

KCSE FINAL PREDICTION

CHEMISTRY

(KCSE PREDICTIONS 1-10)

An Exclusive Top-Notch KCSE Model Prediction Questions.

*A special preview of Possible Expected sample KCSE Questions
Most likely to be Tested in the Forthcoming KNEC examinations.*

SERIES 1

*Proudly prepared by an Exceptional team of
Experienced Veteran KNEC examiners within the
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For Marking Schemes/Answers

0746 222 000

MWALIMU AGENCY

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 1 PAPER 1

TIME: 2 HOURS

NAME..... INDEX NO.....

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QUESTIONS

1. In the industrial preparation of oxygen, state:

(a) How dust particles are removed from air. (1 mark)

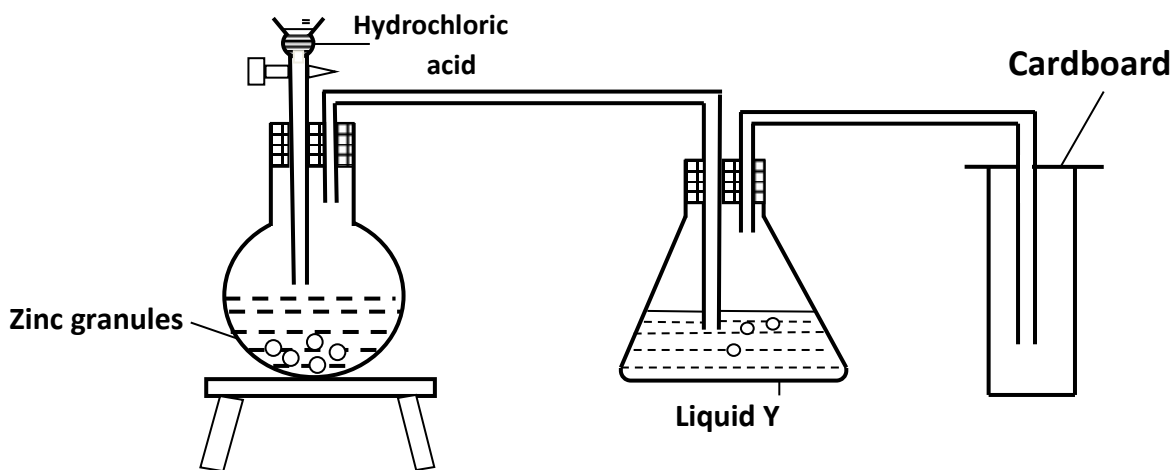
(b) Why carbon (IV) oxide is removed before the mixture is cooled to -25°C (1 mark)

2. A form four student accidentally mixed Sodium Carbonate and Calcium Carbonate.

Describe how he would obtain a dry sample of Sodium Carbonate from the mixture.

(3 marks)

3. The set up below was used to prepare dry hydrogen gas. Study it and answer the questions that follow.



(i) Identify a mistake in the set up (1 mark)

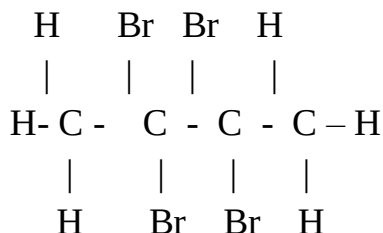
(ii) Write an equation for the reaction for the reaction that produces hydrogen gas (1 mk)

- (iii) State the chemical test for hydrogen (1 mark)
4. When air is bubbled through pure water (pH 7), the pH drops to 6.0. Explain (2mks)
5. Explain why iron III chloride is fairly soluble in methylbenzene while Magnesium chloride is insoluble. (2 mks)
6. Describe how a solid sample of Lead(II) Chloride can be prepared using the following Reagents: Dilute Nitric Acid, Dilute Hydrochloric Acid and Lead Carbonate. (3marks)
7. 50cm^3 of Carbon (IV) Oxide diffuses through a porous plate in 15 seconds. Calculate the time taken by 75cm^3 of Nitrogen (IV) Oxide to diffuse through the same plate under similar conditions. (C = 12, O = 16, N = 14) (2marks)
- 8.(a). Carbon (IV) oxide is bubbled through Calcium hydroxide until there is no further change.
- Explain using equations the changes observed. (2 marks)
- (b) Explain why diamond is used in cutting of glass and drilling. (1 mark)
9. Study the table for certain properties of substances A, B, C and D.

