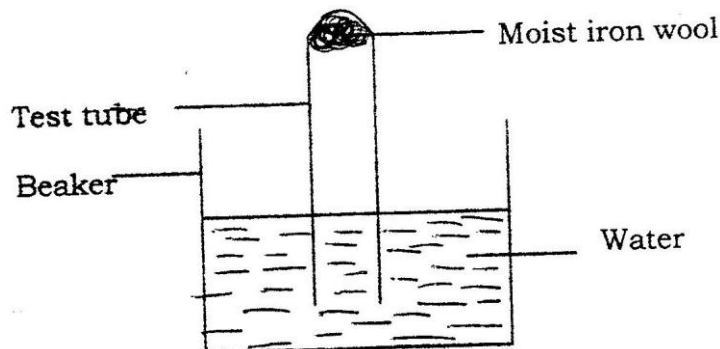


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QUESTIONS.

1. The set – up below was used to study some properties of air.

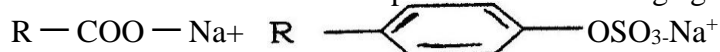


- State and explain two observations that would be made at the end of the experiment.
2. When extinguishing a fire caused by burning kerosene, carbon dioxide is used in preference to water .Explain

3. Complete the table below by inserting the missing information in the space provided.

Name of polymer	Name of monomer	One use of the polymer
	Vinyl chloride (Chloroethane)	

4. When dilute nitric acid was added to a sample of solid C, a colourless gas that formed a white precipitate with limewater was produced. When another sample of solid C was heated strongly in a dry test – tube, there was no observable change.
5. The structure shown below represent two cleansing agents, A and B



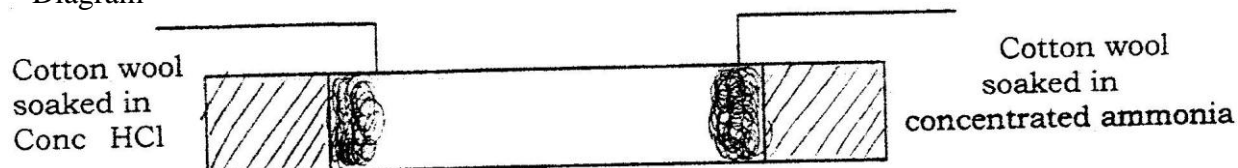
B

Which cleansing agent would be more suitable for washing in water containing magnesium sulphate?

Give a reason

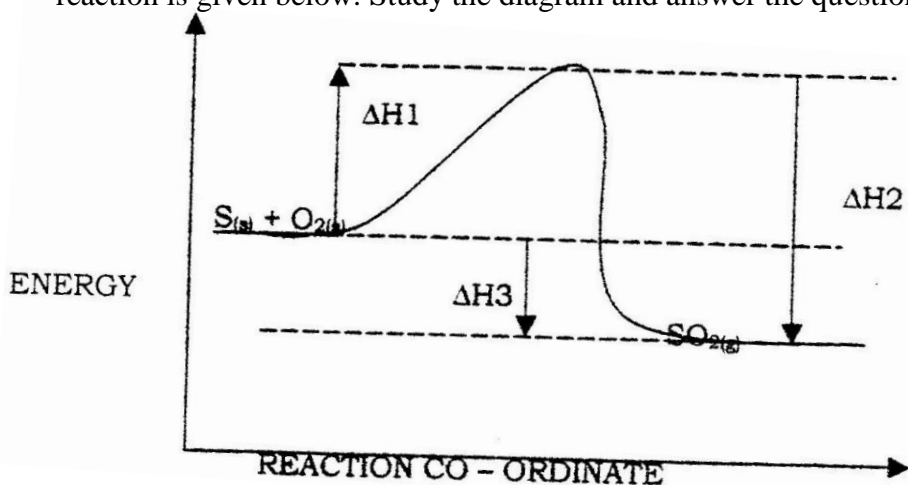
6. Study the set – up below and answer the questions that follow.

