KAMUKUNJI DISTRICT KCSE EVALUATION TEST
JULY 2014
CHEMISTRY THEORY
PAPER 2 (233/2)

TIME: 2 HOURS

NAME………………………………………………..SCHOOL………………………………

ADM NO. :……………………………………   **INDEX NO. …………………………**

INSTRUCTIONS

- Answer all questions in the spaces provided.
- Mathematical tables and electronic calculators may be used.
- All working must be clearly shown where necessary.

For official use only

TOTAL SCORE	STUDENT'S SCORE
80	

1. (a) Name two apparatus used to measure accurate volumes of liquids in the laboratory (1mk)

   (b) Give two reasons why most of the apparatus found in a chemistry laboratory are made up of glass   (2mks)

2. The electronic configuration of ions X^{2+} is 2.8 while that of ion Y^- is 2.8.8.
   (a) Write down the electron arrangement of the atoms of X and Y   (1mk)
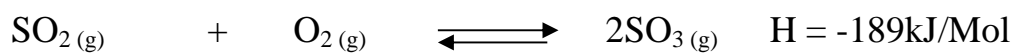
      X-

      Y-

   (b) Compare the atomic radii of the two elements   (1mk)

   (c) Give the name of the chemical family to which element X belongs   (1mk)

3. Sulphur (IV)Oxide reacts with Oxygen as shown below

   $$SO_{2\,(g)} \quad + \quad O_{2\,(g)} \quad \rightleftharpoons \quad 2SO_{3\,(g)} \quad H = -189kJ/Mol$$

   State giving a reason what would happen to the equilibrium, If;

(i)   The temperature is increased   ($1^1/_2$mk)

(ii)   The pressure of the system is increased   ($1^1/_2$mk)

4. Describe how a sample of Calcium Carbonate can be prepared in the laboratory starting with Calcium Oxide   (3mks)

5. A hydrated Salt has the following composition by mass .Iron 20.2% ,Sulphur 11.5% ,Oxygen 23% and Water of crystallization 45.3%.its relative formula mass is 278 .Determine the formula of the hydrated salt.(Fe= 56, O= 16 ,S =32 ,H=1)   (3mks)

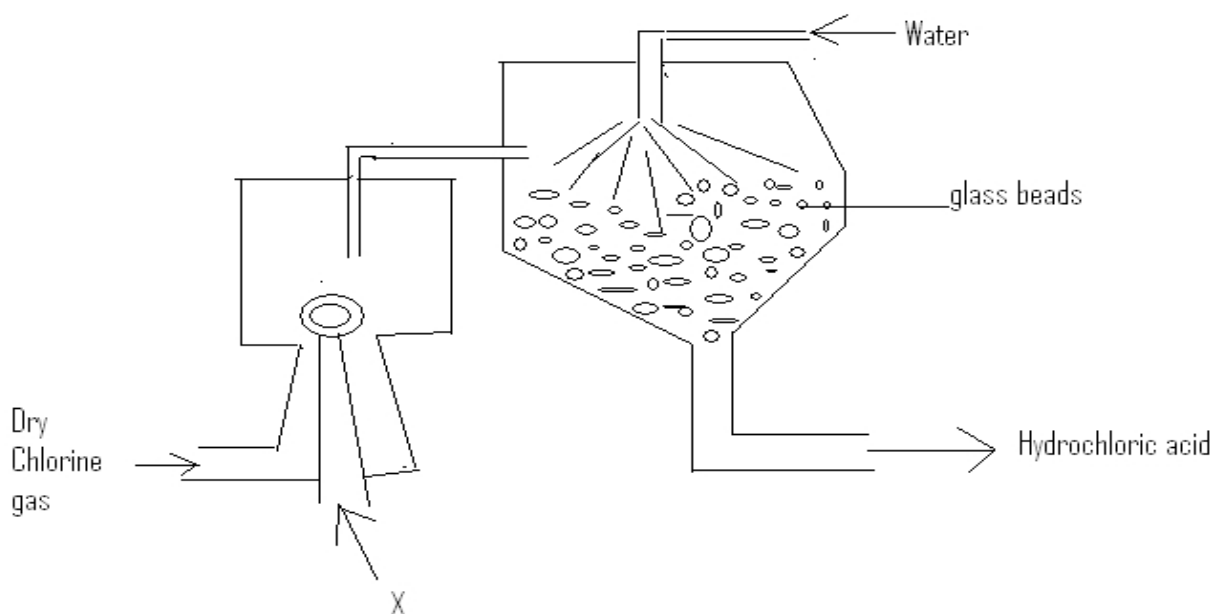6. The atomic number of element A is 15 and that of B is 9.
   (a) Write the formula of the compound formed between A and B   (1mk)