	Melting point $^{\circ}\text{C}$	Solubility in water	Electrical conduct
A	-119°C	Soluble	Solution does not conduct
B	1020°C	Soluble	Solution conducts
C	1740°C	Insoluble	Doesn't not conduct
D	1600°C	Insoluble	Conducts at room temperature

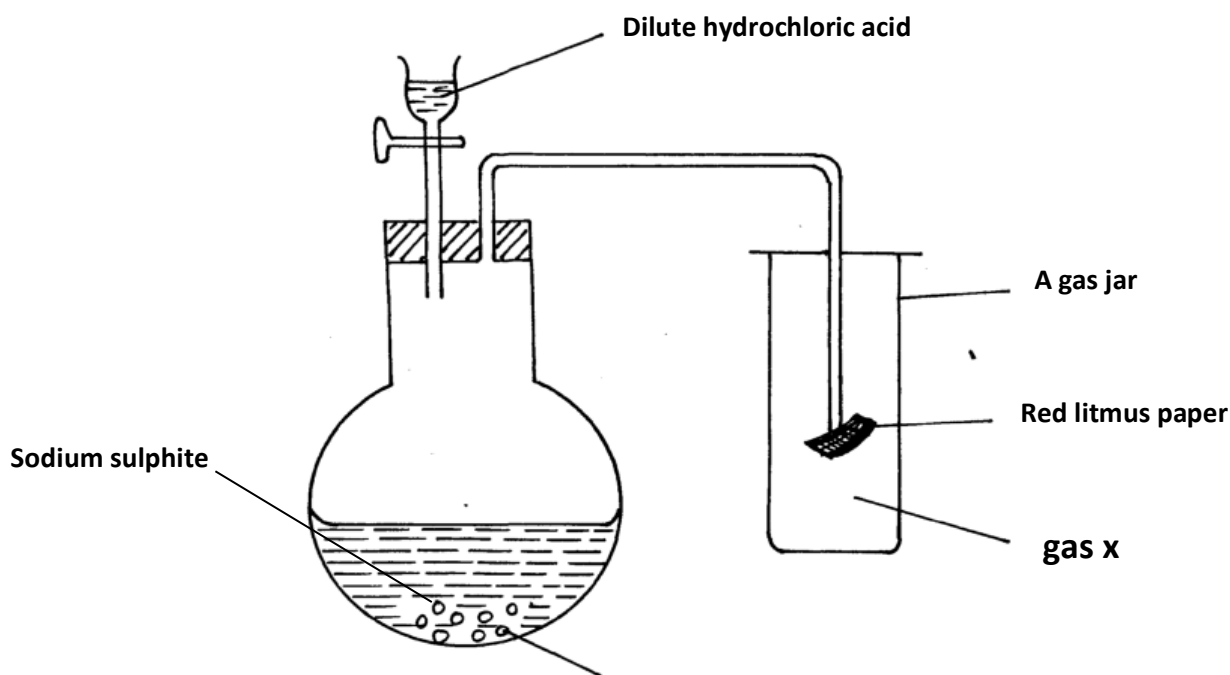
Which of the substances A, B, C and D: (4 mks)

- (i) Is a metal
- (ii) Has a simple molecular structure.....
- (iii) Has a giant ionic structure.....
- (iv) Has a giant covalent structure.....
10. A compound G reacts with 2 moles of bromine to form another compound whose structural formula is.