Diagram



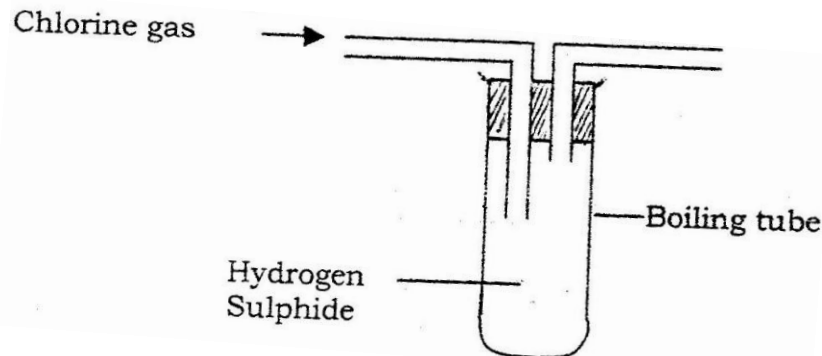
- a) What observation would be made in the tube?
- b) Indicate with across (x) on the diagram the likely position where the observation stated in (a) above would be made.
NB. Not to touch the cotton wool.

7. M grammes of a radioactive isotope decayed to 5 grammes in 100 days. The Half – life of the isotope is 25 days.
- What is meant by half – life?
 - Calculate the initial mass of M of the radioactive isotope.
8. The empirical formula of a hydrocarbon is C_2H_3 . The hydrocarbon has a relative molecular mass of 54. (H = 1.0, C = 12.0).
- C_2H_3
 - Draw the structural formula of the hydrocarbon
 - To which homologous series does the hydrocarbon drawn in (b) above belong?
9. Potassium sulphite solution was prepared and divided into two portions. The first portion gave a white precipitate when reacted with barium nitrate. On addition of dilute hydrochloric acid the white precipitate disappeared.
- Write the formula of the compound which formed as the white precipitate.
 - Write the equation for the reaction between dilute hydrochloric acid and the compound whose formula is written in (a) above.
 - What observation would be made if one drop of potassium dichromate solution was added to the second portion followed by dilute hydrochloric acid?
10. 0.63g of lead powder were dissolved in excess nitric acid to form lead nitrate solution. All the lead nitrate solution was reacted with sodium sulphate solution.
- Write an ionic equation for the reaction between lead nitrate and sodium sulphate solutions.
 - Determine the mass of the lead salt formed in (a) above. (Pb = 207, S = 32.0 = 16)
11. Explain why anhydrous magnesium chloride is fairly soluble in organic solvents while anhydrous magnesium chloride is insoluble.
12. Name and draw the structure of the compound formed when methane reacts with excess chlorine in the presence of U.V light.
13. Sulphur burns in air to form sulphur dioxide. A simple energy level diagram for the reaction is given below. Study the diagram and answer the questions that follow.

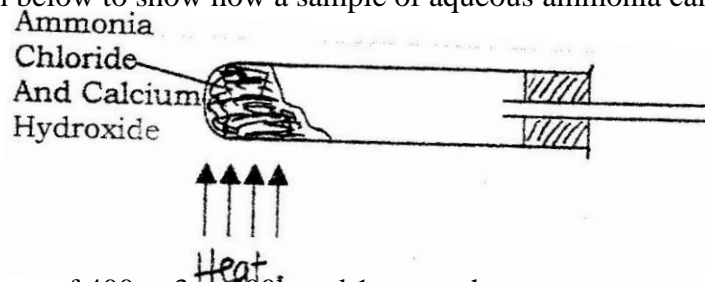


- What do the following represent?
- Write an expression, for ΔH_3 in terms of ΔH_1 and ΔH_2

