Give the name of the process shown above. (1mk
9. A student used the set-up shown in the diagram below inorder to study the reactions of some metals with steam. The experiment was carried out for ten minutes.



   a) What observation would be made if gas H was ignited. (1mk)
   b) When the experiment was repeated using lead powder instead of Beryllium very little of gas H was obtained. Give a reason for this observation. (1mk)

for more free past papers visit www.freekcsepastpapers.com or call 0720502475

c) Name another gas which is used together with hydrogen in welding. (1mk)

10. Compare the reactivity of chlorine and bromine. (2mks)

11. The table below shows the electrical conductivity of substances A, B and C.

Substance	Solid State	Molten state	Aqueous solution
A	Conducts	Conducts	Not soluble
B	Doesn't conduct	Conducts	Conducts
C	Doesn't conduct	Doesn't conduct	Not soluble

a) Give the type of structure and bonding that is present in substance A. (1mk)

b) Which substance is likely to be sodium chloride. Explain. (2mks)

12. Hydrogen Iodide is a product formed when hydrogen reacts with Iodine according to the equations.

$$H_{2(g)} + H_{2(g)} \rightleftharpoons 2HI_{(g)} \qquad \text{Đ}H = +52.0\text{KJ/mole}$$

Explain how the following would affect the yield of Hydrogen Iodide.

a) Increase the temperature. (1mk)

b) A decrease in pressure of the system. (1mk)

c) State the Le Chatelier"s principle. (1mk)

13. Explain the following observation made by a form three student.

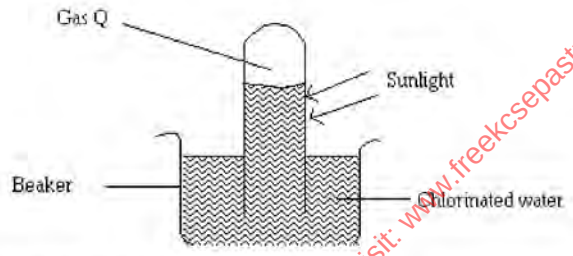
a) Dilute hydrochloric acid does not react with copper metal, but dilute nitric acid does. (1mk)

b) Describe briefly how one can distinguish Nitrogen (I) oxide from Nitrogen (II) oxide. (1mk)

14. a) Noble gas are usually unreactive. Explain this phenomena. (1mk)

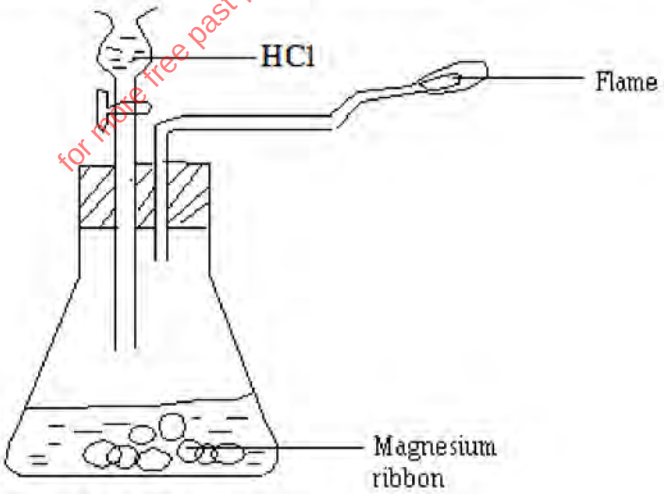
b) Explain the meaning of the term ductility a property found in metals. (1mk)

c) Study the diagram below.



Write down the equation for production of gas Q. (1mk)

15. The diagram below was used by a student to prepare a certain gas.

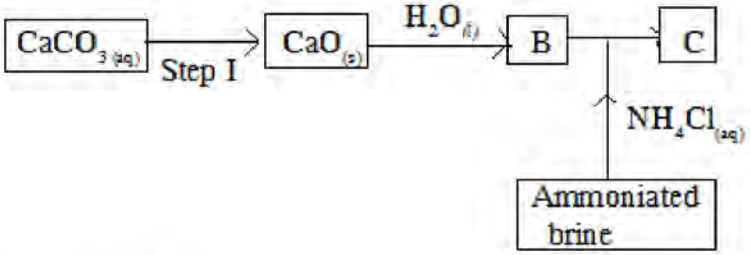


a) Write equation taking place in the experiment. (2mks)

b) State why it is advisable to burn the gas. (1mk)

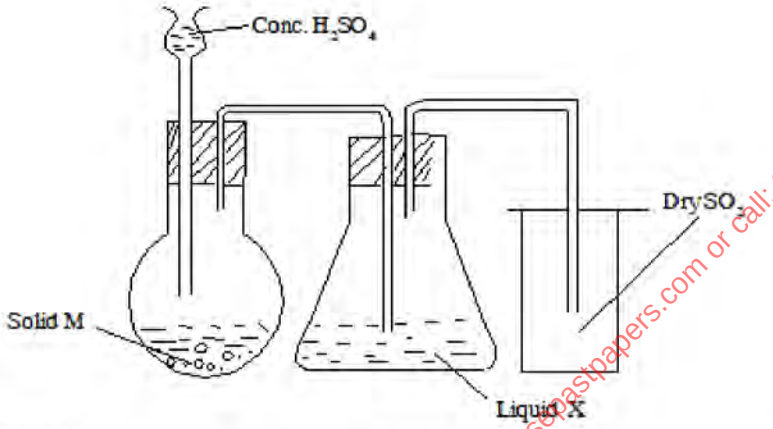
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

16. Study the flow chart given below.



a) Name substance B. (1mk)
b) Give one us of product C. (1mk)
c) Write the equation between substance B to form substance C. (1mk)

17. The diagram below was used to prepare and collect Sulphur (IV) oxide gas.



a) Identify solid M. (1mk)
b) State two properties of SO_2 that makes possible to be collected in the method shown. (1mk)
c) What are the optimum conditions of conversion of SO_2 to SO_3. (1mk)

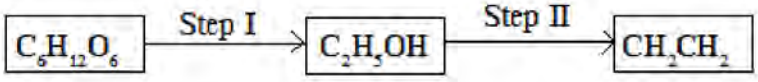
18. During an electrolysis of Zinc sulphate using inert electrodes, a current of 0.5A was passed for 40 minutes on a steady current.
a) Write down the equation at the cathode. (1mk)
b) Calculate the volume produced at the cathode given that 1F = 96,500c, MGV = 22.4 litres. (2mks)

19. a) Half-life of a radio-active elements is 30 days. Calculate the time required for its activity 37.5 counts per minute. (2mks)
b) Differentiate between an alpha and beta particles. (1mk)

20. a) What type of bond is formed when Beryllium and oxygen react. (1mk)
b) Explain why water fetched in rocky areas tend to boil at higher temperature than distilled water. (2mks)

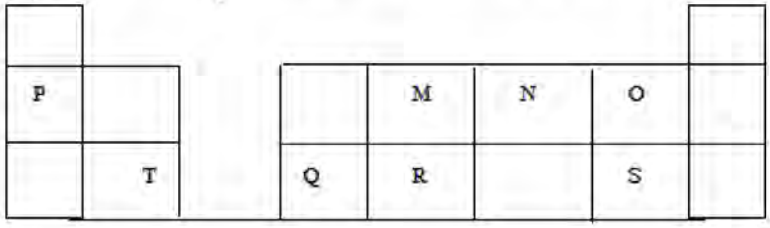
21. a) Copper (II) Sulphate crystals were placed in a beaker containing water. State and explain the observations made after two days. (2mks)
b) Describe how you can differentiate between Lead (II) ions and Calcium ions using Sodium chloride. (1mk)

22. Ethanol obtained from glucose can be converted to ethene as shown below.



a) Name and describe the processes that take place in step I and step II. (2mks)
b) State the importance of producing biodegradable plastics and detergents. (1mk)

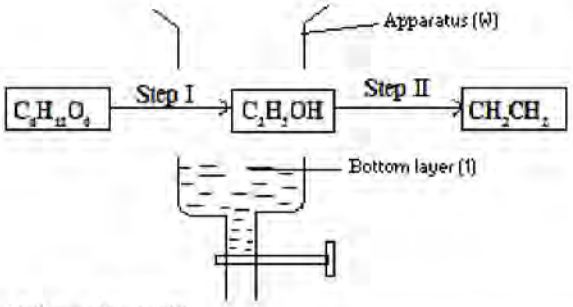
23. The table below is a part of the periodic table. The letters are not the actual symbols of the element. Study it and answer the questions that follows.



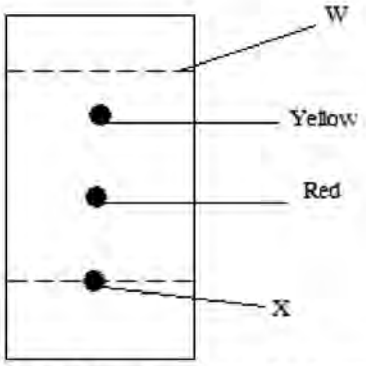
for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

a) Select an element which is the most reactive. (1mk)
b) How do the ionic radius of T and S compared? Explain. (2mks)

24. A mixture of substance K (density 0.626g/cm^3) and Z (density 0.85g/cm^3) was allowed to settle in a container as shown below.

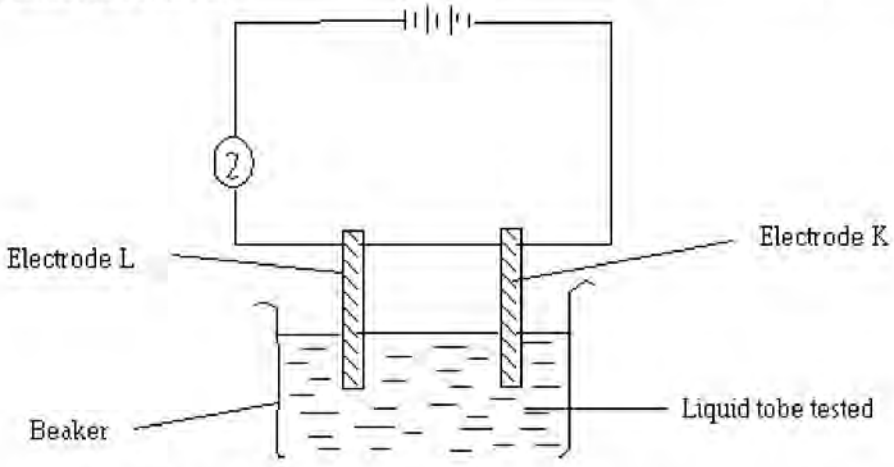


a) Which liquid forms layer (I) (1mk)
b) Explain your answer in (a) above. (1mk)
c) The chromatogram below shoes the constituents of a flower extract. Study it and answer the question that follows.



Give a reason to explain the different positions of red and yellow pigments. (1mk)

25. A student was given a mixture of Lead carbonate and sodium carbonate powders. Explain how you would obtain solid sodium carbonate. (3mks)
26. A compound was analysed and found to contain 24.27% carbonate, 4.08% hydrogen and the rest is chlorine. If the molar mass of the compound is 99.0, calculate the molecular formula.
(C = 12, H = 1, Cl = 25.5) (3mks)
27. a) Write down the equation between burning magnesium and carbon (IV) oxide. (1mk)
b) Carbon (IV) oxide does not support combustion yet burning magnesium continues to burn;
Explain. (2mks)
28. Draw the following structure.
i) 2-bromo-4-methylpent-2-ene (1mk)
ii) Two hydrocarbons compounds are represented by the formulae C_4H_8 and C_4H_{10}
Which of the compounds is saturated;
Explain (2mks)
29. The diagram below illustrates an experiment to investigate the conduction of electricity in liquids. Study it and answer the questions that follows.



a) State one mistake in the set-up. (1mk)
b) If the liquid in the beaker was benzene. State what expected at the bulb? Explain (2mks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KIGUMO SUB-COUNTY CLUSTER EXAMINATION 2016

Kenya National Examination Council

233/2

CHEMISTRY
PAPER 2 (THEORY)
TIME: 2 HOURS
JULY/AUGUST 2016

SECTION A
Answer ALL questions

1. a) State the Hess law. (1mk)
b) Use the standard enthalpies of combustion bwlow to answer the questons that follow.

ĐHc^0 (graphite = -393KJmol^{-1}

ĐHc^0 ($C_2H_{6(g)}$) = -1559.7 KJmol^{-1}

ĐHc^0 ($H_{2(g)}$) = -287KJmol^{-1}

i) Write the equation for the formation of ethane. (1mk)
ii) Draw an energy cycle diagram that links the heat of formation of ethane with its heat of combustion and the hets of combustion of hydrogen and graphite. (3mks)
iii) Calculate the standard heat of formation of ethane. (2mks)
f) i) Define molar heat of neutralisaton. (1mk)
ii) Explain the difference in molar ethalpies of neutralisation of weak acids and strong acids. (2mks)

2. a)

The diagram above shows a set-up used to determine standard electrode potential (E^0) of metal x which is higher than hydrogen in the reactivity series.
i) Label part Y. (1mk)
ii) Write the equation that takes place at x electrode. (1mk)
b) On the diagram, indicate with an arrow the flow of electron through the external conductor. (1mk)
c) Study the electrode potentials given below and answer the questions that follow. The letters do not represent actual symbols of the elements.

			E0Volts
$Q^+_{(aq)}$ + e-	→	$Q_{(s)}$	-2.290
$R^{2+}_{(aq)}$ + 2e-	→	$R_{(s)}$	-0.760
$S^{2+}_{(aq)}$ + 2e-	→	$S_{(s)}$	+0.340
$T_{2(g)}$ + 2e-	→	2T-(aq)	+1.360
$U^+_{(aq)}$ + e-	→	$U_{(s)}$	+0.800

i) Identify the strongest oxidising agent. (1mk)
ii) Calculate the e.m.f. of the cell made by R and U. (2mks)
iii) Is it advisable to store a nitrate or solution or metal S in a container made of Q. (2mks)
d) Which two of the above elements in an electrochemical cell would produce the longest e.m.f. (1mk)
e) Calculate the e.m..f .f the cell chosen in „d" above. (2mks)

3. Study the information in the table below and answer the questions that follow.

Element	Atomic number	Melting point (^{0}C)
A	11	98.7
B	13	660
C	14	1410
D	17	-101
E	19	63.7

The letters do not represent the actual symbols of the elements.
a) Write the electron arrangement for ions of elements,
i) A (1mk)
ii) D (1mk)
b) Select an element which is
i) the most reactive metal. (1mk)
ii) the best conductor of electricity. Explain. (2mks)
c) State the period and group to which element C belongs.
Group ($^1/_2$mk)

for more free past papers visit: www.kcsepastpapers.com or call: 0720502479

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

Period (½ mark)

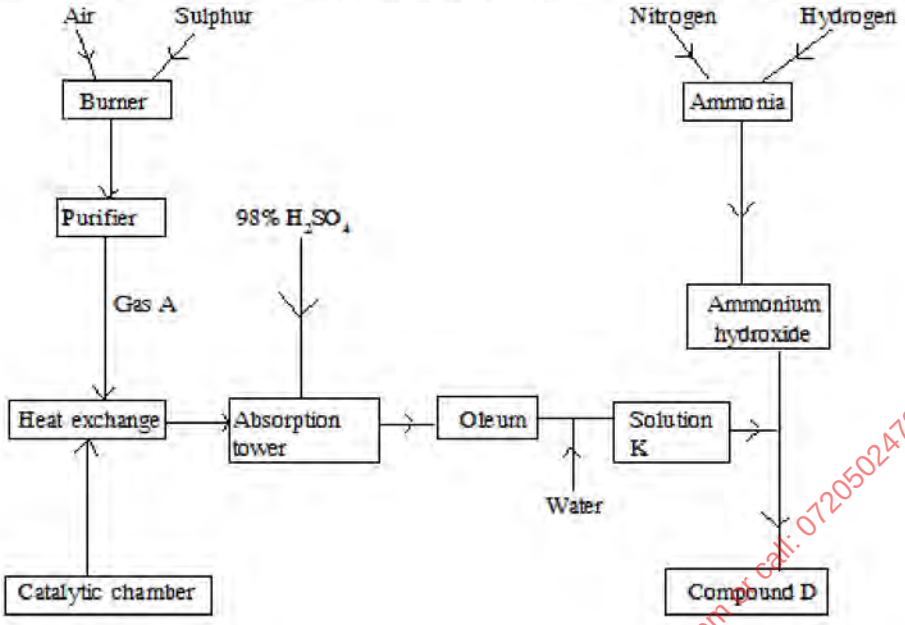
d) Compare the reactivity of A and E. (2mks)

e) Explain why the atomic radius of B is smaller than that of A. (1mk)

f) Describe how a solid mixture of the sulphate of element E and led (II) sulphate can be separated. (3mks)

g) Identify any two elements that belong to the same period in the periodic table. (1mk)

4. Below is a chart showing the commercial production of compound D. Study it and answer the questions that follow.



a) Write an equation for the reaction that takes place in the burner. (1mk)

b) Name other substances that can be used in place of sulphur in the burner. (2mks)

c) Why is it important to purify the products from the burner before being used in the stages that follow? (1mk)

d) Give one function of heat exchange. (1mk)

e) Give two reasons why Vanadium pentoxide is preferred to Platinised absestos in the process. (2mks)

f) i) Name gas A. (1mk)

ii) Why is water not used in place of concentrated sulphuric acid in the absorption tower. (1mk)

f) i) Name substances K ,D (2 marks)

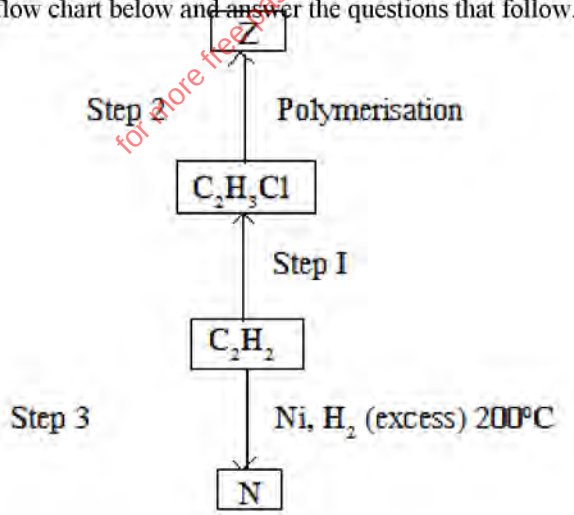
ii) Give one large scale use of compound D. (1mk)

h) Explain the environmental effect of gas A if released to the atmosphere. (2mks)

5. a) i) Crude oil is a source of butane. State the method used to obtain butane from crude oil. (1mk)

ii) State one use of butane. (1mk)

b) Study the flow chart below and answer the questions that follow.



i) State the reagent used in step I (1mk)

ii) Identify products. Z , N (1mk)

iii) State the type of reaction that occurs in step 3. (1mk)

iv) Draw the single repeating unit in product Z. (1mk)

v) Write a chemical equation in step 3. (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

c) Using bromine water, explain how you can differentiate between ethyne and product N. (2mks)

6. The diagram below shows a blast furnace used to extract iron.

a) State any other iron ore that can used in place of haematite (Fe_2O_3). (1mk

b) i) State impurities found in the iron produced. (1mk)

ii) Explain how the impurities above affect the melting point of iron produced. (1mk)

c) What is the function of limestone in the blast furnace. Explain. (2mks)

d) Identify any substance that is contained in slag. (1mk)

e) i) Identify the main reducing agent in blast furnance. (1mk)

ii) Write an equation to show how the reducing agent above reacts with the ore. (1mk)

iv) State one use of iron. (1mk)

f) State the gas recycled in the blast furnance. Explain why? (2mks)

7. a) Other than neutralisation state any other method used to prepare salts. (1mk)

b) Describe how to prepare sodium chloride starting with 1M sodium hydroxide. (3mks)

c) Write a balanced chemical equation to show effect of heat on calcium carbonate. (1mk)

d) Distinguish between a strong base and a weak base. (2mks)

e) i) Explain why permanent hardness cannot be removed by boiling. (2mks)

ii) State one disadvantage of hard water. (1mk)

f) Aluminium oxide reacts with both acids and alkalis. Name any other oxide that behaves like aluminium. (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KIGUMO SUB-COUNTY CLUSTER EXAMINATION 2016

Kenya National Examination Council

233/3
CHEMISTRY
PAPER 2 (practical)
TIME: 2 HOURS
JULY/AUGUST 2016

CHEMSITRY PAPER 3
CONFIDENTIAL TO SCHOOL

Each candidates to be provided with
- Exactly 2.65g of Anhydrous sodium carbonate (Solid P)
- 100cm3 of 0.125M Hydrochloric acid labelled solution (M)
- $FeSO_4.7H_2O$ (Solid C) Approximately 2g
- 2g Zinc powder
- Maleic acid (solid Q) - 2 sapatulafuls
- Universal indicator paper and pH chart
- 0.5g of $NaHCO_3$ labelled
- Burrette
- Pipette
- 250ml Volumetric flask
- 2 Conical flask
- 2 labels
- 100ml measuring cylinder
- 250ml beaker
- Metallic spatula
- 2 boiling tubes
- At least 6 test tubes in a rack
- Distilled water in a wash bottle

Access to
- 2M $Pb(NO_3)_{2(aq)}$ supplied with a dropper.
- Means of heating
- 2M Naoh with a dropper.
- 20 vol. H_2O_2 with a dropper.
- 2M $Ba(NO_3)_{2(aq)}$ with a dropper.
- 2M $NH_4OH_{(aq)}$ with a dropper.
- Acidified KMnO4 with a dropper.
- Acidified K2Cr2O7 with a dropper.
- Methyl-Orange indicator.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KIGUMO SUB-COUNTY CLUSTER EXAMINATION
2016
Kenya National Examination Council

233/3
CHEMISTRY
PAPER 2 (practical)
TIME: 2 HOURS
JULY/AUGUST 2016

1. You are provided with
- 0.125M HCl labelled solution M.
- Anhydrous sodium carbonate labelled solid P.
- Methyl orange indicator

You are required to prepare a solution of sodium carbonate and standarize it using hydrochloric acid solution M.

Procedure

Transfer all solid P into a 250cm^3 volumetric flask. Add 100cm^3 of distilled water and shake until all solid dissolves. Add more distilled water and top up the soluton to 250cm^3 mark. Label this as solution T. Using a measuring cylinder measure 50cm^3 of solution T and put it in a 250cm^3 beaker. Dilute it by adding 50cm^3 of distilled water. Shake well to form uniform solution. Label this solution as R.

Pipette 25.0cm^3 of R into a conical flask. Add two drops of methly orange indicator. Fill the burette with soluion M. Carry out titration.

Record your results in the table below. Repeat the titration twice and complee the table.

Volume of pipette used ..... cm^3

Titration	1	2	3
Final burette readings (cm^3)			
Initial burette reading (cm^3)			
Volume of solution M used cm^3			

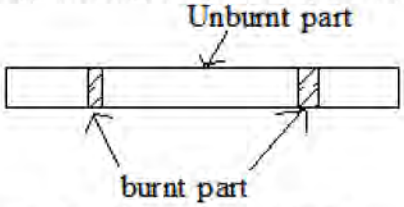
a) Calculate
i) Average volume of solution M used. (1mk)
ii) Moles of solution M used. (1mk)
b) Write a balanced equation for the reaction between solution R and M.
c) Calculate
i) Moles of Na_2CO_3 in 25cm^3 of solution R. (1mk)
ii) Number of moles of Na_2CO_3 in 100cm^3 of solution R. (1mk)
iii) Number of moles of Na_2CO_3 in 50cm^3 of solution T. (1mk)
d) Give that Na = 23, C = 12, O = 16
Calculate
i) Mass of solid Na_2CO_3 that was dissolved to make solution T. (2mks)
ii) The concentrationof Na_2CO_3 in soluton T in moles per litre. (1mk)

2. You are provided with solid C. Carry out the tests below. Write your observatins and inferences in the spaces provided.
a) Place a spatulaful of C in a boiling tube and heat gently.
Observations — Inferences
(1mk) (1mk)
b) Place all the remaining solid C in a boiling tube. Add abount 10cm3 of distilled water and shake well. Divide the resulting mixture into five portions.
Observations — Inferences
(1mk) (1mk)
i) To the first portion add ammonia solution dropwise till in excess.
Observations — Inferences
(1mk) (1mk)
ii) To the second portion portion add sodium hydroxide dropwise followed by 3 drops of hydrogen peroxide.
Observations — Inferences
(2mks) (1mk)
iii) To the third portion add 3 drops of lead (II) nitrate and warm.
Observations — Inferences
(1mk) (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call 0720502475

GATANGA FORM FOUR END OF TERM II EXAMINATION
2016 233/1
CHEMIS TRY (THEORY)
PAPER 1

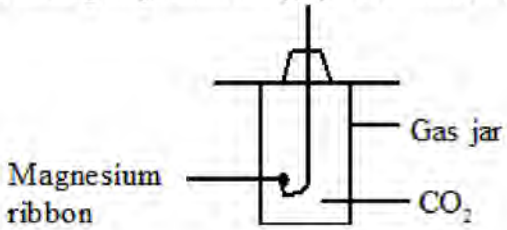
1. A wooden splint was slipped through a region of a particular flame in that laboratory and was burnt as shown in the diagram below.



a) Name the type of flame the splint was slipped through. (1mk)
b) Expalin why the splint was burnt the way it is shown in the diagram. (1mk)

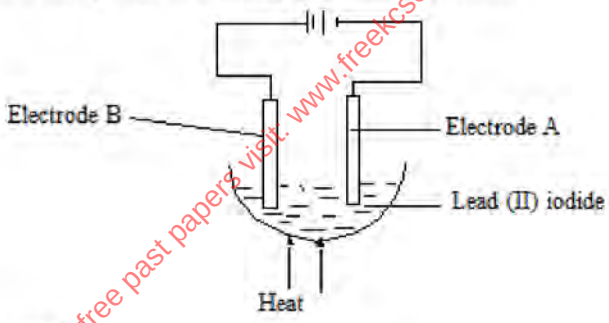
2. Elements A and B have atomic masses 23 and 24 respectively. Both of them have 12 neutrons each.
a) Write the electron arrangement of A and B.
b) Which of the elements has higher ionization energy? Explain. (2mks)

3. A student lowered burning magnesium in a gas jar of carbon (IV) oxide as shown in the diagram below.



a) State and explain the observation made in the gas jar. (2mks)
b) Write the equation for the reaction that takes place in the gas jar. (1mk)

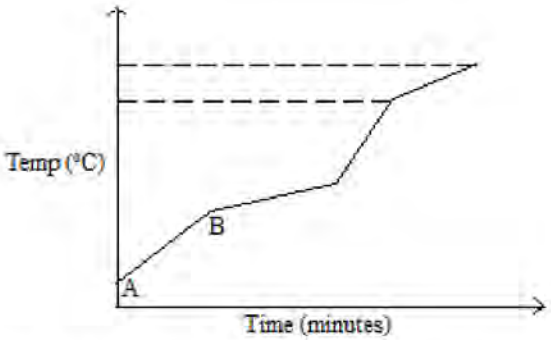
4. The figure below shows a set-up used in electrolysis of lead (II) iodide.



a) Why is heating necessary? (1mk)
b) Write the equation for the reaction that occurs at the cathode. (1mk)
c) At which electrode does reduction occur? (1mk)

5. A mixture contains sodium chloride, ammonium chlorijM and copper (II) oxide. Describe how each substance can be obtained from the mixture. (3mks)

6. Study the diagram shown below and answer the questions that follow. The graph shows the heating curve of water.



a) Is the curve for pure water or impure water? Give a reason for your answer. (2mks)
b) Stat the role of each of the following parts during fractional distillation of a mixture of water and ethanol.
i) Glass beads in the fractionating column. (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

ii)Fractionatincolumn.(1mk)

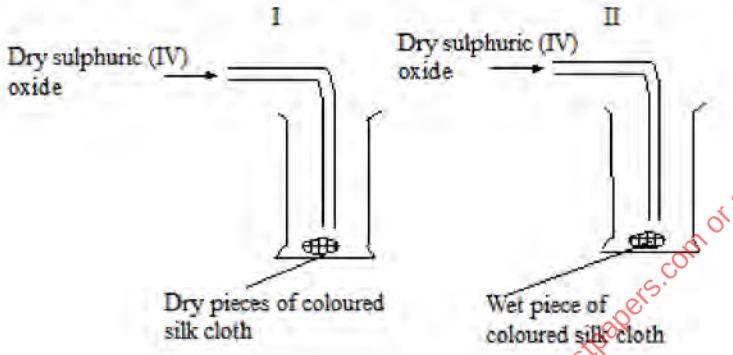
7. The empirical formula of compound A is CH_2Br. Given that 0.470g of A occupies a volume of $56cm^3$ at s.t.p. determine its molecular formula (H = 1.0. C = 12.0. Br = 80.0, Molar gas volume at s.t.p = $22.4dm^3$) (3mks)

8. Using dots (•) and cross (X) to represent electrons, show the bonding in the folloing compounds.
   (i) OH^- (O = 8, H = 1) (1mk)
   ii) Li_2O (Li = 3, O = 8) (1mk)

9 a) State Charles'' law. (1mk)
   b) A balloon contqains $80cm^3$ of gas at 30^0C and 4 atmospheres. Calculate the volume of the balloon at 50^0C and 2 atmospheres. (2mks

10. Ethene and ethyne are unsaturated hydrocarbons.
   a) Explain what is meant by unsaturation in hydrocarbons. (1mk)
   b) Explain how you would distinguish between ethane and ethene in the lab. (1mk)
   c) Write an equation for the complete combustion of ethane. (1m

11. Dry sulphur (IV) oxide was passed through two pieces of coloured silk cloth in a gas jar as shown in the diagram below.

