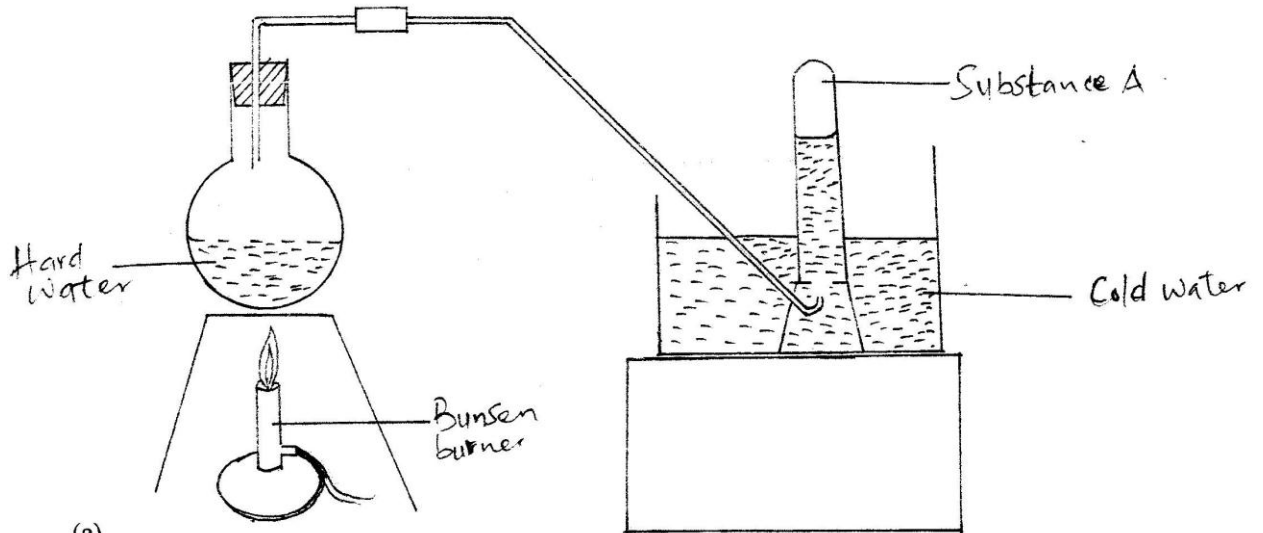


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QUESTIONS

1. State one use of sodium hydrogen carbonate. (1 mark)
2. Calcium oxide can be used to dry ammonia gas. (2 mark)
 - a) Explain why calcium oxide is not used to dry hydrogen chloride gas (2 mark)
 - b) Name one drying agent for hydrogen chloride gas
3. The set-up below was used to demonstrate the effect of heat on hard water



- (a)
- a) Name substance A. (1 mark)
 - b) Explain why the heating of hard water produced substance A. (2marks)
4. Using dots (.) and crosses(x) to represent electrons, show bonding in the compounds formed when the following elements react: (si = 14, Na = 11 and Cl = 17) (1 mark)
 - a) Sodium and chlorine (1 mark)
 - b) Silicon and chlorine (1 mark)
 5. Zinc oxide reacts with acids and alkalis
 - a) Write the equation for the reaction between zinc oxide and:
 - i) Dilute sulphuric acid (1mark)
 - ii) Sodium hydroxide solution (1 mark)
 - b) What property of zinc oxide is shown by the reaction in (a) above? (1 mark)
 6. Use the information in the table below to answer the questions that follow. (The letters do not represent the actual symbols of the elements)

Element	B	C	D	E	F
Atomic number	18	5	3	5	20
Mass number	40	10	7	11	40

- a) Which two letters represent the same element? Give a reason. (2marks)
 - b) Give the number of neutrons in an atom of element D (1 mark)
7. Give the name and draw the structural formula of the compound formed when one mole of ethane reacts with one mole of chlorine gas.