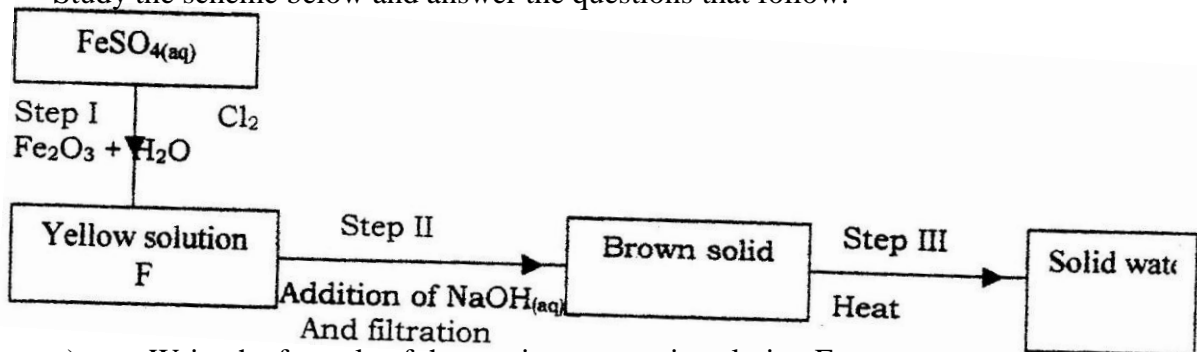
14. In an experiment, chlorine gas was passed into moist hydrogen sulphide contained in a boiling tube as shown in the diagram



- What observation was made in the boiling tube?
 - Write an equation for the above reaction.
 - What precaution should be taken in carrying out this experiment? Give a reason.
15. Complete the diagram below to show how a sample of aqueous ammonia can be prepared in the laboratory.

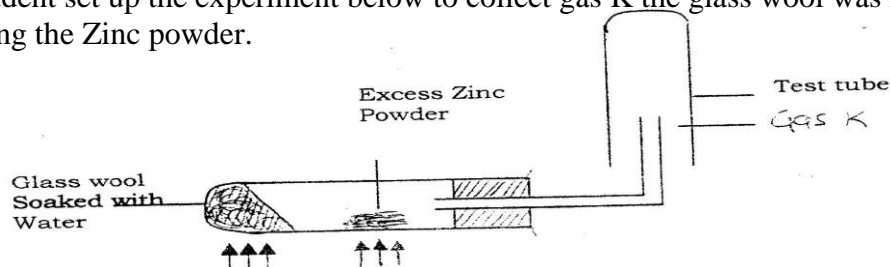


16. A gas occupies a volume of 400cm^3 at 500k and 1 atmosphere pressure. What will be the temperature of the gas when the volume and pressure of the gas is 100cm^3 and 0.5 atmospheres respectively.
17. In an equation below, identify the reagent that acts as abase. Give a reason.
 $\text{H}_2\text{O}_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})} \longrightarrow \text{H}_3\text{O}_{(\text{aq})} + \text{HO}^{2-}_{(\text{aq})}$
18. Study the scheme below and answer the questions that follow.

