NAME: …………………………….. INDEX NO: ……………………….

SIGNATURE: …………………………… DATE : …………………………..

233/1
CHEMISTRY
PAPER 1
THEORY
JULY / AUGUST 2013
TIME: 2 HOURS

NANDI CENTRAL DISTRICT JOINT MOCK 2013

Kenya Certificate of Secondary Education (K.C.S.E.)
CHEMISTRY
PAPER 1
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- Write your Name and Index Number in the spaces provided above.
- Answer all the questions in the spaces provided after each question.
- Mathematical tables and non-programmable electronic calculators may be used.
- ALL working must be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

QUESTIONS	MAX SCORE	CANDITATE'S SCORE
1 – 28	80	

1. A given element E has atomic number 14 and consists of Isotopes as shown below:

Isotope	X	Y	Z
Isotopic Mass	28	29	30
Percentage abundance	92.2	4.7	3.1

(a) What are Isotopes? (1mk)

(b) Determine the relative atomic mass of E. (2mks)

2. Passing a small quantity of carbon (iv) oxide through limewater, forms a white precipitate which dissolves when excess carbon (iv) oxide is bubbled through.

(a) Name the white precipitate. (1mk)

(b) Explain using a chemical equation why the white precipitate dissolve in excess carbon (iv) oxide. (1mk)

(c) What will happen when solution in (b) above is boiled? (1mk)

3. The diagram below shows the laboratory preparation of hydrochloric acid.
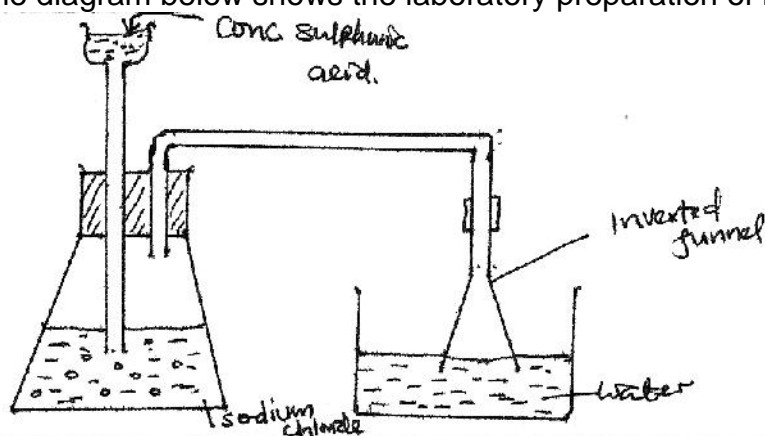

(a) State the condition necessary for the reaction to occur. (1mk)

(b) Write a chemical equation for the reaction between sodium chloride and concentrated sulphuric acid. (1mk)

(c) Give **two** reasons why an inverted funnel is used instead of delivery tube. (2mks)

2

4. The flow chart below shows some processes involved in extraction of lead metal. Study it and answer the questions that follow;
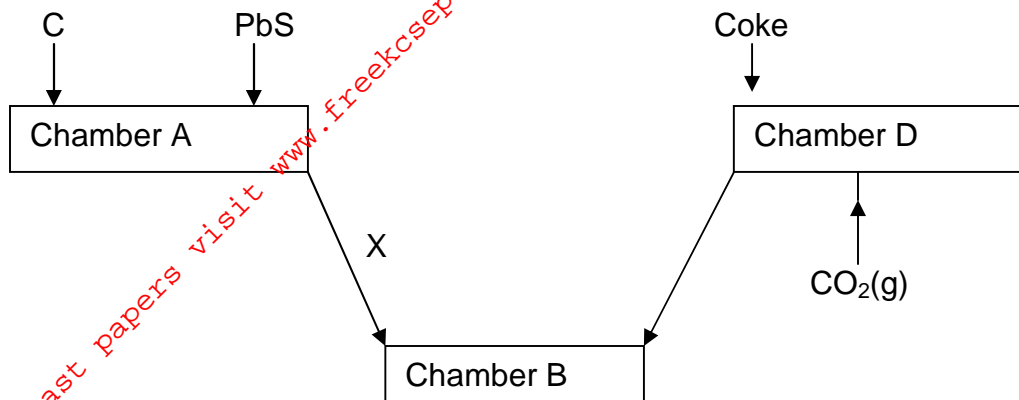
(a) Name substance C. (1mk)

(b) Write an equation for the reaction that take place in chamber B. (1mk)

(c) Give **two** uses of lead metal. (1mk)

5. (a) State Charles law. (1mk)