- i) What is the formula and name of compound G (2 marks)
- ii) State the observations made when acidified potassium chromate (VI) is added to compound G (1 mark)

11. Study the set-up below and answer the questions that follow

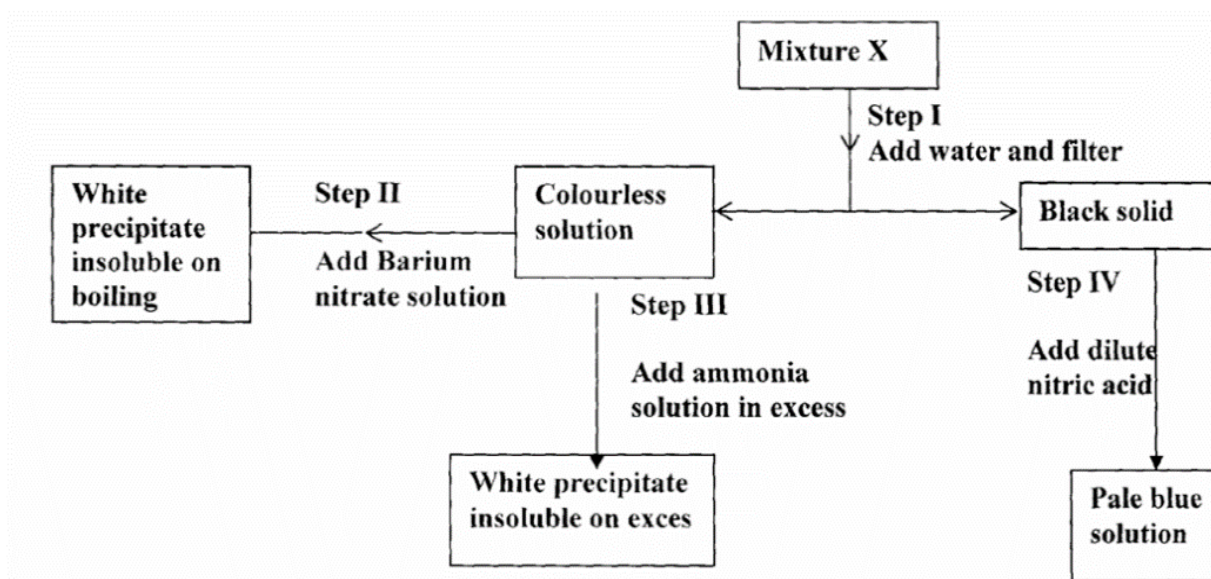


- (a) Identify gas (1 mark)
- (b) Write an equation for the reaction that produces gas x. (1 mark)
- (c) What is the effect of the gas x above on the red-litums paper (1 mark)
- (d) State and explain two observations made when hydrogen sulphide is bubbled through a solution containing iron (III) chloride. (2mks)
12. Aluminium (III) chloride sublimes. Explain why this is possible. (2mks)
13. The table below shows the solubility of a substance at various temperatures. Study it and answer the questions that follow.

Temperature ($^{\circ}\text{C}$)	Solubility in g/100g of water
0	36
40	30
80	25
110	20

- (a) What is the meaning of solubility? (1 mark)
- (b) What is the physical state of the substance? (1 mark)
- (c) State and explain what would happen if a sample of a saturated solution of the substance at 40°C was heated to 110°C . (1mark)

14. Study the chart below and answer the questions that follow.



(a) Name:

(i) Cations present in mixture X.

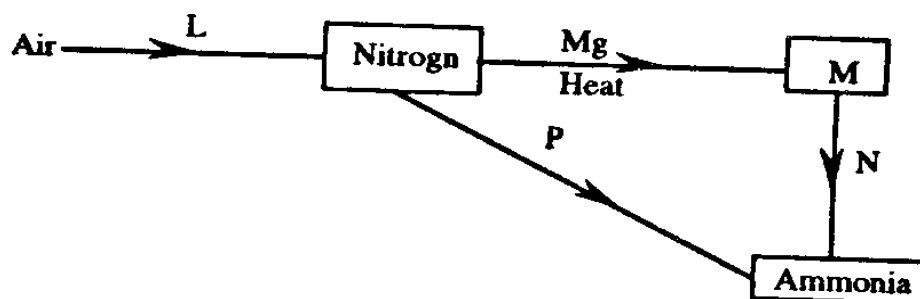
(1mark)

(ii) Anions present in the solution.

