THE ELITES JET

233/1   CHEMISTRY   Paper 1
(Theory)
PRE-MOCK
March 2025 – Time: 2 hours

Name ……………………………………………. Adm No.……..…….. Class……….…

School……………………………….………………Date………......…Sign……………..……..….

<u>INSTRUCTIONS</u>

  a)   Write your name and Index Number in the spaces provided above.
  b)   Sign and write the date of examination in the spaces provided above.
  c)   Answer all questions in the spaces provided.
  d)   All working must be clearly shown where necessary.
  e)   Mathematical tables and silent electronic calculators may be used.
  f)   This paper consists of **16** printed pages.
  g)   Candidates should check the question paper to ensure that all pages are printed as indicated and that no questions are missing.
  h)   Candidates should all the questions in English.

For Examiner's Use Only

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1 - 29	80	

1. The chromatogram below shows the constituents of ink in sample M using methylated spirit as the solvent.
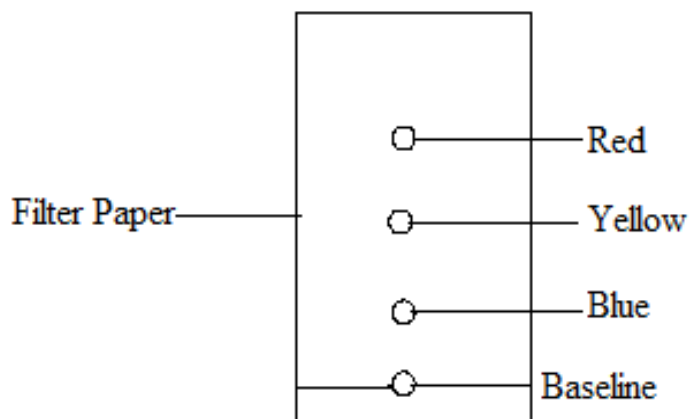
(a) Describe how you would obtain a solid sample of the red pigment from the chromatogram above.

(2 marks)

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(b) State one property of the red dye. (1 mark)

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2. Sulphur IV oxide is a toxic gas that is normally prepared in a fume chamber.

    a) Name two reagents that can be used to prepare sulphur (IV) oxide in the laboratory which does not involve a metal sulphite (1 mark)

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    b) Write equation for the reaction between sulphur (IV) oxide and hydrogen sulphide gas

        (1 mark)

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c) State the industrial source of sulphur for the manufacture of sulphuric (VI) acid. (1 mark)

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3. When magnesium is reacted with steam, it reacts rapidly forming a white solid and hydrogen gas.
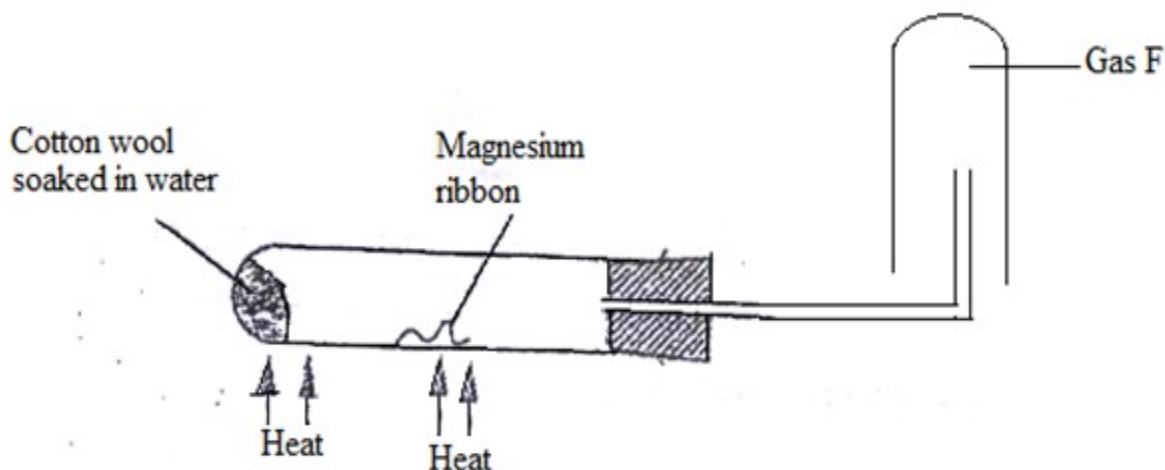
(a) What property of hydrogen gas makes it to be collected as shown above.   (1 mark)