(b) The capacity of a balloon to hold a gas at 5^0C is $1dm^3$ before it burst due to expansion. Show whether it will hold or not at 35^0C if pressure remains constant. (2mks)

6. The table below shows the observations made on tests carried out on a colourless solution sample.

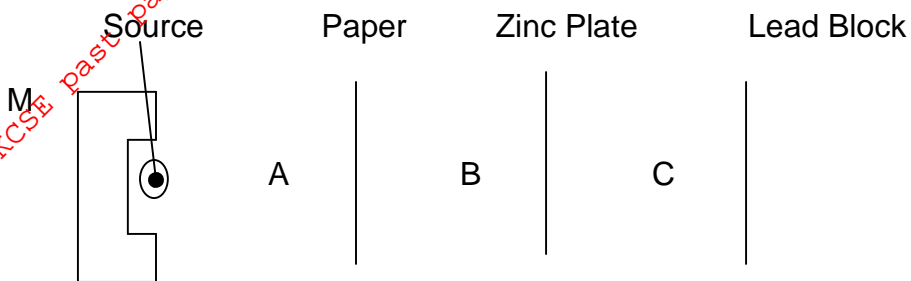| Tests	Observations
Addition of excess $NH_{3(aq)}$	White precipitate
Addition of dilute $H_2SO_{4(aq)}$	White precipitate
Addition of $AgNO_{3(aq)}$	White precipitate

Identify:
(i) Cation in the sample (1mk)

(ii) Anion in the sample. (1mk)

7. The arrangement below was used to compare the penetrating power of emissions in a radio active decay.

    Source   Paper   Zinc Plate   Lead Block

(a) Name the radio active that can be detected at: (1½ mks)
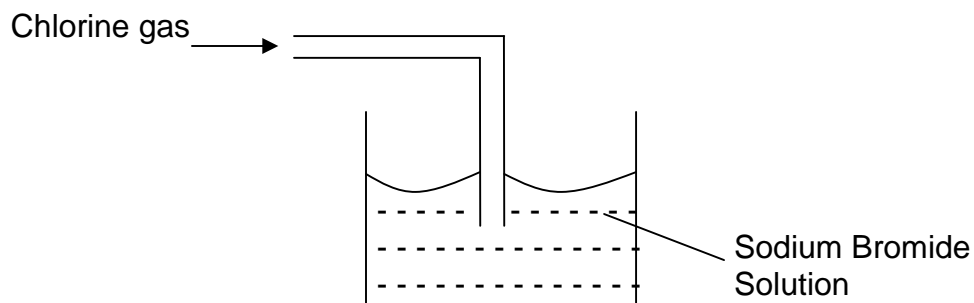   A

   B

   C

(b) Name the material M. (½ mk)

(c) The half life of $^{234}_{92}U$ is 4500 years. The isotope decays by alpha emission.
Write a nuclear equation for its decay to form Thorium (Th). (1mk)

8. Experiment was set as shown below. Explain what was observed. (2mk)

Chlorine gas

Sodium Bromide Solution

9. Study the ionization energies of alkaline earth metals shown in the table below.

Element	First ionization energy $KJmol^{-1}$	Second ionization energy $KJ mol^{-1}$
Beryllium	900	1800
Magnesium	740	1450
Calcium	590	1150

(a) Explain the trend in ionization energies. (2mks)

10. Fill the empty spaces in the table below. (2mks)

Apparatus	Use
Pipe-clay triangle	
Reagent bottle	

11. Some reactions of metals P, Q, R and S are given below.

Metal	Reaction with water	Reaction with dilute hydrochloric acid
P	A few bubbles form slowly in water	Vigorous reaction. Gas is given off
Q	Vigorous reaction, metal melts, gas given off.	Explosive reaction. Should not be attempted.
R	No reaction	No reaction
S	Does not react with cold water. Hot metal reacts with steam.	Steady fizzing.