(1mark)

(b) Write an equation to show how the white precipitate in step III is formed. (1mark)

15. Study the diagram below and answer the questions



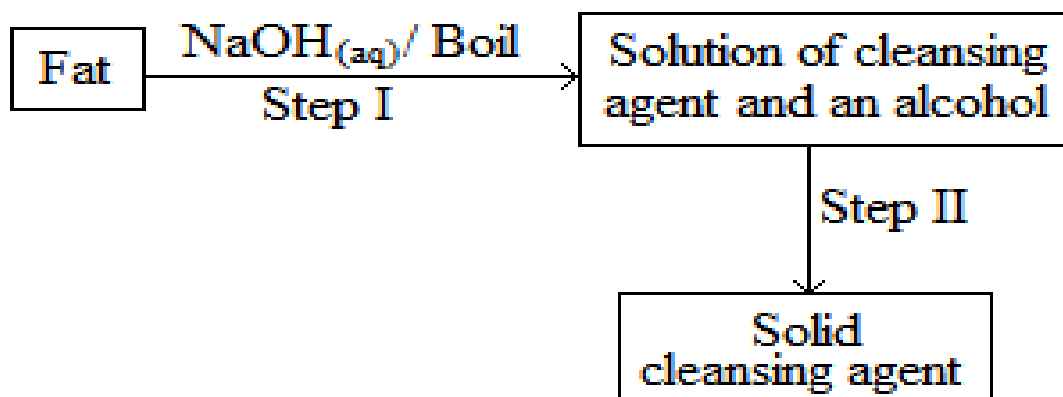
(i) What is the process involved in step L

(1mark)

(ii) Explain how process N and P can be affected

(2marks)

16. The scheme below was used to prepare a cleansing agent. Study it and answer the questions that follow.



(d) Given to the type of cleansing agent prepared by the method above? (1 mark)

(ii) Name one chemical substance added in step II (1 mark)

(iii) What is the purpose of adding the chemical substance named in c (ii) above? (1 mark)

17. Nitrates of metals A, B, C were heated and the products of the reactions recorded in the table below.

Nitrate of metal	Products
A	Metal nitrate and oxygen
B	Free metal, nitrogen (IV) Oxide and oxygen gas
C	Metal oxide, nitrogen (IV) oxide and oxygen gas

a) Name two possible identities of metal A. (1mk)

b) Name the two possible identity of metal B (1mk)

c) Calcium nitrate is one of the nitrate which forms the products in C. Using chemical equation show how the products are formed. (1mk)

18. State and explain what happens to the masses of the following substances when they are separately heated in open crucibles ; (3mks)

(i) copper metal

(ii) Sulphur powder

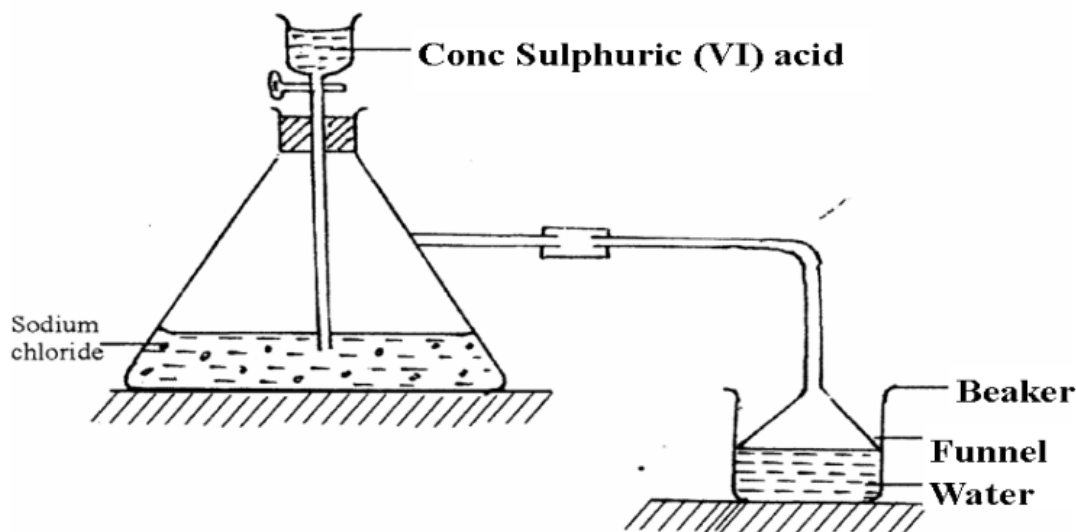
19. The table below gives the first ionization energies of the alkali metals.