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(b) How would you show that the gas collected is hydrogen gas?   (1 mark)

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(c) When copper turnings were used instead of magnesium ribbon, hydrogen gas was not produced.

Explain.   (1 mark)

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4. (a) Determine the oxidation number of phosphorous in the compound H_3PO_4.   (1 mark)

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(b) Study the following equation.

$$Mg (s) + 2H_2O (l) \longrightarrow Mg(OH)_2 (aq) + H_2 (g)$$
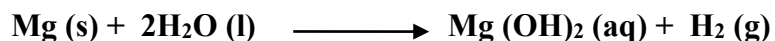
(c) Which species has undergone *oxidation*? Explain   (1 mark)

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(d) Define the term **electrolyte**   (1 mark)

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5. If it takes **12** seconds for **220 cm³** of gas X to diffuse through a certain pipe and it takes **9** seconds for **160cm³** of nitrogen (I) oxide to diffuse through the same pipe. Work out the molar mass of gas X (N=14, O=16   (3 marks)

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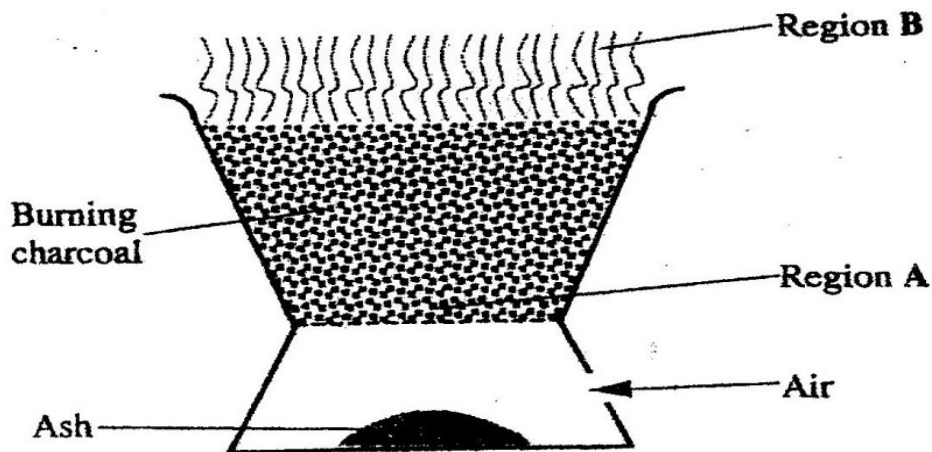………………………………………………………………………………………………

6. a) Both Iron (II) Chloride solution and Copper (II) Chloride solution are Green. Describe how you would distinguish the two salt solutions.   (2 marks)

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b) Name the process that occurs when *Iron (III) chloride crystals* are left out in an open in watch glass for 24hours.   (1 mark)

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7. The diagram below represents a charcoal burner. Study it and answer the questions that follow

a) Explain the observation made in region B   (1 mark)

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b) Distilled water was added to the ash and shaken thoroughly and then filtered. Name the major component of the filtrate.   (1 mark)

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c) Equal volumes of *equimolar quantities* of the filtrate and aqueous *hydrogen sulphide* were reacted. Write a stoichiometric equation for the reaction that took place.   (1 mark)

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8. Study the experiment below and answer the questions that follow. The gas produced ignites spontaneously
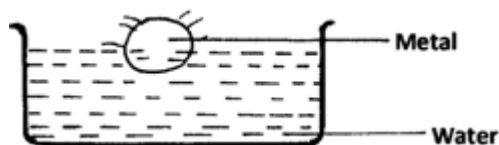
i)   With what colour does the metal burn?   (1 mark)

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ii)   Write down a chemical equation for the reaction demonstrated above   (1 mark)

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iii)   Give one use of the product of the burning the above metal in excess oxygen?
(1 mark)

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9. The table below gives the atomic and ionic radii of elements **A, B** and **C**. Study it and answer the questions that follow.