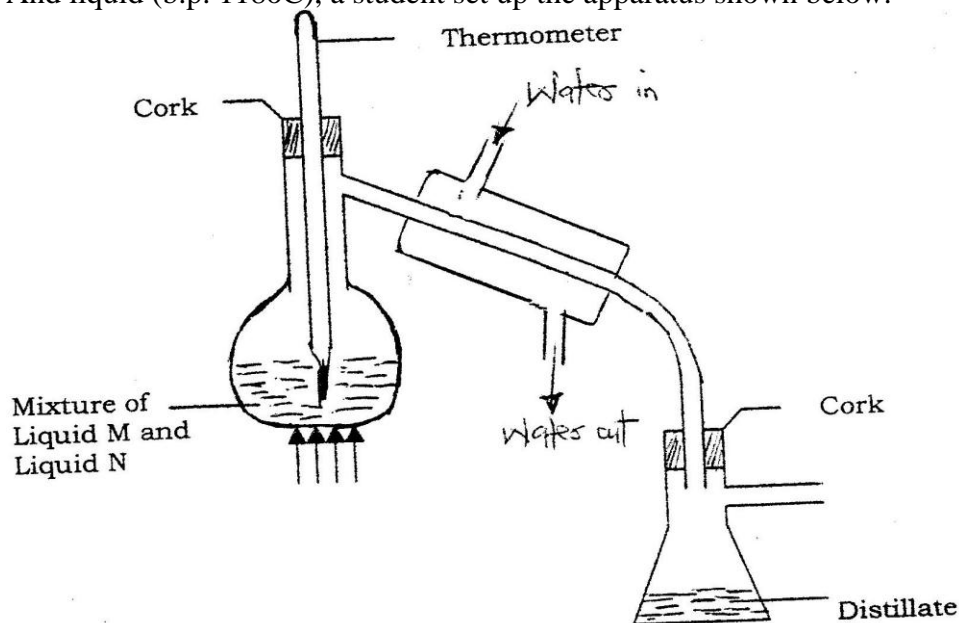


- Write the formula of the cation present in solution F.
 - What property of chlorine is shown in step I
 - Write an equation for the reaction which occurs in step III
19. 90cm^3 of 0.01M calcium hydroxide were added to a sample of water containing 0.001 moles of calcium hydrogen carbonate.

- a) Write an equation for the reaction which took place
- b) Calculate the number of moles of calcium ions in 90cm³ of 0.01M calcium hydroxide.
- c) What would be observed if soap solution was added drop wise to a sample of the water after the addition of calcium hydroxide? Give a reason.
20. When 0.6g of element J were completely burnt in oxygen and all the heat evolved was used to heat 500cm³ of water, the temperature of the water rose from 23°C to 32°C. Calculate the relative atomic mass of element J given that the specific heat capacity of water = 4.2JK⁻¹g⁻¹, density of water = 1.0g/cm³ and molar heat of combustion of J is 380KJmol⁻¹
21. A student set up the experiment below to collect gas K the glass wool was heated before heating the Zinc powder.



- Why was it necessary to heat the moist glass wool before heating zinc powder
22. In an experiment to separate a mixture of two organic liquids, liquid M (b.p 56°C) and liquid N (b.p. 118°C), a student set up the apparatus shown below.

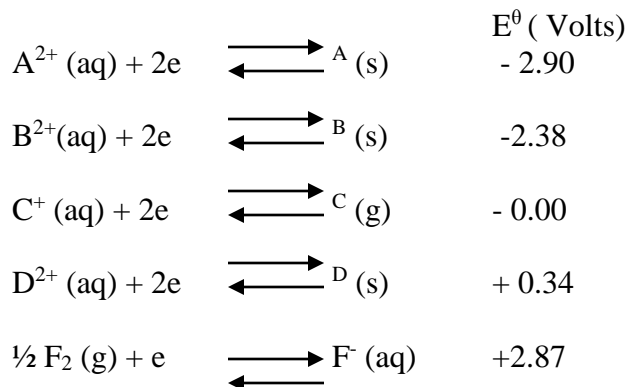


- a) Identify two mistakes in the set – up
- b) What method would the student use to test the purity of the distillates obtained?
23. An element Y has the electronic configuration 2.8.5
- a) Which period of the periodic table does the element belong?
- b) Write a formula of the most stable anion formed when element Y ionizes
- c) Explain the difference between the atomic radius of element Y and its ionic radius.
24. Aqueous potassium sulphate was electrolysed using platinum electrodes in a cell.

