

CHEMISTRY PAPER 233/1 K.C.S.E 2002

QUESTIONS

- 1) Name One property of neon that makes it possible to be used in electric lamps
- 2) Oxygen and sulphur belong to group (VI) of the periodic table. Explain why there is a big difference their (melting points of oxygen is -216°C while that of sulphur is 44°C).
- 3) The oxides of elements A and B have the properties shown in the table below. (the letter do not represent the actual symbols of elements)

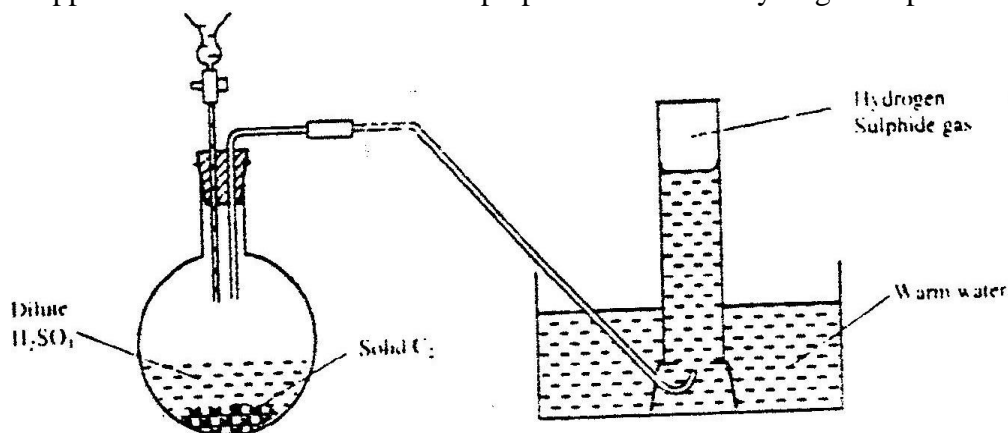
A	B
Gaseous at room temperature	Solid at room temperature
Dissolves in water to form an acidic solution	Dissolves in water to form an alkaline solution

Give one example of elements A and B

A

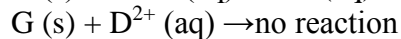
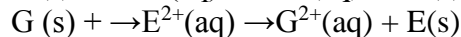
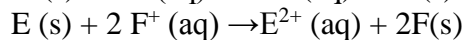
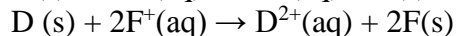
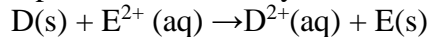
B

- 4) The following two tests were carried out on chlorine water contained in two test tubes
 - (a) A piece of blue flower was dropped into the first – tube. Explain why the flower was bleached
 - (b) The second test- tube was corked and exposed to sunlight after a few days, it was found to contain a gas that rekindled a glowing splint. Write an equation for the reaction which produced the gas
- 5) (a) Write the electronic configuration of calcium (atomic number 20) and beryllium (atomic number 4)
(b) Why is calcium more reactive than beryllium
- 6) When potassium nitrate is heated, it produces potassium nitrate and gas C_1
 - (a) Identify gas C
 - (b) Name the type of reaction undergone by the potassium nitrate
- 7) State and explain how the rate of reaction between zinc granules and steam can be increased
- 8) The apparatus shown below was set to prepare and collect hydrogen sulphide