Element	Atomic radius (nm)	Ionic radius (nm)
A	0.133	0.078
B	0.090	0.120
C	0.157	0.098

a) Which elements are metals? Explain. (1mark)

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b) The metals in (a) above belong to the same group of the periodic table. Which one is the most reactive? Explain. (1mark)

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10. **0.2g** of organic compound containing **carbon, hydrogen** and **oxygen** on combustion gave **0.296g** of **carbon (IV) oxide** and **0.12g** of **water**. Given that its molecular mass is **180**, determine its molecular formula. (C=12.0, O=16.0, H=1.0) (3marks)

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11. Chlorine gas is bubbled into an aqueous solution of potassium iodide

a) State the observation that would be made. (1mark)

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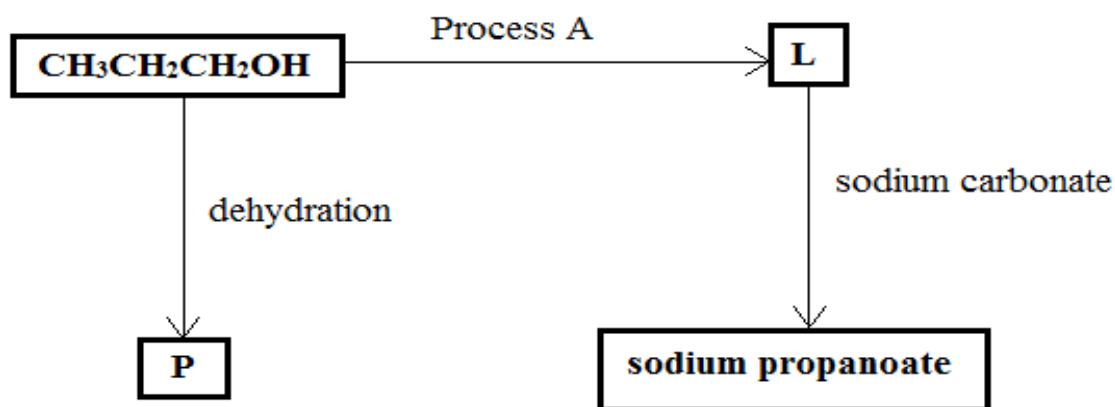
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b) Write a balanced chemical equation for the reaction that occurred.   (1 mark)

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12. Study the flow chart below and answer the questions that follow:

$CH_3CH_2CH_2OH$ →(Process A) L

L →(sodium carbonate) sodium propanoate

$CH_3CH_2CH_2OH$ →(dehydration) P

a) Name the homologous series to which **P** belongs   (1 mark)

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b) Name **one** reagent that can be used to carry out **process A**   (1 mark)

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c) The Sodium propanoate formed above is heated with a mixture of quick lime and sodium Hydroxide. Write the formal equation for the reaction that occurs   (1 mark)

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13. Elements **A** and **B** have atomic numbers **6** and **8** respectively.

a) Give the formula of the compound formed when **A** and **limited amount of B** combine.
          (1 mark)

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b) Use dots (.) and crosses (x) to show bonding in the compound formed in (a) above.

(1mark)

c) Give the adverse effect of the compound formed in (a) above.   (1 mark)

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14. A certain chemical reaction takes place twice as quickly if their temperature is raised by **10°C**. If a particular reaction takes **32 minutes** at **20°C**, how long does it take if the temperature is raised to **50°C**. Explain why the reaction is faster.   (3 marks)

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15. **100cm³** of a mixture of ethane and excess oxygen were ignited. The final volume was cooled and bubbled through aqueous sodium hydroxide. The volume reduced by **32 cm³**. Calculate:-

a) Composition of the original mixture.   (2marks)

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b) Volume of the excess oxygen. (1mark)

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16. A detergent molecule may be represented by the following simplified diagram.