Element	1 st ionization energy kJ mol ⁻¹
A	494
B	418
C	519

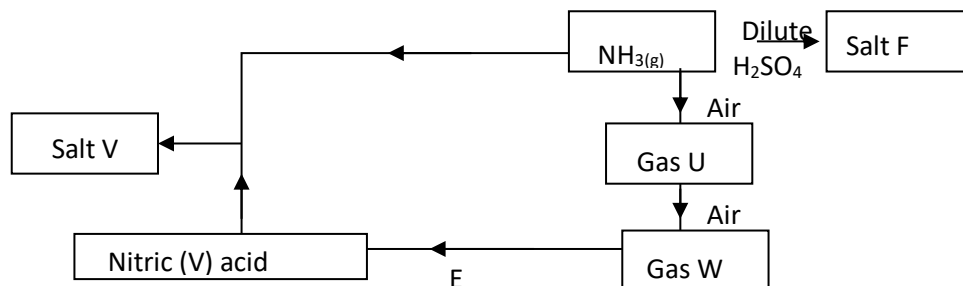
a) Define the term ionization energy. (1mk)

b) Which of the three metals is the least reactive? Give a reason. (2mks)

20. Study the set-up below and answer questions that follow.



- i) Name the gas that is produced when concentrated sulphuric (VI) acid reacts with the Sodium chloride (1mark)
- ii) Why is it necessary to use a funnel in the beaker? (1mark)
- iii) How does the gas affect the P^H of the water in the beaker? (1mark)
21. The flow chart/diagram below outlines a method of preparing a fertilizer

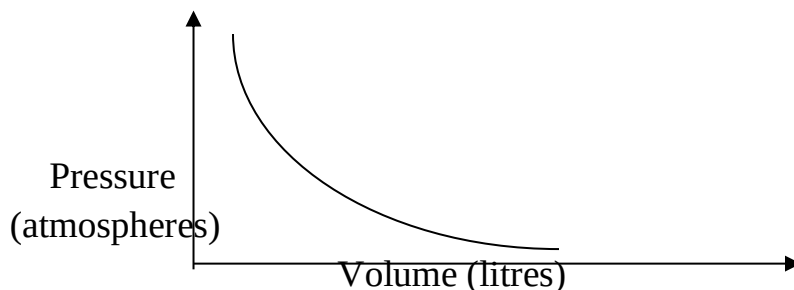


- i) Identify U and W
- U (1/2mark)
- W (1/2mark)
- ii) Give the names of salt F and V
- F (1/2mark)
- V (1/2mark)
- iii) Write a balanced equation for the formation of salt F (1 mark)
- 22.(a) Draw a dot (•) and a cross (x) diagram to show bonding in Cl_2O . (1 mark)
- b) Explain why the compound Cl_2O has a very low melting and boiling point. (1 mark)
23. Ethene reacts with oxygen according to the equation.



15.0 cm³ of ethene were mixed with 50cm³ of oxygen and mixture was sparked to complete the reaction. If all the volumes were measured at a pressure of one atmosphere and 25°C. **Calculate** the volume of resulting gaseous mixture. (3 marks)

24. 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 the pressure of the gas? (1 mark)
- (b) 3 litres of oxygen gas at 1atm atmosphere pressure were compressed to 2atm at constant temperature. Calculate the volume occupied by the oxygen gas. (2marks)