(a) Arrange the metals in order of the reactivity starting with the least reactive. (1mk)

(b) Write a chemical equation for the reaction between metal Q and water. (1mk)

(c) Which of the metals could be:
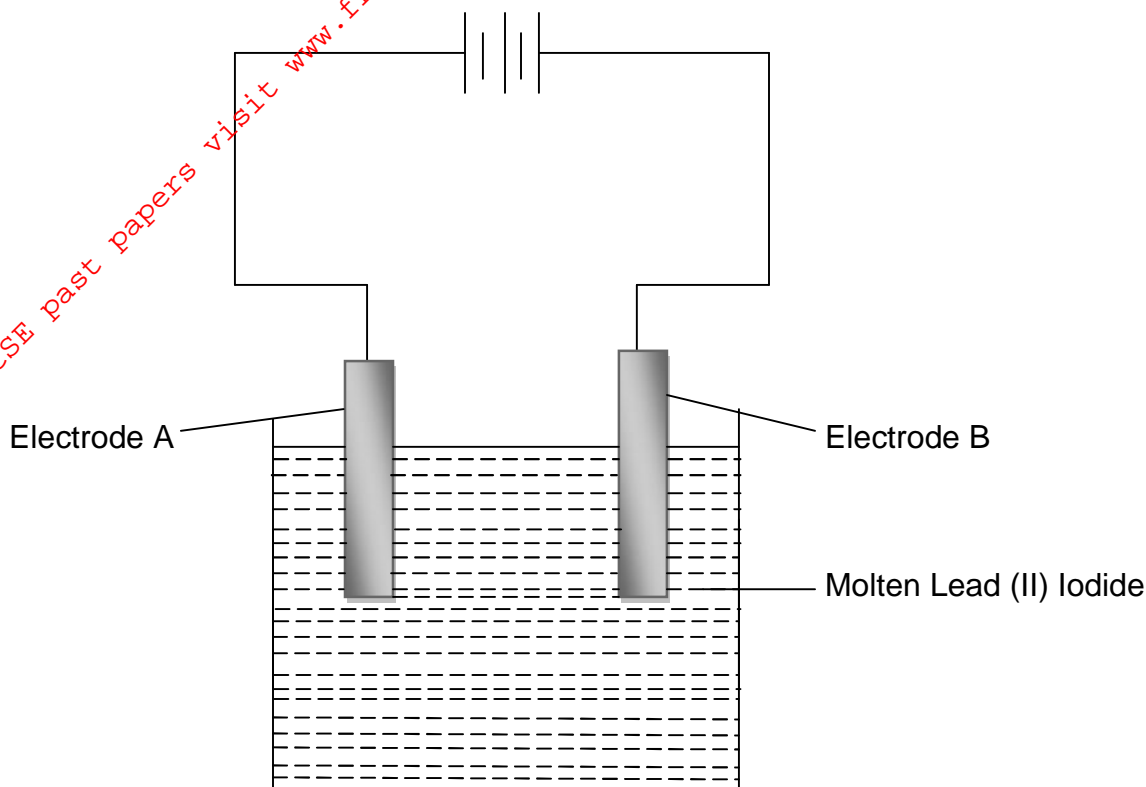(i)   Copper   (½ mk)

(ii)   Magnesium   (½ mk)

5

12. (a) What is a binary electrolyte? (1mk)

(b) The set-up below was used to electrolysed molten lead (ii) iodide.

Electrode A

Electrode B

Molten Lead (II) Iodide

(i) State the observation that was made during electrolysis at electrode A. (1mk)

(ii) Write the ionic equation for the reaction that took place at the anode. (1mk)

13. In an experiment 2.4g of sulphur was obtained by reacting hydrogen sulphide and chlorine as shown in the equation below.

$$H_2S_{(g)} + Cl_{2(g)} \longrightarrow S(s) + 2HCl_{(g)}$$
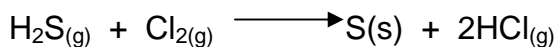
(a) Which of the reactants acts as a reducing agent in the above reaction. Explain.
(1mk)

(b) Given that the yield of sulphur in the above reaction is 75%, calculate the number moles of hydrogen sulphide gas used in the reaction (S=32.2 H = 1.0)
(2mks)

14. Study the energy level diagram for the reaction shown below and use it to answer the questions that follow.
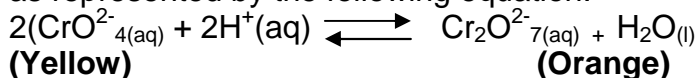
$2SO_2 + O_2 \longrightarrow 2SO_3$
(g)   (g)   (g)