   (b) Using dots(**.**) and crosses (**x**) to represent electrons ,draw a diagram to show bonding in the
       compound formed   (2mks)

7. The diagram below represents a set up for large scale manufacture of hydrochloric acid.
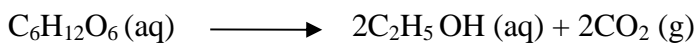
(a) Name the substance X (1mk)

(b) What is the purpose of the glass beads? (1mk)

(c) Give one use of hydrochloric acid (1mk)

8. (a) Define Solubility (1mk)

(b) 8g of a Solid X dissolves in $20cm^3$ of water to form a saturated solution at 40^0 c .Determine the solubility of solid X at 40^0C (2mks)
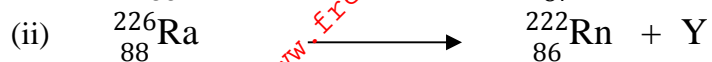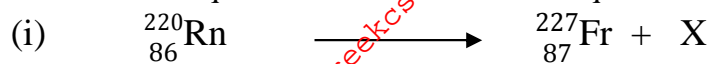
9. **(a)** Fermentation of glucose occurs according to the equation;

$$C_6H_{12}O_6 \text{ (aq)} \longrightarrow 2C_2H_5 OH \text{ (aq)} + 2CO_2 \text{ (g)}$$

If 20 dm^3 of carbon (IV) oxide are collected at S.T.P. during fermentation, what mass of glucose was used? (Molar gas volume = 22.4 dm^3, C = 12, H = 1, O = 16) (2mks)

(b) Name the catalyst used during fermentation. (1mk)

10. Use the nuclear equations below to answer the questions that follow

(i) $\quad {}^{220}_{86}Rn \quad \longrightarrow \quad {}^{227}_{87}Fr \; + \; X$

(ii) $\quad {}^{226}_{88}Ra \quad \longrightarrow \quad {}^{222}_{86}Rn \; + \; Y$

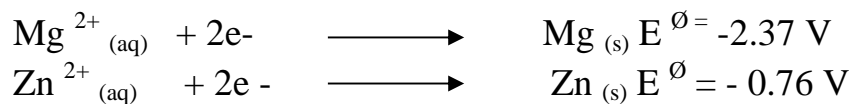Give the actual names of particles X and Y. (1mk)

(a) X –

Y -

b) Give the name of a radiation whose emission does not change the mass number of a radioisotope (1mk)

11. (a) Given the following half equations

$Mg^{2+}_{(aq)} \; + 2e- \quad \longrightarrow \quad Mg_{(s)} \; E^{\varnothing =} \, -2.37 \, V$

$Zn^{2+}_{(aq)} \; + 2e - \quad \longrightarrow \quad Zn_{(s)} \; E^{\varnothing} = - 0.76 \, V$

(i) Calculate the $E^{\varnothing}$ value for the cell (1mk)

(ii) Write the overall equation for the cell reaction (1mk)

b) Name a suitable salt that is normally used in a salt bridge of an electrochemical cell. (1mk)

