Name: ..... **Index No.** .....

School: ..... **Date:** ..... **Candidate's Sign** .....

233/1
CHEMISTRY
PAPER 1 (THEORY)
FORM 4
MARCH / APRIL 2013
TIME: 2HOURS

BARINGO NORTH TRIAL EXAMINATIONS - 2013

The Kenya Certificate of Secondary Education (K.C.S.E)

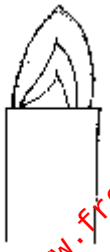
Instructions to candidates

- Write your name and index in the spaces provided.
- Sign and write the date the examination is done
- Answer **ALL** the questions in the spaces provided
- Mathematical tables and electronic calculators may be used.
- All workings **MUST** be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

Question	Maximum Score	Candidates Score
1 - 29	80	

1. Below is a Bunsen Burner flame



a) Describe how this flame is produced. (1mark)

b) Label on the diagram the least hot part of the flame. (1mark)

c) Name the gas produced by a burning candle that is a non-pollutant. (1mark)

2. The element X can be represented as $^{35}_{17}X$ (X is not the actual symbol of element)

a) How many neutrons are contained in X? (1mark)

b) Use the data in the table below to calculate the relative atomic mass X from the masses and percentage abundances. (2marks)

Mass	Percentage abundance
35	90
36	4
37	6

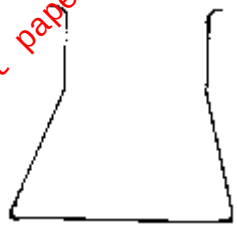
3. A certain volume of oxygen diffused through a porous membrane in 120 seconds. Under the same conditions, the same volume of gas V diffused in 112 seconds. Calculate the relative molecular mass of gas V (0=16) (3marks)

4. a) A student accidentally mixed anhydrous potassium carbonate and ammonium chloride in the laboratory.

i) Suggest and explain an appropriate method that can be used to separate the two salts. (1mark)

ii) State one application of the method named in (a) above. (1mark)

b) Explain how the shape of the apparatus shown below is suited for its function. (1mark)

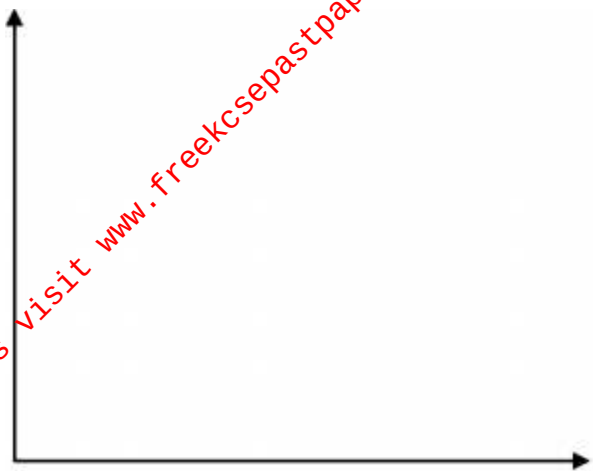


5. The formula of sodium carbonate crystals was known to be $Na_2CO_3.nH_2O$. The crystals were heated to a constant mass in order to drive off water of crystallization. Given that the mass of the hydrated salt was 7.15g while that of the anhydrous salt was 2.65g, find the value of n. (2marks)

6. a) In terms of structure and bonding explain why diamond is used in drilling while graphite is not. (2marks)

b) Draw an electron dot $(\cdot)$ and cross (X) diagram to show how bonding takes place in carbon (II) oxide. (C= 12, O = 16) (2marks)

7. a) On the grid provided, sketch the curves of volume of hydrogen gas produced against time when magnesium ribbon reacts with 1.0m and 0.5m hydrochloric acid. (1mark)



b) When a piece of magnesium ribbon is placed in 1M hydrochloric acid, bubbles of a colourless gas were produced more vigorously than when 1m ethanoic acid was used. Explain. (2marks)

8. Use the information below to answer the questions that follow.

	Equation		Enthalpy of formation
i)	$H_{2(g)} + \frac{1}{2} O_{2(g)} \longrightarrow$	$H_2O_{(l)}$	$\Delta H_1 = -286KJ\ mol^{-1}$
ii)	$C_{(s)} + O_{2(g)} \longrightarrow$	$CO_{2(g)}$	$\Delta H_2 = -394KJ\ mol^{-1}$
iii)	$2C_{(s)} + 3H_{2(g)} + \frac{1}{2} O_{2(g)} \longrightarrow$	$C_2H_5OH_{(l)}$	$\Delta H_3 = -277KJ\ mol^{-1}$