- 8 Determine the oxidation state of sulphur in the following compounds: (2 marks)
- a) H_2S
- b) Na_2S

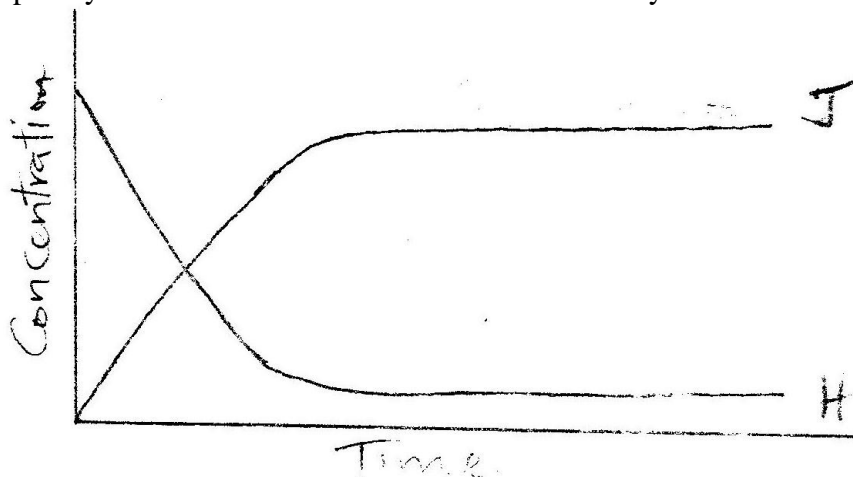
9. A certain carbonate, GCO_3 , reacts with dilute hydrochloric acid according to the equation given below:



If 1 g of the carbonate reacts completely with 20 cm³ of 1 M hydrochloric acid, calculate the relative atomic mass of G

(C = 12.0 = 16.0)

- 10 The sketch completely with substance H is converted into J. study it and answer the question that follows.



Why do the two curves become horizontal after sometime?

11. The reaction between how concentrated sodium hydroxide and chlorine produces sodium chlorate (V), sodium chloride and water
- (a) Write the equation for the reaction
- (b) Give one use of sodium chlorate (V)
12. In the industrial extraction of lead, the ore is first roasted in a furnace. The solid mixture obtained is then fed into another furnace together with coke, limestone and scarp iron. State the function of each of the following in this process: (3 mks)
- (a) Coke
- (b) Limestone
- (c) Scrap iron
13. Methane reacts with oxygen according to the equation given below.
- $$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l}), \Delta H = 890 \text{ KJ MOL}^{-1}$$
- Calculate the volume of methane which would produce 111.25 kJ when completely burnt. (Molar volume of a gas = 24 litres.) (2 mks)
14. 100 g of a radioactive substance was reduced to 12.5 g in 15.6 years. Calculate the half-life of the substance. (2 mks)
15. In terms of structure and bonding, explain why graphite is used as a lubricant. (2mks)

16. The table below gives some information about elements I,II,III and IV which are in the same group of the periodic table. Use the information to answer the questions that follows.

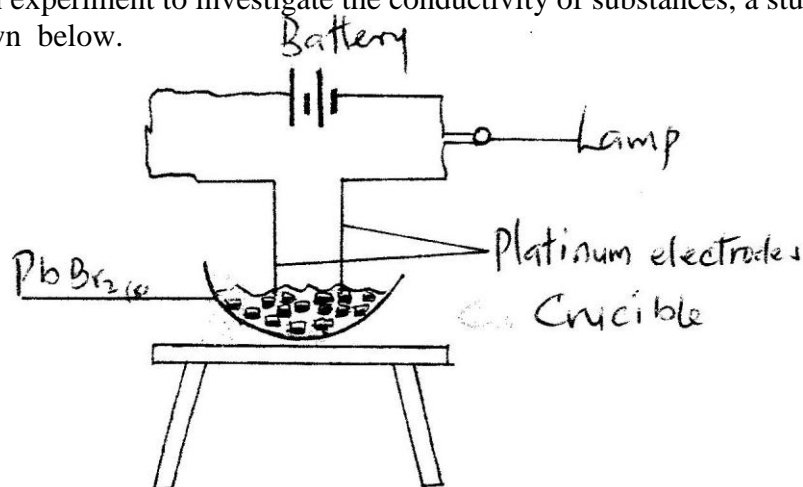
Element	First Ionisation energy (kJmol ⁻¹)	Atomic Radius (nm)
I	520	0.15
II	500	0.19
III	420	0.23
IV	400	0.25

State and explain the relationship between the variations in the first ionization energies and the atomic radii. (3 mks)

17. (a) what condition is necessary for an equilibrium to be established? (1 mk)
 (b) When calcium carbonate is heated, the equilibrium shown below is established
 $\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$