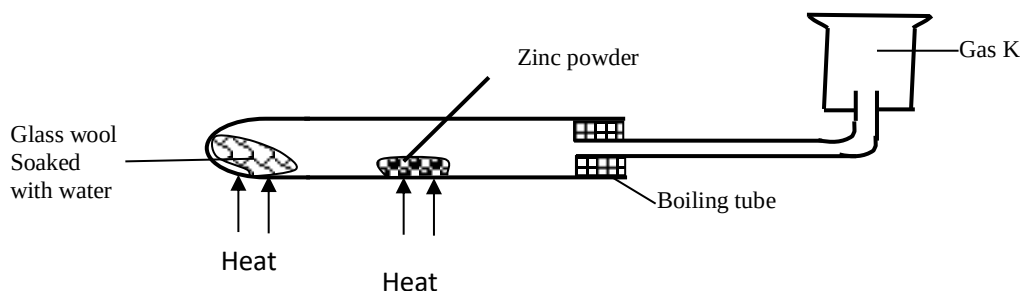
25. Temporary water hardness can be removed by boiling

(a) What is hard water. (1 mark)

(b) Write a chemical equation to show how temporary hardness is removed by boiling. (1 mark)

(c) State **one** advantage of hard water. (1 mark)

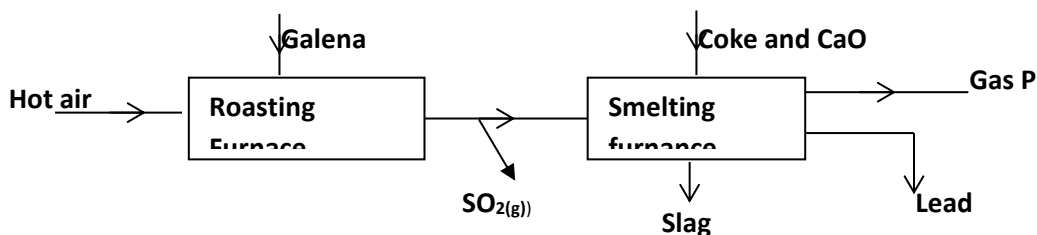
26. A student set-up the experiment below to collect gas K. The glass wool was heated before heating the zinc powder.



(a) Why was it necessary to heat the moist glass wool before heating the zinc powder? (1 mark)

(b) What observation was made in the boiling tube. (1 mark)

27. During the extraction of lead from its ores one of the main ore used is Galena



(i) Write an equation for the reaction in roasting furnace. (1 mark)

(ii) Name gas P (1 mark)

(iii) State **one** use of lead metal. (1 mark)

28. The empirical formula of a compound is CH_2 and it has a molecular mass of 42.

(a) What is the molecular formula of this compound? (1 mark)

(b) Write the general formula of the homologous series to which the compound belongs. (1mk)

(c) Draw the structural formula of the third member of this series and give its IUPAC name. (1mark)

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CHEMISTRY

TRIAL 1 PAPER 2

TIME: 2 HOURS

NAME..... INDEX NO.....

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QUESTIONS

- 1.(a) The grid below show part of the periodic table.(The letter do not represent the actual Symbols. Use it to answer the questions that follow.

T								Q
				S		R	K	
A	J		Y		U		L	
W							M	B
	C						N	
P								

- (i) Select the most reactive non-metal. (1mk)
- (ii) Select an elements that forms a divalent cation. (1mk)
- (iii) Element Z has atomic number 14. Show its position in the grid. (1mk)
- (iv) How do the atomic radii of U and J compare? (2mks)
- (v) How do electrical conductivity of A and Y compare? (2mks)
- (vi) How does the boiling point of elements K, L and M vary? Explain (2mks)

(b) The table below gives information on four elements by letters V, X, E and G. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Electron arrangement	Atomic radius	Ionic radius
V	2:8:2	0.136	0.065
X	2:8:7	0.099	0.181
E	2:8:8:1	0.203	0.133
G	2:8:8:2	0.174	0.099

- (a) Which two elements have similar properties? Explain. (2mks)
 (b) Which element is a non-metal? Explain. (1mk)
 (c) Which one of the elements is the strongest reducing agent. (1mk)

2. (a) Petrol is a mixture of several alkane molecules ranging from pentane (C_5H_{12}) to decane ($C_{10}H_{22}$). Name the process by which petrol is obtained from crude oil (1mk)

(b) A decane molecule derived from petrol is cracked into hydrocarbon with equal number of carbon atoms in each molecule.