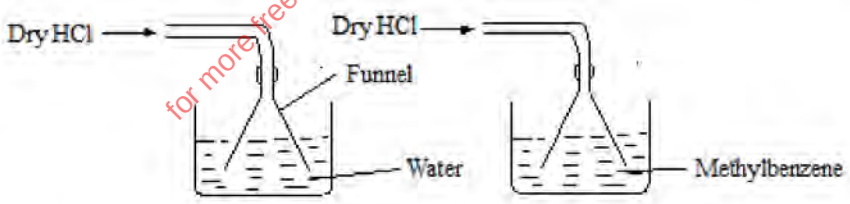


for more free pastpapers visit www.freekcsepastpapers.com or call: 0720502479

   a) State the observation made in the gas jar. (1 mark
   b) Write equations to explain your observations in gas jar II. (2mks)

12. In an experiment to determine the percentage of magnesium hydroxide in an anti-acid, a solution containing 0.05g of the anti-acide was neutralised by $23cm^3$ of 0.01M hydrochloric acid.
   (R.F.M of Magnesium hydroxide = 58)
   a) Calculate the mass of magnesium hydroxide in the anti-acid. (2mks)
   b) Determine the percentage of magnesium hydroxide in the anti-acid. (1mk)

13. A student dissolved hydrogen chloride gas in water and methylbenzene as shown in the set-upsbelow.



   a) What is the purpose of the inverted funnel. (1mk)
   b) A little zinc carbonate was placed in each solution. State and explain the observations that were made. (2 marks)

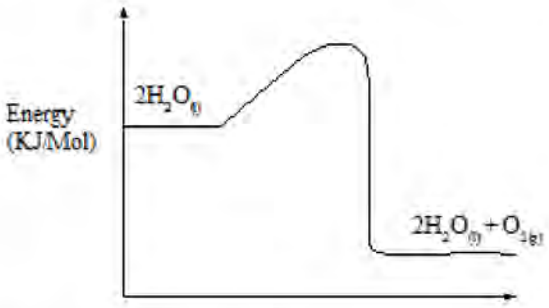
14. The table below shows pH values of some solutions.

Solution	A	B	C	D
pH values	13	7	1	6.5

   a) Which solution reacts vigorously with magnesium metal? (1mk)
   b) Which solution is likely to be lemon juice? (1mk)
   c) Which solution forms complex ions with zinc (II) oxide? (1mk)

15. a) Define heat of solution. (1mk)
   b) When 16g of ammonium nitrate was dissolved in $100cm^3$ of water at 25^0C, the temperature of the solution drops to 19^0C.
   Calculate the molar enthalphy of solution of ammonium nitrate (N = 14, O = 16, H = I, Specific heat capacity of water = $4.2kJKg^{-1}k^{-1}$ Take density = $1g/cm^3$) (2mks)

16. The energy level diagram below shows non-catalysed decomposition of hydrogen peroxide.



a) On the same axis, sketch the graph for the decomposition of hydrogen peroxide when manganese (IV) oxide is added. (1mk)

Label the graph as (a)

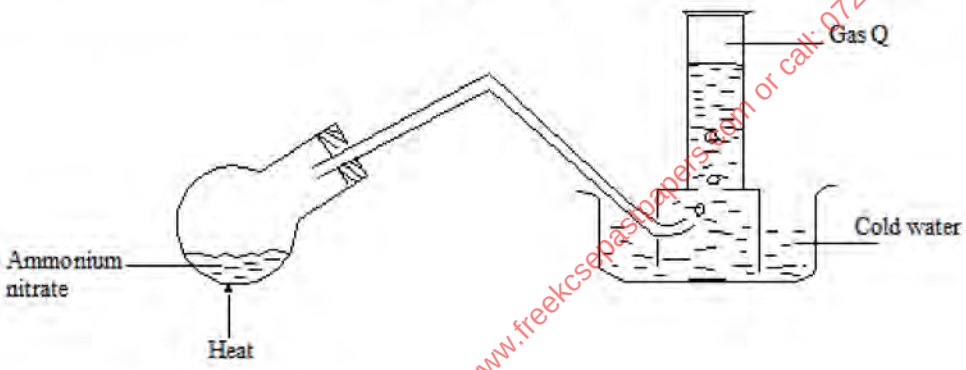
b) Define activation energy. (1mk)

c) The following reaction is in equilibrium in a closed container.

$C_{(s)} + H_2O_{(g)} \rightarrow CO_{(g)} + H_{2(g)}$

How would an increase in pressure affect the amount of hydrogen produced. (1mk)

17. The set up below was used by Form 3 students to prepare gas Q. Study it and answer the questions that follow.

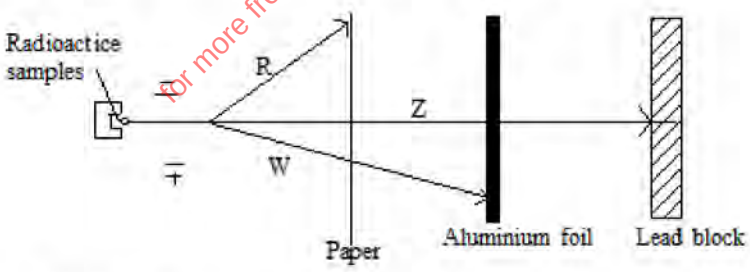


a) Identify one mistake made in the set up. (1mk)

b) Write an equation for the reaction leading to formation of gas Q. (1mk)

c) State one use of gas Q. (1mk)

18. The diagram below shows the radiation emitted by a radioacive sample.



a) Identify radiation W. (1mk)

b) Which of the three radiations would cause most damage to human tissues? Explain your answer. (1mk)

c) Explain why it is not safe to store radioactive substances in containers made of aluminium sheets? (1mk)

19. a) What is solubility? (1mk)

b) In an experiment to determine the solubility of solid X in water at 30^0C, the following results were obtained.

Mass of evaporating dish = 26.2g

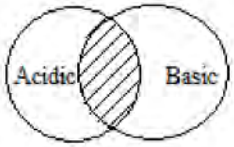
Mass of evaporating dish + saturated solution = 42.4g

Mass of evaporating dish + dry solid X = 30.4g

Using the information, determine the solubility of solid X at 30^0C in g/100g of water. (2mks)

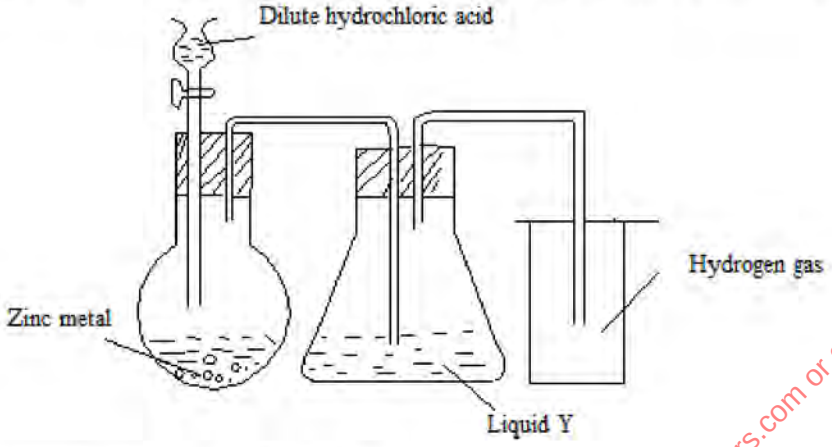
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

20. The diagram below shows acidic and basic oxides fitted into the general family of oxides.



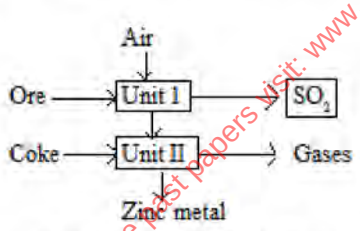
a) Give the name of the type of oxides that would be placed in the shaded region. (1mk)
b) Name one oxide that would be placed in the region. (1mk)
c) State one factor taht would accelerate the rate of rusting. (1mk)

21. The set up below was used to prepare dry hydrogen gas. Study it and answer the questons that follow.



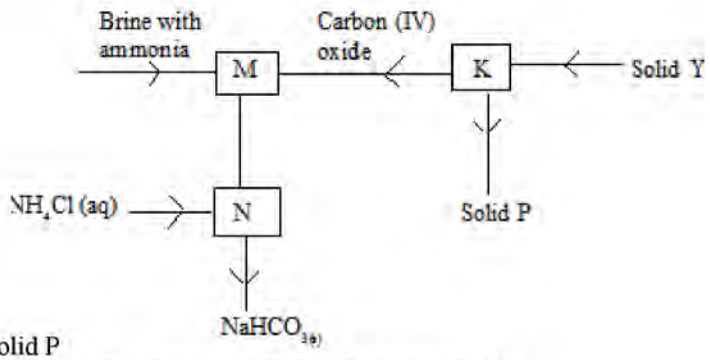
a) Identify one mistake in the set up (1mk)
b) Name liquid Y. (1mk)
c) Explain why helium gas is preferred in weather balloons to hydrogen gas. (1mk)

22. The flow chart below shows some processes involved in the industrial extraction of zinc metal.



a) Name one ore from which zinc is extracted. (1mk)
b) Write the equation for the reaction taking place in Unit II. (1mk)
c) Name one use of zinc metal. (1mk)

23. i) The diagram below shows part of solvay process.



i) Name solid P (1mk)
ii) Write the equation for the reaction that produces solid P. (1mk)
iii) What method of separation is used in chamber N? (1mk)

for more free past papers visit: www.freecsepastpapers.com or call: 0720502479

24. The table below gives some properties of compounds P, Q, R and S.

Compound	B.P.(°C)	M.P. (°C)	Conductivity in water
P	77	-22	Does not conduct
Q	74	-19	Does not conduct
R	-161	-85	Conducts
S	2407	714	Conducts

a) Which of the above compounds is ionic? Explain. (1mk)

b) Select the compound that is a gas at room temperature. Explain your answer. (1mks)

25. Given the following half cells;

$Pb^{2+}(aq) / Pb(s)$ $E\ominus = -0.13V$

$Cu^{2+}(aq) / Cu(s)$ $E\ominus = +0.34V$

i) Write the ionic equation for the half cell that undergoes oxidation. (1mk)
ii) Calculate the e.m.f. of the cell that would be made.(1mk
iii) Determine the oxidation number of chlorine in ClO_3. (1mk)

26. A compund has empirical formula C_3H_6O and a relative formula mass of 116.

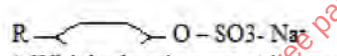
a) Determine its molecular formula. (2mks)
(H = 1.0, C = 12.0, O = 16.0)
b) Calculate the percentage composition of carbon by mass in the compound. (1mk)

27. The table below gives some bond energies of some bonds.

Bond	Bond energy $kJmol^{-1}$
H – H	435
Cl – Cl	243
H – Cl	431

Calculate the enthalpy change for the reaction.
$H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$ (2mks)

28. Name the class to which the following cleansing agents belong.
a) R – COO-Na+
A

b) 

c) Which cleaning agent is not enviromentally friendly.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

GATANGA FORM FOUR END OF TERM II EXAMINATION
2016 233/2
CHEMIS TRY (THEORY)
PAPER 2

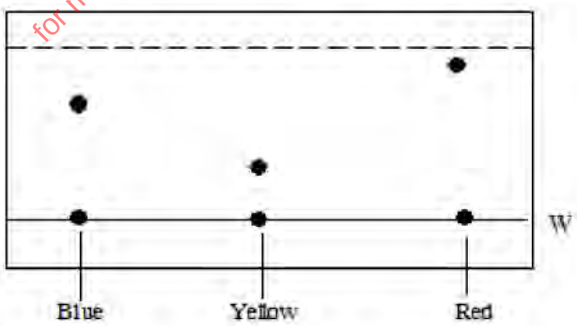
1. The table below shows elements in the periodic table. Use it to answer the questions that follow. The letters are not the actual symbols of the elements.

							F
A	B		C		D	E	
G							H

a) i) Write the electron arrangement of elements; B and A
ii) Write the formula of the compound formed between the elements B and E. (1mk)
b) Element K has atomic number 14. Indicate by use of tick ( ) the position of this element in the table above. (1mk)
c) i) he ionization energy of A is higher than that of G. Explain. (1mk)
ii) The atomic radius of C is larger than that of D. (1mk)
iii) Compare the reactivity of elements A and B.
Explain your answer. (2mks)
d) i) State the name of the group to which elements F and H belong. (1m
ii) Give one use of any of the elements of in group in d(i) above. (1mk)
e) The chloride of B is ionic, while the chloride of C is covalent. Explain this observation. (2mks)
2. (a) A student wrongly categorised air as a compound and not as a mixture. Give two reasons as to why the student was wrong. (2mks)
(b) The table below shows the results obtained when four solvents were used to separate a dye. Study the results and use them to answer the questions that follow.

Solvent	Number of Solute components
A	5
B	1
C	0
D	2

i) Identify the most suitable solvent for this separation. Give a reason for your answer. (2mks)
ii) What does the result of the solvent C tell us about the dye? (1mk)
c) The chromatogram below was obtained from a plant extract. Use it to answer the questions that follow.



i) Name line W (1mk)
ii) What does the dotted line represent? (1mk)
iii) State with a reason the least soluble dye in the moving solvent. (1mk)
d) Below is a list of major component of crude oil and their boiling points.

Component	*Boiling point (^0C)*
Bitumen	Above 400
Lubricating oil	350 - 400
Petrol	40 - 175
Gases	Below 40

i) What is the name of the process by which the constituents of crude oil can be separated? (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720592479

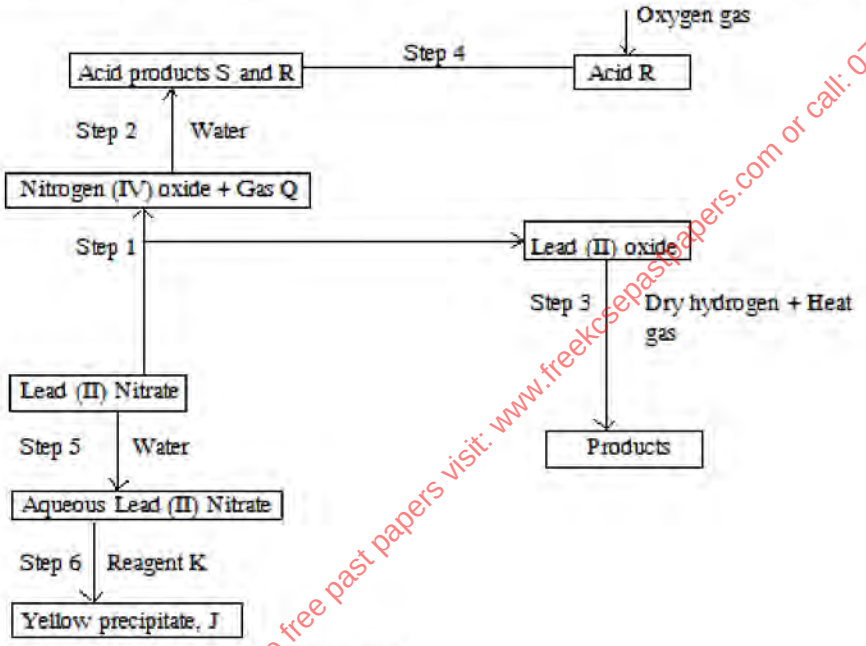
ii) Give one use of the gases component. (1mk)
iii) Give the order by which the components are obtained from the mixture, starting withthe first. (1mk)

3. An impure solid of magnesium carbonate weighing 9.5g was placed in a beaker containing 50cm^3 of dilute nitric (V) acid. The volume of carbon (IV) oxide evolved was recorded at 20 seconds interval in the table below.

Time from start of Reaction (sec)	0	20	40	60	80	100	120
Volume of CO_2 at s.t.p (cm^3)	0	650	900	1070	1100	1120	1120

3. a) Write the equation for the reaction between magnesium carbonate and nitric (V) acid. (1mk)
b) i) Plot a graph of volume of carbon (IV) oxide (y-axis) against time. (3mks)
ii) From the graph; calculate the rate of reaction between
I 20 seconds and 40 seconds interval. (2mks)
II 40 seconds and 60 seconds interval. (2mks)
c) Explain the difference in the reaction rates in I and II. (1mk)
d) Why was there no further increase in the volume of carbon (IV) oxide gas after 100 seconds? (1mk)
e) How many moles of carbon (IV) oxide were in the maximum volume produced from this reaction? (Molar gas volume at s.t.p. = 22.4 litres) (1mk)
f) What mass of magnesium carbonate will have reacted with the acid after 100seconds. (Mg = 24, C= 12, O = 16) (2mks)
g) Determine the percentage purity of magnesium carbonate. (2mks)
h) Calculate the original concentration of the nitric (V) acid in moles per litre. (2mks)

4. The flow chart below shows some reactions starting with lead (II) nitrate. Study it and answer the questions that follow.



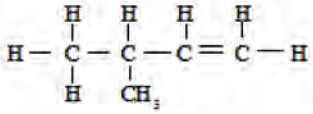
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

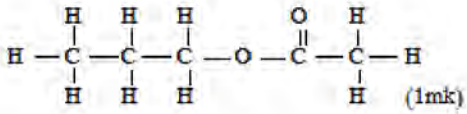
a) i) State the condition necessary in step 1. (1mk)
ii) Identify;
I Gas Q (1mk)
II The acid products S and R (2mks)
b) Write the balanced chemical equations for the reactions in:
i) Step3 (1mk)
ii)Step 4 (1mk)
c) i) The reaction between lead (II) nitrate and dilute sulphuric (IV) acid starts but stops almost immediately. Explain this observation. (2mks)
ii) Name a suitable reagent that can be reacted with concentrated sulphuric (IV) acid to produce Nitric (V) acid. (1mk)
d) In the industrial extraction of lead metal, the ore is first roasted in a furnance. The solid mixture obtained is then fed into another furnance together with coke, limestone and scrap iron. State the function of each of the following in this process:
a) Coke (1mk)
b) Limestone (1mk)
c) Scrap Iron (1mk)

5. a) Candle wax is mainly a hydrocarbon. What is a hydrocarbon? (1mk)

b) Name the following compounds.

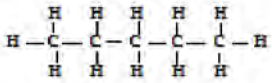
i)





(1mk)

ii)

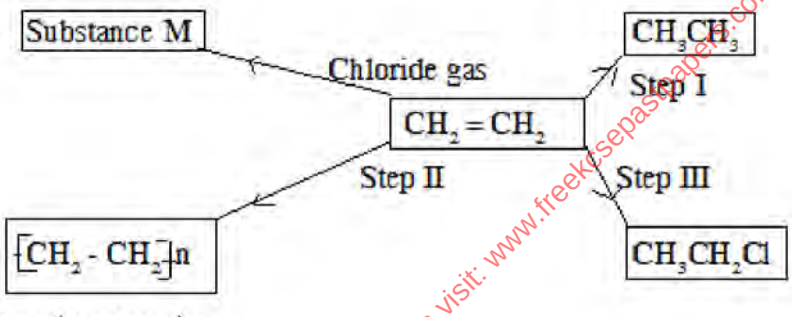


c) Castor oil extracted from castor seeds is found to change the colour of acidified potassium managanate (VII) .

i) State the colour change. (1mk)

ii) Explain why castor oil reacts with acidified Potassium mangate (VII) to cause the colour change. (1mk

d) Study the reaction scheme below and use it to answer the questions that follow.



ii) Name the process in;

Step I (1mk)

Step II (1mk)

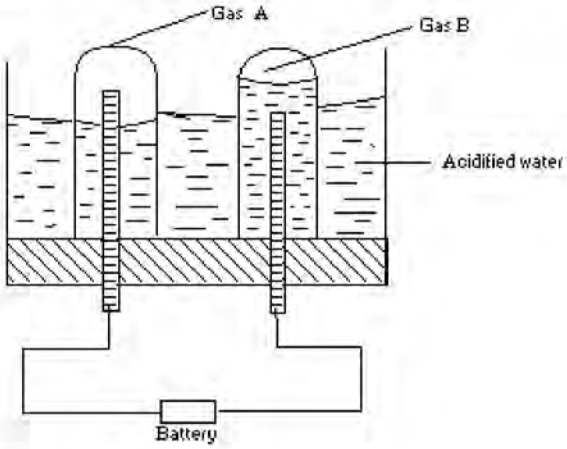
ii) State the reagent necessary for the process in

Step II (1mk)

Step III (1mk)

iii) Name the type of reaction taking place in step III (1mk)

6. The set up below was used during the electrolysis of acidified water using inert electrodes.



a) Why is the water acidified (1mk)

b) What material are the electrodes made of? (1mk)

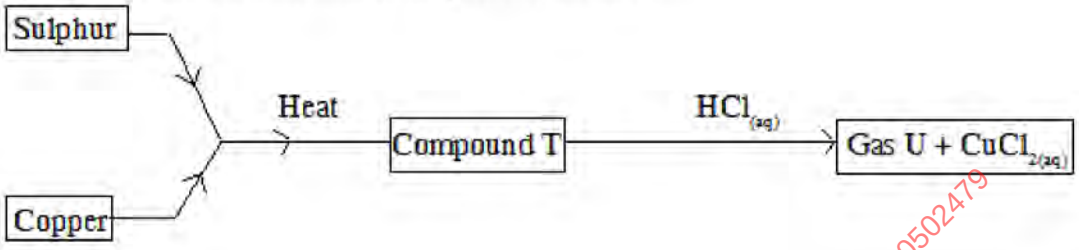
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

c) Identify: Gas A (1mk)
Gas B (1mk)

d) On the diagram label;
The Anode:(1mk)
The cathode (1mk)

e) During the electrolysis a current of 2 amperes was passed through the acidified water for $2^1/_2$ hours. Calculate the volume of gas B produced at rtp.
(1 Faraday = 96500C, Molar gas volume at r.t.p = 24000cm^3) (3 mks)

7. a) Rhombic sulphur and monoclinic sulphur are allotropes of sulphur. Define Allotropy. (1mk)
b)Give two other elements that exhibit allotropy. (1mk)
c) Study the flow chart below and answer the questions that follow.



c) Name (i) Compound T (1mk)
ii) Gas U (1mk)
d) The equation below shows the reaction between sulphur (IV) oxide gas and oxygen gas to produce sulphur (VI) oxide in contact process.
$2\ SO_{2(g)} + O_{2(g)} \rightarrow 2SO_3$ D = -197 kJ/mol
i) State two conditions that are necessary for maximum production of SO_3. (2mks)
ii) Name the catalyst used for this reaction. (1mk)
e) State one use of sulphuric (IV) acid. (1mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KERICHO SUB-COUNTY JOINT EVALUATION

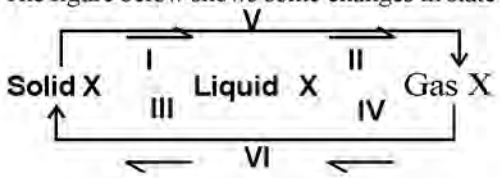
Kenya Certificate of Secondary Education (K.C.S.E)

233/1

CHEMISTRY

PAPER 1 (THEORY)

1. a) The figure below shows some changes in state for a substance X. Study the diagram and answer the questions.