Ionic head

Covalent hydrocarbon tail
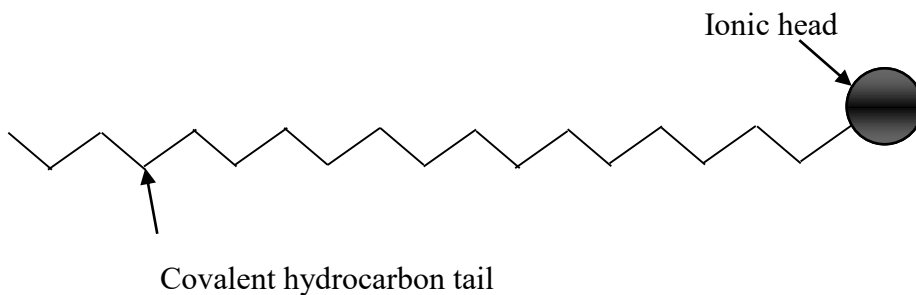
a) Explain how the detergent removes grease from a piece of a greasy cloth. (2 marks)

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a) Explain why soapless detergents do not form scum with hard water (1 mark)

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17. **1.0 g** of an alloy of aluminium and copper was reacted with excess dilute hydrochloric acid. **840 cm³** of hydrogen gas was produced at s. t. p. Calculate the percentage of aluminium in the alloy. **(Al=27, Molar Gas Volume is 22400 cm³).** (3 marks)

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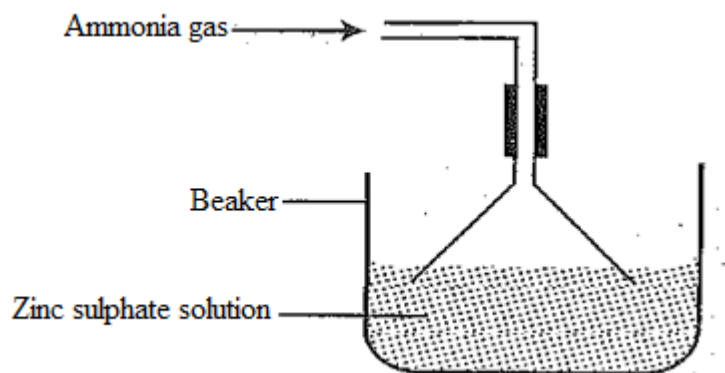
18. A student prepared **ammonia gas** and allowed it to pass into a solution of **zinc sulphate** as shown in the set- up below.

a) State and explain the **observations** that were made in the beaker after sometime.(2marks)

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b) Aqueous *Zinc sulphate* in the beaker above is replaced with water, *Silver chloride* added and ammonia gas bubbled in the mixture for a long time. Name the chemical species that explains the observation made.   (1 mark)

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19. A solution of **Hydrogen Chloride** gas in water produces **effervescence** with limestone while a solution of hydrogen chloride **in methylbenzene** does not. Explain.   (2 marks)

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20. (a) What is meant by molar enthalpy of combustion?   (1 mark)

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(b) **16g** of ethanol (C_2H_5OH) were completely burnt in air. The heat evolved raised the temperature of **600cm³** of water to change from **20⁰ C** to **85⁰C**.Calculate the molar enthalpy of combustion of ethanol. (H=1,C=12,O=16).Specific heat capacity of water = 4.2kJKg⁻¹K⁻¹)

(2 marks)