12. (a) State two observations made when a small piece of potassium metal is put in a trough full of water. (2mk)

(b) Write a chemical equation for the reaction (1mk)

13. (a) Name the chief ore from which iron is extracted (1mk)

(a) Name the two impurities found in iron ores (1mk)

(b) Iron rusts in the presence of moist air .Give the chemical name of rust (1mk)

14. The table below gives some properties of four substances. Study it and answer the questions that follow:

| Substance	M.P ^{0}C	B.P ^{0} C	Electrical Conductivity	
			Solid	Liquid
W	1723	2230	Poor	Good
X	993	1695	Poor	Poor
Y	- 183	- 164	Poor	Poor
Z	1083	2567	Good	Good

(a) Which substance is suitable for making cooking pans? Explain. ($1^1/_2$mk)

(b) Which substance is likely to have a giant atomic structure? Explain. $(1^1/_2 mk)$

15. (a) Define Molar heat of solution   (1mk)

b) When 2g of Ammonium nitrate was passed in $80cm^3$ of water, the temperature changed from 22^0 C to 20^0C .Calculate the molar heat of solution of Ammonium nitrate. (N = 14 , O = 16 ,H = 1 , Specific heat capacity = 4.2 KJ $Kg^{-1}K^{-1}$)   (3mks)

c) Chlorine reacts with moist hydrogen Sulphide as shown below;

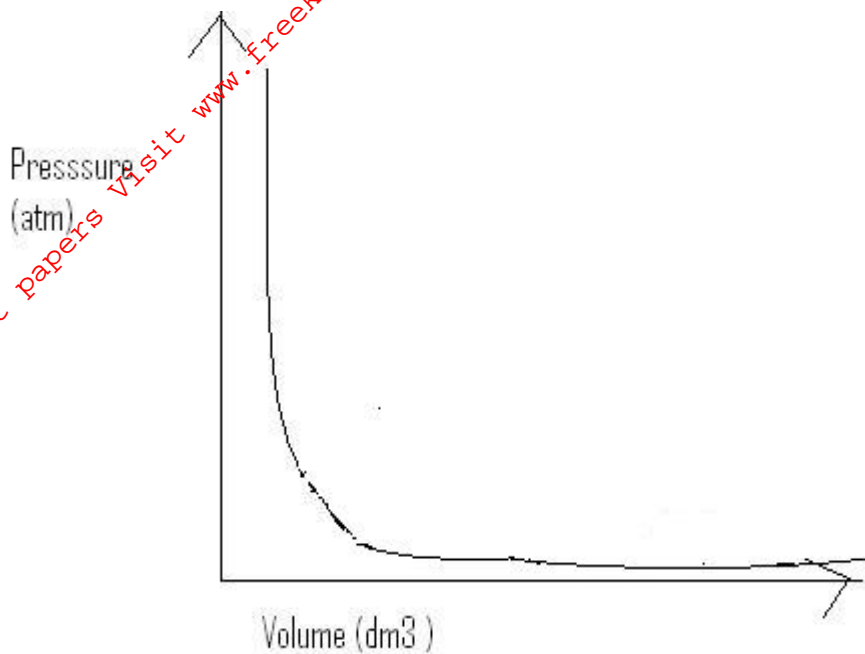$$H_2S \ (aq) \ + \ Cl_2 \ (g) \ \longrightarrow \ 2 \ HCl \ (aq) \ + \ S \ (s)$$
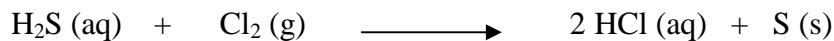
(a) State the observation made   (1mk)