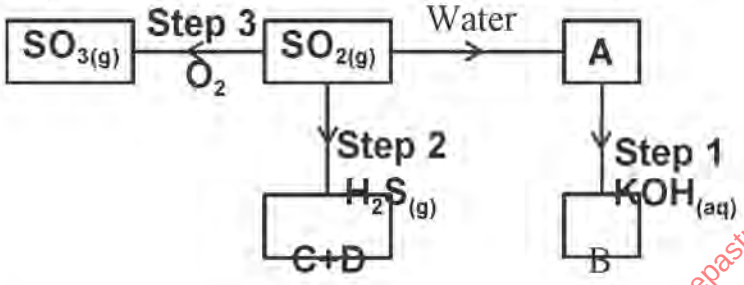


Each of the changes can be speeded up by heating or by cooling. Which changes are speeded up by cooling and which ones by heating. (2 marks)

b) Magnesium sulphate may be used as a laxative. What does this term laxative mean ? (1 mark)

2. Both molten sodium chloride and molten sodium metal conducts electricity. Explain how each of these conducts electricity.
(i) Molten sodium chloride (1 mark)
(ii) Molten sodium metal (1 mark)

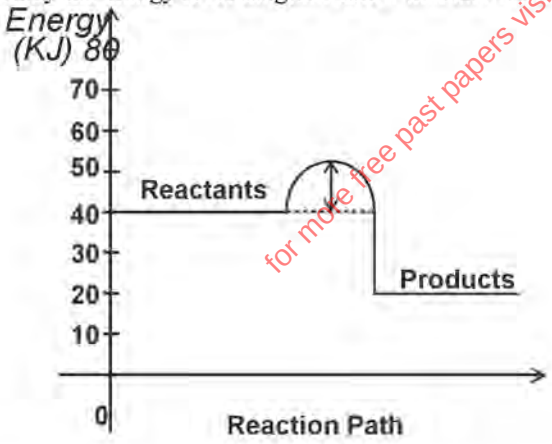
3. Study the flow chart below and answer the questions that follow.



a) Name the substance A and B (1 mark)

b) State the property of SO_2 exhibited in step 2. (1 mark)

4. Study the energy level diagram below and answer the questions that follow.



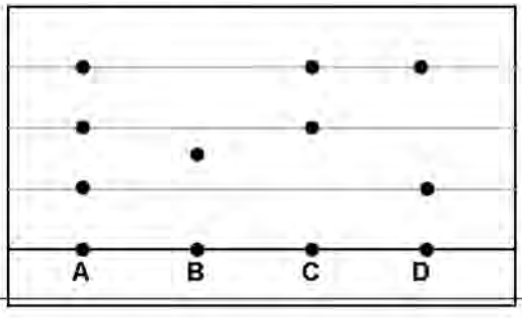
(i) State and explain whether the reaction represented is endothermic or exothermic. (1 mark)

ii) From the diagram, determine

I. the activation energy (1 mark)

II. enthalpy of reaction (1 mark)

5. The following chromatogram was obtained in an experiment to investigate the components present in certain dyes.



for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

a) Which two dyes when mixed would produce A ? (1 mark)
b) Which dye is pure ? (1 mark)
c) Indicate on the diagram the solvent front. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

6. Two elements X and Y are represented as shown below.

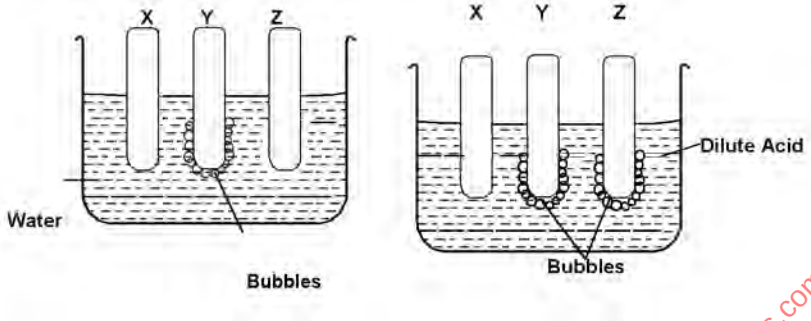
$_{17}X$ and $_{20}Y$

i) Write the formula of the compound formed when X and Y react. (1 mark)
ii) State the family name to which element X belongs. (1 mark)
iii) Element Y has a mass number of 40, how many neutrons are present in its nucleus ? (1 mark)

7. a) State Graham"s law of diffusion. (1 mark)
b) If it takes 30 seconds for 100cm^3 of carbon IV oxide to diffuse across a porous plate, how long will it take 150cm^3 of nitrogen IV oxide to diffuse across the same plate under similar conditions ?
(C = 20, N = 14, O = 16) (2 marks)

8. a) Give the IUPAC names of the following compounds (2 marks)
i) $CH_3(CH_2)CH_2OH$
ii) $CH_3CH_2CH(CH_3)COOH$
b) Given the following polymer, draw the structure of the monomer. (1 mark)

9. In an experiment, rods of metal X, Y, Z were cleaned with sand paper and placed in a beaker containing water. Another set of rods was also placed in a beaker containing dilute acid. After placing the rods in the two liquids, bubbles of gas were seen around some of the rods as shown in the diagram below.



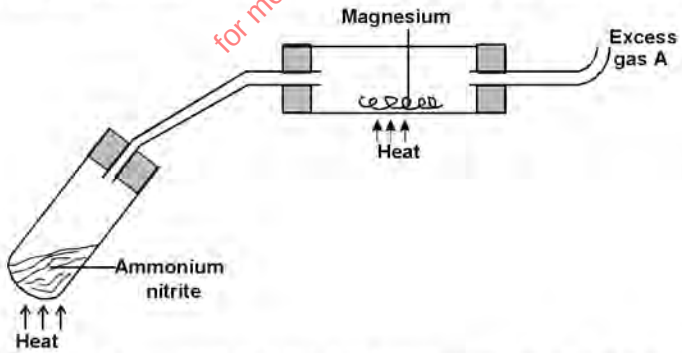
a) Why is it necessary to clean the rods with sand paper before dipping them into the liquid. (1 mark)
b) Arrange the three metals in order of their reactivity starting with the most reactive. (2 marks)

10. The grid below is part of periodic table. Use it to answer the questions that follow. (The letters do not represent the actual symbols of the elements)

						R	S	
N	Q						T	U
P								

a) Indicate in the grid the position of an element represented by letter V, whose atomic number is 14. (1 mark)
b) Select a letter which represents a mono atomic gas. (1 mark)
c) Write an equation for the reaction between Q and T. (1 mark)

11. The set-up below shows how gas A, was prepared and reacted with heated magnesium.



a) Give a reason why it is not advisable to heat magnesium before heating ammonium nitrite. (1 mark)
b) i) Identify gas A. (1 mark)
ii) Write a chemical equation for the reaction between gas A and magnesium. (1 mark)

12. a) Radioactive polonium - 216 decays as shown below.

$$_{84}^{216}Po \longrightarrow {}_{82}^{208}Pb + m + n\beta$$

Determine the value of m and n. (1½ marks)
c) The table below gives the rate of decay of a radioactive element Y. Page | 301
Calculate the half life of the radioactive element Y. (1½ marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

13. Study the table below and use it to answer the questions that follow.

Solution	PH
A	3.5
B	14
C	8.5

(i) In which of the solution will phenolphthalein indicator be colourless. (1 mark)
(ii) Which of the solutions could be used to relieve heartburn ? Explain. (2 marks)

14. Given the following reagents; solid sodium carbonate, solid lead (II) nitrate, water. Describe how a sample of lead (II) carbonate can be prepared in the laboratory. (3 marks)

15. The table below shows the tests carried out on separate sample of water drawn from a well and the results.

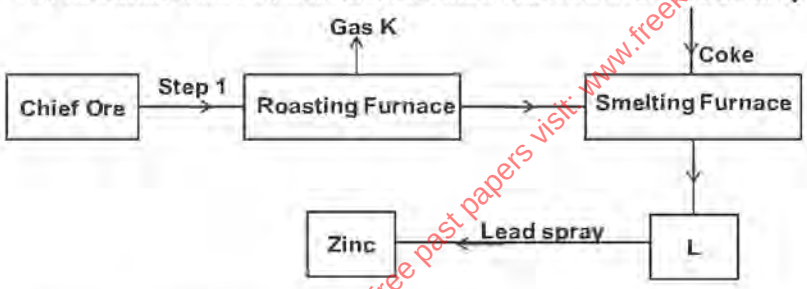
Test	Results
i) Addition of excess aqueous ammonia	White precipitate
ii) Addition of a few drops of dilute sulphuric VI acid	No precipitate formed
iii) Addition of dilute hydrochloric acid followed by few drops of barium chloride	White precipitate

a) Identify the possible cations and anions present in the water. (2 marks)
b) Write an ionic equation for the reaction which takes place in test tube (iii). (1 mark)

16. (a) A mass of 40g of a saturated solution of potassium chlorate at 25°C yields 14 of potassium chlorate when evaporated to dryness. Calculate the solubility of potassium chlorate at 25°C. (2 marks)
b) State one advantage of hard water. (1 mark)

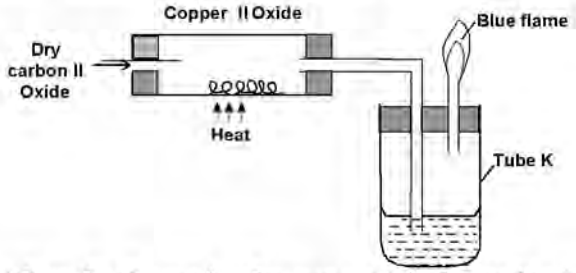
17. a) Why is air considered as a mixture rather than a compound ? (1 mark)
b) State one similarity between rusting and combustion of iron. (1 mark)
c) Explain why iron nails rust faster in sodium chloride solution than in tap water. (1 mark)

18. The flow chart shows the extraction of zinc metal from its chief ore. Study the flow chart and answer the questions that follow.



a) Name the chief ore used in the process. (½ mark)
b) Write equation for the reaction in the roasting furnace ? (1 mark)
c) State the functions of the lead spray. (1 mark)
d) Give one use of zinc. (½ mark)

19. The apparatus shown below was used to investigate the effect of carbon II oxide on copper II oxide.



a) State the observation that was made in the combustion tube by the end of the experiment. (1 mark)
b) Write an equation for the reaction that took place in the combustion tube. (1 mark)
c) Why is it necessary to burn gas coming out of tube K ? (1 mark)

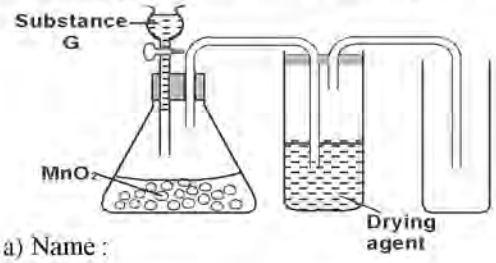
20. When 10g of a mixture of potassium chloride and anhydrous sodium sulphate is dissolved in water and excess barium chloride solution added, 6.9g of Barium sulphate is precipitated. Calculate the composition of the mixture. (K = 39, Cl = 35.5, Na = 23, O = 16, Ba = 137) (3 marks)

21. When bismuth III chloride is added to water, a reaction occurs and a white precipitate forms as shown below.
$BiCl_{3(aq)} + H_2O_{(l)} \quad BiOCl_{(s)} + 2HCl_{(aq)}$

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

What would be the effect on the amount of the precipitate formed if sodium hydroxide solution is added to the equilibrium mixture ? Explain your answer. (2 marks)

22. The set up below was used to investigate some properties of chlorine gas.



a) Name :

i) Substance G (1 mark)
ii) A suitable drying agent. (1 mark)
b) What property of chlorine make it possible for it to be collected as shown in the diagram ? (1 mark)

23. What volume of oxygen gas at r.t.p will be liberated at the anode when a current of 3 amperes is passed through magnesium sulphate solution for 45 minutes and 30 seconds. (Molar gas volume at r.t.p = 24000cm^3, Faraday constant = 96500 Coulombs) (3 marks)

24..a) What is air pollution ? (1 mark)
b) State four gaseous substances present in unpolluted air. (2 marks)

25. The labels of two reagent bottles contained the following safely symbols.

a) What do the symbols mean ? Explain. (2 marks)
b) Which of the reagent is more harmful ? (1 mark)

26. The table below shows properties of some chlorides. Study it and answer the questions that follow.

Chloride	Mp(°	BP (°C)	Electrical conductivity in aqueous solution	PH of solution
Al	-	183	Good	3
Na	860	1420	Good	7
P	32	75	Good	3
H	-146	-29	Good	1

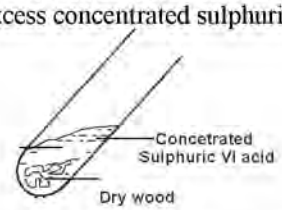
a) Explain the high melting and boiling points of sodium chloride. (1 mark)
b) Write an equation for the reaction between PCl_5 and water. (1 mark)
c) Draw the dot (•) and cross (x) diagram to show bonding in NaCl. (1 mark)

27. The cell convention for and electrochemical cell is shown below.

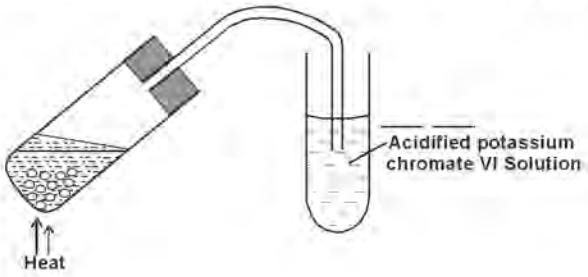
$Zn_{(s)} / Zn^{2+}_{(aq)} // Pb^{2+}_{(aq)} / Pb_{(s)}$

a) Name two substances that can be used as electrolytes in the above cell. (1 mark)
b) Which of the electrodes is the negative in the cell above ? Explain. (2 marks)

28. Excess concentrated sulphuric VI acid was mixed with pieces of dry wood as shown.



a) State the observation made in the tube. (1 mark)
b) When the reaction was complete, the mixture was heated gently, then strongly and set up adjusted as shown below.



for more free kcse past papers visit: www.freekcsepastpapers.com or call: 0720502479

State and explain the observation made on acidified potassium chromate VI solution. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KERICHO SUB-COUNTY JOINT EVALUATION

Kenya Certificate of Secondary Education (K.C.S.E)

233/2

CHEMISTRY

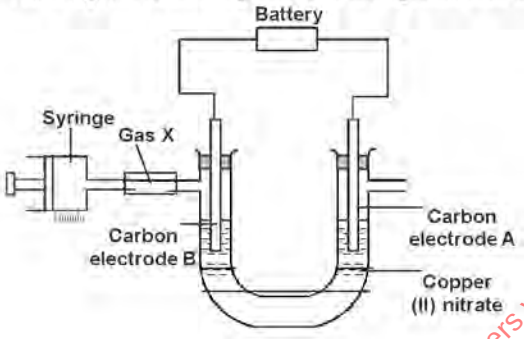
PAPER 2 (THEORY)

1. Study the table below and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Formula of ion	Electron configuration
A^{2+}	2.8
B^{3+}	2.8
C^{+}	2.8.8
D^{-}	2.8
E^{2+}	2

a) Select elements found in :
   i) The same group (1 mark)
   ii) Period three (1 mark)
   iii) What is the family name given to the group to which elements identified in a(i) above belongs. (1 mark)
b) How does the atomic radius of element B and A compare. Explain. (2 marks)
c) State two industrial use of element B. (2 marks)
d) With reason, compare the reactivity of C and D. (2 marks)
e) Write the formula of compound formed when A and D react. (1 mark)
f) What type of bond is formed when element E react with oxygen. Give a reason for your answer. (2 marks)

2. The diagram below represents a set up that was used for electrolysis of aqueous copper (II) nitrate.



a) A gas that relights a glowing splint was produced at electrode A.
i) Which electrode is the cathode ? Explain. (2 marks)
ii) State another suitable method for collecting gas X. (1 mark)
iii) Write ionic equations to show reactions that take place at the:
   Anode (1 mark)
   Cathode (1 mark)
iv) Explain how the identity of the product at the cathode of this electrolysis can be confirmed. (2 marks)
v) Calculate the mass of copper deposited if a constant current of 5A was passed for 3 hours.
   (Cu = 63.5, 1F = 96500C) (2 marks)

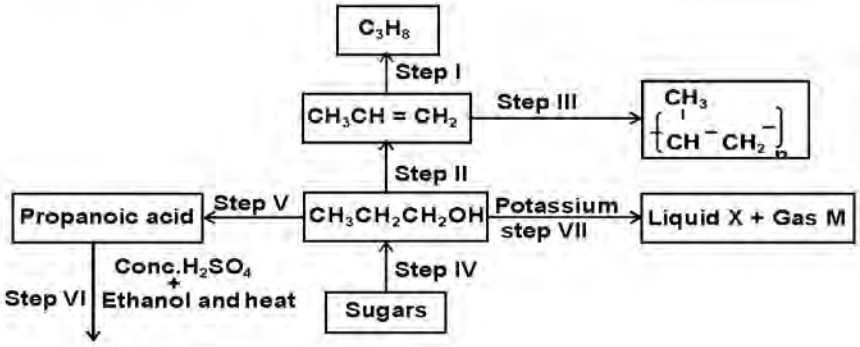
b) The following are standard electrode potentials for some electrodes. The letters do not represent tth actual symbols of the elements.

Element	E^{θ} (volts)
$A^{2+}_{(aq)} + 2e^{-} \rightleftharpoons A_{(s)}$	-2.93
$B^{2+}_{(aq)} + 2e^{-} \rightleftharpoons B_{(s)}$	-2.38
$C^{2+}_{(aq)} + 2e^{-} \rightleftharpoons C_{(s)}$	0.00
$D^{2+}_{(aq)} + 2e^{-} \rightleftharpoons D_{(s)}$	+0.34V
$E^{+}_{(aq)} + e \rightleftharpoons E_{(s)}$	+2.87V

i) Which is the strongest reducing agent ? Explain. (2 marks)
ii) Write the cell representation for the electrochemical cell obtained by combining the half cell of B and D. (1 mark)
iii) Calculate the e.m.f of the cell in (ii) above. (2 marks)

For more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

3. Study the flow chart below and answer the questions that follow.



a) i) Name the type of reaction in the following steps :

I. Step III (½ mark)
II. Step IV (½ mark)

ii) Name the important reagents and conditions in :

Step I : Reagent (1 mark)
Condition
Step II : Reagent (1 mark)
Condition
Step V : Reagent (1 mark)
Condition

b) i) Write a balanced equation for the reaction taking place in :

Step VI (1 mark)
Step VII (1 mark)

ii) Give the systematic name of liquid X and substance L

Liquid X (½ mark)
Substance L (½ mark)

d) i) If the relative molecular mass of compound formed in step III is 42,000, determine the value of n in the compound. (C = 12.0, H = 1.0) (2 marks)

ii) State one disadvantages of continued use of items made from the compound formed in d(i) above. (1 mark)

4. a)Define the following terms :

i) Atomicity (1 mark)
ii) Molar gas volume (1 mark)

b) i) State Gay-Lussac"s law. (1 mark)

ii) A sample of 10cm^3 of hydrogen sulphide was burned in 40cm^3 of oxygen. Calculate the volume and composition of residual gas (assume all volumes are measured at s.t.p) (2 marks)

c) i) Calculate the mass of sodium carbonate contained in 200cm^3 of 0.02M sodium carbonate solution. (2 marks)

ii) 0.239g of copper (II) oxide was placed in a conical flask. Calculate the volume of 0.1M solution of hydrochloric acid that would completely react with copper (II) oxide in the conical flask. (O = 16.0, Cu = 63.5, H = 1.0, Cl = 35.5) (2 marks)

d) Find the mass of 5.2×10^{23} atoms of sodium. (Na = 23.0, L = 6.023×10^{23}) (2 marks)

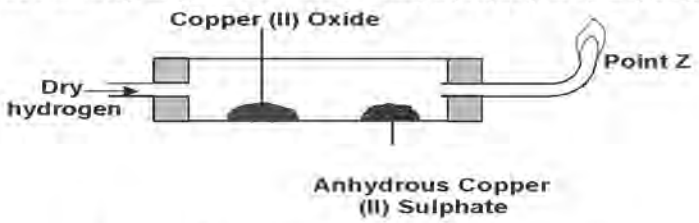
5. a) Starting with lead (II) carbonate, describe how a solid sample of lead sulphate can be prepared. (3 marks)

b) Water was added to lead (II) nitrate by a student. She divided the resulting solution into four, state the observation made after subjecting them to the following tests:

i) To the first portion she added sodium hydroxide dropwise until in excess. (1 mark)
ii) To the second portion she added ammonia solution dropwise until in excess (1 mark)
iii) To the third portion she added hydrochloric acid and warm. (1 mark)
iv) To the last portion she added sodium iodide solution. (1 mark)
v) Write an ionic equation for the reaction in test (iv) above. (1 mark)

c) State two commercial uses of sodium carbonate obtained in Solvay process. (2 marks)

6. The following diagram was used to study a property of hydrogen gas. Study it and answer the questions that follow.



a) Name the missing condition in the above set up. (1 mark)
b) Explain why the combustion tube is clamped in a slanting position. (1 mark)

for more free past papers visit: www.keekcsepastpapers.com or call: 0720502479

c) Before lighting the gas at the end of delivery tube, hydrogen must be let to pass through until all the air is driven out. Explain. (1 mark)

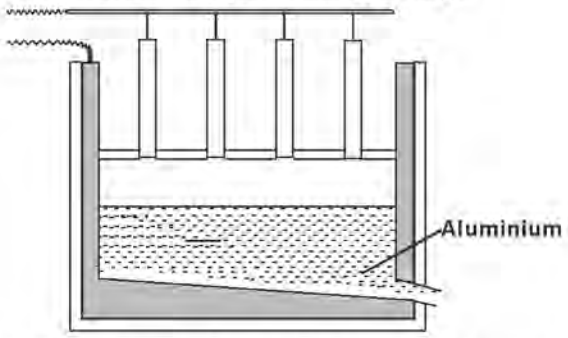
d) State three observations that occur in the combustion tube. (3 marks)

e) Why was hydrogen gas burnt at point Z. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

f) Why should the supply of hydrogen gas be continued while the apparatus cool. (1 mark)
g) What would be observed if the experiment was repeated using lead (II) oxide. (1 mark)
h) Other than the property investigated above, name two other chemical properties of hydrogen gas. (2 marks)
i) State two industrial use of hydrogen gas. (2 marks)

7. The extraction of aluminium from its ore takes place in two stages; purification stage and electrolysis stage. The diagram below shows the set up for electrolysis stage.



a) i) Name the ore from which aluminium is extracted. (1 mark)
ii) Name one impurity which is removed at the purification stage. (1 mark)
b)i) Label on the diagram each of the following
I. Anode
II. Cathode
III. Region containing the electrolyte (3 marks)
ii) The melting point of aluminium is 2054°C but electrolysis is carried out between 800-900°C.
I. Why is electrolysis not carried out at 2054°C (1 mark)
II. What is done to lower the temperature ? (1 mark)
iii) The aluminium which is produced is tapped off as a liquid. What does this suggest about its melting point ? (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0725502479

KERICHO SUB-COUNTY JOINT EVALUATION

Kenya Certificate of Secondary Education (K.C.S.E)

233/3

CHEMISTRY

PAPER 3 (PRACTICALS)

1. You are provided with :

- Solution A, 0.15M solution thiosulphate
- Solution B, 2M hydrochloric acid
- Solution C, a solution of basic solution (0.2M X $(OH)_n$)

You are required to determine the rate of reaction between hydrochloric acid solution B at different concentrations of sodium thiosulphate solution A.

Procedure 1

Draw a cross (x) on a piece of white paper using a pencil. Measure 30cm^3 of a solution A using a measuring cylinder and put it into a 100ml glass beaker placed over a white piece of paper drawn above.
Measure 10cm^3 of hydrochloric acid solution B using a 10ml measuring cylinder and add to the beaker, start the stopwatch. Immediately swirl the mixture.
View the cross from above the mixture in the beaker. Stop the clock when the cross just disappears. Record the time taken in the table below.
Repeat the above procedure using volumes of solution A, water and solution B as indicated in the table below.
TABLE 1

Experiment	Volume of solution A (cm^3)	Volume of water (cm^3)	Volume of solution B (cm^3)	Concentration of solution A ($moldm^{-3}$)	Time for X to disappear (seconds)	Rate =
1	30	0	10			
2	25	5	10			
3	20	10	10			
4	15	15	10			
5	10	20	10			
6	5	25	10			

(5 marks)

a) Plot a graph of rate (S^{-1}) against volume of solution A (cm^3) (3 marks)

b) From the graph determine :

i) The rate of reaction when 19cm^3 of solution A was used. (1 mark)

ii) The time taken for X to disappear when 12cm^3 of solution A was used. (1 mark)

iii) Determine the time taken for X to disappear if 3cm^3 of water was used. (1 mark)

c) How does the rate of reaction relate to the concentrations of reagents ? (1 mark)

Procedure II

Using a clean 100ml measuring cylinder measure exactly 25cm^3 of solution B into a 250cm^3 volumetric flask. Add distilled water upto the mark. Labe this as solution D. Fill a burette with solution D.
Using a pipette and a pipette filler place 25cm^3 of solution C into a 250ml conical flask. Add two drops of methyl orange indicator and shake. Titrate it with solution D and record your results in table II. Repeat the titration two more times and complete the table.

Table II

	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution D added (cm^3)			

for more free past papers visit: www.freekcsepastpapers.com or call 0726602475

a) Determine the :

ii) moles of hydrochloric acid in solution D used. (2 marks)

iii) moles of the alkaline solution C used. (1 mark)

b) Find the mole ratio for the reaction between solution A and solution C. (1 mark)

c) Hence determine the oxidation state of metal X. (1 mark)

2. You are provided with substance M for this question. Transfer the substance into a clean boiling tube. Add about 10cm^3 of distilled water and stir. Pour the mixture into four clean test tubes of about 2cm^3 each.

Observations	Inferences
1 mk	1 mk

a) To the first portion of the solutions, add sodium hydroxide solution dropwise until in excess.

Observations	Inferences
1 mk	1 mk

b) Dip a clean stirring rod / glass rod / nichrome wire into the second portion and then place into the side of a blue bunsen flame.

Observations	Inferences
1 mk	1 mk

c) To the third portion, add 2-3 drops of barium nitrate solution followed by excess hydrochloric acid.

Observations	Inferences
1 mk	1 mk

d) To the fourth portion, add 2-3 drops of acidified potassium manganate (VII)

Observations	Inferences
1 mk	1 mk

3. You are provided with substance W for tests in this question.

a) Place 3 drops of substance W on a clean dry watch glass and ignite it.

Observations	Inferences
1 mk	1 mk

b) Place about 2cm^3 of substance W in a clean dry test tube, then add all the sodium hydrogen carbonate provided.

Observations	Inferences
1 mk	1 mk

c) Place about 2cm^3 of substance W in a test tube then add about 1cm^3 of acidified potassium manganate (VII) and warm the mixture.

Observations	Inferences
1 mk	1 mk

d) Place about 2cm^3 of substance W in a test tube then add 2-3 drops of bromine water.

Observations	Inferences
1 mk	1 mk

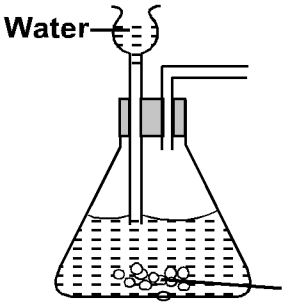
for more free past papers visit www.freekcsepastpapers.com or call: 0725502479

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2016
233/1
CHEMISTRY
PAPER 1

1. When carbon is reacted with concentrated Nitric (V) acid, a brown gas is evolved as one of the products.
a) Write a chemical equation for the above reaction. (1 mark)
b) Using oxidation numbers show that the above reaction is a redox reaction. (2 marks)

2. a) State Graham's law of diffusion. (1 mark)
b) Gas V takes 10 seconds to diffuse through a distance of one fifth of a meter. Another gas W takes the same time to diffuse through a distance of 10cm. If the relative molecular mass of gas V is 16.0, calculate the relative molecular mass of w. (2 marks)

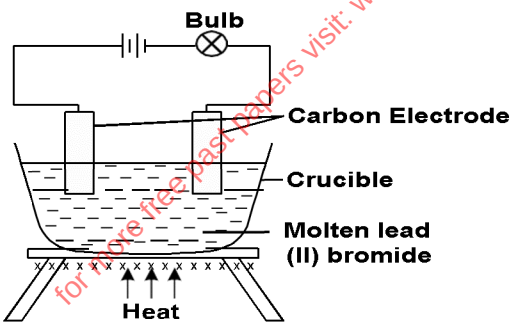
3. The set up below was used to prepare a sample of oxygen gas.



a) Complete the set up to show the collection of oxygen gas. (1 mark)
b) Name solid X. (1 mark)
c) Write a chemical equation for the reaction that occurs in the flask. (1 mark)

4. a) What is meant by the term isotope. (1 mark)
b) Chlorine consists of two isotopes; chlorine -37 and chlorine -35. If the relative atomic mass of chlorine is 35.5, determine the relative abundance of each isotope. (2 marks)

5. Study the set-up below and then answer the questions that follow.



State and explain the observations that would be made when the circuit is completed. (3 marks)

6. Describe how a solid sample of zinc carbonate can be prepared starting with zinc oxide. (3 marks)

7. 5.0g of calcium carbonate was allowed to react with 25.0cm^3 of 1.0m hydrochloric acid until there was no further change. Calculate the mass of calcium carbonate that remained unreacted. (3 marks)
(Ca = 40.0 C=12.0, O=16.0)

8. The table below shows the atomic and ionic radii of some period three elements, the letters do not represent the actual symbols.