21. Nitrogen (II) Oxide is prepared by reacting copper metal with 50% dilute Nitric (V) Acid.

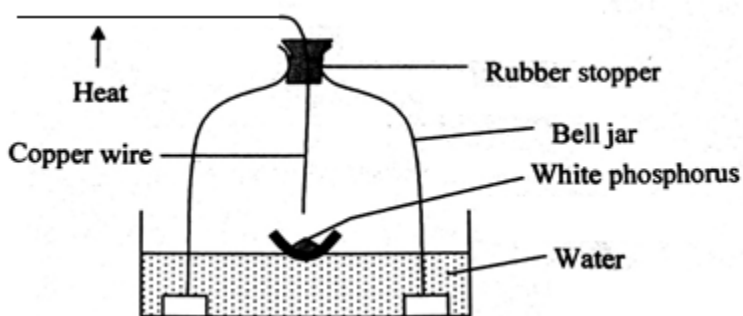a) Write Equation for the reaction.   (1 mark)

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b) Nitrogen (II) Oxide is denser than air but it cannot be practically collected by downward delivery. Explain.   (1 mark)

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22. (a) Define the term Solvent extraction   (1 mark)

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(b) The set – up was used to investigate whether the volume of air changes when phosphorous is placed in a fixed volume of air.

i. State one observation that would be made inside the bell jar. (1 mark)

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ii. Give the formular of the compound in the solution formed at the end of the experiment that will affect the colour of blue litmus paper dropped into the solution.

(1 mark)

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23. (i) Define Solubility (1 mark)

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(ii) The solubility of sodium nitrate at **90ºC** is **50g** in 100g of water and at 15ºC its solubility is 25g in 100g of water.**120g** of a saturated solution of sodium nitrate is cooled from **90ºC to 15ºC**.Calculate the mass of sodium nitrate crystals that would be formed at 15ºC. (2 marks)

24. The diagram below represents a type of flame produced by a Bunsen burner
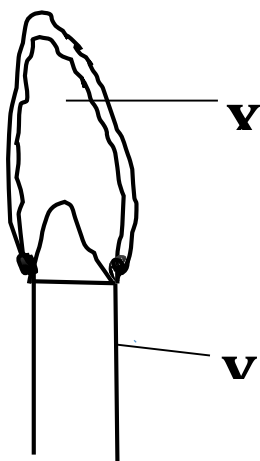
a) Name the type of flame above   (1 mark)

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b) Give a reason for your answer   (1 mark)

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c) State the colour of the parts of the flame labeled **X** and **Y**   (1 mark)

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25. Give the systematic names of the following compounds

a) $CH_3CH_2CH_2CH_2OH$ (1 mark)

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b) $CH_3CH_2CH_3$ (1 mark)

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c) $CH_3COOCH_2CH_2CH_2CH_3$ (1 mark)

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26. Use the data below to calculate the enthalpy change for the reaction below.   (3 marks)

$$CH_{4(g)} + 2\, O_{2\,(g)} \longrightarrow 2\, CO_{2\,(g)} + 2\, H_2O_{(l)}$$
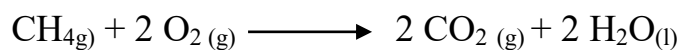
Bonds	Energy kJ
C-H	414
O=O	497
C=O	803
H-O	464