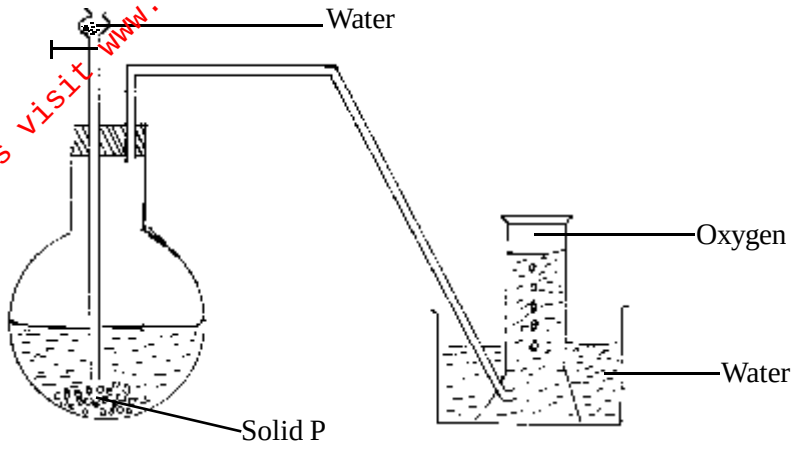
Calculate the molar enthalpy of combustion of ethanol, given that

$C_2H_5OH_{(l)} + 30_{2(g)} \longrightarrow 2CO_{2(g)} + 3H_2O_{(l)}$ (2marks)

9. a) State and explain the observations made when a piece of burning magnesium ribbon is introduced into a gas jar of sulphur (IV) oxide. (2marks)

b) Write an equation for the reaction that took place. (1mark)

10. The diagram below represents the set-up that can be used to prepare and collect oxygen gas.



a) Name solid P ..... (½ mark)

b) What property of oxygen makes it possible to be collected as indicated in the diagram.

..... (½ mark)

c) Explain why it is important not to collect any gas for the first few seconds of the experiment. (½ mark)

11. The table below shows the pH values of solution J to N.

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

a) Which solution

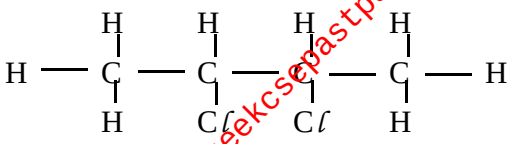
i) Contains the largest concentration of hydroxide ions? (½ mark)

ii) Is likely to be a solution of acetic acid. (½ mark)

b) In the equation below, identify the reagent that acts as an acid in the forward reaction. Give a reason. (1mark)

$NH_{4\,(aq)}^{+} + H_2O_{(l)} \rightleftharpoons NH_{3(g)} + H_3O^{+}_{(aq)}$

12. An organic compound T reacts with chlorine gas in the presence of u.v light to form compound U. The structural formula of compound U is shown below.



Name the organic compound T and draw its structural formula. (2marks)

13. a) What do you understand by the term molar enthalpy of displacement of an element? (1mark)

b) During a displacement reaction excess iron powder was added to $25cm^3$ 0.5M, Copper (II) sulphate solution. The temperature rose form 18.5^0C to 33.0^0C. Calculate the molar enthalpy of displacement of copper (II) sulphate solution (specific heat capacity is $4.2Jg^{-1}K^{-1}$, Density of the solution is $1.0g/cm^3$). (3marks)

14. Element A has atomic mass 23, element B atomic mass 7 and also has 12 neutrons and 4 neutrons respectively.

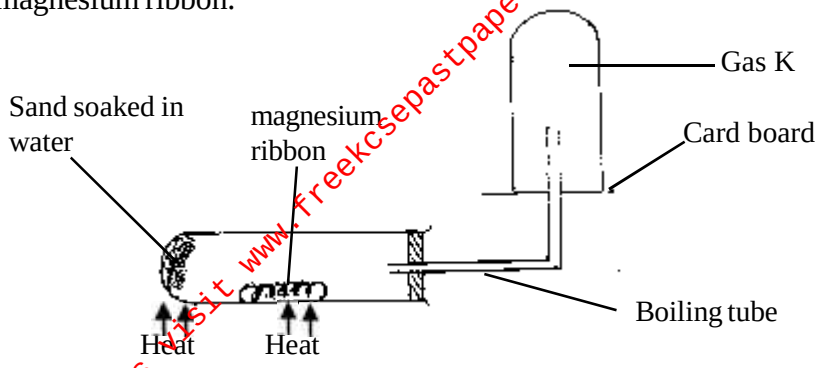
a) Write the electron arrangement of elements A and B.