Element	Atomic radius (nm)	Ionic radius (nm)
P	0.186	0.175
Q	0.160	0.135
R	0.104	0.184

From the table identify;

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

a) The strongest reducing agent. Give a reason for your answer. (2 marks)
b) An element whose oxide has pH of below seven when dissolved in water. (1 mark)

9. Study the information in the table below and answer the questions that follow. (C=12.0, H=1.0)

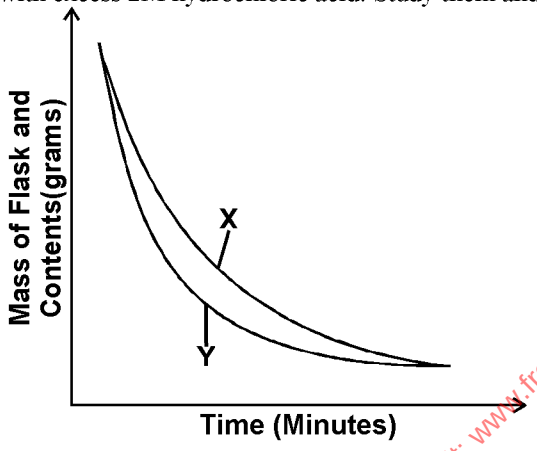
Hydrocarbon	No. of carbon atoms per molecule	No. of hydrogen atoms per molecule	Relative molecular mass
S	3		42
T	4	10	58
U		12	72
V	6	12	84

a) Complete the table by filling the missing information. (1 mark)
b) Name and draw two isomers of hydrocarbon T. (2 marks)

10. Hydrogen chloride gas can be prepared by reacting two substances. Name the two substances.
b) Write a chemical equation for the reaction between the two substances. (1 mark)
c) Give **two** uses of hydrogen chloride. (1 mark)

11. Draw a set-up that can be used to separate a mixture of sand and ammonium chloride. (3 marks)

12. The curves below represents the change in mass when equal masses of powdered magnesium and magnesium ribbon were reacted with excess 2M hydrochloric acid. Study them and answer the questions below.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

Which curve represents the reaction with magnesium powder ? Explain your answer. (3 marks)

13. Study the information in the table below and answer the questions that follow.

Salt	Solubility g/100g of water	
	at 40°C	of 60°C
$CuSO_4$	28	38
$Pb(NO_3)_2$	79	98

A mixture containing 35g of $CuSO_4$ and 78g of $Pb(NO_3)_2$ in 100g of water at 60°C was cooled to 40°C.
a) Which salt crystallised out? Give a reason. (2 marks)
b) Calculate the mass of the salt that crystallized out. (1 mark)

14. Complete the nuclear equation below.

a) $^{131}_{53}\mathrm{I} \rightarrow {}^{131}_{54}Xe +$

b) the half-life of $^{131}_{53}\mathrm{I}$ is 8 days.

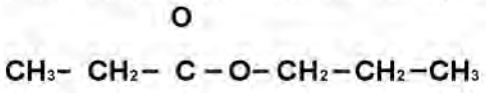
Determine the mass of $^{131}_{53}\mathrm{I}$ remaining if 50g decayed for 40 days. (1 mark)

c) Give one harmful effect of radioisotopes. (1 mark)

15. When a hydrocarbon was completely burnt in oxygen, 4.2g of carbon (IV) oxide and 1.71g of water was formed. Determine the empirical formula of the hydrocarbon. (3 marks)
(C=12.0, H=1.0, O=16.0)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

16. The structure below represents a certain compound



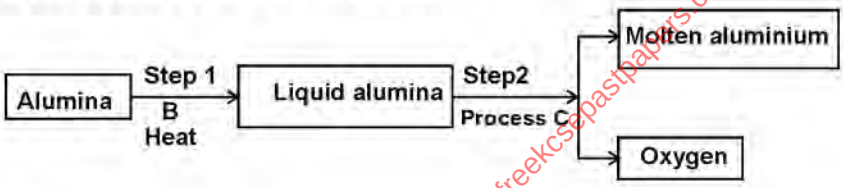
a) Draw and name two organic compounds that can be used to prepare this compound in the laboratory. (2 marks)
b) Give the name of the above compound. (1 mark)

17. The following are half-cell reactions and their reduction potentials.

	$E^{\theta}(volts)$
$Zn^{2+}_{(aq)} + 2e^{-} \rightarrow Zn_{(s)}$	-0.76
$Pb^{2+}_{(aq)} + 2e^{-} \rightarrow Pb_{(s)}$	-0.13
$Ag^{+}_{(aq)} + e^{-} \rightarrow Ag_{(s)}$	$+0.80$
$Cu^{2+}_{(aq)} + 2e \rightarrow Cu_{(s)}$	$+0.30$

a) Write the cell representation for the electrochemical cell that would give the highest electrode potential. (1 mark)
b) State and explain the observations made when a copper rod is placed in a beaker containing silver nitrate solution. (2 marks)

18. During the extraction of aluminium from its ores, the ore is first purified to obtain alumina. The flow chart below shows the stages in the extraction of aluminium from alumina.



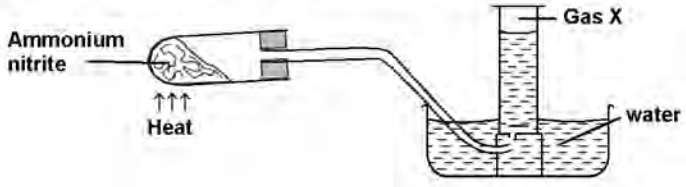
a) Name:
i) Substance B. (1 mark)
ii) Process C. (1 mark)
b) Give two reasons why aluminium is used extensively in making cooking pans. (1 mark)

19. Copper (II) sulphate reacts with Barium chloride according to the equation below.

$$CuSO_{4(aq)} + BaCl_{2(aq)} \rightarrow BaSO_{4(S)} + CuCl_{2(aq)} \qquad \Delta H = -17.7kJmol^{-1}$$

Calculate the temperature change when 900cm³ of 1M copper (II) sulphate were added to 600cm³ of 1M Barium chloride solution.
(Specific heat capacity of solution = 4.2Kj $kg^{-1}k^{-1}$ and density of solution = 1g/cm³) (3 marks)

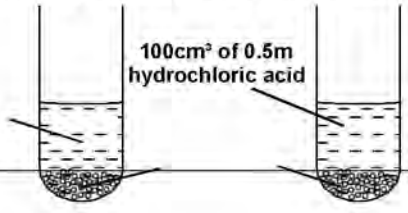
20. Ammonium nitrite was heated as shown in the set-up below.



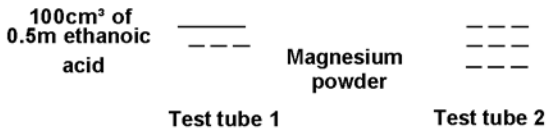
Identify, gas X. (1 mark)
b) State and explain the precaution that must be taken before heating is stopped. (2 marks)

21. When wood is burnt, a grey powder called ash remains. When the ash is stirred with water and filtered, a colourless solution is obtained.
a) What is the name of the main component of the colourless solution? (1 mark)
b) Explain your answer in (a) above. (2 marks)

22. In an experiment, equal amounts of magnesium powder were placed into test-tube 1 and test-tube 2 as shown below.



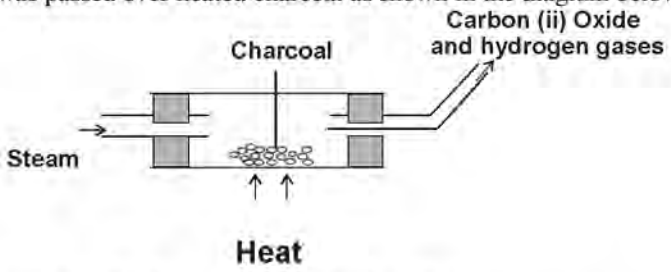
for more free past papers visit: www.freekcsepastpapers.com or call: 0700502479



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

Explain why the amount of hydrogen gas liberated in test-tube 2 is greater than that in test-tube 1 before the reaction is complete. (3 marks)

23. When steam was passed over heated charcoal as shown in the diagram below, hydrogen-gas and carbon (II) oxide gas were formed.



a) Write the equation for the reaction which takes place. (1 mark)
b) Name **two** uses of carbon (II) oxide gas which are also uses of hydrogen gas. (2 marks)

24. The table below shows the tests carried out on a sample of water and the observations made.

Test number	Tests	Observation
1	Addition of sodium hydroxide solution dropwise until in excess	white precipitate which dissolves in excess
2	Addition of excess aqueous ammonia	Colourless solution obtained
3	Addition of dilute hydrochloric acid followed by barium chloride solution	White precipitate

a) Identify the anion present in the water. (1 mark)
b) Write an ionic equation for the reaction in test number 3. (1 mark)
c) Write the formula of the complex ion formed in test number 2. (1 mark)

25. In the Haber process, the optimum yield of ammonia is obtained when a temperature of 450°C, a pressure of 200 atmospheres and iron catalyst are used.

$$N_{2(g)} + 3H_{2(g)} \quad 2NH_{3(g)} \qquad \Delta = -92kJ$$

a) How would the yield of ammonia be affected if the temperature was raised to 600°C. (2 marks)
b) Give **one** use of ammonia. (1 mark)

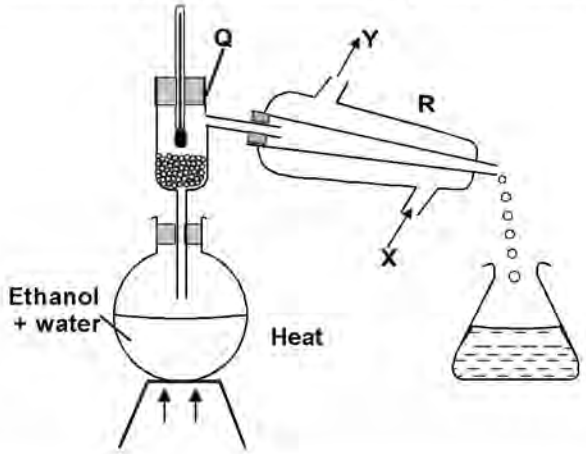
26. Iron is extracted from its ore by the blast furnace process.
a) Name **two** ores from which iron is extracted. (2 marks)
b) One of the impurities in iron one is removed in the form of calcium silicate. Write an equation for the reaction in which calcium silicate is produced. (1 mark)

27. With reference to chlorine, distinguish between covalent bonds and van der Waals forces. (2 marks)

for more free past papers visit www.freekcsepastpapers.com or call: 0720592419

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2016
233/2
CHEMISTRY
PAPER 2

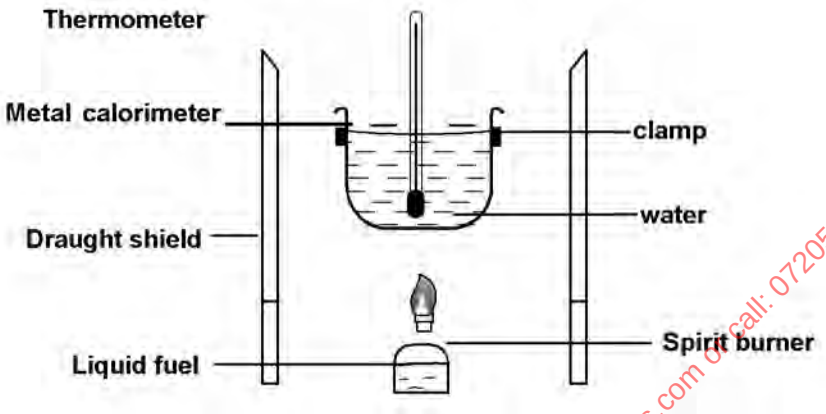
1. The diagram below shows a set-up of apparatus used to separate a mixture of ethanol (B.P=78.0°C) and water (B.P= 100.0°C)



a) Name the parts labelled Q and state its function. (2 marks)
b) Name the apparatus R. (1 mark)
c) At what point should apparatus R be connected with water? (1 mark)
d) Name the distillate that was collected first. (1 mark)
e) State the purpose of the thermometer. (1 mark)
f) What property of the mixture makes it possible to be collected as shown above? (1 mark)
g) Why is around bottomed flask preferred for the experiment instead of the flat bottomed flask? (1 mark)
h) Name three industrial applications of the above process. (3 marks)

2. a) Carbon (II) oxide, methane and hydrogen are major sources of energy.
i) State and explain three reasons why hydrogen is a very attractive fuel. (3 marks)
ii) State one disadvantage of using hydrogen fuel instead of methane. (1 mark)

b) The diagram below shows the set up of the apparatus by a student to determine the enthalpy change of combustion of ethanol. The heat produced by burning fuel warms known mass of known.



Results.
Volume of water in the beaker = 500cm³
Initial temperature of water = 12°C
Final temperature of water = 31.5°C
Mass of ethanol burnt = 1.50g
Density of water = 1g/cm³
Specific heat capacity of water = 4.2 kJ kg⁻¹K⁻¹

i) Define standard heat of combustion. (1 mark)
ii) Calculate the heat required to raise the temperature of water from 12°C to 31.5°C (2 marks)
iii) Find the molar enthalpy of combustion of ethanol. (C=12, O=16, H=1) (2 marks)
iv) Draw an energy level diagram for the combustion of ethanol. (2 marks)

3. I.
a) Study the data in the table below and answer the questions that follow. The letters do not represent actual symbol of the elements.

Eleme	Atomic No.	M.P. °C	B.P°	Ionic radius (nm)
A	11	98	890	0.095
B	12	650	1110	0.065
C	13	660	2470	0.05
D	14	1410	2360	0.041
E	15	4412 590	280	0.034
F	16	113 119	445	0.212
G	17	-101	-35	0.184
H	18	-189	-186	0.181

i) Write the electronic arrangement for the atoms represented by letters F & B (1 mark)
ii) State the nature of the oxides of the elements represented by B and F. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

Oxide of B .....

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

Oxide of F .....

b) Why does the elements represented by letter E have two values of melting point? (1 mark)

c) Explain the following observations in terms of structure and bonding.

i) There is an increase in boiling point from A to C. (1 mark)

ii) Element D has a high boiling point. (1 mark)

d) Explain the difference in ionic radius between elements represented by letters A and G. (2 marks

II

.a) The table below gives the percentage of radioactive isotope of lead that remains after decaying at different times.

Time (min)	0	6	12	22	38	62	100
percentage of lead	100	81	65	46	29	12	3

i) On the grid provided plot a graph of the percentage of lead remaining (vertical axis) against time. (3 marks)

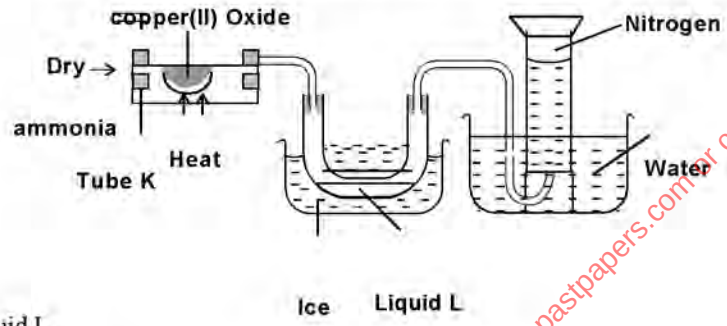
ii) Using the graph:

Determine the

I. Half life the lead. (1 mark)

II. Original mass of lead isotope given that the mass remained after 70 minutes was 0.16g. (2 marks)

4. a) The diagram below shows a set-up that can be used to obtain nitrogen gas in an experiment.



i) Name liquid L. (1 mark)

ii) What observation would be made in tube K after sometime? (1 mark)

iii) Write down the equation for the reaction that took place in tube K. (1 mark)

iv) If 320cm³ of ammonia gas reacted completely with copper (II) oxide, calculate:

I. The mass of copper (II) oxide that reacted. (3 marks)

(Cu = 63, O=16, molar gas volume at r.t.p = 24dm³

II. The volume of nitrogen gas produced. (2 marks)

v) At the end of the experiment the pH of water in the beaker was found to be about 10. Explain. (2 marks)

b) Why is it advisable to obtain nitrogen from air instead of from ammonia. (1 mark)

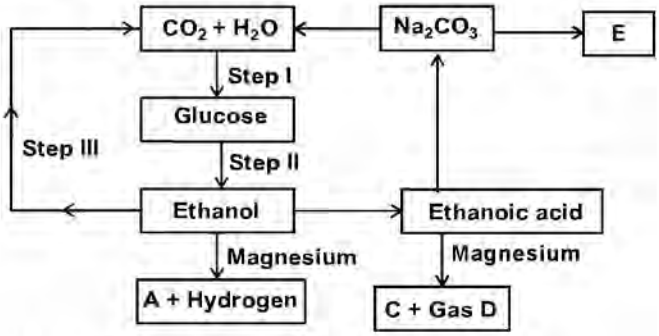
5. a) Draw the structures of the following organic compounds.

i) 3-chloro-2-methylpent-2-ene (2 marks)

ii) 2, 2-dimethylpropane

b) Methanoic acid has higher melting and boiling point than methane. Explain. (2 marks)

c) Study the flow chart below and answer the questions that follow.



i) I. State the conditions necessary for step 1 to occur. (1 mark)

II. Identify substances A, C, E and Gas D

ii) Write an equation for the reaction taking place in step III. (1 mark)

iii) Name the type of reaction in Step IV. (1 mark)

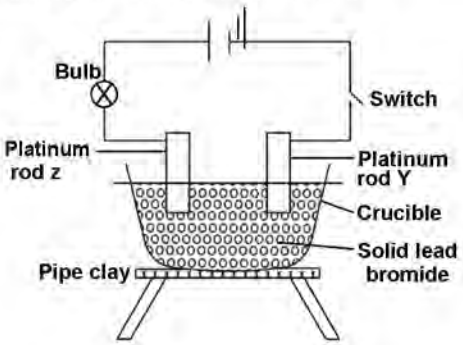
iv) State the alternative method of preparing ethanol. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

d) State two advantages of synthetic materials over natural ones. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

6. a) The set-up below was used to electrolyse lead bromide.



i) Identify the anode .....

ii) Did the experiment succeed ? Explain (2 marks)

iii) The electrodes used in the experiment were made of platinum, give a reason. (1 mark)

iv) Give a reason why this experiment is carried out in fume cupboard. (1 mark)

v) When the switch was closed, some mass of metal were deposited. Described how the amount of metal deposited was determined. (3 marks)

b) Study the half cells below and answer the questions that follow, the letters do not represent the actual symbols of the elements.

Half cell	$E^{\ominus}$(v)
$A_{(S)}/A^{+}_{(aq)}$	-2.60
$B_{(S)}/B^{2+}_{(aq)}$	+0.34
$C_{(S)}/C^{2+}_{(aq)}$	-0.83
$D_{2(g)}/D^{-}_{(aq)}$	+1.20
$E_{(S)}/E^{3+}_{(aq)}$	+0.77

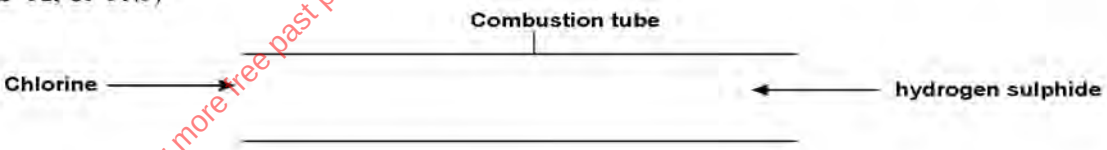
i) Name the electrode that was used as a reference. (1 mark)

ii) Identify the strongest oxidising agent. (1 mark)

iii) Identify a pair of half cells that will yield the lowest voltage when connected and give the cell notation.
Half cell .....
Notation .....

7. a) State Graham's law of diffusion. (1 mark)

b) An experiment was carried out to compare the rates of diffusion of chlorine gas and hydrogen sulphide gas. (H=1, S=32, Cl=35.5)



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502409

i) What observation was made in the combustion tube? (1 mark)

ii) Indicate where the observation in (i) above would occur. (1 mark)

iii) It takes 15 seconds for 45cm³ of chlorine to diffuse through the combustion tube. How long will it take 135cm³ of hydrogen sulphide to diffuse under similar conditions? (3 marks)

c) i) Complete the table below involving variation of volume with pressure at constant temperature. (3 marks)

Pressure (Pascals)	101325		103221	
Volume (cm³)	80	100		120

ii) State the law being investigated in (i) above. (1 mark)

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2016
Paper - 233/3
CHEMISTRY PRACTICAL
PAPER 3

1. **a)** You are provided with
- 2.0M sodium hydroxide solution labelled solution B
- Solution C containing 12.25 g per litre of an mineral acid C

You are required to

i) Prepare a dilute solution of sodium hydroxide, solution B.

ii) Determine the
Relative Formular mass of the acid C
Molar Enthalpy change of reaction between acid C and sodium hydroxide solution B.

Procedure 1.
Using a pipette and a pipette filler place 25.0cm³ of solution B in a 250.0ml volumetric flask. Add to it about 150cm³ of distilled water. Shake well. Add more distilled water to make upto the mark. Label this solution D.

Fill a burette with solution C. Using a clean pipette and a pipette filler, place 25.0cm³ of solution D into a 250ml conical flask. Add two drops of phenolphthalein indicator and titrate with solution C. Record your results in table 1. Repeat the titration two more times and complete the table.

	1	2	3
Final burette reading (cm³)			
Initial burette reading (cm³)			
Volume of solution C used (cm³)			

Calculate the
i) average volume of solution C used. (1 mark)
ii) moles of solution D used. (2 marks)
iii) Concentration in moles per litre of acid in solution C given that the number of moles of acid C used are half the moles of D used. (2 marks)
vi) Relative formula mass (RFM) of solution C. (1 mark)

b) Procedure II.
i) Using a clean burette, place 5.0cm³ of solution C into each of six (6) test-tubes.
ii) Using a 100ml measuring cylinder, place 20cm³ of solution D, sodium hydroxide solution in a 100ml plastic beaker. Measure the temperature of solution D and record it in table 2 below.
iii) To solution D in the beaker, add acid C, solution C from one of the test-tubes. Stir the mixture with the thermometer and record in Table 2, the maximum temperature reached. Continue with step (iv) IMMEDIATELY
iv) Add the acid C, solution C from another test-tube to the mixture obtained in (iii) above, stir and record the maximum temperature reached in Table 2. Continue adding the acid C, solution C from each of the other four test-tubes, stirring the mixture and recording the maximum temperature each time and complete Table 2.

TABLE 2

Volume of solution C acid C added (cm³)	0	5	10	15	20	25	30
Maximum temperature (°C)							

c) On the grid provided, plot a graph of temperature (vertical axis) against volume of acid C solution C added. (3 marks)
d) Using the graph
i) determine the volume of solution C which gave the maximum change in temperature. (1 mark)
ii) determine the temperature change, DT, for the reaction. (1 mark)
e) Using your answer in parts d(i) and d(ii), calculate the molar enthalpy change of the neutralisation reaction between acid C and sodium hydroxide solution.
(Heat capacity = 4.2J g^{-1} k^{-1}; density of the mixture= 1.0gcm^{-3}) (3 marks)

2. You are provided with substance P. Carry out the tests below and write your observations and inferences in the spaces provided.
a) Describe the appearance of substance P. (1 mark)
b) Place about one third of substance P in a dry test-tube and heat it strongly.
c) Place the remaining amount of substance P in a boiling tube. Add about 10cm³ of distilled water and shake well. Retain the

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

BURETI SUB-COUNTY JOINT EVALUATION TEST
233/1
CHEMISTRY
PAPER 1

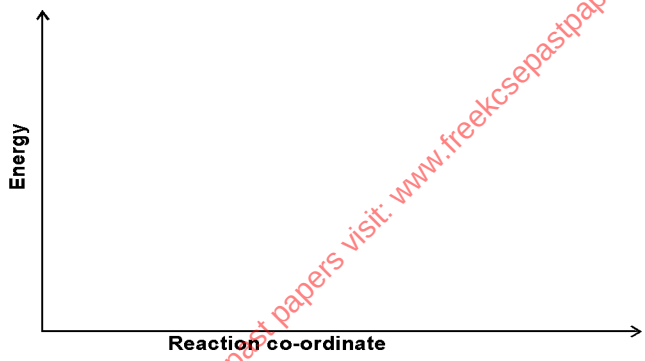
1. a) What name is given to the process by which alcohol is formed from a carbohydrate. (1 mark)
   b) Explain why the solubility of ethane in water is lower than that of ethanol. (2 marks)
2. When solid A was heated strongly, it gave off water and a solid residue. When water was added to the solid residue, the original solid A was formed.
   a) What name is given to the process described. (1 mark)
   b) Give **one** example of solid A. (1 mark)
3. The table below gives some properties of three elements in group VII of the periodic table. Study it and answer the questions that follow.