27. Describe how a solid sample of **barium sulphate** can be prepared starting with copper (II) oxide. (3 marks)

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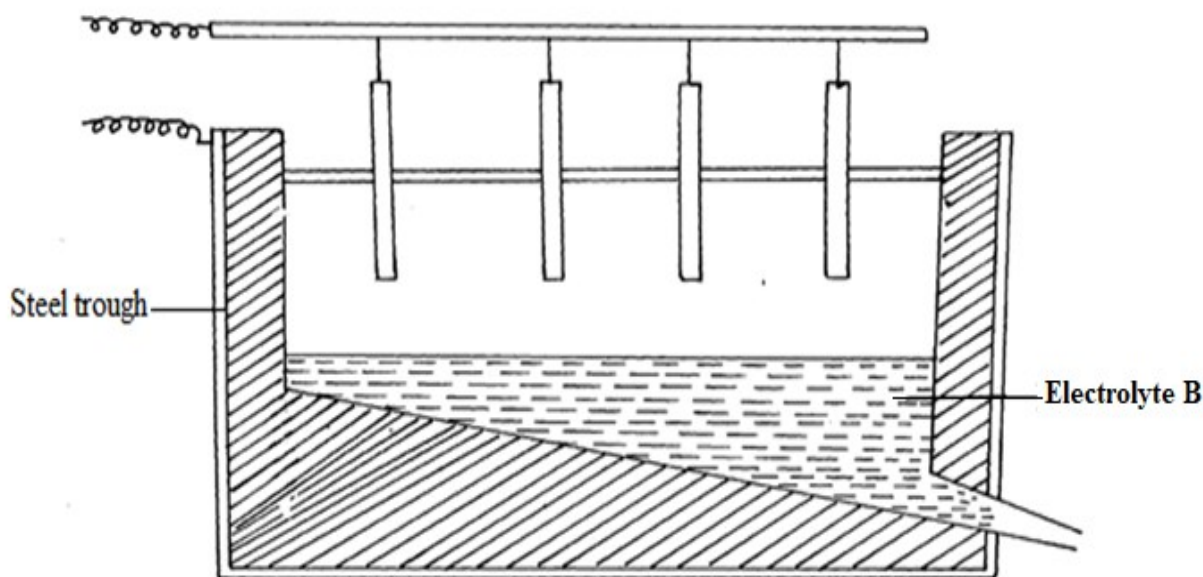...

28. The diagram below represents the second stage in extraction of aluminium metal
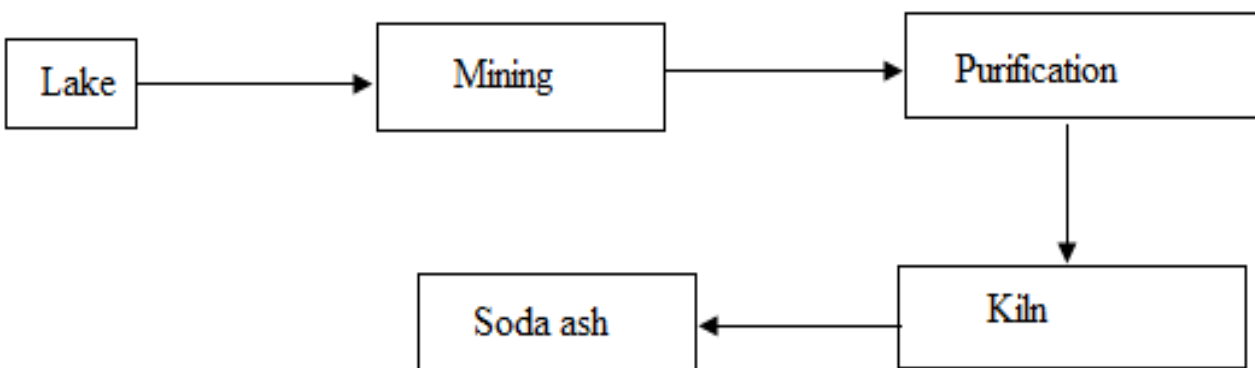

i. Write the formula of **bauxite** (1mark)

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ii.   How is the ore (bauxite) concentrated before it is electrolyzed   (1mark)

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iii.   What is the purpose of dissolving electrolyte B in molten cryolite (Na_3AlF_6)

(1mark)

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29. The flow chart below shows the soda ash manufacturing process at Lake Magadi. Study it and answer the questions that follow.

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│  Lake  │─────▶│  Mining  │─────▶│ Purification │
└────────┘      └──────────┘      └──────────────┘
                                          │
                                          ▼
┌──────────────┐      ┌──────────────┐
│   Soda ash   │◀─────│     Kiln     │
└──────────────┘      └──────────────┘
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a) Give the formula of **trona**   (1mark)

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b) Name **two** other salts found in the lake   (1mark)

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c) State **one** use of sodium hydrogen carbonate   (1mark)

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