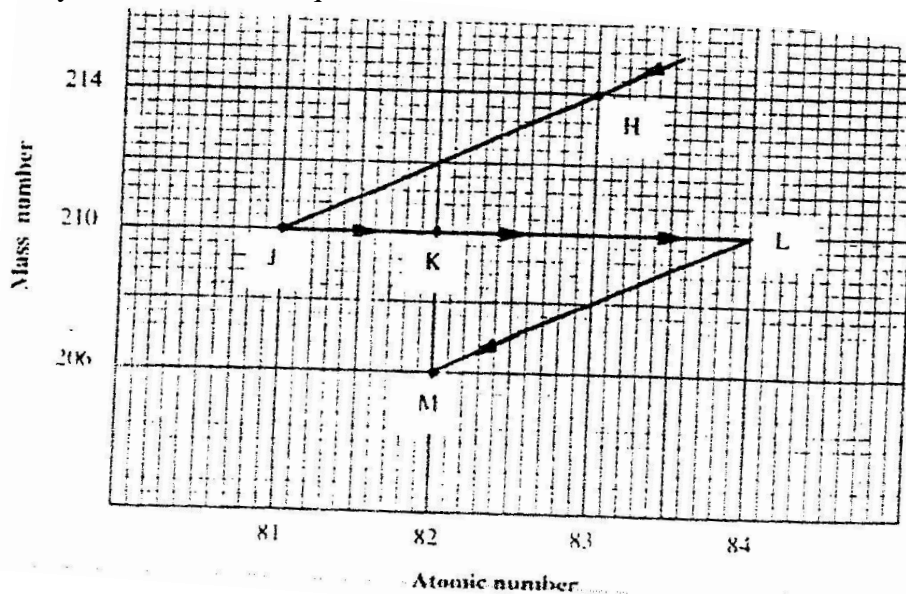
- (a) Name solid C_2
- (b) Give a reason why warm water is used
- (c) What observation would be made if hydrogen sulphide gas was bubbled into a solution of lead II nitrate?

- 9) Use the reactions given below to answer the questions that follow. The letters do not represent the actual symbols of the elements

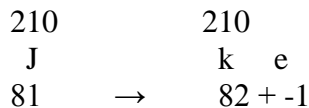


- (a) What name is given to the type of reaction given above?
 (b) Arrange the elements D, E, F and G in the order of their reactivity starting with the most reactive
 (c) Complete the equation below
 $G(s) + 2F^{+}(aq) \rightarrow$

- 10) The graph below represents a radioactive decay series for isotope H. Study it and answer the questions that follow



- (a) Name the type of radiation emitted when isotope H changes to isotope J.
 (b) Write an equation for the nuclear reaction that occurs when isotope J changes to isotope K



- (c) Identify a pair of isotopes of an element in the decay series

- 11) In an experiment, sulphur dioxide gas was bubbled into water followed by chlorine gas. The resulting clear solution gave a white precipitate when mixed with an acidified barium chloride solution. Explain these observations

- 12) Concentrated sulphuric acid was added to iron II sulphate acidified with sulphuric acid and the mixture heated. The solution turned from pale green to yellow with evolution of brown gas. Explain these observations.
- 13) Use the equations below to answer the questions that follow
 $K(g) + Cl(g) \rightarrow KCl(s); \Delta H_1 = -701 \text{ kJ mol}^{-1}$
 $KCl(s) \rightarrow K^+(aq) + Cl^-(aq); \Delta H_2 = +15 \text{ kJ mol}^{-1}$
- (a) What is the name of ΔH_1 ?
- (b) Calculate the heat change for the process
 $K(g) + Cl(g) \rightarrow K^+(aq) + Cl^-(aq)$
- 14) Iron is extracted from its ore by the blast furnace process
 (a) Name one ore from which iron is extracted
 (b) One of the impurities in iron is removed in the form of calcium silicate. Write an equation for the reaction in which calcium silicate is produced
- 15) When carbon dioxide gas was passed through aqueous calcium hydroxide a white suspension was formed
 (a) Write an equation for the reaction that took place
 (b) State and explain the changes that would occur when carbon dioxide gas is bubbled through the white suspension
- 16) With reference to iodine, distinguish between covalent bonds and Van Der Waals forces
- 17) The structures below represent a portion of a polymer