(b) Using oxidation numbers ,identify the reducing agent   (2mks)

d) 17g of Zinc carbonate was reacted with 50 cm^3 of 4M nitric acid .Calculate the mass of Zinc Carbonate that remained unreacted. (Zn = 65, C = 12, O = 16)   (3mks)
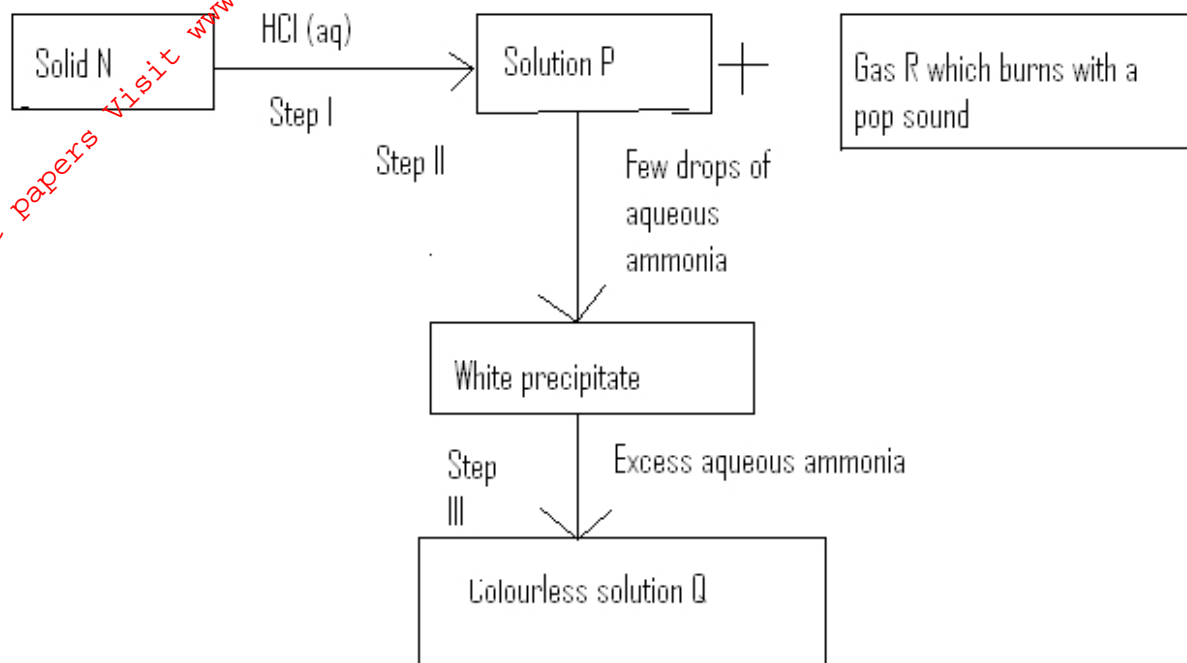
18. The graph below shows the behavior of a fixed mass of a gas at constant temperature.

(a) What is the relationship between the volume and pressure of the gas?   (1mk)

(b) A fixed mass of a gas at 750mmHg pressure and -23 ^{0}C temperature occupies a
    volume of 600 cm^3 .What volume will it occupy at 33^{0}C and 900mmHg?   (2mks)