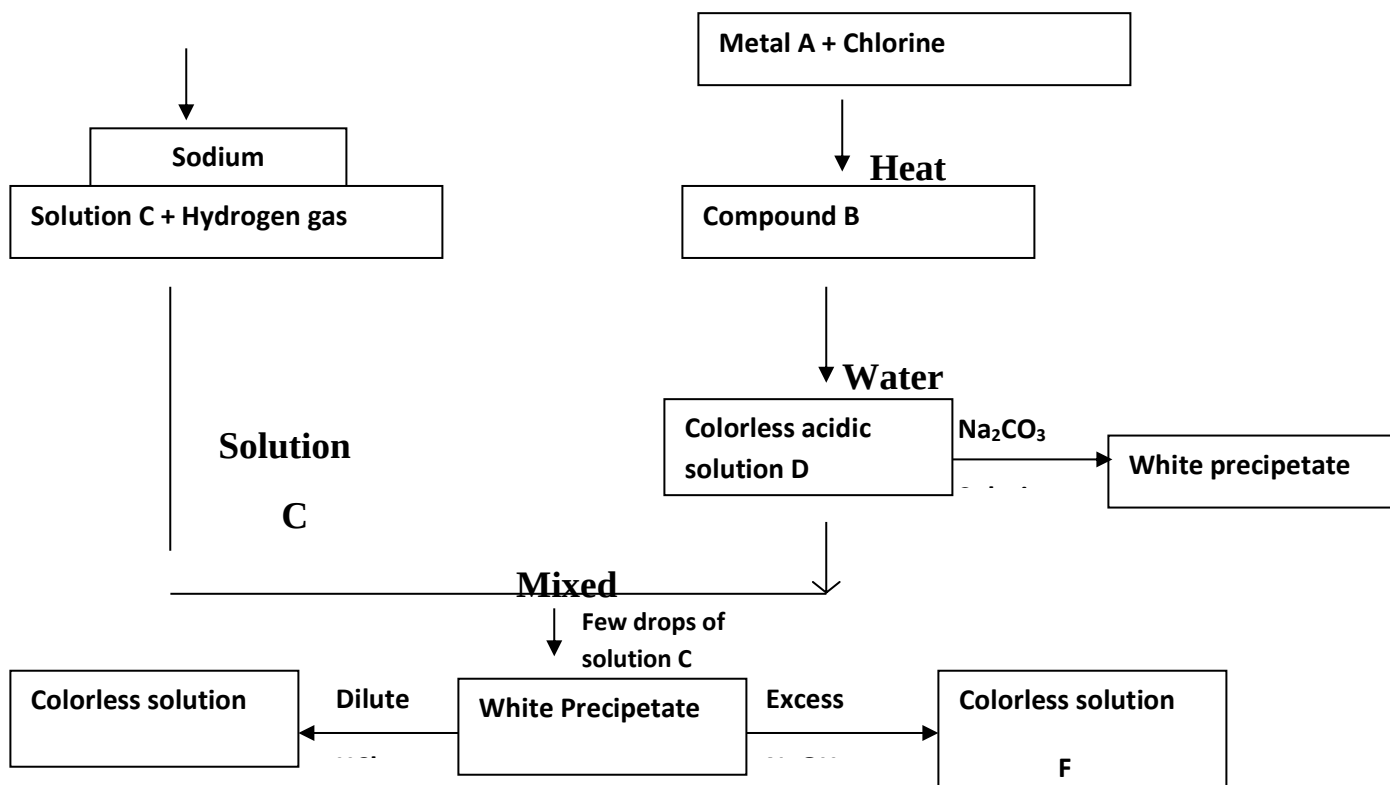
- (i) What is cracking? (1mk)
 (ii) State **two** conditions necessary for the above process. (2mks)
 (iii) Write an equation for the cracking of decane molecule. (1mk)
 (iv) Draw and name **two** isomers of molecule with lower molecular mass obtained from cracking of decane as shown in b(iii) above. (2mks)
 (v) How would you distinguish the products formed by cracking as shown in b(iii) in the laboratory. (2mks)

(c) Name the class to which the following cleansing agents belong.