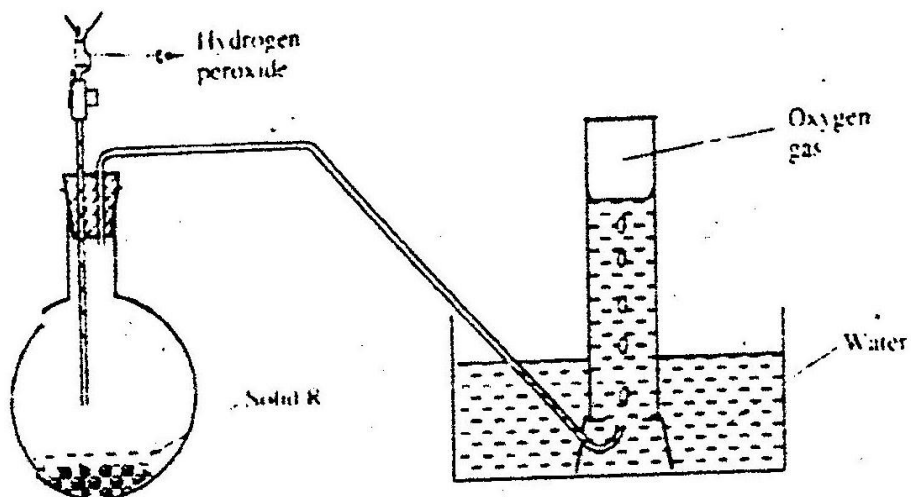
- (a) Give the name of the polymer
 (b) Give one industrial use of the polymer
- 18) Describe how a solid sample of Zinc (II) carbonate can be prepared starting with zinc oxide
- 19) Bismuth chloride (BiCl_3) reacts with water according to the equation given below
 $\text{BiCl}_3(aq) + \text{H}_2\text{O}(l) \rightleftharpoons \text{BiOCl}(s) + 2\text{HCl}(aq)$
- (a) State what would happen when a few drops of dilute hydrochloric acid are added to the mixture at equilibrium
 (b) Give a reason for your answer in (a) above
- 20) The table below gives some information about the electrical conductivity and the likely bonding in substances N, P and Q. Complete the table by inserting the missing information in the spaces numbered I, II and III

Substance	Likely type of bonding present	Electrical solid	Conductivity
N	Metallic	I.....	Conducts
P	II.....	Does not conduct	Conducts
Q	III.....	Does not conduct	Does not conduct

- 21) In an experiment 30 cm^3 of 0.1 M sulphuric acid were reacted with 30 cm^3 of 0.1 M sodium hydroxide
 (a) Write an equation of the reaction that took place

- (b) State the observations that were made when both blue and red litmus papers were dropped into the mixture
 (c) Give a reason for your answer in (a) above

22) The diagram below is set – up for the laboratory preparation of oxygen gas



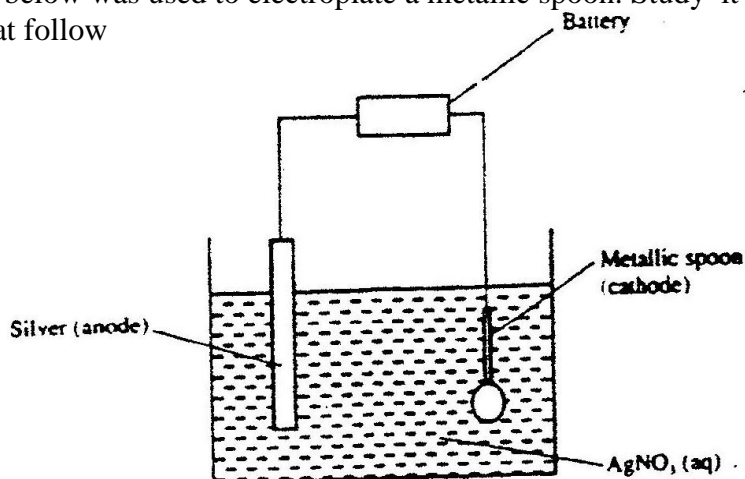
- (a) Name solid R
 (b) Write an equation for the reaction that takes place in the flask
 (c) Give one commercial use of oxygen
- 23) When excess lead nitrate solution was added to a solution containing sodium chloride, the precipitate formed was found to weigh 5.56 g. Determine the amount of sodium chloride in the solution (Pb = 207, Cl = 35.5 Na = 23)

$$\text{Pb}(\text{XO}_3)(\text{aq}) + 2\text{NaCl}(\text{aq}) \rightarrow \text{PbCl}_2 + \text{NaNO}_3(\text{aq}) \downarrow$$
- 24) (a) Give a reason why concentrated sulphuric acid is not used to dry ammonia gas
 (b) Name one suitable drying agent for ammonia gas
- 25) But -2- ene undergoes hydrogenation according to the equation given below

$$\text{CH}_3\text{CH} = \text{CHCH}_3(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3(\text{g})$$