19. Study the reaction scheme below and answer questions that follow;

```
                HCl (aq)
  ┌─────────┐  ─────────→  ┌──────────┐        ┌──────────────────────────┐
  │ Solid N │    Step I     │ Solution P│  ╂     │ Gas R which burns with a  │
  └─────────┘               └──────────┘        │ pop sound                 │
                                    │            └──────────────────────────┘
                 Step II            │  Few drops of
                                    │  aqueous
                                    │  ammonia
                                    ↓
                            ┌──────────────────┐
                            │ White precipitate │
                            └──────────────────┘
                     Step          │  Excess aqueous ammonia
                      III          ↓
                            ┌──────────────────┐
                            │ Colourless solution Q │
                            └──────────────────┘
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(a) Identify   (2mks)
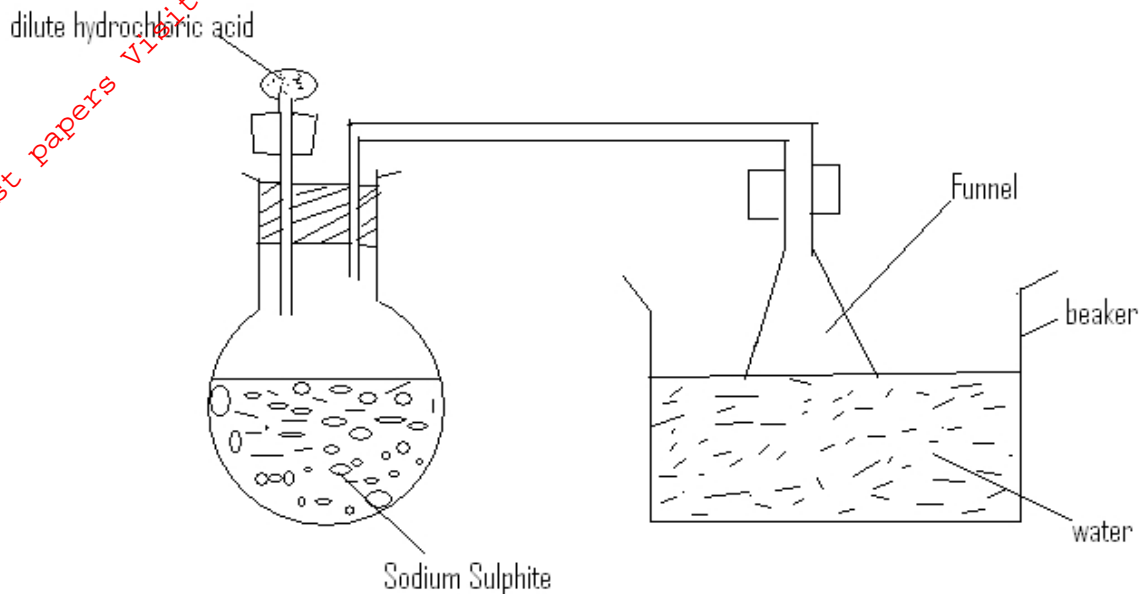(i)   Solid N

(ii)   Gas R

(b) Write the formula of the complex ion present in colorless solution Q   (1mk)

20. Study the diagram below that shows how to prepare a given gas and dissolve it in water.

dilute hydrochloric acid
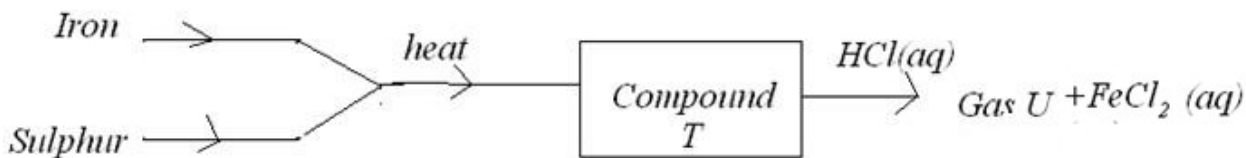
Funnel

beaker

water

Sodium Sulphite

(a) Write a chemical equation to show how the gas is produced   (1mk)