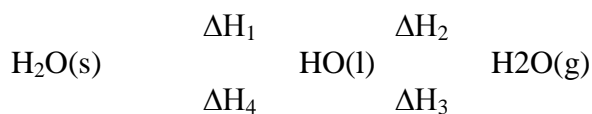
How would the position of equilibrium be affected if a small amount of dilute potassium hydroxide is added to the equilibrium mixture? Explain (2 mks)

18. In an experiment to investigate the conductivity of substances, a student used the set – up shown below.



The Student noted that the bulb did not light (1mk)

- (a) What had been omitted in the set- up?
 (b) Explain why the bulb lights when the omission is corrected (2 mks)
19. The scheme below shows the energy changes that are involved between ice, water and steam. Study it and answer the questions that follow



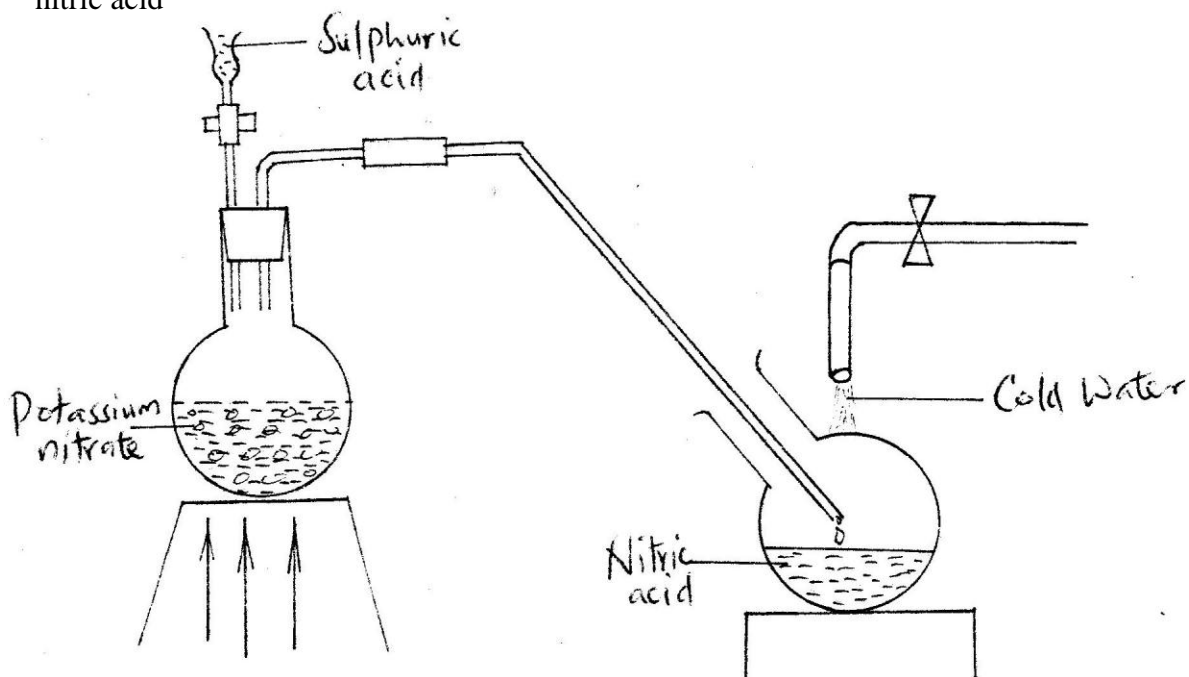
- (a) What name is given to the energy change, ΔH_4 ? (1mk)
 (b) What is the sign of ΔH_3 ? Give a reason (2 mks)

20. Equal volumes of 1M monobasic acids L and M were each reacted with excess magnesium turnings. The table below shows the volumes of the gas produced after one minute.

Acid	Volume of gas (cm ³)
L	40
M	100

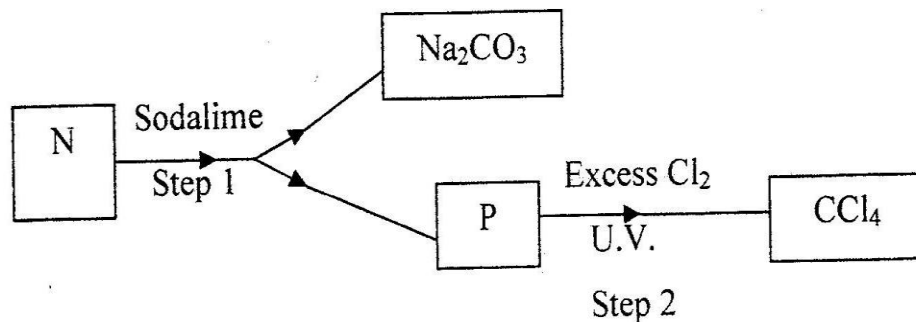
Explain the differences in the volumes of the gas produced (2 mks)