- (a) Name the product formed when but -2 – ene reacts with hydrogen gas
 (b) State one industrial use of hydrogenation

26) The set – up below was used to electroplate a metallic spoon. Study it and answer the questions that follow



- (a) Write an ionic equation for the reaction that occurred at the cathode
 (b) State and explain what happened to the anode

27) The following tests were carried out on three separate portions of a colourless solution S

Tests	Observations
(i) Addition of dilute hydrochloric acid to the first portion of solution	No observable change
(ii) addition of aqueous sodium carbonate to the second portion of solution S	A white precipitate was formed
(iii) Addition of aqueous ammonia to the third portion of a solution	A white precipitate was formed which dissolved on addition of excess aqueous ammonia

- (a) From the information in test (i), name a cation, which is not present in solution S.
 (b) Identify a cation, which is likely to be present in solution S
 (c) Write an ionic equation for the reaction, which takes place in test (ii)

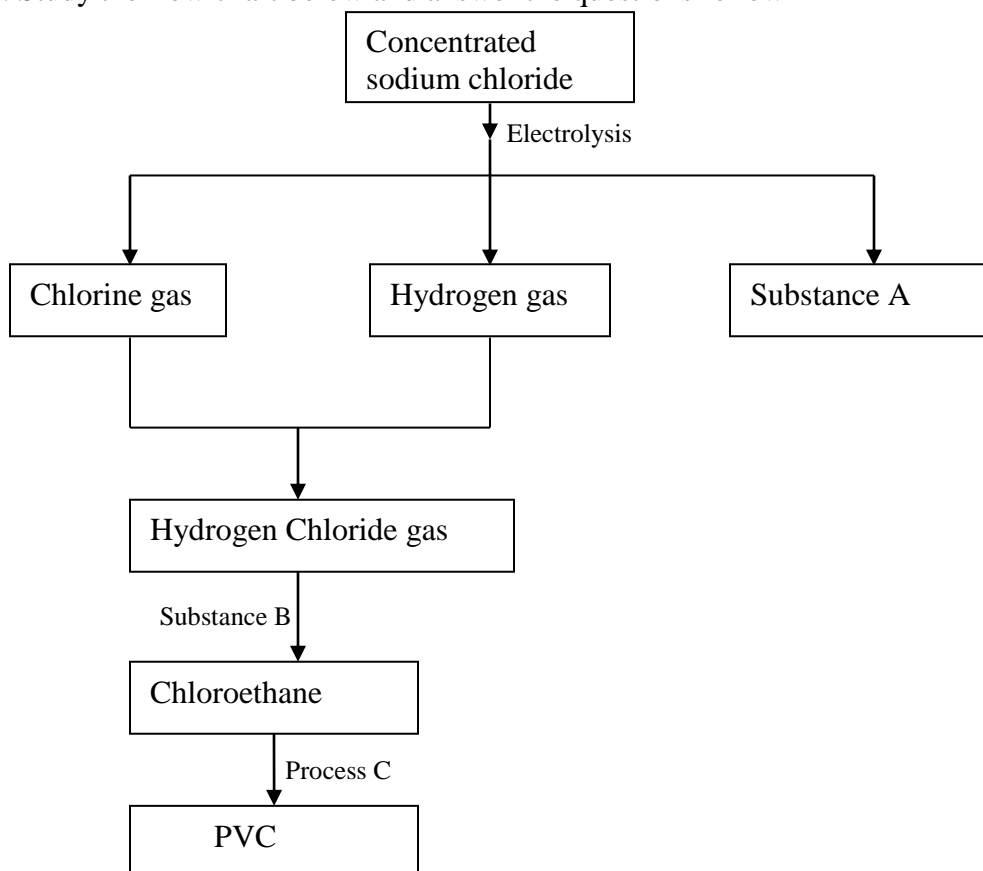
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QUESTIONS