(b) Why was it necessary to use a funnel while dissolving the gas in water?   (1mk)

(c) How does the gas affect the PH of the water in the beaker .Explain?   (1mk)

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

Iron

Sulphur

heat

Compound T

$HCl(aq)$

Gas U $+FeCl_2$ (aq)

Identify
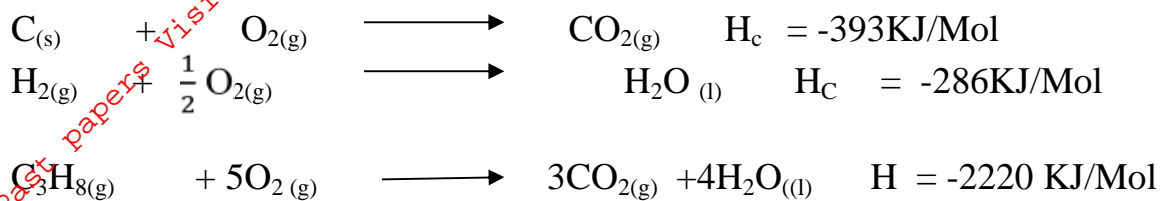(a) Compound T

(1mk)
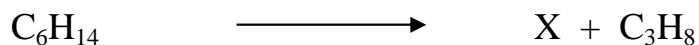
(b) Gas U   (1mk)

22. Use the information given below to calculate the enthalpy of formation of propane.   (3mks)

$C_{(s)}$ + $O_{2(g)}$ $\longrightarrow$ $CO_{2(g)}$ H_c = -393KJ/Mol

$H_{2(g)}$ + $\frac{1}{2}$ $O_{2(g)}$ $\longrightarrow$ $H_2O_{(l)}$ H_C = -286KJ/Mol

$C_3H_{8(g)}$ + $5O_{2(g)}$ $\longrightarrow$ $3CO_{2(g)}$ $+4H_2O_{((l)}$ H = -2220 KJ/Mol

23. The molecular formula of a hydrocarbon is C_6H_{14}. It can be converted into two smaller
hydrocarbons as shown below

C_6H_{14} $\longrightarrow$ X + C_3H_8

(a) Name the process through which C_6H_{14} is converted to X and C_3H_8 (1mk)

(b) Name X and draw its structural formula.   (1mk)

(c) Write the chemical equation for the complete combustion of C_3H_8 (1mk)

24. Sodium hydrogen Carbonate is obtained from trona which is found together with Sodium Chloride in some lakes in the Rift Valley.

(a) State the method used to separate trona from the mixture with Sodium Chloride.   (1mk)

b) Give one use of Sodium hydrogen Carbonate   (1mk)