Reactants

ΔH_1

Energy

ΔH_2

Product

Reaction Path
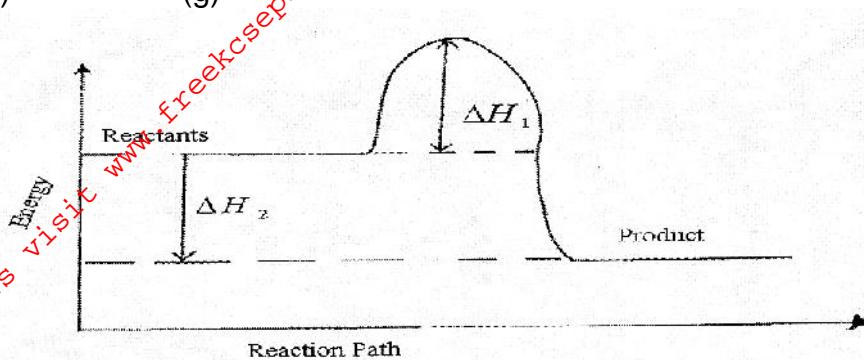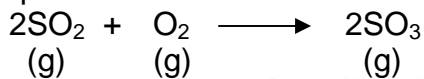
(i) State and explain **two** ways of increasing the yield of SO_3 per unit time from the diagram. (2mks)

(ii) What do the following represent?

$\Delta H1$ (½mk)

$\Delta H2$ (½mk)

15. An equilibrium exists between the chromate ion (CrO^{2-}_4) and the dichromate ($Cr_2O^{2-}_7$) as represented by the following equation:

$2(CrO^{2-}_{4(aq)} + 2H^+(aq) \rightleftharpoons Cr_2O^{2-}_{7(aq)} + H_2O_{(l)}$
(Yellow)   **(Orange)**

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

(b) What would be the effect of increasing pressure on the equilibrium reaction? (1mk)

7

16. A liquid X is added dropwise to $20cm^3$ of Urea fertilizer $(NH_2)_2 CO$ solution. The pH value is noted after the addition of every 10 drops and a graph of pH against number of drops is drawn as shown below.

No. of drops added
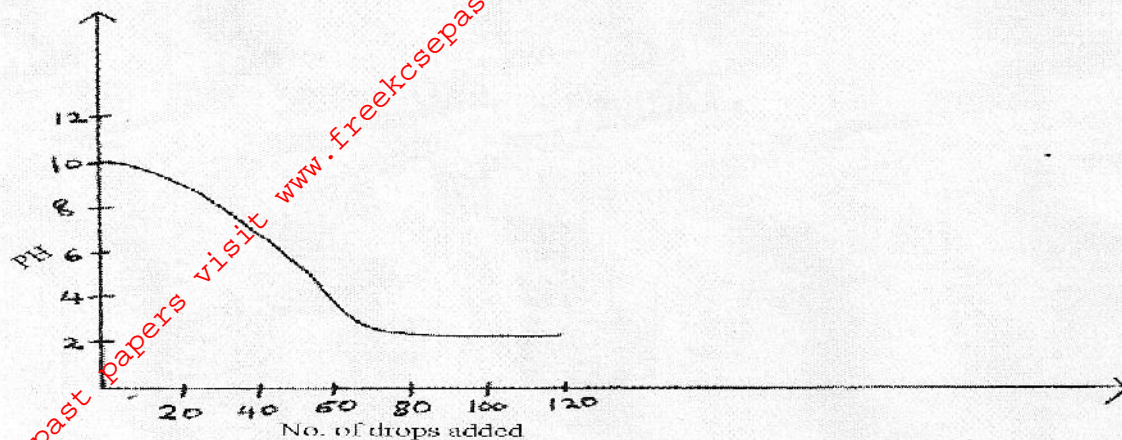
(a) From the evidence on the graph, state the nature of liquid X added and explain your deduction. (2mks)

(b) The table below shows solution and their pH value.

Solution	pH Value
P	2.0
R	7.0
Q	14.0

Select **two** solutions that would react with zinc hydroxide. Explain. (1mk)

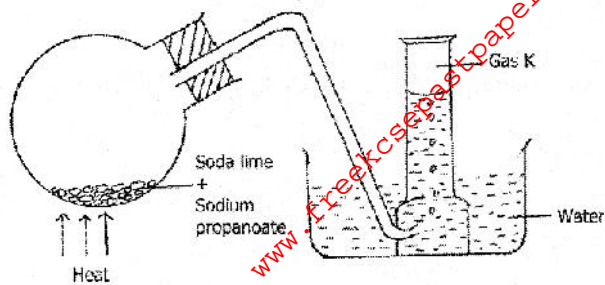17. The table below shows the pH values of solutions A to E.