Element	Atomic No.	Melting point (°C)	Boiling point (°C)
Chlorine	17	-101	-34.7
Bromine	35	-7	58.8
Iodine	53	114	184

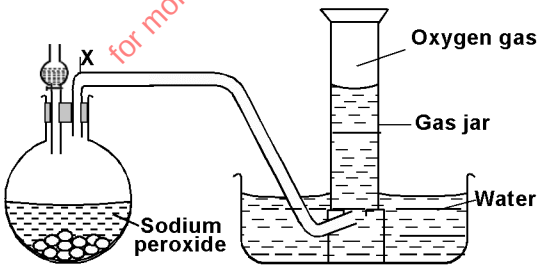
   a) Which element is in liquid form at room temperature ? Give a reason. (1 mark)
   b) Explain why the boiling point of Iodine is much higher than that of chlorine. (2 marks)
4. The thermochemcial reaction between carbon and sulphur is as shown by the equation below.

$$C_{(S)} + 2S_{(S)} \rightarrow CS_{2(l)} \quad \Delta H = +117kJmol^{-1}$$

On the grid below, sketch and label the energy level diagram for the reaction. (2 marks)



5. The set-up below can be used to prepare oxygen gas. Study it and answer the questions that follow.



   a) Identify X..... (1 mark)
   b) What property of oxygen makes it possible for it to be collected as shown in the above set-up? (1 mark)
   c) State **two** uses of oxygen (1 mark)
6. Describe an experimental procedure that can be used to extract oil from nut seeds. (2 marks)
7. A beaker contained 75.0cm^3 of aqueous copper (II) sulphate at 23.7°C. When scrap Iron metal was added to the solution, the temperature rose to 29.3°C
   a) Write an equation for the reaction that took place. (1 mark)
   b) Given that the mass of copper deposited was 5.83g, calculate the molar enthalpy change in kJmol^{-1} (specific heat capacity of solution = 4.2Jg^{-1}k^{-1}, density of solution = 1.0g/cm^3, Cu=63.5) (2 marks)
8. Analysis of a compound showed that it had the following composition:
   69.42%, carbon, 4.13%, Hydrogen and the rest oxygen.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

a) Determine the empirical formula of the compound. (C=12.0, H=1, O=16) (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

b) If the mass of one mole of the compound is 242, determine its molecular formula. (1 mark)

9. The diagram below represents part of the periodic table. Use it to answer the question that follow.

M					Q			
T	V		W					

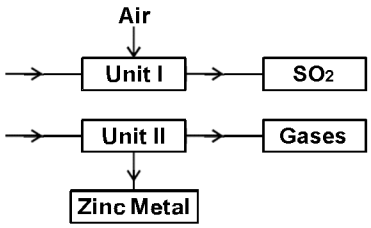
a) Write the electronic arrangement for the stable ion formed by W. (1 mark)

b) Write an equation for the reaction between V and Q (1 mark)

c) How do the ionisation energies of element M and T compare? Explain. (1 mark)

10. Distinguish between the terms deliquescent and efflorescent as used in chemistry. (2 marks)

11. The flow chart below shows some processes involved in the industrial extraction of zinc metal.



a) Name **one** ore from which zinc is extracted. (1 mark)

b) Write the equation for the reaction taking place in unit II. (1 mark)

c) Name **two** uses of zinc metal. (1 mark)

12. The use of CFCs has been linked to depletion of the ozone layer.

a) What does CFC stand for? (1 mark)

b) Explain the problem associated with the depletion of the ozone layer. (1 mark)

c) State another environmental problem caused by CFC. (1 mark)

13. The table below gives the solubilities of substances T and U at 10°C and 40°C.

Substance	Solubility g/100g water	
	10°C	40°C
T	40	65
U	15	17

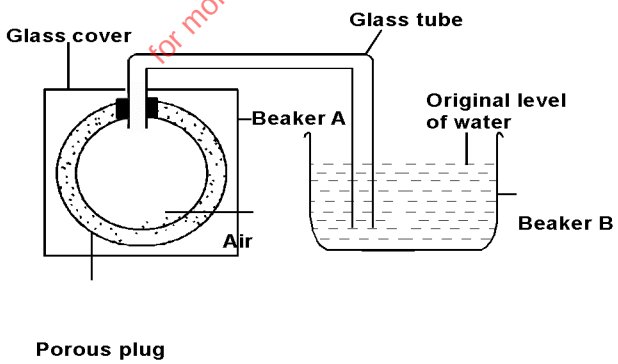
When an aqueous mixture containing 55g of T and 12g of U at 80°C was cooled to 10°C, crystals formed.

a) Identify the crystals formed. (1 mark)

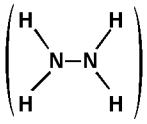
b) Determine the mass of the crystals formed. (1 mark)

c) Name the method used to obtain the crystals. (1 mark)

14. The set-up shown below was used to investigate a property of hydrogen gas.



State and explain the observation that would be made in the glass tube if beaker A was filled with hydrogen gas. (3 marks)

15. Hydrazine gas  burns in oxygen to form nitrogen gas and steam.

a) Write an equation for the reaction. (1 mark)

b) Using the bond energies given below, calculate the enthalpy change for the reaction in (a) above. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

Bond	Bond energy (kJ per mole)
N □□N	944
N - N	163
N - H	388
O = O	496
H - O	463

16. Aqueous, hydrogen chloride gas reacts with potassium manganate (VII) to produced chlorine gas while a solution of hydrogen chloride in methylbenzene has no effect on potassium manganate (VII). Explain this observation. (2 marks)

17. a) What would be observed if sulphuric (IV) oxide is bubbled through acidified potassium manganate (VII)? (1 mark)

b) In an experiment, sulphuric (IV) oxide was dissolved in water to form solution L.

i) What would be observed if a few drops of barium nitrate solution were immediately added to solution L ? (1 mark)

ii) Write an ionic equation for the reaction that occurred between solution L and aqueous barium nitrate in b(i) above. (1 mark)

18. a) Diamond and graphite are allotropes of carbon. What is meant by an allotrope? (1 mark)

b) Explain why graphite can be used as a lubricant while diamond cannot. (2 marks)

19. A solution was made by dissolving 8.2g of calcium nitrate to give 2 litres of solution (Ca=40, N=14, O=16). Determine the concentration of nitrate ions in moles per litres. (3 marks)

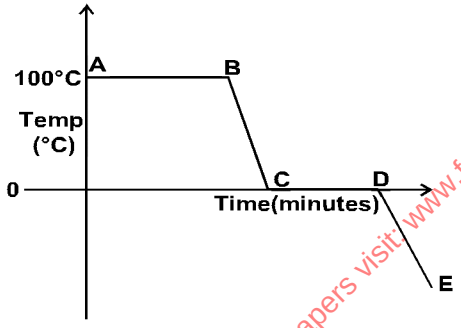
20. The atomic number of an element T is 15.

a) Write the electronic configuration of the ion T^{3-}. (1 mark)

b) Write the formula of an oxide of T. (1 mark)

21. Dilute sulphuric (VI) acid was electrolysed using platinum electrodes. Name the product formed at the anode and give a reason for your answer. (2 marks)

22. The graph below is a cooling curve for water. Study it and answer the questions that follow.



a) Explain what happens to the molecules of water in the region BC in terms of kinetic theory. (2 marks)

b) In what state is the water in the region DE? (1 mark)

23. a) Describe how carbon(IV) oxide can be distinguished from carbon (II) oxide using calcium hydroxide solution. (2 marks)

b) What is the role of carbon (IV) oxide in fire extinguishing? (1 mark)

24. Study the standard electrode potentials in the table below and answer the questions that follow.

	E^{θ} volt
$Cu^{2+}_{(aq)} + 2e^{-} \rightarrow Cu_{(S)}$	+ 0.34
$Mg^{2+}_{(aq)} + 2e^{-} \rightarrow Mg_{(S)}$	-2.38
$Ag^{+}_{(aq)} + e^{-} \rightarrow Ag_{(S)}$	+0.80
$Ca^{2+} + 2e^{-} \rightarrow Ca_{(S)}$	-2.87

a) Which of the metals is the strongest reducing agent. (1 mark)

b) What observations will be made if a silver coin was dropped into an aqueous solution of copper (II) sulphate? Explain. (2 marks)

25. a) Name the raw material from which sodium is extracted. (1 mark)

b) Give a reason why sodium is extracted using electrolysis. (1 mark)

c) Give **two** uses of sodium metal. (1 mark)

26. When magnesium carbonate is heated the equilibrium shown below is established.

for more free past papers visit www.freekcsepastpapers.com or call: 0720502419

$$MgCO_{3(s)} \rightleftharpoons MgO_{(s)} + CO_{2(g)}$$

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

How would the position of the equilibrium be affected if a small amount of dilute potassium hydroxide solution is added to the equilibrium mixture. Explain (2 marks)

27. In an experiment three separate samples of water were tested using soap solution to find out the volume of soap needed to form permanent lather with 1000cm³ of the water sample. Each sample was boiled and again the amount of soap required was determined. The following results were obtained

	SAMPLE		
	I	II	III
Volume of soap required before boiling (cm³)	27.0	3.0	10.6
Volume of soap required after boiling (cm³)	27.0	3.0	3.0

a) Explain the change in the volume of soap solution in sample III. (2 marks)

b) Write down the formula of the compounds present in sample I. (1 mark)

28. Calculate the oxidation state of sulphur in the following compounds. (2 marks)

i) $Na_2S_2O_3$ .....

ii) H_2S ....

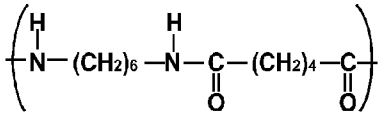
29. Aluminium oxide reacts with both dilute acids and alkalis.

Write the equation for the reaction between aluminium oxide and

i) dilute sulphuric acid. (1 mark)

ii) Sodium hydroxide solution (1 mark)

30. The following is a structure of a polymer.



a) Draw the structures of the monomers forming the above polymer. (2 marks)

b) Identify the type of polymerization represented above. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

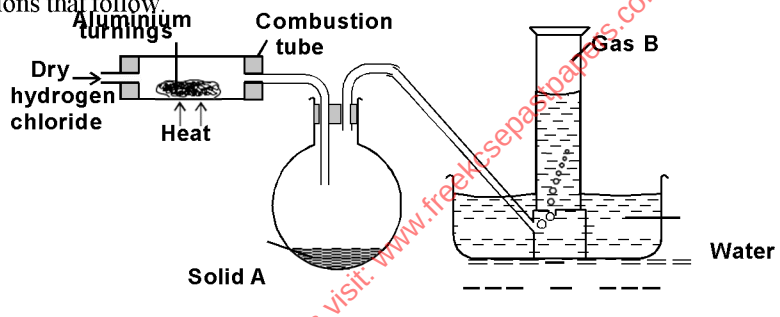
BURETI SUB-COUNTY JOINT EVALUATION TEST
233/2
CHEMISTRY
PAPER 2

1. **a)** The table below shows some elements of the periodic table and their atomic numbers (The letters do not represent the actual symbols of the elements). Study it and answer the questions that follow.

Element	A	B	C	D	E	F	G	H	I	J
Atomic number	1	7	8	19	15	2	9	6	16	20
Electronic configuration										

i) Complete the table by filling the electronic configuration for each element. (5 marks)
ii) Which letter represents:
I. The most powerful reducing agent.
Explain 1 mark)
II. The most powerful oxidizing agent
Explain. (1 mark)
iii) Select two elements with oxidation state of -2. (1 mark)
iv) Which element has the highest first ionization energy? Explain. (1 mark)
v) Select two elements which when reacted form a compound that conducts electricity both in molten and aqueous state. (1 mark)
vi) Which two elements when reacted form a compound that dissolves in water to form an acidic solution? (1 mark)
vii) Using dots (•) and cross (×) to represent electrons, show the bonding in a compound formed when A combines with B. (2 marks)

2. The diagram below shows a set up in which dry hydrogen chloride gas was reacted with aluminium turnings. Study it and answer the questions that follow.



a) Name two reagents that are commonly used to prepare hydrogen chloride gas and write an equation for the reaction.
Reagents
Equation (1 mark)
b) Name two reagents that would be used to dry hydrogen chloride gas.
c) Name
Solid A ..... (½ mark)
Gas B ..... (½ mark)
d) Explain why it is possible to collect solid A using the method shown. (1 mark)
e) Give an equation for the reaction that takes place in the combustion tube. (1 mark)
f) After the reaction has gone on for some time, the water in the trough turns blue litmus paper red. Explain. (1 mark)
g) State and explain the observation that would be made if Aluminium was replaced with copper in the combustion tube. (2 marks)
h) Potassium manganate (VII) oxidizes concentrated hydrochloric acid forming chlorine gas as per the equation below.

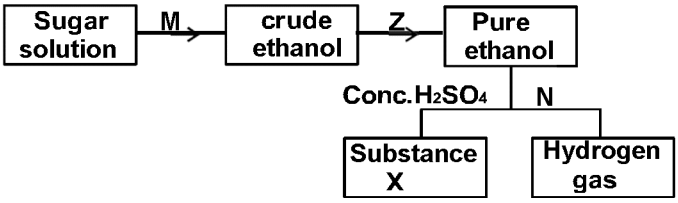
$$2KMnO_{4(S)} + 16HCl_{(aq)} \rightarrow 2KCl_{(aq)} + 2MnCl_{2(aq)} + 8H_2O_{(l)} + 5Cl_{2(g)}$$

Calculate the maximum volume of chlorine measured at standard temperature and pressure that can be obtained when 15.8g $KMnO_4$ reacts completely with hydrochloric acid.
(K=39, Mn = 55, O=16, M.G.V at s.t.p = 22.4dm³) (3 marks)

3. a) Draw the structural formula of each of the following organic compounds.
i) Ethan-1, 2-diol (1 mark)
ii) Magnesium -2- methyl butanoate. (1 mark)
iii) Ethylbutanoate (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call 0720502479

b) Study the flow chart below and answer the questions that follow.



Name

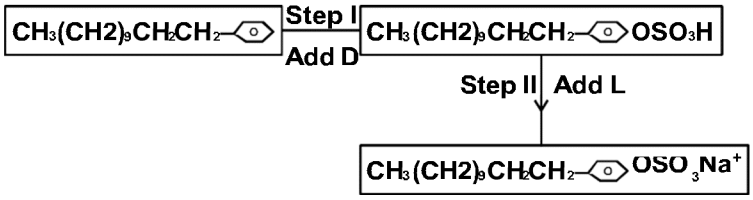
i) Substance M..... (½ mark)

ii) Process Z..... (½ mark)

iii) Substance N..... (½ mark)

iv) Substance X..... (½ mark)

c) The flow chart below shows the manufacture of a cleansing agent.



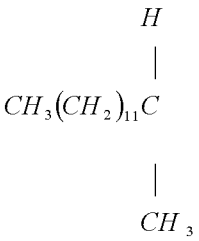
i) Name substances D,L

ii) Explain how the above cleansing agent improves the cleaning properties of water. (1 mark)

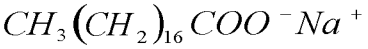
iii) Give one advantage of using this cleaning agent over ordinary soap. (1 mark)

d) The formulae below represent active ingredients of two cleansing agents A and B.

A.



B.



Which one of the cleansing agents would be least suitable for washing in water containing magnesium hydrogen carbonate ? Explain. (2 marks)

e) Dacron is a synthetic fibre formed by polymerization reaction between a dicarboxylic acid and a diol (a polyhydric alkanol)

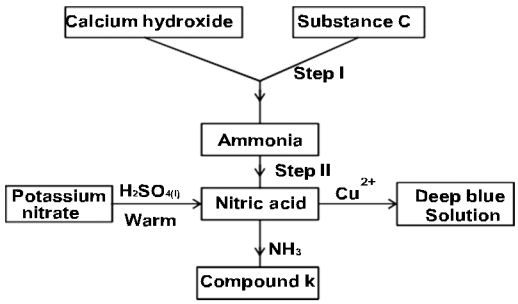
Dicarboxlic acid Ethanel -1, 2 - diol

i) Show how polymerization between the two occurs. (1 mark)

ii) Name the type of polymerization involved in forming Dacron (1 mark)

iii) Give one advantage of synthetic fibres over natural fibres. (1 mark)

4. a) Use the flow chart drawn to answer the questions that follow.



Name

I. i) Substance C..... (½ mark)

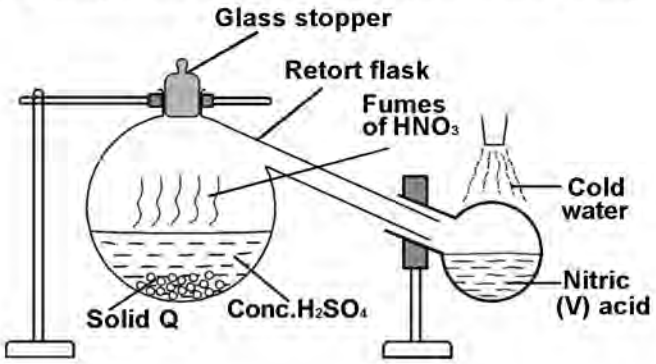
ii) Compound K..... (½ mark)

iii) The deep blue solutions..... (½ mark)

II. Write the formula of compound K. (½ mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

b) The following set-up is used to prepare nitric (V) acid in the laboratory.



i) All the apparatus used during preparation of nitric (V) acid are made of glass. Give a reason. (1 mark)
ii) Name solid Q ..... .(1 mark)
iii) Give a reason why it is possible to separate nitric (V) acid from the sulphuric (VI) acid used as one of the reagents. (1 mark)
iv) Give two uses of nitric (V) acid. (2 marks)

c) In an experiment, 1200cm^3 of ammonia gas measured at r.t.p reacted completely with copper(II) oxide. Calculate
i) The mass of copper formed. (3 marks)
ii) The volume of the nitrogen gas formed. (2 marks)

(N=14, H=1, Cu=64, O=16, M.G.V. at r.t.p = 24dm^{-3})

5. a) State Charles's law. (1 mark)

b) The table below shows the relationship between the volume of a fixed mass of a gas and its temperature (°C) at constant pressure.

Volume (cm^3)	30	32	34	37	39	41	43
Temperature (°C)	0	20	40	60	80	100	120
Temperature (K)							

i) Complete the table by filling the corresponding temperature in Kelvin. (3½ marks)
ii) Plot a graph of volume (cm^3) on the vertical axis against temperature in Celsius on the Horizontal axis using a temperature range : -300°C to 120°C (3 marks)
iii) Extrapolate the graph in (ii) above to cut the horizontal axis and read the temperature value. (1 mark)
iv) Determine from the graph, the volume of the gas when the temperature is -225°C. (1 mark)

c) A balloon contains 100cm^3 of air at 25°C. The balloon was put outside in the sun where the temperature was 40°C. Calculate the new volume of air. (2½ marks)

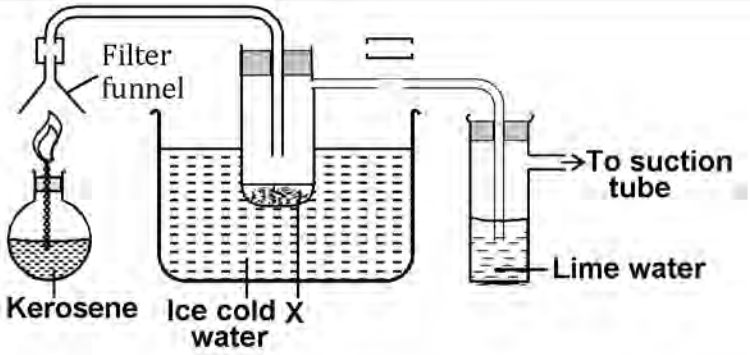
6. a) The table below shows the observation made when an electric current was passed through two substances, A and B.

Substance	Observation
Molten A	conducts an electric current and a greyish substances is deposited at the cathode
Molten B	Conducts an electric current and is not decomposed.

i) Give the type of structure and bonding that is present in substances A and B.
Substance A
Structure ..... (1 mark)
Bonding ..... (1 mark)
Substance B
Structure ..... (1 mark)
Bonding ..... (1 mark)
ii) Name the particles that are responsible for electrical conductivity in
Substance A ..... .(½ mark)
Substance B ..... (½ mark)
iii) Which of the two substances would not conduct electricity in its solid state? Explain. (2 marks)
iv) If one of the substances is metal bromide, state the observation you would expect to make at the anode (1 mark)
v) In what other state would you expect substance A to conduct electricity ? Explain. (2 marks)

7. The diagram below shows an experiment to demonstrate the products formed when an organic compound burns in air. Study it and answer the questions that follow.

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479



a) Identify liquid X..... (½ mark)
b) Describe how liquid X would be tested to confirm its purity. (2 marks)
c) State the role of ice-cold water in the experiment. (½ mark)
d) State and explain the observation that would be made in the boiling tube containing lime water. (2 marks)
e) When a certain hydrocarbon is burnt completely in excess oxygen, 5.28 g of carbon (IV) oxide and 2.16g of water were formed. If the molecular mass of the hydrocarbon is 84, determine the molecular formula of the hydrocarbon.

BURETI SUB-COUNTY JOINT EVALUATION TEST
Paper - 233/3
CHEMISTRY PRACTICAL
PAPER 3

1. You are provided with
- 1.5g of solid P, a metal hydrogen carbonate, $MHCO_3$
- Hydrochloric acid solution Q
- Solution R, which was prepared by dissolving 10.5g of $MHCO_3$ in about 100cm³ of distilled water and topping up to 250ml. Mark of the solution.

You are required to:
- Standardise solution Q using solution R
- Determine the enthalpy change for the reaction between solution Q, hydrochloric acid and solution R, $MHCO_{3(aq)}$

Procedure I
i) Pipette exactly 25cm³ of solution R into a clean 250ml. Conical flask.
ii) Add two drops of methyl orange indicator.
iii) Fill the burette with solution Q
iv) Titrate solution Q with solution R. Stop titrating when a permanent colour JUST appears, and record your results in the table below.
v) Repeat procedure (i) and (iv) and complete table 1 below.

Table 1

Experiment Number	I	II	III
Final burette reading (cm³)			
Initial burette reading (cm³)			
Volume of solution Q used (cm³)			

(4 mar

a) Workout the average volume of solution Q used. (1 mark)
Calculate the :
b) Concentration of R in moles per litre (RFM of $MHCO_3$ = 84) (2 marks)
c) Number of moles of :
i) solution R in 25cm³ used. (1 mark)
ii) Solution Q in the averaged titre (1 mark)
d) Molarity of solution Q. (1 mark)

PROCEDURE II.
i) Fill the burette with solution Q.
ii) Measure exactly 35cm³ of solution Q from the burette and place it in a clean 250cm³ plastic beaker.
iii) Using a thermometer stir and take the temperature of solution Q every 30 seconds. Record the readings in table II below. At

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

exactly 150 seconds add ALL solid P into the contents in the plastic beaker and stir gently. Continue taking the temperature

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

every 30 seconds and complete the table II below. **(5 marks)**

Time (sec)	0	30	60	90	120	150	180	210	240	270	300
Temperature (°C)											

a) On the grid provided, plot a graph of time (seconds) against temperature (Y -axis) (3 marks)
b) Using your graph determine the change in temperature. show your working. (1½ marks)
c) Calculate the
   i) enthalpy change in Joules for the reaction when 1.5g of solid P was used (specific heat capacity of the solution is $4.2Jg^{-1}k^{-1}$, density of solution is $1.0gcm^{-3}$) (2 marks)
   ii) Molar enthalpy change for the reaction in Kilojoules per mole. (1½ marks)

2. You are provided with solid F. You are required to carry out the tests, write observations and inferences in the table below.
a) Place a spatula end full of solid F into a clean dry test tube. Heat it gently followed by strong heating, while the mouth of the test tube faces away from you. Test for any gases produced (if any) with red an blue litmuspapers.
b) Place another spatula end full of solid F into a clean boiling tube and shake thoroughly for about one minute. Retain and divide the result into four 2mls portions for future use in (c) to (f) below
c) To the first portion add 3 drops of sodium carbonate solution
d) To the second portion add aqueous ammonia dropwise until in excess.
e) To the third portion, add six drops of lead (II) nitrate solution. Shake the contents well and filter.
f) To the fourth portion, add three (3) drops of calcium nitrate solution followed by five drops of dilute hydrochloric acid.

3. You are provided with an organic compound solid K. You are required to carry out tests,, write the observations and the inferences in the spaces provided.
Place a spatula endfull of solid K into a clean boiling tube. Add about $15cm^3$ of distilled water and shake the mixture thoroughly.
a) Place about $2cm^3$ portion into a clean test-tube add 2 drops of acidified potassium manganate (VII) solution.
b) To another $2cm^3$ portion in a different clean test-tube add 2 drops of acidified potassium dichromate (VI) solution.
c) To the third portion add half spatula of solid sodium hydrogen carbonate.

CONFIDENTIAL INSTRUCTIONS

Each candidate should be provided with the following :
- orange / lemon
- DCPIP
- scalpel blade
- a dropper
- a 10ml measuring cylinder
- 2 test tubes
- a beaker
- bone M - lumbar vertebra
  N - cervical vertebra

for more free past papers visit: www.freekcsepastpapers.com or call: 0720392479

BURETI SUB-COUNTY JOINT EVALUATION TEST
233/1
CHEMISTRY
Marking scheme

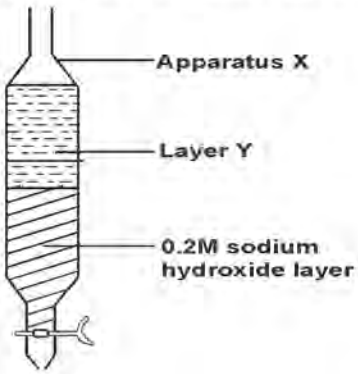
1.
a) Fermentation.
b) Ethane remains in molecular form while ethanol forms hydrogen bonds with water.

2.
a) Reversible reaction / temporary chemical change.
b) Hydrated copper (II) sulphate, hydrated cobalt (II) chloride, hydrated copper (II) chloride.

3.
a) Bromine : At room temperature (25°C), bromine is liquid since its melting and boiling points is below -7 and 59.
b)
- Atomic mass of iodine is higher than that of chlorine.
- Van der Waals forces are stronger in Iodine than chlorine hence iodine's boiling point is higher than that of chlorine.