A: ..... (1mark)

B: ..... (1mark)

b) Which element has higher ionization energy? Explain. (1mark)

15. A student set up the experiment below to collect gas K. The sand was heated before heating the magnesium ribbon.

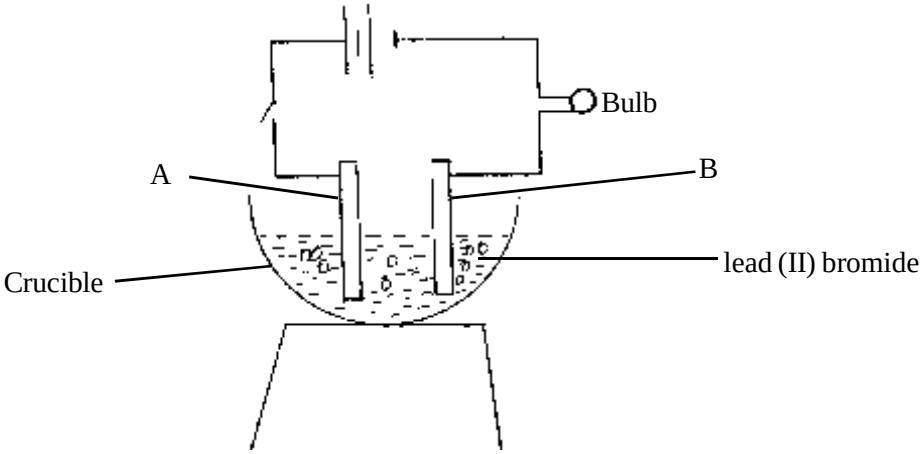


a) Why was it necessary to heat the moist sand before heating the magnesium ribbon? (1mark)

b) Write the equation for the reaction which occurred in the boiling tube during the experiment. (1mark)

c) State the test for gas K (1mark)

16. The set-up below illustrates an experiment to investigate conduction of electric current by lead (II) bromide. Study it and answer the questions that follow.



a) Explain why the bulb did not light. (½ mark)

b) If the experiment was properly carried out, state the observations made at the electrode.

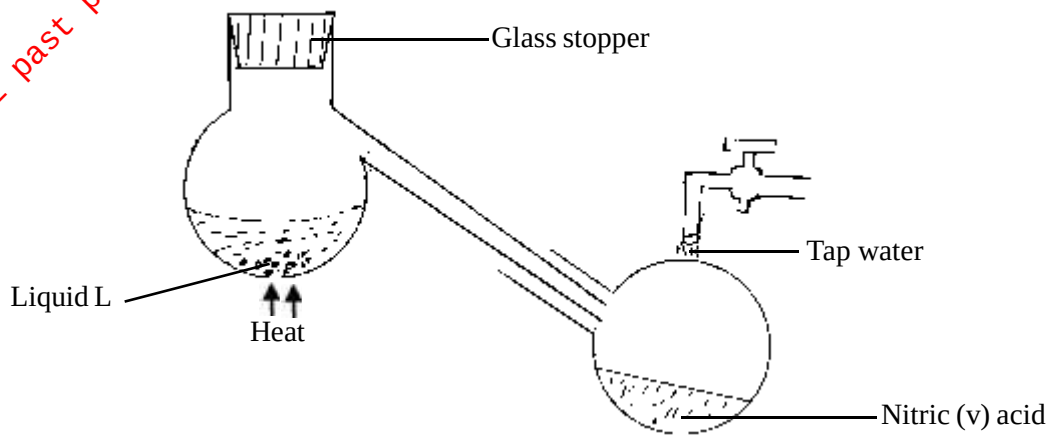
A: ..... (½ mark)

B: ..... (½ mark)

c) Write an ionic equation of discharge at the anode assuming that the electrodes used were graphite. (1mark)

17. $20cm^3$ of sodium hydroxide solution containing $8.0gdm^{-3}$ were required for complete neutralization of 0.18g of a dibasic acid H_2X. Calculate the relative molecular mass of the acid. (3marks)