- a) Name the products formed at the cathode and anode.
Anode
- b) How does the concentration of the electrolyte change during electrolysis.
- c) Why would it not be advisable to electrolyse aqueous potassium sulphate using potassium metal electrodes.
25. The information below relates to element L, Q,R and T. The letters do not represent the actual symbols of the elements. Arrange the elements in
- $$2Q_{(aq)} + R_{2(aq)} \longrightarrow Q_{2(g)} + 2r_{(aq)}$$
- $$2T_{(aq)} + Q_{2(g)} \longrightarrow 2Q_{(aq)} + T_{2(g)}$$
- $$L_{(aq)} + R_{2(g)} \longrightarrow \text{no reaction}$$
- a) Give the formula of an oxide which reacts with both dilute hydrochloric acid and hot concentrated sodium hydroxide.
- b) Give the formulae of the products formed when the oxide in (a) above reacts with excess hot concentrated sodium hydroxide.
26. Using dots (.) and crosses (x) to represent outermost electrons, draw diagrams to show the bonding in CO₂ and H₃O⁺ (Atomic numbers; H = 1.0, C = 14.0, O = 8).
27. Calculate the mass of nitrogen dioxide gas that would occupy the same volume as 10g of hydrogen gas at same temperature and pressure. (H = 1.0, N = 14.0, o = 16.0)

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QUESTIONS

1. Use standard electric potentials for elements A, B, C, D and F given below to answer the questions that follow.

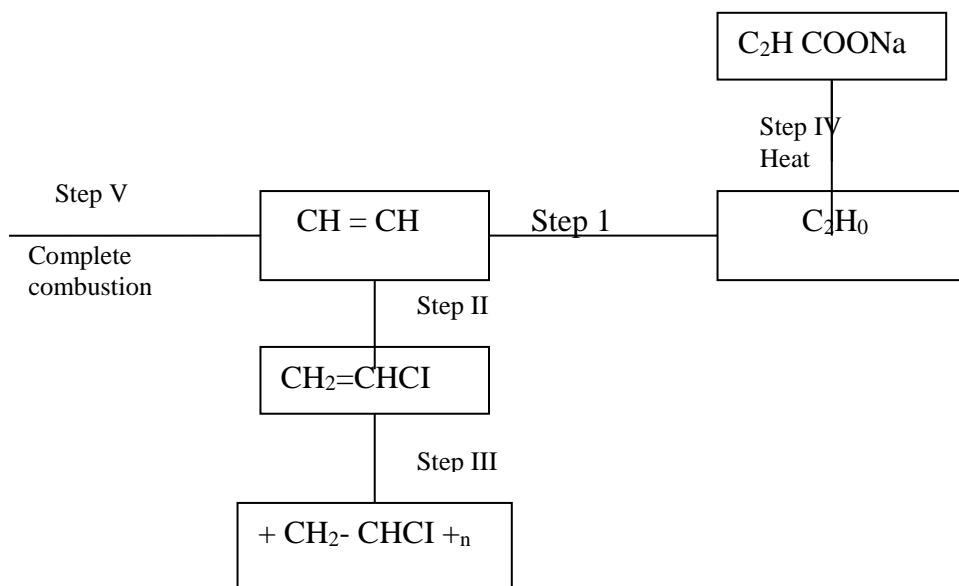


- (i) Which element is likely to be hydrogen? Give a reason for your answer
- (ii) What is the E^{θ} value of the strongest reducing agent?
- (iii) In the space provided draw a labeled diagram of the electrochemical cell that would be obtained when half – cells of elements B and D are combined
- (iv) Calculate the E^{θ} value of the electrochemical cell constructed in (iii) above
- (b) During the electrolysis of aqueous copper (II) sulphate using copper electrodes, a current of 0.2 amperes was passed through the cell for 5 hours
- (i) Write an ionic equation for the reaction that took place at the anode
- (ii) Determine the change in mass of the anode which occurred as a result of the electrolysis process
(Cu= 63.5, 1 Faraday = 96,500 coulombs.)
2. (a) Give the names of the following compounds
- (i) $CH_3CH_2CH_2CH_2OH$
- (ii) CH_3CH_2COOH
- (iii) $CH_3C-O-CH_2CH_3$
- (b) Study the information in the table below and answer the questions that follow