25. Name a gas used together with Oxygen in welding.   (1mk)

26. Explain how the electrical conductivity of Sodium and Aluminium compare.   (2mks)

27.(a) When ammonia gas is passed through water ,the solution formed changes red litmus paper to blue .Name the ion responsible for the colour change of the litmus paper   (1mk)

b) Study the effect of heat on the following metal nitrates

METAL	PRODUCTS
A	Metal Oxide , Nitrogen (IV) Oxide and Oxygen
B	Metal nitrite and Oxygen
C	Metal, Nitrogen (IV) Oxide and oxygen.

i) Arrange the metals A, B, C in order of their reactivity starting with the most reactive   (1mk)

ii) To which group of the periodic table does metal B belong?   (1mk)
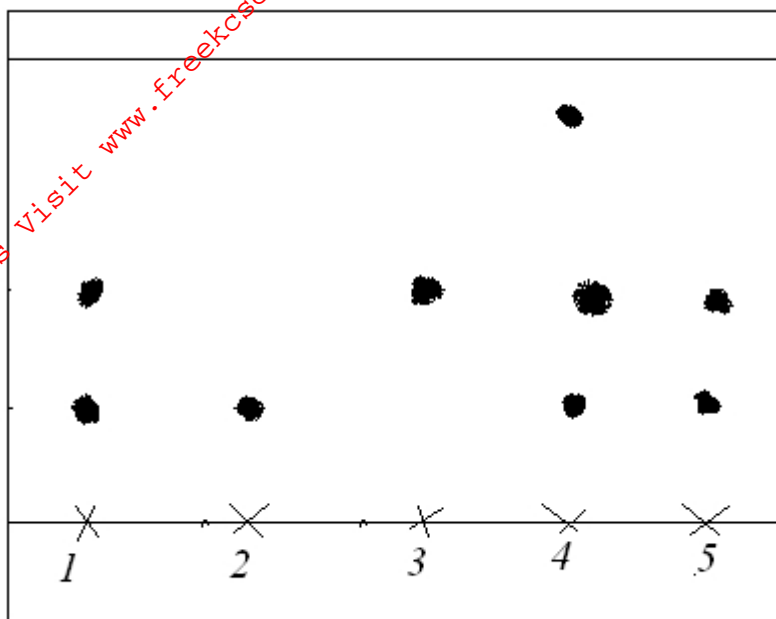
28. The setup below shows the effect of Carbon (ii) oxide in Copper (ii) oxide.
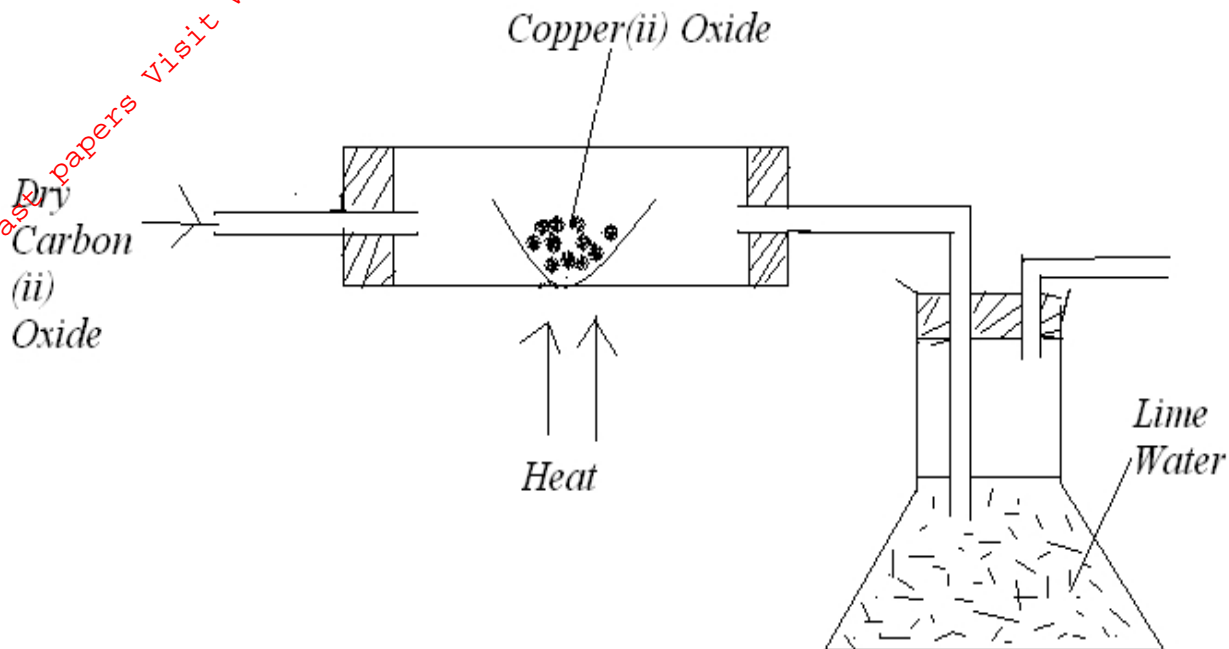
(a) State two observations made during the experiment   (2mks)

(b) Write a chemical equation for the reaction between Copper (II) Oxide and Carbon (ii) Oxide.   (1mk)

29. A piece of chromatogram is represented in the diagram below. 1, 2, 3, 4 and 5 represents different inks.

(i)   Which number (s) represents the ink which contain only one pigment?   (1mk)

(ii)   What numbers represent two inks that contain same pigments?   (1mk)

30. (i) State the observation made when Concentrated nitric (V) acid is added to a few pieces of Copper turnings in a test tube .   (1mk)

(iii)   Explain the observations in (i) above.   (1mk)