1. (a) what method can be used to separate a mixture of ethanol and propanol?
(b) (i) Explain how a solid mixture of sulphur and sodium chloride can be separated into solid sulphur and solid chloride
(c) The table below gives the solubilities of potassium bromide and potassium sulphate at 0°C and 40°C

Substance	Solubility g/100g water at	
	0°C	40°C
Potassium bromide	55	75
Potassium sulphate	10	12

When an aqueous mixture containing 60g of potassium and 7 g of potassium sulphate in 10g of water at 80°C was cooled to 0°C some crystals were formed

- (i) Identify the crystals
(ii) Determine the mass of the crystals formed
(iii) Name the method used to obtain the crystals
(iv) Suggest one industrial application of the method named in (iii) above
2. Study the flow chart below and answer the questions follow



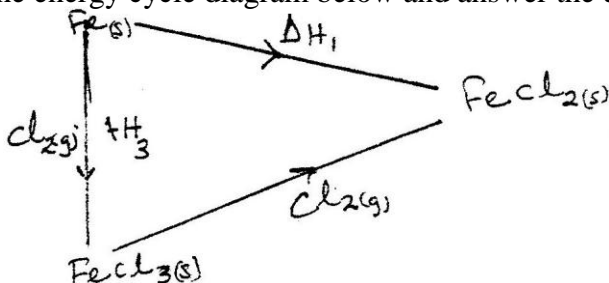
- (a) Identify substance

- (i) A
- (ii) B
- (b) Name process C
- (c) Give one use of PVC
- (d) Write an equation for the reaction in which chlorine gas is produced
- (e) State and explain the observation that would be made if chlorine gas was bubbled into an aqueous solution of sodium iodide
- (f) In the preparation of a bleaching agent (Sodium hypochlorite), Excess chlorine gas was bubbled into 15 litres of cold 2 m sodium hydroxide
 - (i) Write an equation for the reaction between chlorine gas and cold dilute sodium Hydroxide
 - (ii) Calculate the:
 - Number of moles of sodium hydroxide used
 - Mass in kilograms of the sodium hypochlorite produced = 1. 1175

3. (a) Distinguish between exothermic and endothermic reaction (2mks)
- (b) Changes of state are either exothermic or endothermic
Name a change of state that is:
- (i) Endothermic (1 mk)
 - (ii) Exothermic (1 mk)

(c) When pure water is heated at 1 atmospheric pressure at sea level, the temperature of the water does not rise beyond 100°C. Even with continued heated. Explain this observation.

(d) Study the energy cycle diagram below and answer the questions that follow



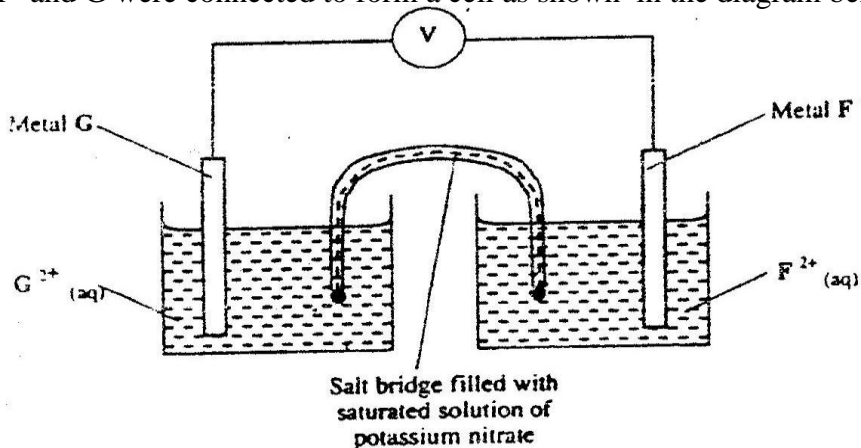
- (i) What does ΔH_1 represent?
- (ii) Show the relationship between ΔH_1 , ΔH_2 and ΔH_3

(e) Butane and propane are constituents of a cooking gas. Which produces more energy per mole on combustion? Explain

4. The table below gives standard electrode potentials for the metals represented by the Letters D, E, F and G. study it and answer the questions that follow.