21. The diagram below shows a set-up that was used to prepare and collect a sample of nitric acid



- Give a reason why it is possible to separate nitric acid from sulphuric acid in the set-up (1 mk)
- Name another substance that can be used instead of potassium nitrate (1 mk)
- Give one use of nitric acid (1 mk)

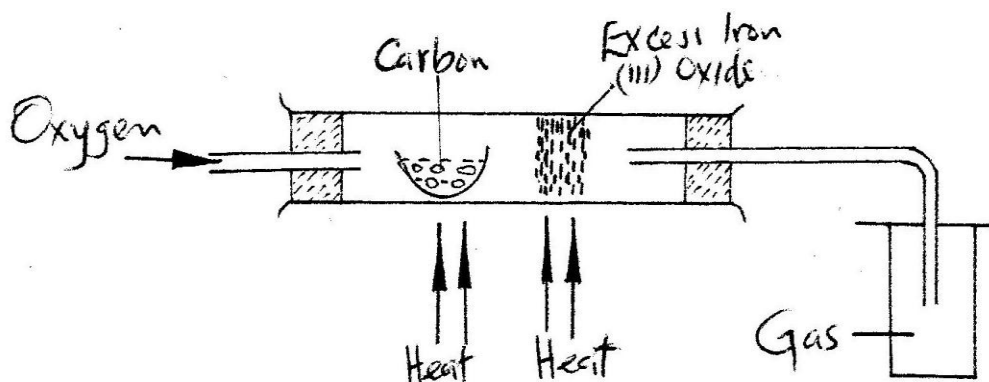
22. Study the flow chart below and answer the questions that follow



(a) Identify N and P (2 mks)
 N.....
 P.....

(b) What name is given to the type of halogenations/ chlorination reaction in step 2?

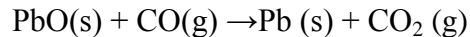
23. The set – up below was used to obtain a sample of iron



Write two equations for the reactions which occur in the combustion tube (2mks)

24. In an experiment, a gas jar containing most sulphur dioxide was inverted over another gas jar containing hydrogen sulphide gas
- State and explain the observation that was made (2mks)
 - State the precaution that should be taken when carrying out this experiment (1mk)
25. When a few drops of aqueous ammonia were added to copper (II) nitrate solution, a light blue precipitate was formed. On addition of more aqueous ammonia, a deep blue solution was formed.
 Identify the substance responsible for the:
- Light blue precipitate (1mk)
 - Deep blue solution (1mk)
26. When a current of 0.82A was passed for 5 hours through an aqueous solution of metal Z, 2.65 g of the metal were deposited. Determine the charge on the ions of metal Z. (1 Faraday = 96500 Coulombs:
 Relative atomic mass of Z = 52

27. Dry carbon monoxide gas reacts with heated lead (II) oxide as shown in the equation below



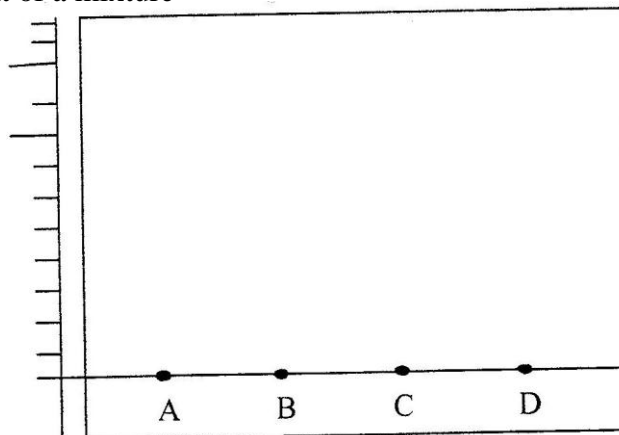
- (a) Name the process undergone by the lead (II) oxide (1 mk)
(b) Give a reason for your answer in (a) above (1mk)
(c) Name another gas that can be used to perform the same function as carbon monoxide gas in the above reaction.