Number of carbon atoms molecule	Relative molecular mass hydrocarbon
2	28
3	42
4	56

- (i) Write the general formula of the hydrocarbon in the table
- (ii) Predict the relative atomic mass of the hydrocarbon with 5 carbon atoms
- (iii) Determine the molecular formula of the hydrocarbon in (ii) above and draw its structural formula (H = 1.0 C= 12.0)

(c) Study the scheme given above and answer the questions that follow



- (i) Name the reagents used in:
 - Step I
 - Step II
 - Step III
- (ii) Write an equation for the complete combustion of $\text{CH}=\text{CH}_2$
- (iii) Explain one disadvantage of the continued use of items made from the compound formed in step III

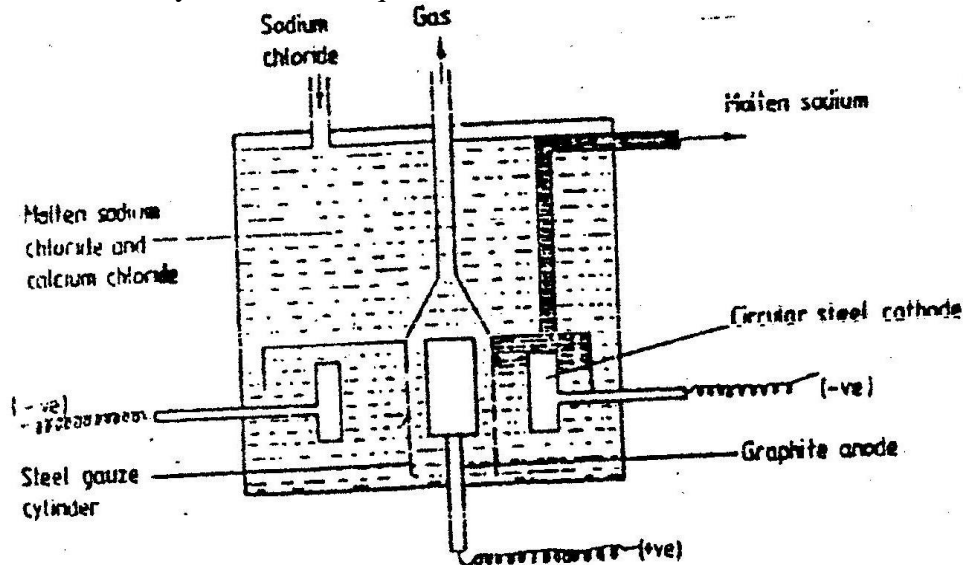
3. (a) Study the information below and answer the questions that follow:
The letters do not represent the actual symbols of the elements

Element	Atomic Number	Melting Point Element	Formula of Chloride	Melting Point Chloride
G	11	98	GCl	801
H	12	650	HCl ₂	715
J	14	1410	JCl ₄	-70
K	16	113	K ₂ Cl ₂	-80
L	20	851	LCl ₂	780

- (i) Which elements are metals? Give a reason
- (ii) Write the formula of the compound formed when element H reacts with elements K
- (iii) Explain why the melting point of J is higher than that of K
- (iv) What is the oxidation state of J in its chloride
- (v) How does the:
 - I – Melting point of fluoride of G compare with that of its chloride?
 - II- Reactivity of H and L with water compare? Give an explanation

(2mks)

4. (a) The diagram below shows the extraction of sodium metal using the Downs cell. Study it and answer the questions that follow