Metals	Standard electrode potential (volts)
D	-0.13
E	-0.85
F	+0.34
G	- 0.76

- (a) Which metal can be displaced from a solution of its salts by all the other metals in the table? Give a reason (2 mks)
- (b) Metals F and G were connected to form a cell as shown in the diagram below



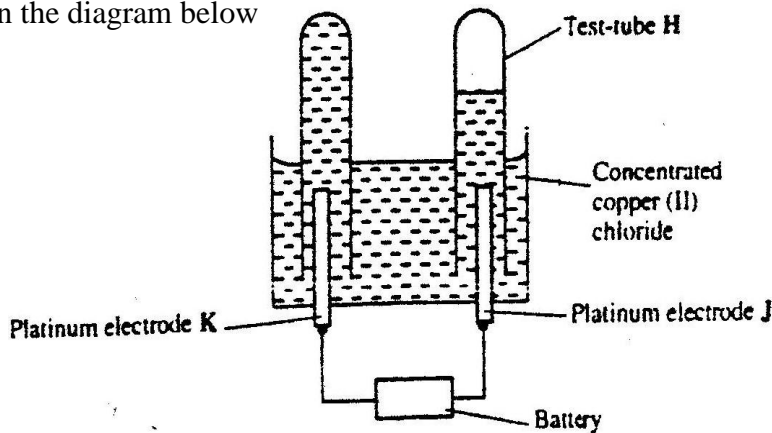
- (i) Write the equation for the reactions that occur at electrodes

F

G

- (ii) On the diagram, indicate with an arrow the direction in which electrons would flow on the diagram above
- (ii) What is the function of the salt bridge? (1 mk)

- (c) An electric current was passed through a concentrated solution of copper (II) chloride as shown in the diagram below



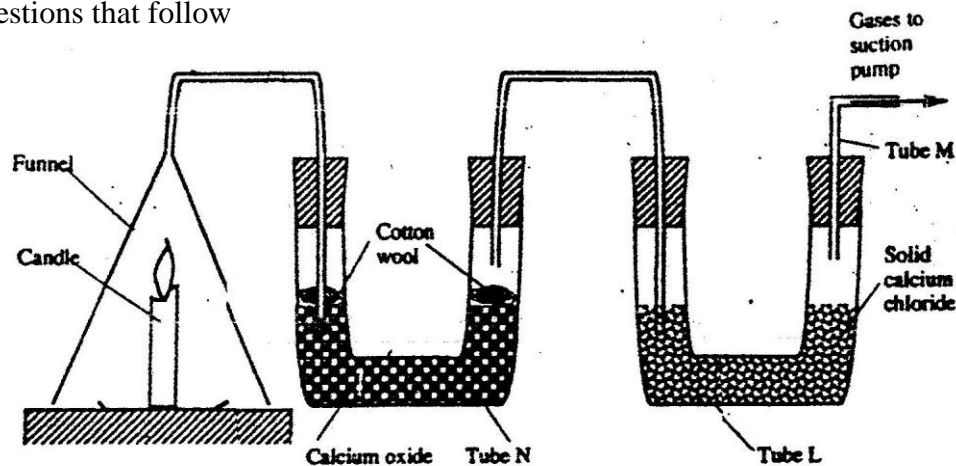
- (i) Explain the observation that would be made on the electrolyte as the experiment progresses (2 mks)

- (ii) After sometime, test-tube H was found to contain a mixture of two gases. Explain this observation (3 mks)

- (iii) Which of the electrodes is the anode? Explain (2 mks)

5. (a) Candle wax is mainly a compound consisting of two elements.
Name the two elements (2 mks)

(b) The set-up below was used to investigate the burning of a candle study it and answers the questions that follow



(i) What would happen to the burning candle if the pump was turned off? Give reasons