28. When a hydrocarbon was completely burnt in oxygen, 4.2g of carbon dioxide and 1.71 g of water were formed. Determine the empirical formula of the hydrocarbon

(H= 1.0 ; C=12.0 ; O = 16.0) (3 mks)

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QUESTIONS

1. (a) The diagram below shows spots of pure substance A,B, and C on a chromatography paper. Spot D is that of a mixture



After development, A, B and C were found to have moved 8cm, 3cm and 6 cm respectively. D has separated into two spots which had moved 6cm and 8 cm

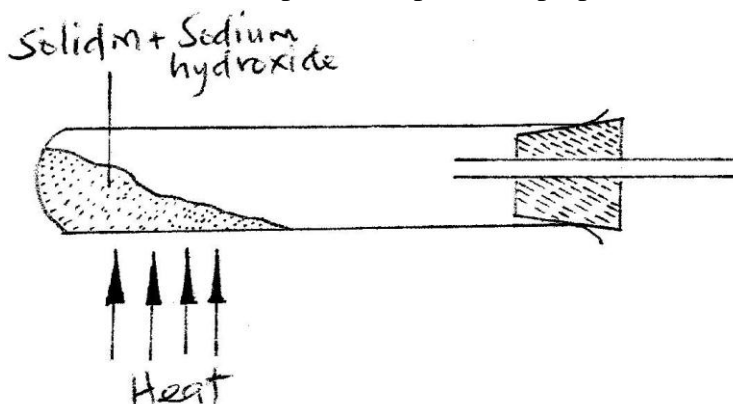
- (i) On the diagram
 - I Label the baseline (origin) (1mk)
 - II Show the positions of all the spots after development (3 mks)
- (ii) Identify the substances present in the mixture D (2mks)
- (b) Describe how solid ammonium chloride can be separated from a solid mixture of ammonium chloride and anhydrous calcium chloride (2mks)
- (c) The table shows liquids that are miscible and those that are immiscible

Liquid	L ₃	L ₄
L ₁	Miscible	Miscible
L ₂	Miscible	Immiscible

Use the information given to answer the questions that follow

- (i) Name the method that can be used to separate L₁ and L₃ from a mixture of two (1 mk)
 - (ii) Describe how a mixture of L₂ and L₄ can be separated (2mks)
2. (a) Name one raw material which sodium hydroxide is manufactured (1 mk)
- (b) Sodium hydroxide pellets were accidentally mixed with sodium chloride 17.6 g of the mixture were dissolved in water to make one litre of solution. 100 cm³ of the mixture were dissolved in water to make one litre solution. 100cm³ of the solution was neutralized by 40cm³ of 0.M sulphuric acid
- (i) Write an equation for the reaction that took place
 - (ii) Calculate the:
 - (i) Number of moles of the substance that reacted with sulphuric acid (2mks)
 - (ii) Number of moles of the substances that would react with sulphuric acid in the one litre of solution (1mk)
 - (iii) Mass of the unreacted substances in one litre of solution (2 mks)
- (H = 1,0 ; Na = 23.0 ; Cl= 35.5 ; O= 16.0)

- (c) The diagram below shows an incomplete set-up used to prepare and collect ammonia gas