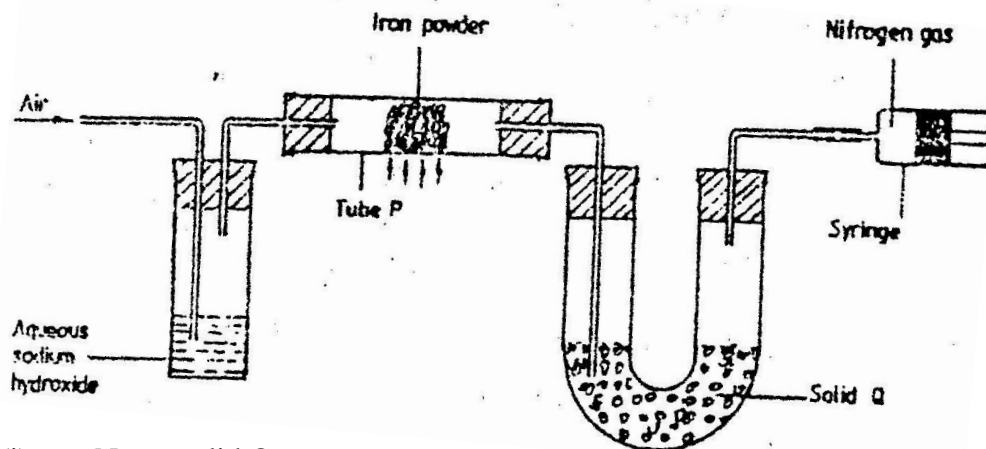
- (i) Explain why in this process the sodium chloride is mixed with calcium chloride.
 - (ii) Why is the anode made of graphite and not steel?
 - (iii) State two properties of sodium metal that make it possible for it to be collected as shown in the diagram
 - (iv) What is the function of the steel gauze cylinder?
 - (v) Write ionic equations for the reactions which take place at:
 - I Cathode
 - II Anode
 - (vi) Give one industrial use of sodium metal
- (b) Explain why the sodium metal is kept stored under kerosene
5. The reaction between and methanoic acid at 30⁰ C proceeds according to the information given below



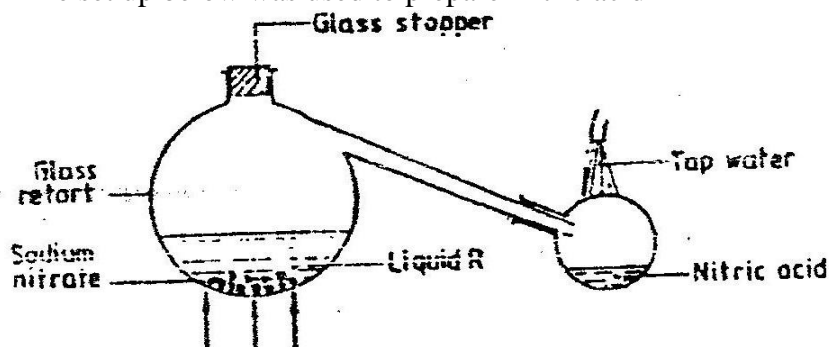
Concentration of Br ₂ (aq) Mol dm ⁻³	Time minutes
10.0 x 10 ⁻³	0
8.1 x 10 ⁻³	1
6.6 x 10 ⁻³	2
4.4 x 10 ⁻³	4
3.0 x 10 ⁻³	6
2.0 x 10 ⁻³	8
1.3 x 10 ⁻³	10

- (a) On the grid below, plot a graph of concentration of Bromine (Vertical axis against time)
- (b) From the graph determine:
 - (i) The concentration of bromine at the end of 3 minutes
 - (ii) The rate of reaction at time 't' where t = 1 ½ minutes

- (c) Explain how the concentration of bromine affects the rate of reaction
- (d) On the same axis sketch the curve that would be obtained if the reaction was carried out at 20⁰ C and label the curve as curve II. Give a reason for your answer.
6. (a) The diagram below represents a set up that was used to obtain dry nitrogen from air. Study it and answer the questions that follow