18. The diagram below was arranged by a student in an attempt to prepare nitric (v) acid.



a) Name liquid L (1mark)

b) Explain why the set up above is made up of all glass ware. (1mark)

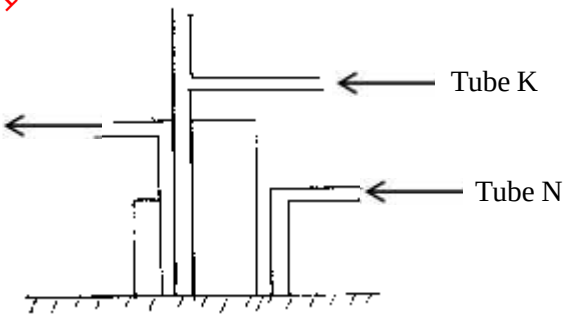
c) Write an equation for the reaction that took place in the glass retort. (1mark)

19. a) State Boyle's law. (1mark)

b) On the axes below sketch a graph to show how the pressure of a gas varies with volume at constant temperature. (1mark)

c) At 27^{0}C and 740mmHg pressure, a sample of nitrogen gas occupies 30cm^3. Calculate the volume that the gas would occupy at s.t.p. (1½ marks)

20. Sulphur is extracted by the Frasch process. Study the diagram below and answer the questions that follow.



a) Name the substances that pass through

Tube K: (1mark)

Tube N: (1mark)

b) What is the purpose of the substance that pass through tube K. (1mark)

21. An equilibrium exists between the chromate ion (CrO_4^{2-}) and the dichromate ion ($Cr_2O_7^{2-}$) as represented by the following equation.

$$2\,CrO_{4\,(aq)}^{2-} + 2H^+_{(aq)} \rightleftharpoons Cr_2O_7^{2-} + H_2O_{(l)}$$

(Yellow) (Orange)

State and explain the observation made on adding aqueous potassium hydroxide solution to the equilibrium mixture. (2marks)

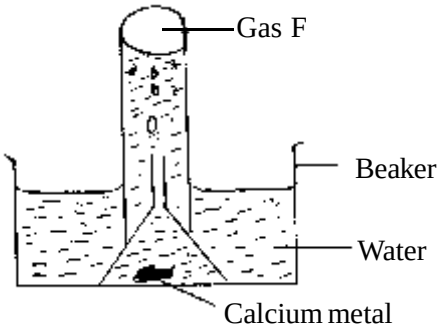
22. a) Define solubility of a salt

b) The table below shows solubility's of two salts M and N at different temperature. Study it and answer the questions that follow.

Temperature	30	90
Solubility of M in g/100g of H_2O	25.0	64.0
Solubility of N in g/100g of H_2O	32.5	48.0

A mixture of 55g of saltt M in 100g of water and 30g of salt N in 100g of water were cooled from 90^{0}C to 30^{0}C. Calculate the mass of salt that crystallizes out. (2marks)

23. The set-up below was used to collect gas F, provided by the reaction between water and calcium metal.



a) Name gas F (½ mark)

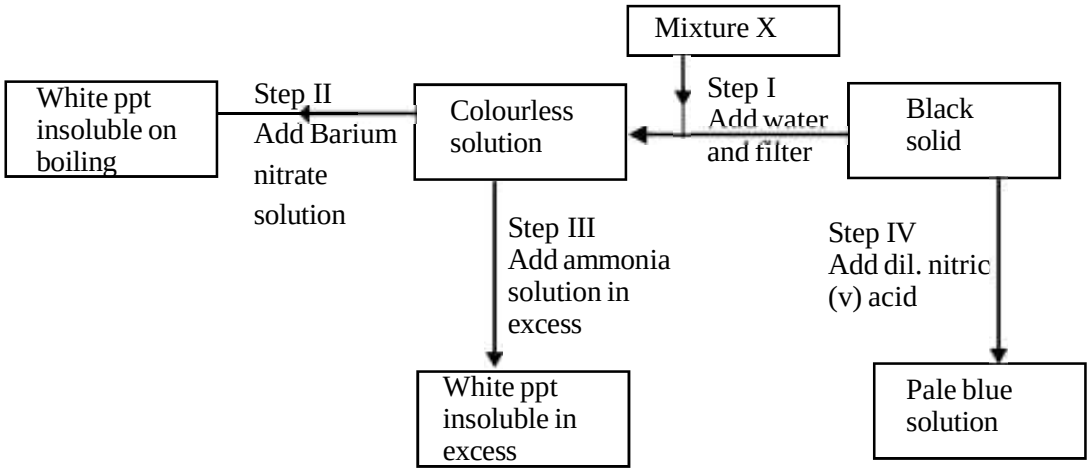
b) State and explain the effect of the solution formed on red and blue litmus papers after the reaction. (1½ marks)