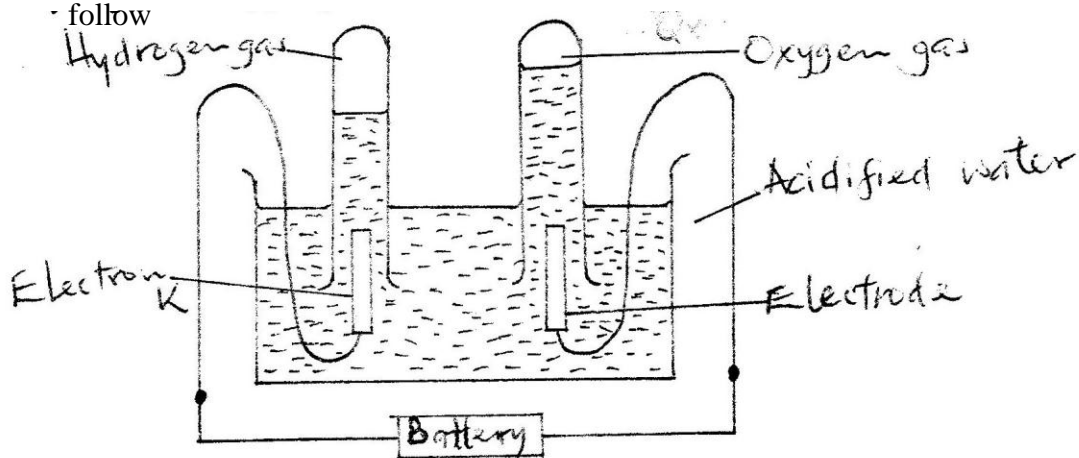


- (i) Name solid M (1 mk)
- (ii) Complete the diagram to show how a dry sample of ammonia gas can be collected (3 mks)
- (d) In an experiment, excess ammonia gas passed over heated copper (II) oxide on a combustion tube.
- (i) State the observation that was made in the combustion tube at the end of the experiment (1 mk)
- (ii) What property of ammonia is shown in the above reaction (1 mk)
- (iii) Name one use of ammonia (1 mk)
3. (a) The table below shows the standard reduction potentials for four half-cells. Study it and answer the questions that follow. (Letters are not the actual symbols of the elements)

	E^{θ} (volts)
$F_2(aq) + 2e \rightarrow 2F(aq)$; + 0.54
$G^{2+}(aq) + 2e \rightarrow G(s)$; -0.44
$H^{2+}(aq) + 2e \rightarrow H(s)$; + 0.34
$2J^{+}(aq) + 2e \rightarrow J_2$; 0.00

- (i) Identify the strongest reducing agent (1 mk)
- (ii) Write the equation for the reaction which takes place when solid G is added to a solution containing H^{2+} ions (1 mk)
- (iii) Calculate the E^{θ} value for the reaction in (ii) above (1mk)

- (b) The diagram below shows the apparatus that can be used to electrolyze acidified water to obtain hydrogen and oxygen gases. Study it and answer the questions that follow



- (i) Identify the electrode at which oxidation takes place (1 mk)
 (ii) Give a reason why it is necessary to acidify the water (1mk)
 (iii) Explain why hydrochloric acid is not used to acidify the water (2mks)
 (c) During electrolysis of aqueous copper (II) sulphate, 144750 coulombs of electricity were used.

Calculate the mass of copper metal that was obtained

Cu = 64 ; 1 Faraday = 96500 coulombs (3 mks)

4. (a) An atom Q can be represented as

52

Q

24

What does the number 52 represent? (1mk)

- (b) Study the information in the table below and answer the equations that follow
 (Letters are not the actual symbols of the elements)

Element	Electronic Arrangement of stable ion	Atomic Radius (nm)	Ionic Radius (nm)
N	2.8.8	0.197	0.099
P	2.8.8	0.099	0.181
R	2.8	0.160	0.065
S	2.8	0.186	0.095
T	2	0.152	0.068
U	2.8	0.072	0.136

- (i) Write the formula of the compound formed when N reacts with P. (atomic numbers are N = 20; P = 17) (1 mk)
 (ii) Identify the elements which belong to the third period of the periodic table. Explain (2 mks)
 (iii) Which of the element identified in b (ii) above comes first in the third period? Explain (2 mks)
 (iv) Select two elements which are non- metals (1 mk)

- (c) The table below gives some properties of substances I, II, III, and IV. Study it and answer the questions that follow

Substance	Electrical conductivity		M.P ($^{\circ}$ C)	B.P ($^{\circ}$ C)
	Solid	Molten		
I	Does not conduct	Conducts	801	1420
II	Conducts	Conducts	650	1107
III	Does not conduct	Does not conduct	1700	2200
IV	Does not conduct	Does not conduct	113	440