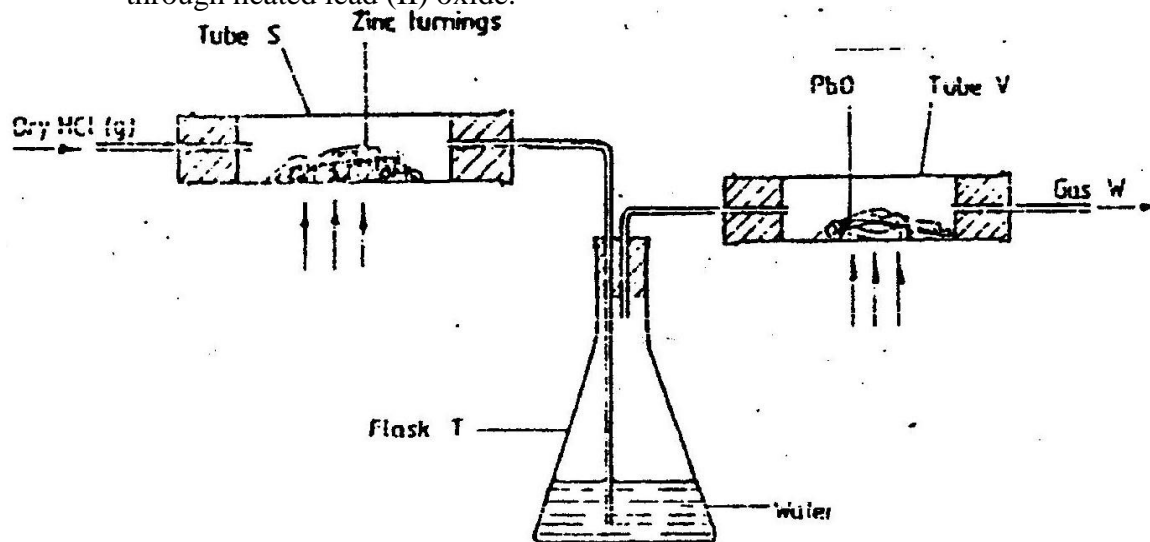


- (i) Name solid Q
- (ii) What is the purpose of sodium hydroxide?
- (iii) Write an equation for the reaction which took place in tube P
Give the name of one impurity present in the nitrogen gas obtained
- (iv) Give a reason why liquid nitrogen is used for storage of semen for artificial insemination
- (b) The set up below was used to prepare nitric acid



- (i) Give the name of liquid R
- (ii) Write an equation for the reaction which took place in the glass retort
- (iii) Explain the following
- Nitric acid is stored in dark bottles
 - The reaction between copper metal with 50% nitric acid (one volume of acid added to an equal volume of water) in an open test tube gives brown fumes.
- (c) A factory uses nitric acid and ammonia gas as the only reactants for the preparation of fertilizer. If the daily production of the fertilizer is 4800 kg calculate the mass of ammonia gas used daily.

7. (a) In an experiment, dry hydrogen chloride gas was passed through heated zinc turnings as shown in the diagram below. The gas produced was then passed through heated lead (II) oxide.



- (i) What is the function of water in the flask?
Write equations for the reactions that took place in the tubes
S
V
- (ii) How would the total mass of tube V and its contents compare before after the experiment? Explain
- (b) Chloride can be prepared by using the following three agents; solid sodium chloride, concentrated sulphuric acid and potassium permanganate
- (i) What is the role of each of the following in the reaction?
- I Concentrated sulphuric acid
II potassium permanganate
- (ii) Name the bleaching agent formed when chlorine gas is passed through cold dilute sodium hydroxide solution
- (iii) Name one other use of the compound formed in (ii) above other than bleaching
- (c) 1.9 gm of magnesium chloride was dissolved in distilled water. Silver nitrate solution was added until in excess. Calculate the mass of silver nitrate that was used for the complete reaction. Relative molecular mass of magnesium chloride = 95, N = 14.0, O = 16.0, Ag = 108.0