KISII CENTRAL FORM 4 JOINT EVALUATION
233/1
CHEMISTRY
PAPER 1

1. An element in period 4 of the periodic table forms a basic oxide of formula P_2O.
   a) What is the valency of P ? (1 mark)
   b) What name is given to the group of elements in which element P belongs ? (1 mark)
   c) Write down the electronic arrangement of P in the oxide P_2O. (1 mark)
2. a) State Graham's law of diffusion. (1 mark)
   b) The rate of diffusion of sulphur (IV) oxide gas through a porous material is $40cm^3s^{-1}$. Calculate the rate of diffusion of carbon (IV) oxide gas through the same porous material.
   (S= 32.0, O = 16.0, C = 12.0) (2 marks)
3. An aqueous solution of hydrogen chloride gas reacts with manganese (IV) oxide to form chlorine gas while a solution of hydrogen chloride in methylbenzene does not react with manganese (IV) oxide. Explain. (2 marks)
4. A mixture of propane and propanoic acid was shaken with 0.2M sodium hydroxide solution and let to separate as shown in the diagram below.



   a) Name apparatus X. (1 mark)
   b) Name the main component in layer Y. Give a reason for the answer. (2 marks)
5. Chlorine and iodine are elements in the same group in the periodic table. Chlorine gas is yellow while aqueous iodine, $I_{2(aq)}$ is brown.
   a) What observation would be made if chlorine gas is bubbled through aqueous potassium iodide? Explain using an ionic equation. (2 marks)
   b) Under certain conditions, chlorine and iodine react to give iodine trichloride, $ICl_{3(s)}$. What type of bonding would you expect to exist in iodine trichloride ? Explain. (1 mark)
6. When 0.6g of element J were completely burnt in oxygen and all the heat evolved was used to heat 0.5 litres of water, the temperature of the water changed by 11°C. Calculate the relative atomic mass of element J given that the specific heat capacity of water = $4.2Jk^{-1}g^{-1}$, density of water = $1.0g/cm^3$ and molar heat of combustion of J is $380KJmol^{-1}$. (3 marks)
7. During extraction of iron in the blast furnace, state the uses of the following in the furnace.
   a) Molten slag (1 mark)
   b) Waste gases leaving the furnace. (1 mark)
   c) Limestone (1 mark)
8. Radioactive Polonium-216 decays as shown below:

$$^{216}_{84}Po \longrightarrow {}^{208}_{82}Pb + {}^{m}_{n}\beta + {}^{0}_{m}\alpha$$

   a) Determine the value of :
      i) m (1 mark)
      ii) n (1 mark)
   b) Distinguish between nuclear fusion and nuclear fission. (1 mark)
9. A reagent bottle containing concentrated hydrochloric acid has a density of $1.18g/cm^3$, molecular mass of 36.5 and is 36%

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

pure.

a) Determine the molarity of the concentrated acid. (2 marks)

b) What volume of the concentrated acid would be required to make one litre of 1M dilute acid ? (1 mark)

10. Starting with copper metal describe how copper (II) carbonate can be prepared inthe laboratory. (3 marks)

11. When bromine gas reacts with aqueous sodium hydroxide, an equilibrium is established as shown below.

$$Br_{2(aq)} + 2OH^-_{(aq)} \underset{\text{(Brown)}}{\rightleftharpoons} Br^-_{(aq)} + OBr^-_{(aq)} + \underset{\text{(colourless)}}{H_2O_{(l)}}$$

Explain what would be observed if a few drops of dilute sulphuric (VI) acid were added to the equilibrium mixture. (2 marks)

12. On strong heating sodium nitrate liberates oxygen gas. In the space provided below, draw a labelled diagram of a set upthat

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

could be used for heating sodium nitrate and collecting the oxygen gas liberated. (3 marks)

13. When a hydrated sample of $CaSO_4.nH_2O$ was heated until all water was lost, the following data was recorded.
Mass of crucible = 30.296g
Mass of crucible + hydrated salt = 33.111g
Mass of crucible + anhydrous salt = 32.781g
Determine the value of n in the hydrated salt ($CaSO_4$ = 136, H_2O = 18) (2 marks)

14. Use the cell representation below to answer the questions that follow.
$Cr_{(s)} / Cr^{3+}_{(aq)} // Fe^{2+}_{(aq)} / Fe_{(s)}$

a) Write the equation for the cell reaction. (1 mark)
b) If the e.m.f of the cell is +0.30volts and E^{θ} value for $Fe^{2+}_{(aq)} / Fe_{(s)}$ is -0.44 volts, calculate the E^{θ} for $Cr^{3+}_{(aq)} / Cr_{(s)}$ (2 marks)

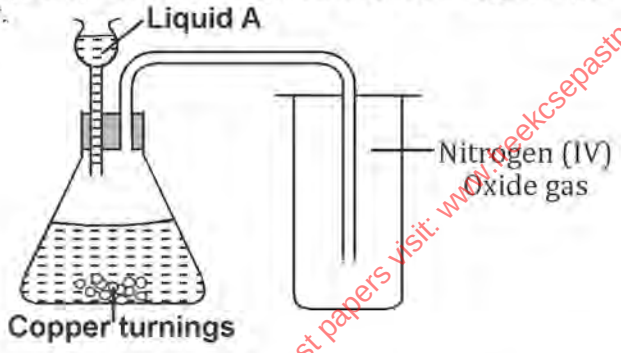
15. When excess carbon (II) oxide gas was passed over heated lead (II) oxide in a combustion tube, lead (II) oxide was reduced.
a) Write an equation for the reaction which took place. (1 mark)
b) What observation was made in the combustion tube when the reaction was complete ? (1 mark)
c) Name another gaseous compound which could be used to reduce lead (II) oxide. (1 mark)

16. The table below shows the pH values of solutions A, B, C and D.

Solution	A	B	C	D
P^H value	2	7	11	14

a) Which solution is likely to be that of calcium hydroxide ? (1 mark)
b) Select the solutions in which a sample of zinc oxide is likely to dissolve. Give a reason for your answer. (2 marks)

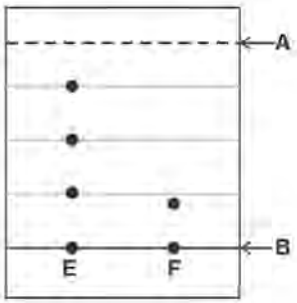
17. The following set up was used to prepare and collect nitrogen (IV) oxide in the laboratory. Study it and answer the questions that follow.



a) Identify liquid A. (1 mark)
b) Write the equation for the reaction that produces nitrogen (IV) oxide gas. (1 mark)
c) Name the method used to collect nitrogen (IV) oxide. (1 mark)

18. a) Draw and name structures of the two positional isomers of butene, C_4H_8. (2 marks)
b) Name the type of reaction that occurs when chlorine gas is mixed with methane gas in sunlight. (1 mark)

19. The following is chromatogram showing the results obtained after separating two substances E and F.



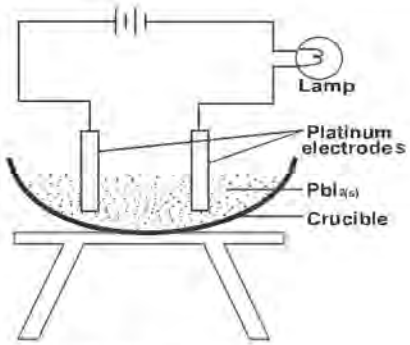
a) Name lines (1 mark)
b) Name a suitable solvent which can be used in the above process. (1 mark)
c) Which of the two substances is pure ? (1 mark)

20. Explain why there is a general increase in the first ionisation of the elements in period 3 of the periodic table from left to right. (2 marks)

for more free past papers visit: www.geekcsepastpapers.com or call: 0720502479

21. In an experiment to investigate the electrical conductivity of substances, a student used the set up shown below.

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

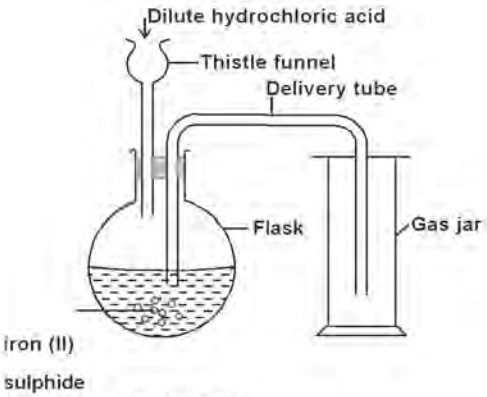


The student noted that the bulb did not light.

a) What had been omitted in the set up ? (1 mark)

b) Explain why the bulb lights when the omission is corrected. (2 marks)

22. Dilute hydrochloric acid and solid iron (II) sulphide were reacted as shown in the set up below.



a) Name the gas produced in the flask. (1 mark)

b) Give two reasons why no gas was collected in the gas jar. (2 marks)

23. When excess dilute hydrochloric acid was added to sodium sulphite, 960cm^3 of sulphur (IV) oxide gas was produced. Calculate the mass of sodium sulphite that was used. (Na = 23, S = 32, O = 16, molar gas volume= 24dm^3) (3 marks)

24. The table below shows the tests carried out on a sample of water and the results obtained.

	Tests	Results
I	Addition of sodium hydroxide solution dropwise until in excess	White precipitate which does not dissolve in excess
II	Addition of excess aqueous ammonia	No white precipitate
III	Addition of lead (II) nitrate then heating the mixture	White precipitate that dissolves on heating

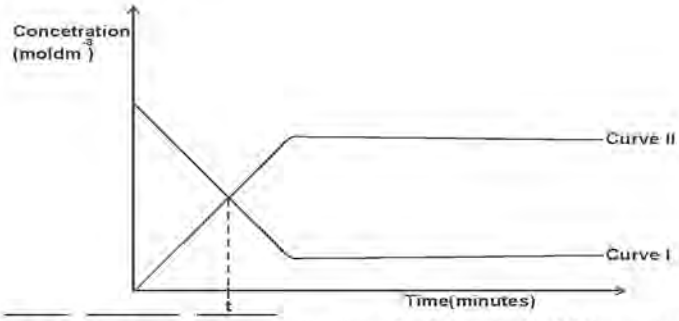
a) Identify the anion present in the water. (1 mark)

b) Write an ionic equation for the reaction in III. (1 mark)

c) What type of hardness is in the sample of water ? (1 mark)

25. The curves below represent the changes in the concentrations of subtstances C and D with time in the reaction

$C_{(g)} \rightleftharpoons D_{(g)}$



a) Which curve represents the change in concentration of substance C. ? Give a reason. (2 marks)

b) What is the significance of time 't' ? (1 mark)

26. An ion of aluminium can be represented as. Drawa diagram to show the distribution of the electrons and the composition of the nucleus of the ion of aluminium. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

27. Complete the table by inserting the missing information in the spaces provided. (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

Name of polymer	Name of monomer	One use of the polymer
i) Polychloroethene	.....	.....
ii)	Propene	.....

28. a) Define the term solubility. (1 mark)
b) 70g of salt Y were added to 80cm^3 of water at 25°C. After stirring, 10g of crystals of Y were filtered out. Determine the solubility of salt Y at 25°C. (2 marks)
29. The atomic and mass numbers of two elements M and N are and respectively. Describe how one can distinguish between the oxides of the elements above. (2 marks)

KISII CENTRAL FORM 4 JOINT EVALUATION
233/2
CHEMISTRY
PAPER 2

1.
a) The grid below represents part of the periodic table. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements ?

A				E			H	
	C		D		G			K
B				F			J	

i) Select the most reactive non-metal. Give a reason for your answer. (2 marks)
ii) Explain how the melting points of elements C and D compare. (2 marks)
iii) Explain why the atomic radius of K is smaller than that of G. (1 mark)
iv) Element W forms ion W^{2-} and is found in period 3. Indicate the position of W on the grid. (1 mark)
v) Write an equation for the reaction between C and H. (1 mark)

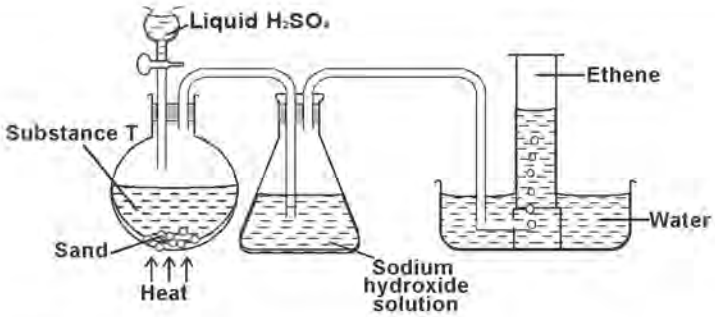
b) Study the table below and answer the questions that follow.

Formula of chloride	NaCl	$MgCl_2$	$AlCl_3$	$SiCl_4$	PCl_3
Melting point (°C)	801	714	-	-	-
Formula of oxide	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5
Melting point (°C)	1190	3080	2050	1730	560

i) Using dots (•) and crosses (x) to represent electrons in the outermost energy level, show the bonding in the following compounds.
I. PCl_3 (1 mark)
II. $MgCl_2$ (1 mark)
ii) Why is the melting point of $AlCl_3$ not indicated in the table above ? (1 mark)
iii) Explain the large difference in the melting points of MgO and P_2O_5. (2 marks)

2.
a) Crude oil is a source of many compounds that contain carbon and hydrogen only.
i) Name the process used to separate the components of crude oil. (1 mark)
ii) On what two physical properties of the above components does the separation depend ? (2 marks)
b) Under certain conditions hexane can be converted into two products. The formula of one of the products is C_3H_6.
i) Write the formula of the other product. (1 mark)
ii) Describe a simple chemical reaction to show the difference between the two products formed in (b) above. (2 marks)
c) Ethyne C_2H_2 is another compound found in crude oil. One mole of ethyne was reacted with one mole of hydrogen chloride gas and a product A_1 was formed. A_1 was then reacted with excess hydrogen gas to form A_2.
i) Give the IUPAC name of product A1. (1 mark)
ii) Draw the structure of A_2. (1 mark)
d) The set up below was used to prepare and collect ethene gas. Study it and answer the questions that follow.

for more free past papers visit: www.mocksandpastpapers.com or call: 0720502479

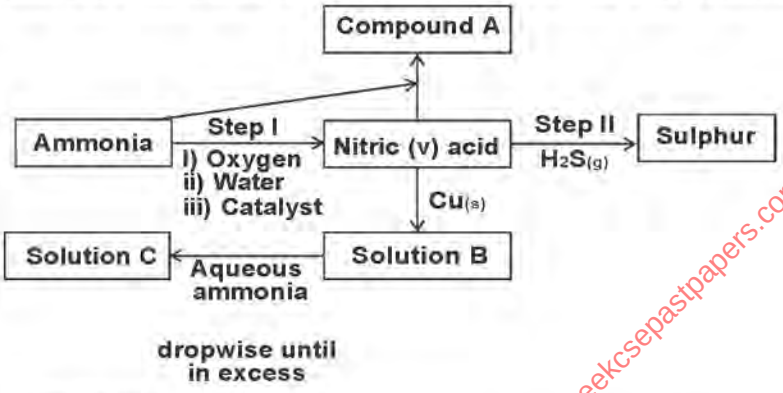


i) Identify substance T. (1 mark)
ii) What type of reaction is taking place in the round bottomed flask ? (1 mark)
iii) Give one property of ethene that allows it to be collected as shown in the set up. (1 mark)
iv) Name two gaseous impurities removed by the sodium hydroxide solution. (1 mark)

3.

a) Nitrogen and hydrogen are the raw materials used in the manufacture of ammonia. Name two sources of hydrogen used in this process. (1 mark)

b) The chart below shows some reactions starting with ammonia. Study it answer the questions that follow.



i) Name the catalyst used in step I. (1 mark)
ii) Write down the equation for the reaction that requires the catalyst in step I. (1 mark)
iii) What observation are made in step III ? (1 mark)
iv) Write down the formula of the complex ion present in solution C. (1 mark)
v) What property of concentrated nitric (V) acid is shown by the reaction in step II ? (1 mark)
vi) State one use of compound A. (1 mark)

c) 1.8 litres of ammonia gas was bubbled through excess dilute nitric (V) acid at room temperature and pressure. Determine the mass of the product formed. (Molar gas volume = 24.0dm^3, N = 14, O = 16, H = 1) (3 marks)

4.

a) Use the standard electrode potentials for elements J, K, L, M and N given below to answer the questions that follow. The letters do not represent the actual symbols of the elements.

	E^{θ} volts
$J^{2+}_{(aq)} + 2e^- \rightleftharpoons J_{(s)}$	-2.90
$K^{2+}_{(aq)} + 2e^- \rightleftharpoons K_{(s)}$	-2.38
$L^{+}_{(aq)} + e \rightleftharpoons \frac{1}{2}L_{2(g)}$	0.00
$M^{2+}_{(aq)} + 2e^- \rightleftharpoons M_{(s)}$	+0.34
$\frac{1}{2}N_{2(g)} + e \rightleftharpoons N^{-1}_{(aq)}$	+2.87

i) Which element is likely to be hydrogen ? Give a reason for your answer. (2 marks)
ii) What is the E^{θ} value of the strongest oxidising agent. (1 mark)
iii) In the space provided, draw a labelled diagram of the electrochemical cell that would be obtained when half-cells of elements K and M are combined. (3 marks)
iv) Calculate the E^{θ} value of the electrochemical cell constructed in (iii) above. (1 mark)

b) During the electrolysis of aqueous copper (II) sulphate using copper electrodes, a current of 0.5A was passed through the cell for 2 hours.
i) Write an ionic equation for the reaction that took place at the anode. (1 mark)

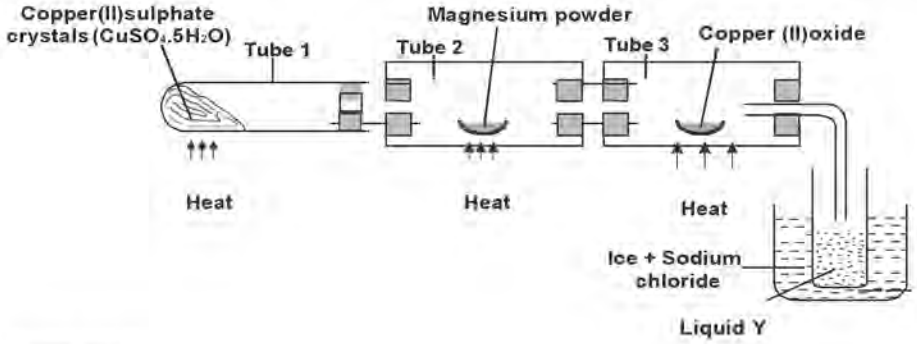
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

ii) Determine the change in mass of the anode which occured as a result of the electrolysis process. (Cu = 64.0, 1Faraday = 96500 coulombs) (3 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

c) State the main reason for electroplating metallic items. (1 mark)

5. The diagram below shows the apparatus for the preparation of gas P and investigation on its properties. Study it and answer the questions that follow.



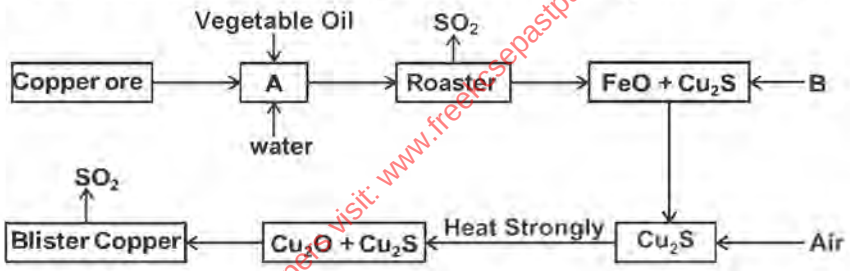
a) i) Name gas P. (1 mark)
ii) Suggest the property of gas P under investigation. (1 mark)
iii) Write chemical equations for the reactions in the :
I. tube 1 (1 mark)
II. tube 2 (1 mark)

b) State and explain the observations made in :
i) tube 1 (2 marks)
ii) tube 3 (2 marks)

c) i) What is the use of copper (II) sulphate crystals in the experiment ? (1 mark)
ii) State the role of sodium chloride in the ice (freezing mixture). (1 mark)
iii) Describe how the purity of liquid Y can be confirmed. (1 mark)

d) Explain why helium is preferred in filling of aeroplane tyres to gas P. (1 mark)6.

Study the flow chart below on extraction of copper and answer the questions that follow.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

a) Name the chief copper ore used for the extraction of copper. (1 mark)

b) The amount of copper in the copper ore is very small. State the method used to concentrate the ore in chamber A. (1 mark)

c) Identify substance B and state its function. (2 marks)

d) Write an equation for the reaction that takes place in the roaster. (1 mark)

e) The blister copper obtained is impure. With the aid of a diagram, describe how it can be purified. (2 marks)

f) Give two side effects that this process would have on the environment. (2 marks)

g) Bronze is an alloy of copper and another metal.
i) Give the chemical symbol of the other metal. (1 mark)
ii) State one use of bronze. (1 mark)

7.

a) State Hess's law. (1 mark)

b) Use the following thermochemical equations to determine the heat of formation of butane, C_4H_{10}. (3 marks)

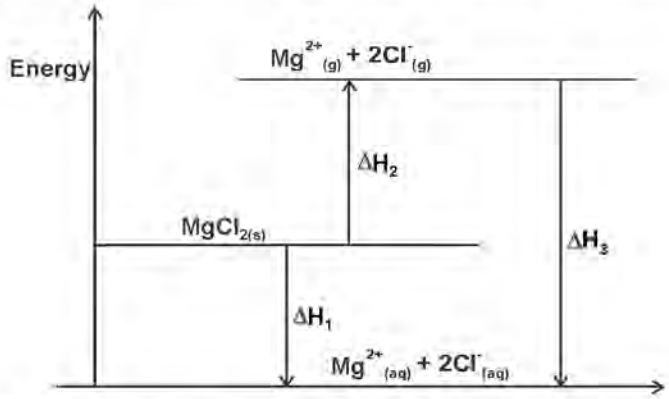
$C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)} \quad \Delta H = -393 kJmol^{-1}$

$H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(g)} \quad \Delta H = -286 kJmol^{-1}$

$C_4H_{10(g)} + {}^{13}/_2O_{2(g)} \rightarrow 4CO_{2(g)} + 5H_2O_{(g)} \quad \Delta H = -2877 kJmol^{-1}$

c) Explain how the hydration energies of fluoride (F^{-1}) and chloride (Cl^{-1}) ions compare. (2 marks)

d) The diagram below shows an energy level diagram for the dissolution of magnesium chloride. Study it and answer the questions that follow.



i) Which of the energy changes ΔH_1, ΔH_2 and ΔH_3 represent an exothermic process ? Explain. (2 marks)
ii) What is the relationship between ΔH_1, ΔH_2 and ΔH_3 ? (1 mark)
iii) i) Define heating value of a fuel. (1 mark)
ii) Give one reason why wood and charcoal are chosen for domestic heating. (1 mark)

KISII CENTRAL FORM 4 JOINT EVALUATION
233/3
CHEMISTRY
PAPER 3

1. You are provided with :
- 0.5M sodium hydroxide solution labelled solution N
- accurately weighed 6.3g of a dibasic acid, $H_2A.xH_2O$ labelled solid M
- acidified potassium manganate VII labelled solution P
- phenolphthalein indicator

Required :

i) To standardize solution M using solution N so as to obtain concentration of solution M in moles per litre and value of X in one mole of the dibasic acid, solid M.
ii) To determine the rate of reaction between solution M and solution P at different temperatures.

Procedure I

Put all solid M into a 200ml clean beaker. Add 100cm^3 of distilled water and stir until all the solid M dissolves.
Transfer the resulting solution into a 250ml volumetric flask. Add more water to the mark. Shake to homogeneous. Label the solution as solution M.
Fill the burette with solution N.
Using a pipette filler and pipette place 25cm^3 of solution M into a 250ml conical flask. Add 2-3 drops of phenolphthalein indicator.
Titre solution N with solution M till end point. Record your results in table 1. Repeat to complete I with consistent readings.
(Retain solution M for procedure II and question 3)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

Experiment No.	1	2	3
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution N used			

(4 marks)

a) Calculate the average volume of solution N. (show your work) (1 mark)
b) Calculate moles of dibasic acid in 25cm^3 of solution M. (1½ marks)
c) Calculate moles of dibasic acid in 250cm^3 of solution M. (1 mark)
d) Calculate the molar mass of solid M. (1½ marks)
e) Calculate the value of X in one mole of solid M. (H = 1, A = 88) (2 marks)

Procedure II

Using a measuring cylinder, measure 10cm^3 of solution P into a 100ml glass beaker.
Wash the cylinder and use it to measure 10cm^3 of solution M into a boiling tube. Use a test tube holder and heat the contents of the boiling tube to a temperature of 50°C.
Pour the contents of the boiling tube to contents of the beaker and immediately start the stopwatch. Stir the contents of the beaker gently with a thermometer continuously until the purple colour turns to colourless and record time taken in seconds for the mixture to decolourise in table II.

Wash the apparatus and repeat the procedure for the stated temperature of M at 60°C, 70°C and 90°C to complete table II.
Computer $^1/_t$ to complete the table.

Table II

Temp. of solution M °C	50	60	70	90
Time taken for decolourisation, t (sec)				
$^1/_t$ sec^{-1}				

a) i) Draw a graph of $^1/_t$ sec^{-1} (vertical axis) against temperature of solution M. (3 marks)
ii) From your graph determine time taken for decolourisation to occur if temperature of solution M is 80°C. (2 marks)

2. You are provided with solid K. Carry out the following tests on it and record your observations and inferences.

a) Put a sample of solid K into a boiling tube. Add 15cm^3 of distilled water. Shake well.

b) Divide mixture in (a) onto four portions of 2cm^3 each in separate test tubes for tests that follow.
i) To first portion add ammonia solution dropwise till in excess. (3marks)
ii) To second portion add 2cm^3 of dilute sulphuric (VI) acid. (3marks)
iii) To third portion add sodium hydroxide dropwise till in excess. (3marks)
iv) To fourth portion add 3 drops of lead nitrate solution and boil the mixture. (3marks)

3. Divide solution M prepared in question 1 into four portions of 2cm^3 each into separate test tubes for tests i - iv.
i) To first portion add sodium hydrogen carbonate provided. (3marks)
ii) To the second portion add 3 drops of acidified potassium chromate VI. (3marks)
iii) To the third portion add 3 drops of bromine water. (3marks)
iv) To fourth portion add 1cm^3 of ethanol followed by 2 drops of conc. sulphuric VI acid. Warm the mixture and leave to cool. (3marks)

KISII CENTRAL FORM 4 JOINT EVALUATION
233/1
CHEMISTRY
Marking scheme

1. a) 1 ✓1
b) Alkali metals ✓1
c) 2.8.8 ✓1

2. a) Under same conditions of temperature and pressure, the rate of diffusion of a gas is inversely proportional to the square root of its density ✓1

b) $\frac{R_{SO_2}}{R_{CO_2}} = \frac{\sqrt{M_{CO_2}}}{\sqrt{M_{SO_2}}}$

$\frac{40}{R_{CO_2}} = \frac{\sqrt{44}}{\sqrt{64}}$

$R_{CO_2} = \frac{40\sqrt{64}}{\sqrt{44}}$

$= 48.24 cm^3 s^{-1}$

3. HCl dissociates in water ✓1 to form acidic solution that reacts with MnO_2. In methylbenzene, HCl remains in molecular ✓1 form hence does not react with MnO_2 (owtte)

4. a) Separating funnel ✓1
b) Propane ✓1 does not react with NaOH solution ✓1

5. a) The solution turns brown ✓1
$Cl_{2(g)} + 2I^-_{(aq)} \rightarrow 2Cl^-_{(aq)} + I_{2(aq)}$ ✓1
b) Covalent ✓½. There is sharing of electrons ✓½

6. Heat evolved = 500 x 4.2 x 11 ✓½
= 23100J ✓½
or 23.1kJ

0.6g of J → 23.1KJ ✓1
= 380KJ
= $\frac{380 \times 0.6}{23.1}$ ✓½
= 9.87 ✓½

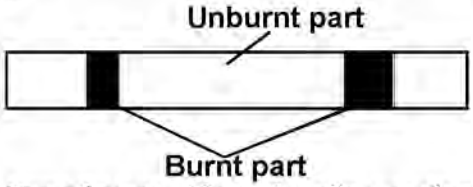
7. a) Prevents molten iron from reoxidation ✓1
b) Preheating air fed at the bottom of the furnace
c) To produce CaO for removal of silica impurities ✓1

for more free past papers visit: www.freekesepastpapers.com or call: 0720502279

REVISION EXERCISES

KIMA JOINT EVALUATION TEST - 2016
Kenya Certification of Secondary Education
233/1
CHEMISTRY
Paper 1
July/August 2016
Time 2 hours

1. A wooden splint was slipped through a region of a particular flame in the laboratory and was burnt as shown in the diagram below.



a) Name the type of flame the splint was slipped through. (1 mark)
b) Explain why the splint was burnt the way is shown in the diagram. (1 mark)
c) State one difference between a dropping funnel and a thistle funnel. (1 mark)

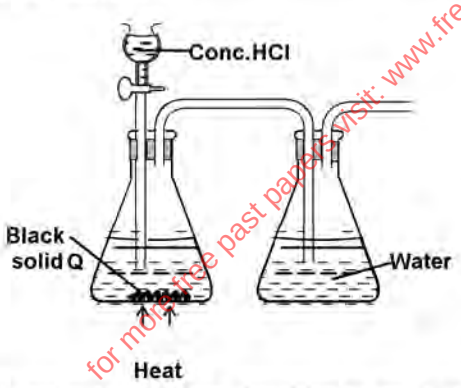
2. **M** grammes of a radioactive isotope decayed to 5 grammes in 100 days. The half life of the isotope is 25 days.
a) What is meant by half life? (1 mark)
b) Calculate the initial mass **M** of the radioactive isotope. (2 marks)

3. The table below shows the first ionization energies of elements **Y** and **Z**.

Element	Ionization energy kJ/mol
Y	494
Z	418

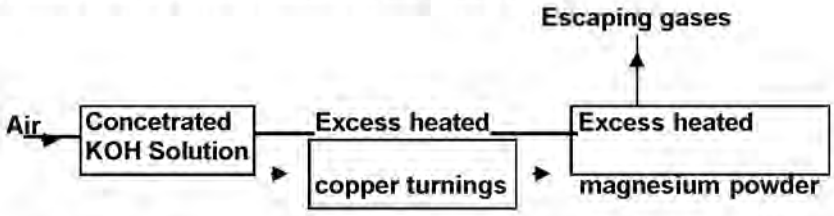
a) What is ionization energy? (1 mark)
b) Which of the two elements is the most reactive ? Explain. (2 marks)

4. The diagram below shows an incomplete set-up for the laboratory preparation and collection of dry chlorine gas. Study it and answer the questions that follow.



a) Complete the set up to show how dry chlorine gas is collected. (3 marks)
b) Name substance **Q**. (1 mark)

5. Air was passed through several reagents as shown below.

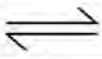


a) Write an equation for the reaction which takes place in the chamber with magnesium powder. (1 mark)
b) Name one gas which escapes from the chamber containing magnesium powder. Give a reason for your answer. (2 marks)