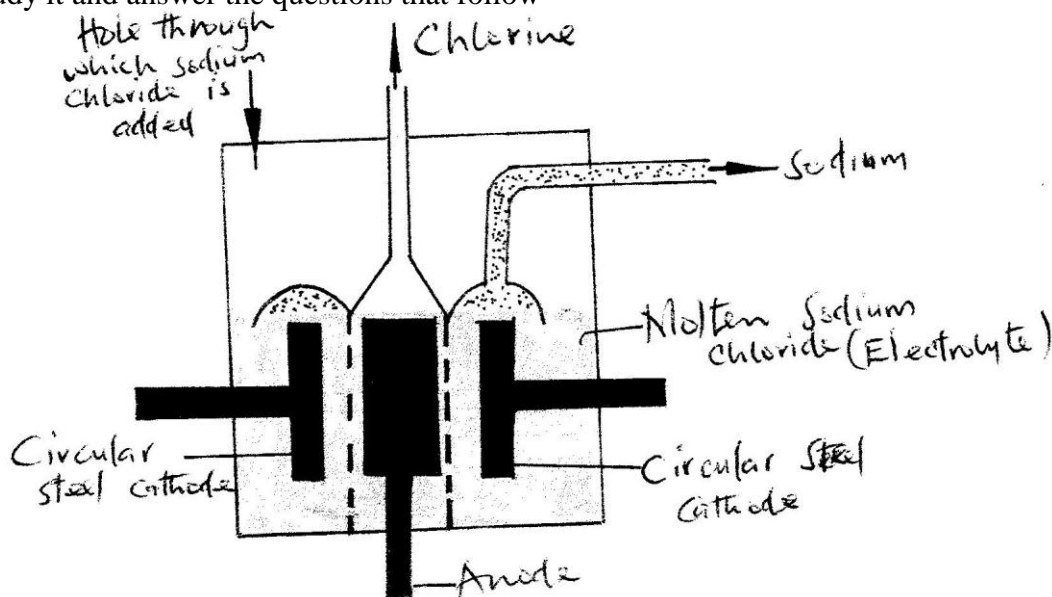
- (i) What type of bonding exists in substances I and II (2mks)
 I
 II
- (ii) Which substances is likely to be sulphur? Explain (2mks)
5. In an experiment, a piece of magnesium ribbon was cleaned with steel wool. 2.4 g of the clean magnesium ribbon was placed in a crucible and completely burnt in oxygen. After cooling, the product weighed 4.0 g
- (a) Explain why it was necessary to clean the magnesium ribbon (1mk)
 (b) What observation was made in the crucible after burning (1 mk)
 (c) Why was there an increase in mass? (1 mk)
 (d) Write the equation for the reaction which took place in the crucible (1mk)
 (e) The product in the crucible was shaken with water and filtered. Explain the observation which was made when blue and red litmus papers were dropped into the filtrate. (3 mks)
6. (a) The list below shows the formulae of some organic compounds. Use it to answer the questions that follow.
- V₁ HC₃CH₂CH₂OH
 V₂ CH₃CH₂CH₃
- $$\begin{array}{c} \text{O} \\ \parallel \\ \text{C} \end{array}$$
- V₃ CH₃CH₂CH₂C – OH
 V₄ CH₃CH₂CH = CH₂
 V₅ CH₃ CH₂CH₂CH₃
- (i) Select two compounds which
 I are not hydrocarbons (1mk)
 II Belong to the same homologous series (1 mk)
- (ii) Identify the compound that is likely to undergo polymerization. Give a reason for your answer. (2 mks)
- a. The structures below represents two cleansing agents:
 R – COO⁻ Na⁺
 R – OSO₃⁻ Na⁺

In the table below, give one advantage and one disadvantage of using each one of them

	Advantage	Disadvantage
$R - COO - Na^+$		
$R - OSO_3 - Na^+$		

- b. Under certain, ethanoic acid ($C_2H_4O_2$) and ethanol (C_2H_5OH) react to form a sweet smelling compound.
- What is the general name of compound to which the sweet smelling compound belong? (1mk)
 - Write the formula of the sweet smelling compound (1mk)
 - Give one use of ethanoic acid other the formation of the sweet smelling compounds (1mk)
 - Write the equation for the reaction dilute ethanoic acid and solid potassium carbonate (1mk)
- c. Fibres are either synthetic or natural. Give one:
- Example of a natural fibre (1mk)
 - Advantage of synthetic fibres have over natural fibres (1mk)

7. (a) Below is a simplified diagram of the Downs Cell used for the manufacture of sodium. Study it and answer the questions that follow



- What material is the anode made of? Give a reason (2 mks)
 - What precaution is taken to prevent chlorine and sodium from re-combination? (1 mks)
 - Write an ionic equation for the reaction in which chlorine gas is formed (1mk)
- (b) In the Downs process, (used for manufacture of sodium), a certain salt is added to lower the melting point of sodium chloride from about $800^{\circ}C$ to about $600^{\circ}C$.
- Name the salt that is added (1mk)
 - State why it is necessary to lower the temperature (1mk)
- (c) Explain why aqueous sodium chloride is not suitable as an electrolyte for the manufacture of sodium in the Downs process (2mk)
- (d) Sodium metal reacts with air to form two oxide. Give the formulae of two oxides (1mk)