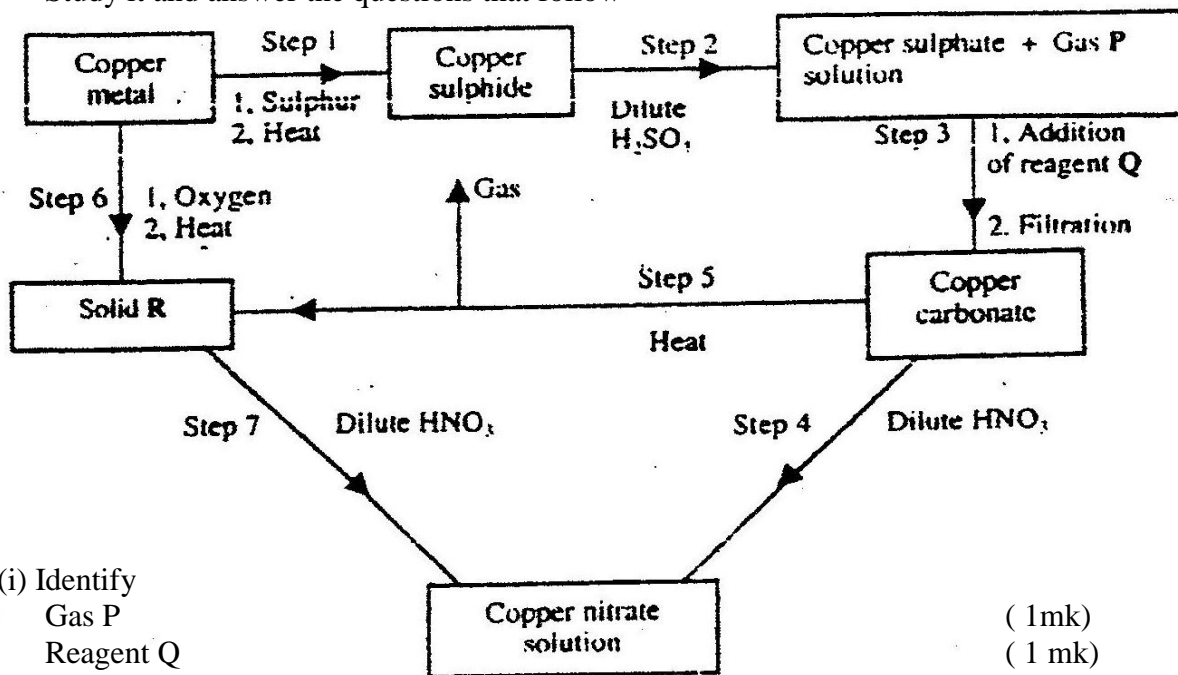
(ii) State and explain the changes in mass that are likely to occur in tube N by the end of the experiment (3 mks)

(iii) Name two gases that come out through tube M (2 mks)

(iv) Name another substance that could be used in the place of calcium oxide in tube N

6. (a) Name one ore from which copper metal is extracted (1 mk)

(b) The chart below shows a sequence of reactions starting with copper.
Study it and answer the questions that follow



(i) Identify
Gas P (1mk)
Reagent Q (1 mk)
Solid R (1 mk)

- (ii) Write an equation for the reaction that takes place in step 5
- (iii) State the observations made in steps 4 and 7 (2 mk)
 Step 4
 Step 7 (1mk)
- (c) Bronze is an alloy of copper and another metal
 (i) Name the other metal (1mk)
 (ii) Give one use of Bronze (1mk)
6. (a) Write the structural formula of:
 (i) Methanol
 (ii) Methanoic acid (1mk)
- (b) Write the equation for the reaction between methanoic acid and aqueous sodium hydroxide (1mk)
- (c) (i) Name the product formed when methanol reacts with methanoic acid
 (ii) State one condition necessary for the reaction in (c) (i) above to take place
- (d) (i) Describe one chemical test that can be used to distinguish between hexane and hexane (2 mks)
 (ii) State one use of hexane (1mk)
 (iii) Hydrogen reacts with hexane to form hexane. Calculate the volume of hydrogen gas required to convert 42g of hexane to hexane at S.T.P (C=12.0, H=1.0, molar gas volume at S.T.P is = 22.4 litres) (4 mks)