6. Describe how you would prepare crystals of sodium nitrate starting with 200cm³ of 2M sodium hydroxide. (3 marks)

7. 30cm³ of ethane were mixed with 100cm³ of oxygen and the mixture was sparked to complete reaction. If all the volume were measured at a pressure of one atmosphere and a temperature of 25°C, calculate the volume of the residual gas under. State condition. (2 marks)

8. Study the following equilibrium equation



for more free past papers visit: www.freekcsepastpapers.com or call: 0720502470

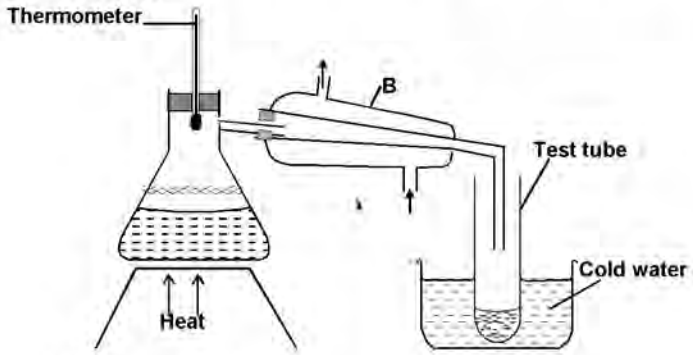
$$2X_2 + Y_{2(g)} \qquad 2X_2Y_{(g)} \qquad \Delta H = -197kJ / Mol$$

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

a) Study two ways of increasing the yield of X_2Y. (1 mark)
b) Draw the energy level diagram for the forward reaction. (2 marks)

9. Describe a chemical test to distinguish between CH_3CH_3 and $CH_2=CH_2$ (3 marks)

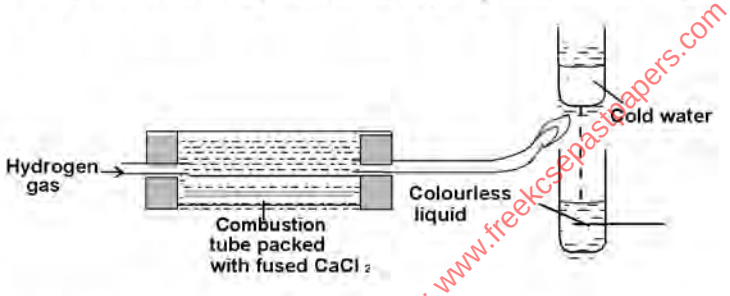
10. The set up below shows the apparatus that may be used to separate a mixture of two miscible liquids **C** and **D** whose boiling points at 80°C and 110°C respectively.



a) Name B. (1 mark)
b) What is the purpose of the thermometer? (1 mark)
c) Which liquid was collected in the test-tube first? (1 mark)

11. a) Define the term solubility. (1 mark)
b) A form four student wanted to determine the solubility of potassium nitrate. He obtained the following results.
Mass of evaporating dish = 15.13g
Mass of evaporating dish and solution = 36.51g
Mass of evaporating dish and salt = 19.41g
Use the information above to calculate the solubility of potassium nitrate. (2 marks)

12. The diagram below shows the set-up used to burn hydrogen and collect the product.



a) Why is hydrogen not readily used as a fuel? (1 mark)
b) i) State the precaution that must be taken before igniting the hydrogen. (1 mark)
ii) State two industrial uses of hydrogen gas. (1 mark)

13. Dry carbon (II) oxide gas was passed over heated lead (II) oxide.
a) Write an equation for the reaction. (1 mark)
b) Give one industrial application of the above reaction. (1 mark)
c) Name another gas that can be used in the above reaction. (1 mark)

14. **a)** Element X contains isotopes with mass number 16 and 18 respectively existing in the ratio 1 : 3 calculate the relative atomic mass of X. (2 marks)
b) In terms of structure and boiling. Explain why water (H_2O) is a liquid at room temperature while Hydrogen sulphide (H_2S) is a gas (2 marks)

15. The table below shows tests that were carried on three portions of a solution and the results obtained. Study it and answer the questions that follow:

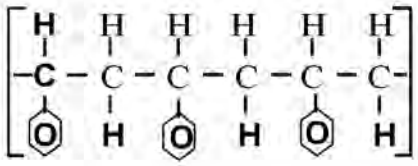
	TESTS	OBSERVATION
1	Addition of aqueous ammonia to portion 1	White ppt soluble in excess
2	Addition of a few drops of acidified barium nitrate to portion 2	White precipitate formed
3	Addition of few drops of lead (II) nitrate to portion 3	A white precipitate formed

a) Identify the
i) Anion present (1 mark)
ii) Cation present (1 mark)
b) Write ionic equation for test 3. (1 mark)

16. 50cm³ of carbon (IV) oxide diffuses through a porous plate is 15 seconds. Calculate the time taken by 75cm³ of Nitrogen (IV) oxide to diffuse through the same plate under similar conditions.
(C = 12, O=16, N=14) (3 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502419

17. The formula given below represents a portion of a polymer.

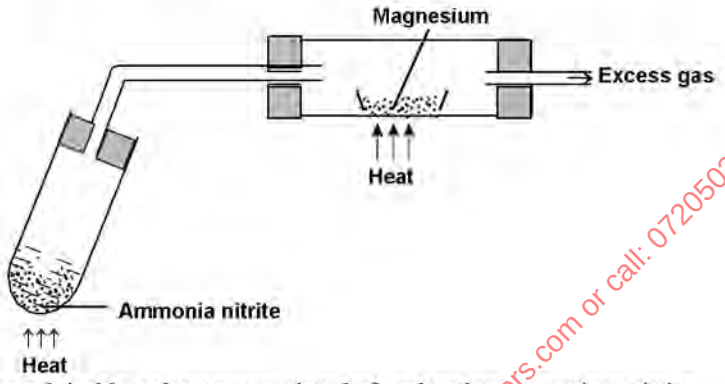


a) Give
   i) the name of the polymers. (1 mark)
   ii) The structure and the name of the monomer from which the polymer is formed. (1 mark)

b) State one disadvantage of the continued use of the polymer. (1 mark)

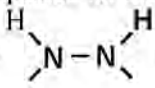
18. During purification of copper by electrolysis, 1.48g of copper were deposited when a current was passed through aqueous copper (II) sulphate for two and half hours. Calculate the amount of electricity that was passed. (Cu=63.5, 1 Faraday = 96500C) (3 marks)

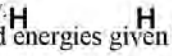
19. The set-up below shows how gas A was prepared and reacted with heated magnesium



a) Give a reason why it is not advisable to heat magnesium before heating ammonium nitrite. (1 mark)
b) i) Identify gas **A**. (1 mark)
   ii) Write a chemical equation for the reaction between gas **A** and magnesium (1 mark)

20. A student burnt magnesium ribbon in a gas jar full of sulphur (IV) oxide gas.
   i) State two observation made in the gas jar. (2 marks)
   ii) Write an equation for the reaction that took place. (1 mark)

21. Hydrazine gas  burns in oxygen to form nitrogen gas and steam according to the equation below.



Using the bond energies given below, calculate the enthalpy change for the reaction in the above equation. (3 marks)

Bond	Bond energy (KJ/mol)
N ≡N	944
N - N	163
N - H	388
O = O	496
H - O	463

22. 5.0g of calcium carbonate were allowed to react with 25cm³ of 1.0M hydrochloric acid until there was no further reaction. Calculate the mass of calcium carbonate that remained unreacted. (3 marks)

23. In the extraction of iron metal, limestone is added at a certain stage.
   i) Explain the main role of limestone. (1 mark)
   ii) **Name** two reducing agents in the extraction of iron. (1 mark)
   iii) State one way in which impurities affect properties iron. (1 mark)

24. a) The fomula for cane sugar is ($C_{12}H_{22}O_{11}$). Use an equation to show what happens when sugar is added to conc. Sulphuric (VI) acid. (1 mark)
   b) What name is given to the type of reaction above. (1 mark)
   c) Calculate the oxidation state of sulphur in sodium thiosulphate ($Na_2S_2O_3$) (1 mark)

25. You are given the following half equations.

$$I_{2(s)} + 2e^- \qquad 2I^-_{(aq)} \qquad E^\theta = +0.54$$

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

$Br_{2(s)} + 2e^{-} \qquad 2Br^{-}_{(aq)} \qquad E^{\theta} = +1.09V$

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

a) Write an overall equation for the cell reaction. (1 mark)
b) Calculate the E^{θ} value of the cell. (1 mark)
c) Name the oxidizing agent. (1 mark)

26. A hydrocarbon gas **Y** in which the percentage of hydrogen by mass is 14.3% occupies a volume of 2.24dm^3 at s.t.p and weighs 7g

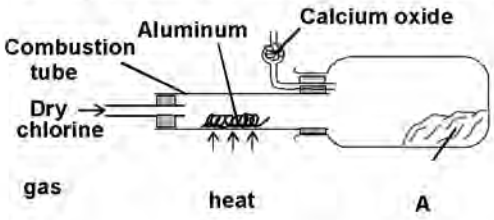
i) Determine the empirical formula of **Y**. (C=12, H=1.0) (2 marks)
ii) Give the structural molecular formula of **Y**. (1 mark)

27. Sate one application of electrolysis. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

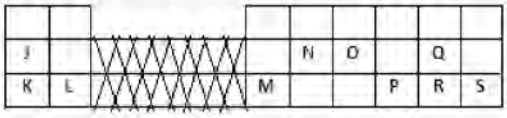
KIMA JOINT EVALUATION TEST - 2016
Kenya Certification of Secondary Education
233/2
CHEMISTRY
Paper 2
July/August 2016
Time 2 hours

1. a) Two reagents that can be used to prepare chlorine gas are manganese (IV) oxide and concentrated hydrochloric acid.
i) Write an equation for the reaction. (1 mark)
ii) Give the formula of another reagent that can be reacted with concentrated hydrochloric acid to produce chlorine gas. (1 mark)
iii) Describe how the chlorine gas could be dried in the laboratory. (2 marks)
b) In an experiment, dry chlorine gas was reacted with aluminium as shown in figure below.



i) Name substance A. ..... (1 mark)
ii) Write an equation of the reaction that took place in the combustion tube. (1 mark)
iii) 0.84g of aluminium reacted completely with chlorine gas. Calculate the volume of chlorine gas used (Molar gas volume is 24dm³. Al = 27) (3 marks)
iv) Give two reasons why calcium oxide is used in the set up. (2 marks)
v) State one use of chlorine. (1 mark)

2. I. Below is grid which represents part of periodic table. Use it to answer the questions that follow.



a) What name is given to the group of elements to which **L** belongs? (½ mark)
b) What name is given to the elements that occupy the shaded region? (½ mark)
c) How would the boiling points of element **Q** and **R** compare? (2 marks)
Explain. .....
d) Give the name and the formula of the products formed when the oxide of **M** reacts with excess sodium hydroxide solution. (2 marks)
i) Name .....
ii) Formula
iii) Oxide of **M** is also found to react with dilute hydrochloric acid. What type of oxide is M oxide? (1 mark)
e) Give one use of elements **S** and state the property that makes it suitable for that use. (2 marks)

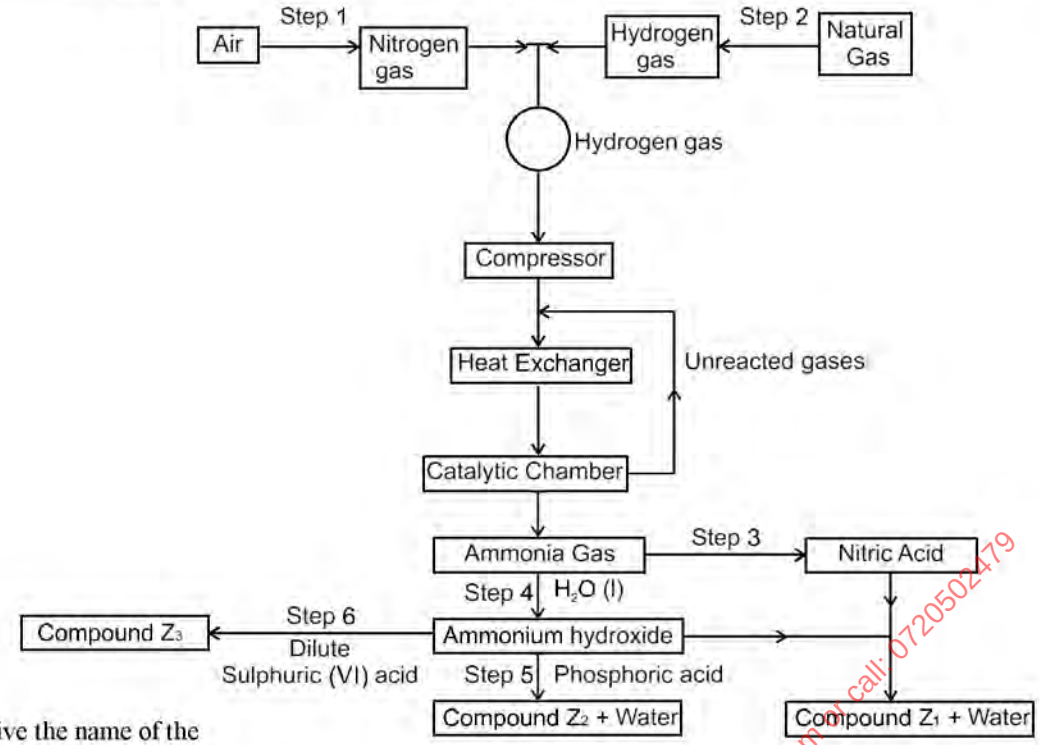
II. Study the data in the table below and answer the questions that follow the letters do not represent actual symbol of the elements.

Element	Atomic No.	MP°C	BP°C	Ionic radius
C	11	98	890	0.095
D	12	650	1110	0.065
E	13	660	2470	0.05
F	14	1410	2360	0.041
G	15	44.2	280	0.034
H	16	113	445	0.184
I	17	-101	-35	0.181
J	18	-189	-186	

a) State the structure of chlorides of element **D** and **F**. (1 mark)
b) Explain the following observations in terms of structure and bonding:
i) There is an increase in boiling points from **C** to **E**. (1 mark)
ii) Element **P** has a high melting point. (1 mark)
iii) There is a decrease in boiling point from **H** to **I**. (1 mark)

for more free past papers visit www.freekcsepastpapers.com or call 0720502479

3. The flow chart below shows the industrial preparations and ammonia and the process used in the manufacture of some ammonium compounds. Study it and answer the questions that follow.



a) Give the name of the
   i) Process in Step I. (1 mark)
   ii) Reaction that takes place in Step 5. (1 mark)
b) State other sources of hydrogen gas apart from natural gas. (1 mark)
c) Write an equation for the reaction which takes place in step 6. (1 mark)
d) Name the catalyst and the reagents used in step 3. (2 marks)
e) Name compound Z_1 (1 mark)
f) Give one commercial use of compound Z_2 (1 mark)
g) Concentrated nitric acid was added to iron (II) sulphate acidified with dilute sulphuric acid and the mixture heated. The solution turned from pale green to yellow with evolution of brown gas. Explain (2 marks)

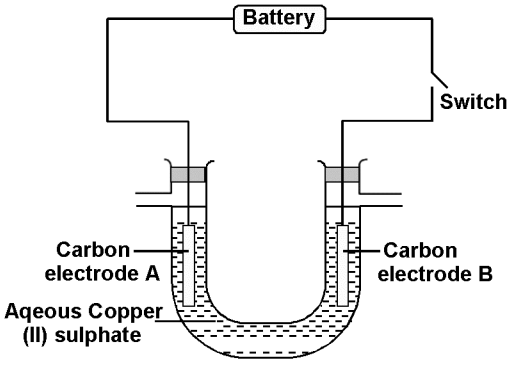
4. a) Use the standard electrode potential for elements A, B, D and F given below to answer the questions that follow, the letters do not represents the actual symbols of the elements.

	E^{θ} (Volts)
$A^{2-}_{(aq)} + 2e^- \rightleftharpoons A_{(s)}$	-2.90
$B^{2-}_{(aq)} + 2e^- \rightleftharpoons B_{(s)}$	-2.38
$C^{2-}_{(aq)} + e^- \rightleftharpoons \frac{1}{2}C_{2(g)}$	0.00
$D^{2-}_{(aq)} + 2e \rightleftharpoons D^{(s)}$	+0.34
$F_{2(g)} + e^- \rightleftharpoons F^-_{(aq)}$	+2.87

   i) Which element is likely to be hydrogen? Give a reason for your answer (2 marks)
   ii) In the space provided below, draw a labelled diagram of the electrochemical cell that would be obtained when half cells of element B and D are joined (3 marks)
   iii) Calculate the E^{θ} value of the electrochemical cell constructed in (ii) above. (1 mark)
   iv) If one of the half cells contained lead (II) nitrate then $KCl_{(aq)}$ would not be appropriate for use in the salt bridge. Explain this using an ionic equation. (2 marks)

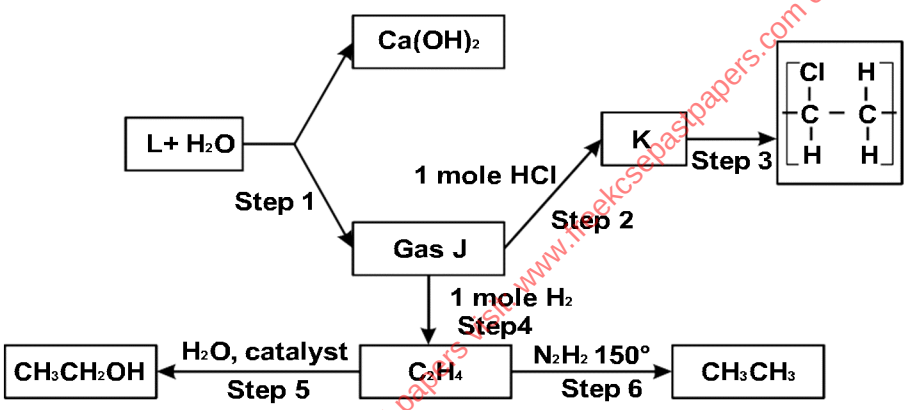
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

b) Aqueous copper (II) sulphate was electrolysed using the set up below.



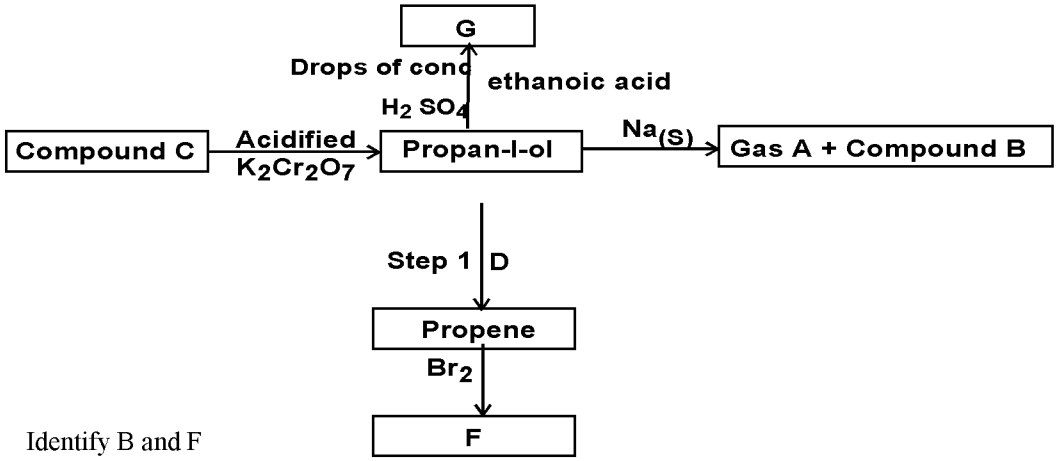
i) When the switch was closed a gas was produced only at electrode B. Which electrode is the anode? (1 mark)
ii) Write the half equation for the reaction occurring at electrode B. (1 mark)
iii) What happens to the PH of the electrolyte during electrolysis? Explain. (2 marks)
iv) If carbon electrodes were replaced with copper electrodes in the cell above, write the equation of the reaction that would occur at the anode. (1 mark)

5. a) What name is given to a compound that contains carbon and hydrogen only? (1 mark)
b) Hexane is a compound containing carbon and hydrogen
i) What method is used to obtain hexane from crude oil? (1 mark)
ii) State one use of hexane. (1 mark)
c) Study the flow chart below and answer the questions that follow.



i) Identify reagent **L**. (1 mark)
ii) Name the catalyst used in step 5. (1 mark)
iii) Draw the structural formula of gas **J**. (1 mark)

d) Study the scheme below and answer the questions that follow.



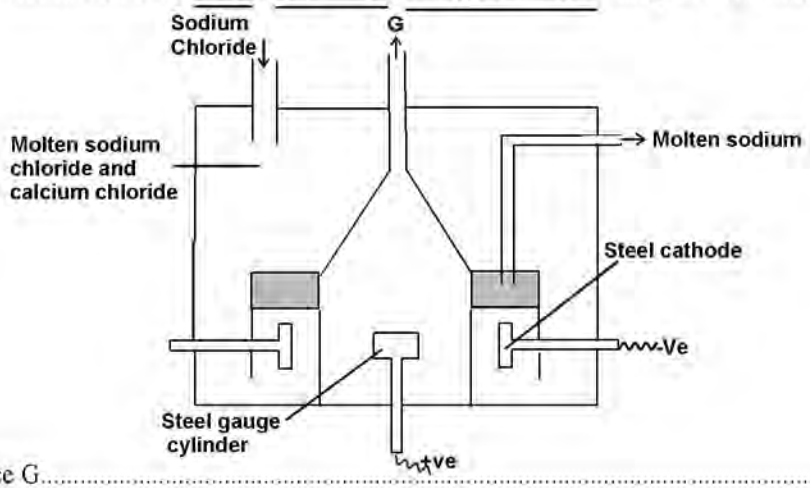
i) Identify B and F
ii) Name the compound C. (1 mark)
iii) Write the structural equation leading to the formation of F. (1 mark)
iv) State the process and condition for step 1 to occur (1 mark)
v) Draw the structure of G. (1 mark)

for more free past papers visit www.freekcsepastpapers.com or call: 0720502479

vi) State the characteristic property of compound G. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

6. The diagram below shows the extraction of sodium metal using down's cell. Study it and answer the questions that follow.



a) i) Name substance G.....

ii) Explain why in this process sodium chloride is mixed with calcium chloride. (2 marks)

iii) Why is the anode made of graphite and not steel. (1 mark)

iv) State two properties of sodium metal that make it possible for it to be collected as shown in the diagram. (2 marks)

v) What is the function of the steel gauze cylinder. (1 mark)

vi) Write the ionic equations for the reactions that take place at:

Cathode: (1 mark)

Anode (1 mark)

vii) Give two industrial uses of sodium metal. (2 marks)

b) Explain why sodium metal is stored in Kerosene. (1 mark)

7 .a) Define molar enthalpy of Neutralisation. (1 mark)

b) Study the table below and use it to answer the questions that follow

Volume of solution R(cm^3)	16	12	8	6	4	2
Volume of solution P(cm^3)	4	8	12	14	16	18
Final temperature °C	24	25.5	27	27.5	26	24
Initial temperature °C	25.5	22.5	22.5	22.5	22.5	22.5
Change in temperature ΔT						

i) Complete the table to obtain ΔT. (1 mark)

ii) On the grid provided plot a graph of ΔT(°C) against volume of NaOH (**P** cm^3) (3 marks)

iii) Determine the volume of NaOH, solution **P** required to neutralize the carboxylic acid. (1 mark)

iv) Calculate the volume of the carboxylic acid used R used for neutralization. (1 mark)

v) Calculate the:

I. The ratio between the volumes of solution **P** and **R**. (1 mark)

II. Concentration in moles of per litre of the carboxylic acid solution **R** (assuming the volume ratio is same as the mole ration). (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KIMA JOINT EVALUATION TEST
CHEMISTRY
Paper 3
July/August 2016
CONFIDENTIAL INSTRUCTIONS

In addition to the fittings and apparatus found in a Chemistry laboratory each candidate should have :

1. Solution B about 150cm^3
2. About 60cm^3 of solution A
3. About 80cm^3 of solution C
4. Burette 50ml
5. Filter funnel
6. 25cm^3 pipette
7. Clamp and stand
8. White tile
9. Conical flasks
10. 10ml measuring cylinder
11. 6 test tubes
12. Boiling tube
13. Distilled water
14. Thermometer
15. A stopwatch
16. About 1g solid Q
17. About 1.5g of solid L
18. Metallic spatula
19. About 1g of sodium hydrogen carbonate
20. Water bath
21. Pipette filler

Access to :

1. Phenolphthalein indicator
2. Source of heat
3. 2M $Pb(NO_3)_{2(aq)}$
4. 2M $HNO_{3(aq)}$
5. 0.5M $Ba(NO_3)_{2(aq)}$
6. 2M ammonia solution
7. 2M $NaOH_{(aq)}$
8. Acidified potassium manganate (VII)
9. 2M $HCl_{(aq)}$
10. Acidified potassium dichromate (VI)

Notes

1. Solution B is 0.05M oxalic acid
2. Solution A is 0.01M potassium manganate (VII) solution
3. Solution C is 0.1M NaOH solution
4. Water bath prepared by placing about 200cm^3 of water in a 250mlbeaker
5. Solid Q - mixture of $(NH_4)_2SO_4$ and $Al_2(SO_4)_3$ in the ratio 1 : 1
6. Solid L is maleic acid crystals
7. Acidified potassium dichromate (VI) is prepared by dissolving 25g of solid potassium dichromate (VI) in about 600cm^3 of 2M sulphuric acid and diluting to one litre of solution.
8. Acidified $KMnO_4$ is made by dissolving 3.16g of the solid in about 500cm^3 of 2M H_2SO_4 and diluting to one litre of solution

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

KIMA JOINT EVALUATION TEST - 2016

Kenya Certificate of Secondary Education
233/3
CHEMISTRY
Paper 3
July/August 2016

Time 2¼ hours

1. You are provided with
- Potassium manganate (VII), solution **A**.
- Solution **B**, containing 6.3g/l of a dibasic acid $H_2X.nH_2O$.
- Solution $\mathbf{C_1}$ containing 4.0g / litre of sodium hydroxide solution

You are required to determine

a) the value of **n** in $H_2X.nH_2O$

b) how the rate of reaction of solution **A** with solution **B** varies with change in temperature.

Procedure I.