24. When iron nail are left overnight they will be covered by red-brown solid called rust.

a) What is the chemical name for rust? (1mark)

b) State **two** methods for preventing rusting of iron. (1mark)

25. Study the chart below and answer the questions that follow.



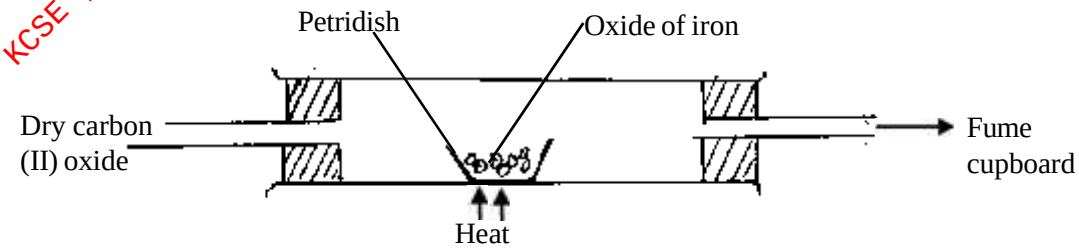
a) Name

i) Cations present in mixture x (1mark)

ii) Anions preset in the colourless solution (1mark)

iii) Write an equation to show how the white precipitate in step III dissolves. (1mark)

26. Excess carbon (II) oxide was passed over a heated sample of an oxide of iron as shown in the set up below. Study it and answer the questions that follow.



Mass of empty dish = 10.98g
Mass of empty dish and oxide of iron = 13.30g
Mass of empty dish + residue = 12.66g

a) Determine the formula of the oxide of iron (Fe = 56, O = 16) (2marks)

b) Write an equation for the reaction which took place in the petri dish. (1mark)

27. In an experiment, ammonium chloride was heated in a test tube. A moist red litmus paper place at the mouth of the test tube first changed blue then red. Explain (2marks)

28. ..... $^{32}_{16}W$ (w is not the actual symbol of the element).

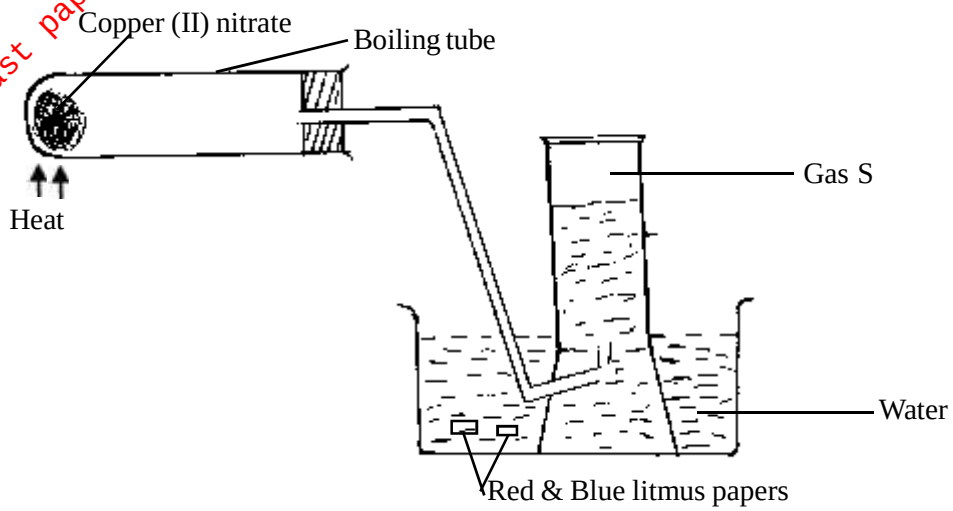
a) Which group and period does the element belong?

Group ..... (½ mark)

Period: ..... (½ mark)

b) Draw the structure of an ion of W. (2marks)

29. Copper (II) nitrate was heated in the set-up below.



a) Name gas S (½ mark)

b) State and explain the effect of the resulting solution on the red and blue litmus after the reaction. (1½ marks)

c) Write the equation of the reaction which occurred in the boiling tube during the reaction. (1mark)