Solution	A	B	C	D	E
pH	6	13	2	10	7

(a) What is meant by the term pH? (1mk)

(b) Which of the solutions contains the largest number for hydroxide ions? (1mk)

(c) What will the pH value of the mixture of D and E? (1mk)

18. Study the set-up below and answer the questions that follow.

(i) Name gas K. (1mk)

(ii) To which homologous series does K belong? (1mk)

(iii) Write the chemical equation of the reaction in the round bottom flask. (1mk)

19. Use the reaction scheme below to answer the questions that follow:

Alcohol X	Process Y Conc.H_2SO_4	Propene	$H_{2(g)}$ 140^{0}C	Compound Z
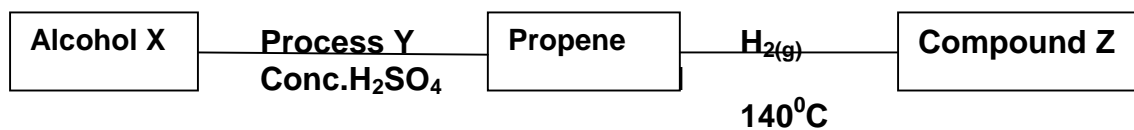
(i) Draw the structure of alcohol X. (1mk)

(ii) Name process Y. (1mk)

(iii) Write the molecular formula of the 5th member in which propene belong. (1mk)

9

20. Study the two structural formula of compounds labeled Q and R.

Q $CH_3CH_2CH_2COOCH_2CH_3$

R $CH_3CH_2CHCH_2CH_3$
      |
     HO – C = O
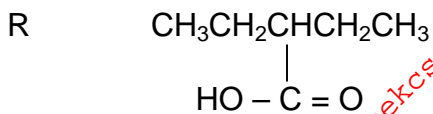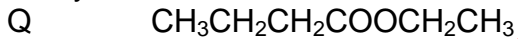
(a) (i) Give the empirical formula that represents both compounds Q and R. (1mk)

  (ii) Which single chemical term best describes the two substances Q and R. (1mk)

  (iii) Which unique physical property of substance Q is used to identify it? (1mk)

21. Element R has atomic number 8 and a mass number 16.
 (i) Draw the atomic structure of element R.   (1mk)

 (ii) Write the formula of the ion of element R.   (1mk)

 (iii) Explain why R forms a hydride with a low boiling point. (1mk)

22. The mass of $1dm^3$ of a gas at s.t.p. is 1.52g. What is the relative molecular mass of the gas? (Molar volume at s.t.p. is $22.4dm^3$) (2mks)

23. The melting and boiling points of molecular substances increase with increase in relative molecular mass. Explain why sugar with a relative mass of 183 has a higher melting point (200^0C) than iodine with a relative molecular mass of 86 and a melting point of 114^0C. (2mks)

24. (a) State role of the following parts during fractional distillation of a mixture of water and ethanol.
    (i) Fractionating column (1mk)

    (ii) Glass beads in the fractionating column. (1mk)

    (b) State any **two** applications of fractional distillation process. (2mks)

25. $18.7cm^3$ of a dibasic acid H_2A required $25cm^3$ of 0.1m Sodium hydroxide 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)

26. An oxide of Potassium has a relative formula mass of 110, if 2.75g of the oxide
    contains 1.95g of Potassium, determine the formula of the oxide. K = 39.0, O = 16.0.
                                                                                          (3mks)
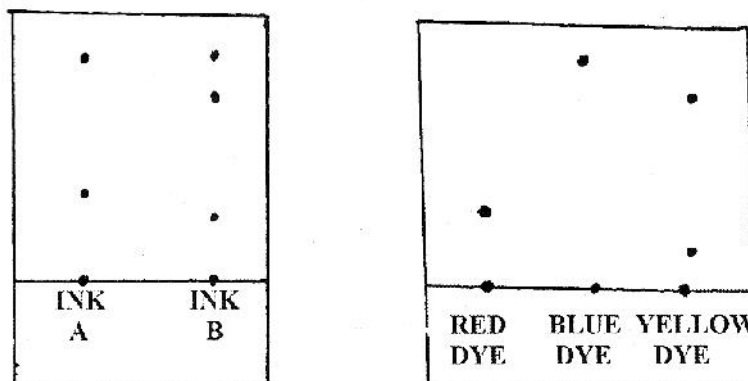
27. Using dots (.) and crosses (x), show bonding in:
    (a)   The compound formed when nitrogen reacts with fluorine (Atomic numbers F =
           9, N = 7)   (2mks)

    (b)   Sodium oxide.   (Atomic numbers Na = 11, O = 8)   (1mk)

28. The chromatogram of two inks and three dyes is drawn below.

    (a)   Name the colours of ink A.   (1mk)

    (b)   Suggest how separated components can be recovered.   (1mk)

    (c)   Suggest **two** reasons why separations occur in this method.   (1mk)