Fill the burette with solution **B**, Pipette 25cm³ of solution **C** into a conical flask and titrate solution **B** with solution **C** using Phenolphthalein indicator. Record your results in table 1 below and repeat the titration to obtain consistent results:

Table 1

	1	2	3
Final burette reading (cm³)			
Initial burette reading (cm³)			
Volume of solution **B** used (cm³)			

(4 marks)

a) Determine the average volume of solution **B** used. (1 mark)

b) Calculate the concentration of solution **C** in moles per litre. (1 mark)
(Na=23, O=16, H=1.0)

c) Given the equation of the reaction taking place.and RFM of X = 88.

$$H_2X_{(aq)} + 2NaOH_{(aq)} \rightarrow Na_2X_{(aq)} + H_2O_{(l)}$$

Calculate

i) the number of moles of dibasic acid solution **B** that reacted. (2 marks)

ii) the number of moles of the dibasic acid solution **B** in 1000 cm³ of solution. (1 mark)

iii) The RFM of the dibastic acid, hydrated. (1 mark)

iv) The value of n in the formula of the hydrated acid.(O=16, H=1.0) (2 marks)

Procedure II

i) Using a measuring cylinder, place 10.0cm³ portions of solution **A** into 5 test tubes placed in a test tube rack.

ii) Clean the measuring cylinder and use it to place 10.0cm³ of solution **B** into a boiling tube.

iii) Insert a thermometer in the solution **B** in the boiling tube and place the boiling tube in the warm water bath till the solution **B** attains a temperature of 40°C

iv) Remove the boiling tube form the water bath and place it in a test tube rack and add the first portion of solution **A** and at the same time start a stopwatch.

v) Record the time taken for the purple colour and the mixture to decolourise in table II.

vi) Repeat the experiment by using 10.0cm³ of solution B at temperatures of 50°C, 60°C, 70°C and 80°C. Record the times in the table. Complete the table by computing $^1/_t$ Sec^{-1}

Table II

Temperature of solution B °C	40	50	60	70	80
Time of colour to decolourise (sec)					

(5 marks)

a) Plot a graph of $^1/_t$ against temperature. (3 marks)

b) From the graph determine the time taken for decolourisation of the mixture. If the temperature o the solution **B** was 65°C. (1 mark)

c) How does the rate of reaction of potassium manganate (VII) with oxalic acid vary with temperature.
Explain. (1 mark)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

2. You are provide with solid **Q**. Carry out the tests below and record your observations and inferences in the spaces provided.

a) Strongly heat a spatula-end full of solid **Q** in a dry test tube.

Observations	Inferences
(1 mark)	(1 mark)

b) i) Place the remaining solid **Q** in a boiling tube. Add 10cm³ of distilled water. Divide the solution into five portions.

Observations	Inferences
(1 mark)	(1 mark)

ii) To the first portion, add aqueous lead (II) nitrate solution.

Observations	Inferences
(1 mark)	(1 mark)

iii) To the second portion, add dilute nitric (V) acid, followed by barium nitrate solution.

Observations	Inferences
(1 mark)	(1 mark)

iv) To the third portion add a few drops of sodium hydroxide until in excess.

Observations	Inferences
(1 mark)	(1 mark)

v) To the fourth portion, add a few drops of aqueous ammonia until is excess.

Observations	Inferences
(1 mark)	(1 mark)

vi) To the fifth portion, add a few drops of hydrochloric acid. Warm the contents.

Observations	Inferences
(1 mark)	(1 mark)

3. a) Place about one third of solid **L** on a metallic spatula and burn it using a Bunsen burner.

Observations	Inferences
(1 mark)	(1 mark)

b) Place the remaining solid **L** in a test-tube. Add about 6cm³ of distilled water and shake well. (Retain the mixture for use in test (c)

Observations	Inferences
(1 mark)	(1 mark)

c) i) To about 2cm³ of the mixture, add a small amount of solid sodium hydrogen carbonate.

Observations	Inferences
(1 mark)	(1 mark)

ii) To about 1cm³ of the mixture, add 1cm³ of acidified potassium dichromate (VI) and warm.

Observations	Inferences
(1 mark)	(1 mark)

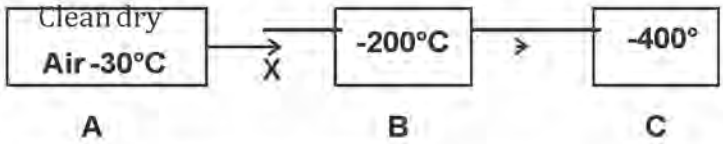
iii) To about 2cm³ of the mixture, add two drops of acidified potassium manganate (VII)

Observations	Inferences
(1 mark)	(1 mark)

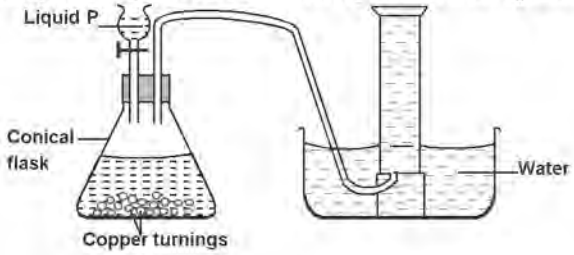
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

WESTLANDS SUB-COUNTY JOINT EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)
233/1
CHEMISTRY
PAPER 1 (THEORY)

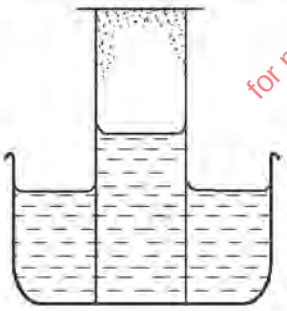
1. Study the flow chart given below and answer the questions that follow.



a) Identify the state of matter in box C (1 mark)
b) List two processes that occur at point X (i.e. between A and B) (2 marks)
2. a)Name two ores from which copper is extracted. (1 mark)
b) During the extraction of copper metal, the ore is subjected to FROTH FLOTATION. Give a reason why this process is necessary. (1 mark)
c) Name one alloy of copper and state its use. (1 mark)
3. Study the diagram below which represents a set up used to prepare nitrogen (IV) oxide gas in the laboratory.



a) Name liquid P. (1 mark)
b) State two observations made in the conical flask. (1 mark)
c) Why was there no gas collected ? (1 mark)
4. a) What is an acid ? (1 mark)
b) Name the acid from which the following salts have been obtained. (strictly use IUPAC naming)
i) $MgSO_3$ (½ mark)
ii) NaClO (½ mark)
iii) $Na_2CO_3.NaHCO_3$ (½ mark)
iv) $Ca_3(PO_3)_2$ (½ mark)
5. Using crosses (x) and dots (•) draw the structure of carbon (II) oxide. (C = 6.0, O = 8.0) (2 marks)
6. A radioactive isotope P decays by emitting two alpha particles and one beta particle to form
a) What is the atomic number of P ? (1 mark)
b) After 112 days, $^1/_{16}$ of the mass of P remained, determine the half life of P. (2 marks)
7. The diagram below shows the final set up observed after three days used to investigate the percentage of active air. Study it and answer the questions that follows.



a) Label the diagram fully. (1 mark)
b) List two conditions which catalyse rusting. (2 marks)
c) Write the chemical formula for rust. (1 mark)
d) Give two techniques used to deposit a thin metal on iron to prevent rusting. (1 mark)
8. Silicon consists of three isotopes: 28 with 92.2%, 29 with 4.7% and 30 with 3.1%. Find the relative atomic mass of silicon (2 marks)
9. Sulphur (IV) oxide and nitrogen (IV) oxide react as shown in the equation below.
$SO_{2(g)} + NO_{2(g)} \rightarrow SO_{3(g)} + NO_{(g)}$
i) Using the oxidation numbers, show that the reaction above is a redox reaction (2 marks)
ii) Identify the oxidising agent. (1 mark)

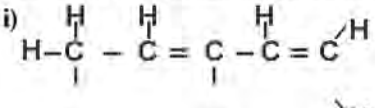
10. a) Draw the structure of the given molecules.
i) 2, 3-dimethylpentane (1 mark)

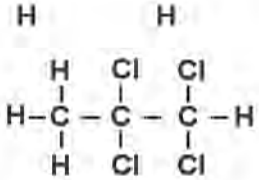
for more free past papers visit: www.freeksepastpapers.com or call: 0720502479

ii) 2-Bromo-3-chlorobutane (1 mark)

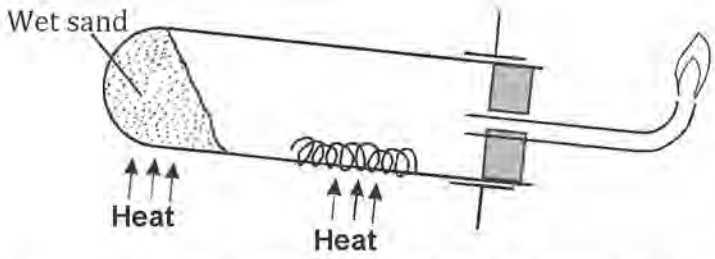
for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

b) Give the IUPAC names of the following molecules.

i)  (1 mark)

ii)  (1 mark)

11. The diagram below shows a reaction of a clean magnesium ribbon with steam. Study it and answer the questions that follow.



a) Name two impurities removed using sand paper for magnesium ribbon to react. (2 marks)
b) Write a balanced equation between steam and magnesium metal. (1 mark)
c) Why was the magnesium ribbon coiled ? (1 mark)

12. 1.64g of sodium phosphate were dissolved into distilled water and then made up to 1dm^3. Find the number of sodium ions in this solution.
(O = 16.0, P = 31.0, Na = 23.0, L = 6.0×10^{23}) (3 marks)

13. Starting with solid lead (II) carbonate, solid sodium chloride, distilled water and dilute nitric (V) acid, describe how solid lead (II) chloride salt can be prepared. (3 marks)

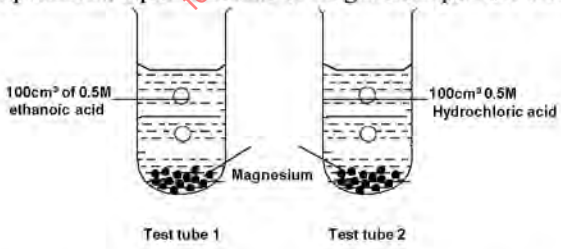
14. Study the information in the table below and answer the questions below the table.

Bond	Bond energy: KJ/mole
C - H	414
Cl - Cl	244
C - Cl	326
H - Cl	431

Calculate the enthalpy change of the reaction.

$$CH_{4(g)} + Cl_{2(g)} \xrightarrow{V} CH_3Cl_{(l)} + HCl_{(g)}$$ (3 marks)

15. In an experiment, equal amounts of magnesium powder were placed into test tubes 1 and 2 as shown below.



Explain why the amount of hydrogen gas liberated in test tube 2 is greater than that in test tube 1 before the reaction was complete. (3marks

16. a) Provide the approximate pH value of the following substances.

Substance	pH value
i) Aluminium chloride solution	(½mk)
ii) Sour milk	(½mk)
iii) Distilled water	(½mk)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

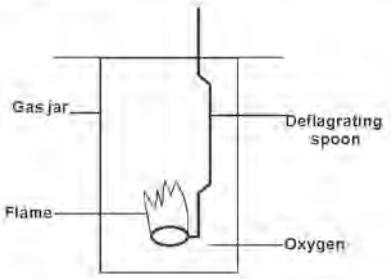
iv) Dilute sodium hydroxide	(½mk)

b) Name the substance responsible for the acidity or alkalinity in:

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

I. (a) (ii) above (1 mark)
II. (a) (iv) above (1 mark)

17. $48cm^3$ of an oxide of nitrogen diffused through a porous plug in the same time it took $159cm^3$ of helium to diffuse through the same plug under the same conditions. What is the molecular mass of the oxide ? (He = 4) (2 marks)
18. Hydrogen chloride gas was dissolved in water to make solution S. Solution S reacted with metal M to form salt T. About $2cm^3$ of solution T was reacted with 2 drops of ammonia solution, forming a white precipitate. The precipitate dissolved on addition of excess ammonia.
    a) Identify metal M (1 mark)
    b) Write the formula for salt T (1 mark)
    c) Write an equation for the reaction that took place between metal M and solution S. (1 mark)
19. The presence of impurities affect the melting and boiling points of substances. What will be the effect of :
    a) Impurity to a boiling point of a liquid. (1 mark)
    b) Name the impurity used in :
    (i) Extraction of sodium metal from sodium chloride (rock salt). (1 mark)
    ii) Clearing ice from road surfaces during winter time in Europe. (1 mark)
20. The diagram below shows a piece of potassium metal which was ignited over flame and then lowered into a gas jar full of oxygen gas.



    a) What is the colour of the flame ? (1 mark)
    b) Write a balanced equation for the reaction which occurred in the gas jar. (1 mark)
    c) The product of the reaction in (b) above was dissolved in water, write a balanced equation for the reaction which occurred if the conditions were maintained at 5^oC. (1 mark)
21. Identify the type of bond which is present in the following situations.
    a) Mercury vapour in fluorescent bulb. (1 mark)
    b) Graphite in a pencil tip. (1 mark)
    c) Neon gas in advertising tubes. (1 mark)
    d) A thin string of viscous honey. (1 mark)
22. Under certain conditions, carbon (IV) oxide reacts with water to form methanol (CH_3OH) and oxygen as shown below.
    $2CO_{2(g)} + 4H_2O_{(l)} \rightleftharpoons 2CH_3OH_{(l)} + 3O_{2(g)} \quad \Delta H = +1452kJ / mol$
    What would be the effect on the yield of methanol if the temperature of the reaction mixture is increased ? Explain. (2 marks)
23. Copper (II) sulphate solution was electrolysed using graphite electrodes.
    a) State the observations made at the cathode. (1 mark)
    b) Write an equation for the reaction at the anode electrode. (1 mark)
24. Group II elements are also called ALKALINE EARTH metals.
    a) Provide a reason why the elements are termed as :
    i) Alkaline (1 mark)
    ii) Earth (1 mark)
    b) The diagram below shows calcium metal reacting with cold water.
    i) Write a chemical equation for the reaction occurring below the filter funnel. (1 mark)

ii) Some of the resultant solution was put into a test tube and two drops of universal indicator added. Record the pH shown by this solution. (1 mark)

25. The equations below give the effect of heat on different substances.
    I. $I_{2(s)} \quad I_{2(g)}$
    II. $CuSO_4.5H_2O_{(s)} \rightleftharpoons CuSO_{4(s)} + 5H_2O_{(l)}$
    III. $2Pb(NO_3)_{2(s)} \rightleftharpoons 2PbO_{(s)} + 4NO_{2(g)} + O_{2(g)}$
    a) Give another substance which behaves like iodine. (1 mark)
    b) Classify equations II and III.

    Equation II (1 mark)
    Equation III (1 mark)

26. When an organic compound Y is reacted with aqueous sodium carbonate, it produces carbon (IV) oxide. Y reacts with propanol to form a sweet smelling compound Z whose formula is

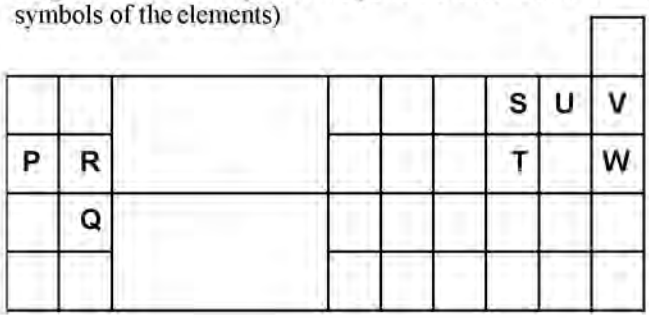
$$CH_3 - CH_2 - \overset{\overset{O}{\|}}{C} - OCH_2 - CH_2CH_3$$

    a) Name and draw the structural formula of compound Y. (2 marks)
    b) What is the name of the group of compounds to which Z belongs ? (1 mark)

For more free KCSE past papers visit www.freekcsepastpapers.com or call: 0720502479

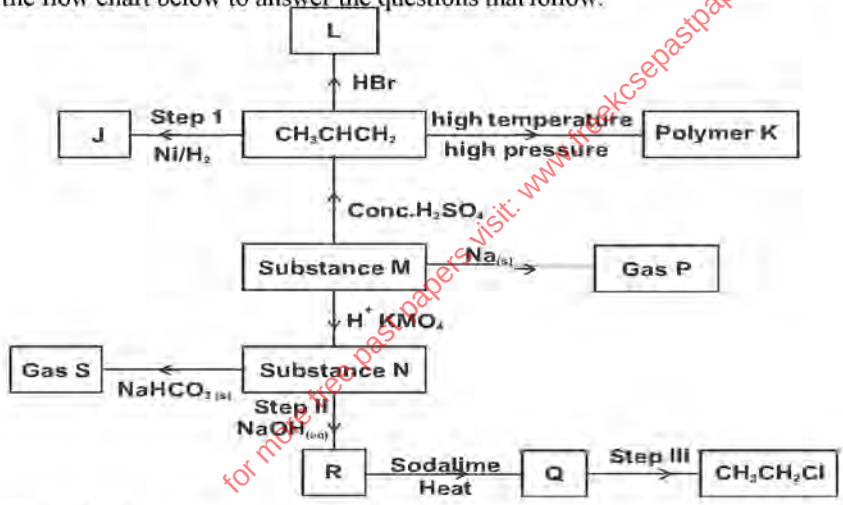
WESTLANDS SUB-COUNTY JOINT EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)
233/2
CHEMISTRY
PAPER 2 (THEORY)

1. The grid below shows part of the periodic table. Use it to answer the questions that follow. (The letters are not the actual symbols of the elements)



a) Identify the element representing the largest atom. Explain. (1 mark)
b) Identify the most reactive non-metal. Explain. (1 mark)
c) Give the oxidation state of element S. (1 mark)
d) Explain why atom of element W is heavier than that of element V. (1 mark)
e) Given that the atomic mass of W is 40, write down the composition of its nucleus. (1 mark)
f) What name is given to the group of elements in which element U belongs ? (1 mark)
g) Write an equation for the decomposition of nitrate of element P. (1 mark)
h) When 3 litres of chlorine gas were completely reacted with element Q, 11.88g of the product were formed. Determine the relative atomic mass of element D. (Atomic mass of chlorine = 35.5, molar gas volume = 24 litres) (3 marks)

2. Use the flow chart below to answer the questions that follow.



a) Name the following
(i) Gas S (1 mark)
ii) Gas P (1 mark)
iii) Substance J (1 mark)
b) Name the process in
i) Step I (1 mark)
ii) Step II (1 mark)
iii) Step III (1 mark)
c) Draw the structural formula of :
i) K (1 mark)
ii) L (1 mark)
d) Write a chemical equation for complete combustion of substance M. (1 mark)
e) Name the reagent and condition in step III
i) Reagent (½ mark)
ii) Condition (½ mark)

3. Iron is extracted from its ore in a blast furnace.
a) Name two chief iron ores that are used for extraction of iron. (2 marks)
b) Give the main reducing agent in the blast furnace and write the equation for its formation. (2 marks)
c) Using equations describe the processes which lead to formation of iron in the blast furnace. (3 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

d) State two impurities found in molten iron from the blast furnace and explain how they are removed. (3 marks)

e) Explain the main difference between pig iron and cast iron. (1 mark)

4. a) The following are standard electrode potentials for some electrodes.

$A^{2+}_{(aq)} + 2e^- \rightleftharpoons A_{(s)}$ $E^q = -2.92V$

$R^{2+}_{(aq)} + 2e^- \rightleftharpoons B_{(s)}$ $E_q = -2.38V$

$\frac{1}{4}C^{2+}_{(aq)} + e^- \rightleftharpoons C_{(s)}$ $E_q = 0.00V$

$D^{2+}_{(aq)} + 2e^- \rightleftharpoons D_{(s)}$ $E_q = +0.34V$

$\frac{1}{2}E^{+}_{(aq)} + e^- \rightleftharpoons E_{(s)}$ $E^q = +2.87V$

i) Which is the strongest reducing agent ? Explain. (2 marks)

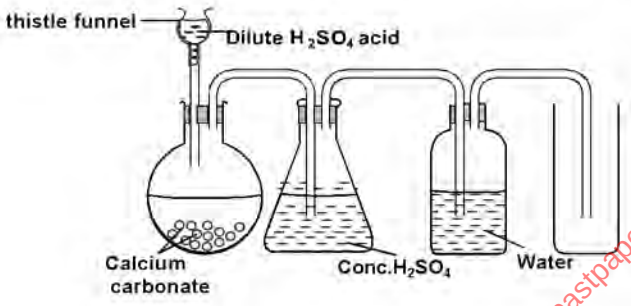
ii) Write the cell representation for the electrochemical cell obtained by combining the half cells B and D. (1 mark)

iii) Calculate the e.m.f of the cell in (ii) above. (2 marks)

b) i) During electrolysis processes, graphite electrodes are preferred to platinum. Explain. (1 mark)

ii) Magnesium sulphate solution was electrolysed using graphite electrodes for 1 hour and 20 minutes. Given that a current of 2.5A was passed. calculate the volume of gas produced at the anode. (1F = 96500C. molar gas volume at r.t.p = $24dm^3$) (3 marks)

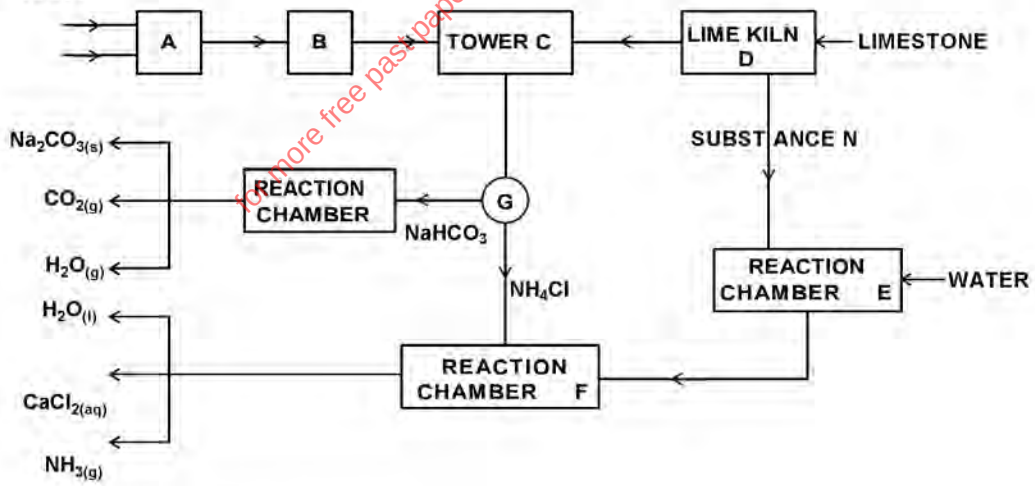
5. A student set up the apparatus below to prepare and collect a dry sample of carbon (IV) oxide.



State a correction for three mistakes in the set up above. (3 marks)

b) $30cm^3$ of carbon (II) oxide gas were reacted with $10cm^3$ of oxygen gas. The resulting mixture of gases was bubbled through an alkali. Determine the volume of the residual gas. (2 marks)

c) The flow chart below is for the manufacture of sodium carbonate by Solvay process. Use it to answer the questions that follow.



i) Name substance N (1 mark)

ii) Explain the use of water in chamber E. (1 mark)

iii) Name the two raw materials required in the starting chamber A for manufacture of sodium carbonate. (1 mark)

iv) Write an equation for the reaction taking place in tower C. (1 mark)

v) Name the major process taking place at G. (1 mark)

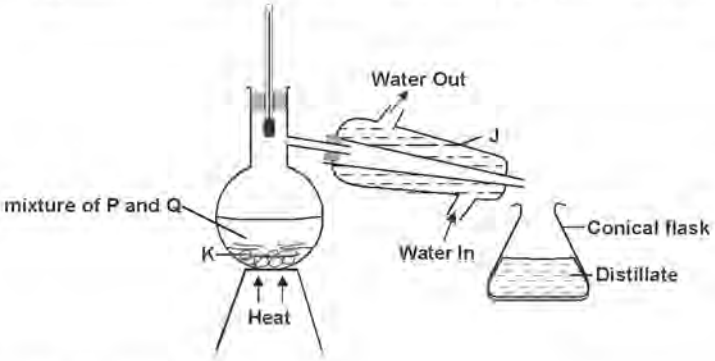
6. a) Nitrogen is obtained by fractional distillation of liquid air.

i) Name two other gases obtained during the distillation according to their order of collection. (2 marks)

ii) State one property that makes it possible for the components of liquid air to be separated by fractional distillation. (1 mark)

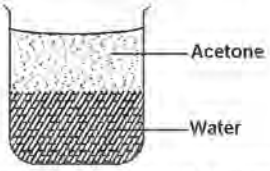
for more free pastpapers visit www.freekcsepastpapers.com or call: 0720502479

b) In an experiment to separate a mixture of two miscible liquids P (b.p = 83°C) and Q (b.p = 114°C) a student set up the apparatus shown below. Study it and answer the questions that follow.



i) Name the apparatus labelled J. (1 mark)
ii) Solids labelled K were included in the mixture. State the role of these solids. (1 mark)
iii) A round bottomed flask is usually preferred when carrying out fractional distillation of miscible liquids. Explain. (1 mark)
iv) Identify the second distillate. (1 mark)
v) The distillates collected are not pure. Explain. (1 mark)

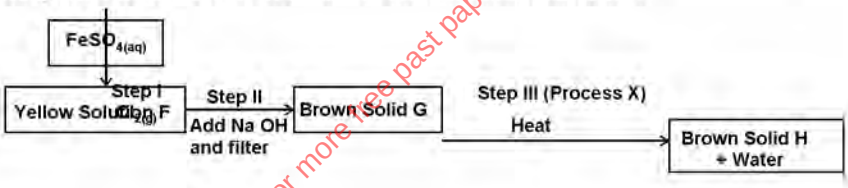
c) Two liquids (water and acetone) were mixed in a beaker in equal proportions then left to settle. The results were as shown below.



i) Name the best method that can be used to separate these liquids. (1 mark)
ii) What name is given to two liquids which behave in this manner when mixed ? (1 mark)
iii) Solid V dissolves in acetone but not in water. Name the type of bond that exists in solid V. (1 mark)

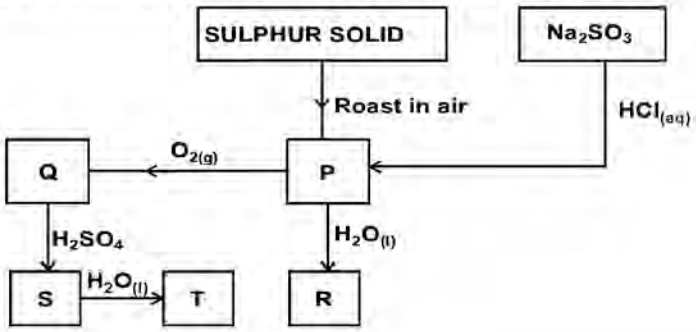
7.a) Chlorine can be prepared by using the following three reagents. Solid sodium chloride, concentrated sulphuric (VI) acid and potassium manganate (VII).
i) What is the role of each of the following in the reaction ? (2 marks)
I. Concentrated sulphuric (VI) acid
II. Potassium manganate (VII)
ii) Name the bleaching agent formed when chlorine gas is passed through cold dilute sodium hydroxide solution. (1 mark)

b) Study the scheme below and answer the questions that follow.



i) Write the formula of the cation present in the yellow solution F. (1 mark)
ii) What property of chlorine is shown in step I ? (1 mark)
iii) Identify the brown solid G. (1 mark)
iv) Write an equation for the reaction in step III. (1 mark)
v) What name is given to process X. (1 mark)

8. The flow chart below shows various reactions involving sulphur.



for more free past papers visit: www.freekcsepastpapers.com or call: 0720402479

a) Identify the following substances :

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479

i) Q (1 mark)
ii) R (1 mark)
(ii) S (1 mark)
iv) T (1 mark)

b) Write an equation for the reaction that takes place when sulphur is roasted in excess air. (1 mark)

c) What observations would be made when dilute hydrochloric acid is added to sodium sulphite. (1 mark)

d) Write an equation for the formation of Q. (1 mark)

e) How can the presence of P be confirmed. (1 mark)

f) Write an equation for the formation of substance R. (1 mark)

g) Sulphur (IV) oxide is a bleaching agent. Explain the differences in the bleaching action of sulphur (IV) oxide and that of chlorine. (use equations) (2 marks)

for more free past papers visit: www.freekcsepastpapers.com or call: 0720502479