- (i) $R-COONa^+$ (1mk)
 (ii) $R-O-SO_3Na$ (1mk)

(d) Which cleaning agent above is not environmental friendly? Explain. (2mks)

3. Study the flow diagram below and use it to answer the questions that follow.



(a) Give the name and formula of the following.

(i) White precipitate E

Name..... (½ mk)

Formula..... (½ mk)

(ii) Colourless solution F

Name (1mk)

Formula..... (1mk)

(b) What property is exhibited by white precipitate E when it reacts with Sodium hydroxide and HCl acid. (1mk)

(c) Write an ionic equation for the reaction between white precipitate E and excess sodium hydroxide solution. (1mk)

(d) The information below gives the solubilities (In g/100g of water) of substances X and Y at various temperatures

Temperature		0	20	40	60	80	100
Solubility g/100g of water	X	10	15	26	40	63	100
	Y	30	34	37	40	44	48

(i) Plot a graph of solubility against temperature for the two salts X and y on the same axis. (4mks)

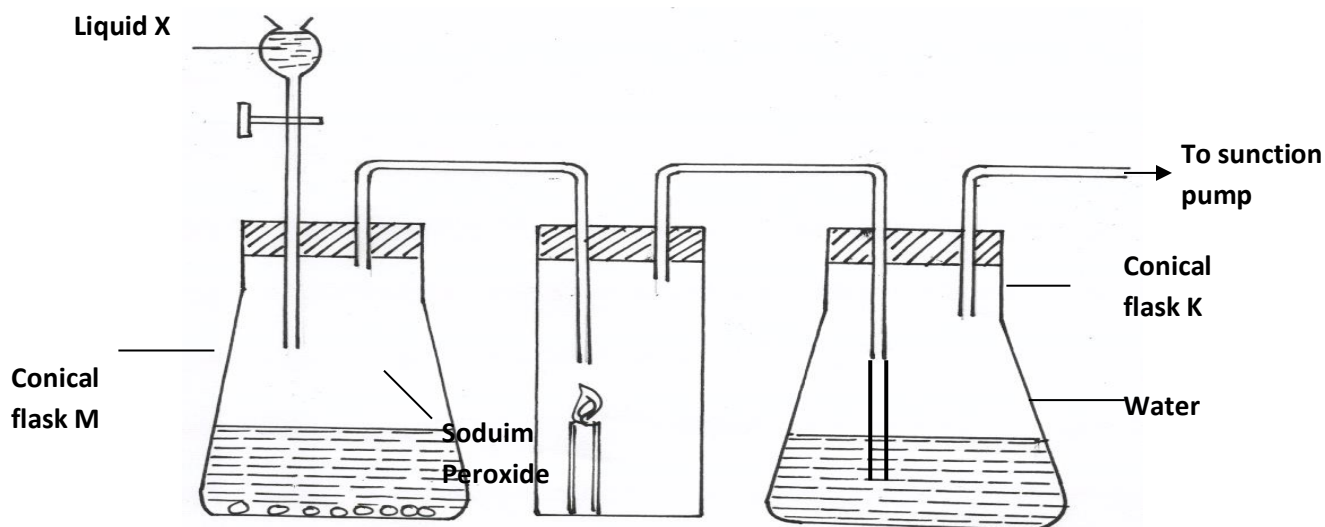
(i) From the graph state:

I The solubility of X at 50°C (1mk)

II The temperature at which solubility of Y is 36g/100g of water. (1mk)

III Calculate the mass of crystals of substance X which will deposit when a solution containing 50g of X in 100g of water initially at 80°C is cooled to a temperature of 30°C (1mk)

4. The diagram below shows a set – up that was used to prepare oxygen gas and passing it over a burning candle. The experiment was allowed to run for some time.



(i) Name liquid X (1mk)

(ii) Suggest the PH of the solution in conical flask K. (1mk)

(iii) Write an equation for the reaction taking place in the conical flask M. (1mk)

(b) During the extraction of sodium metal from sodium chloride in the Down's cell, calcium chloride is added

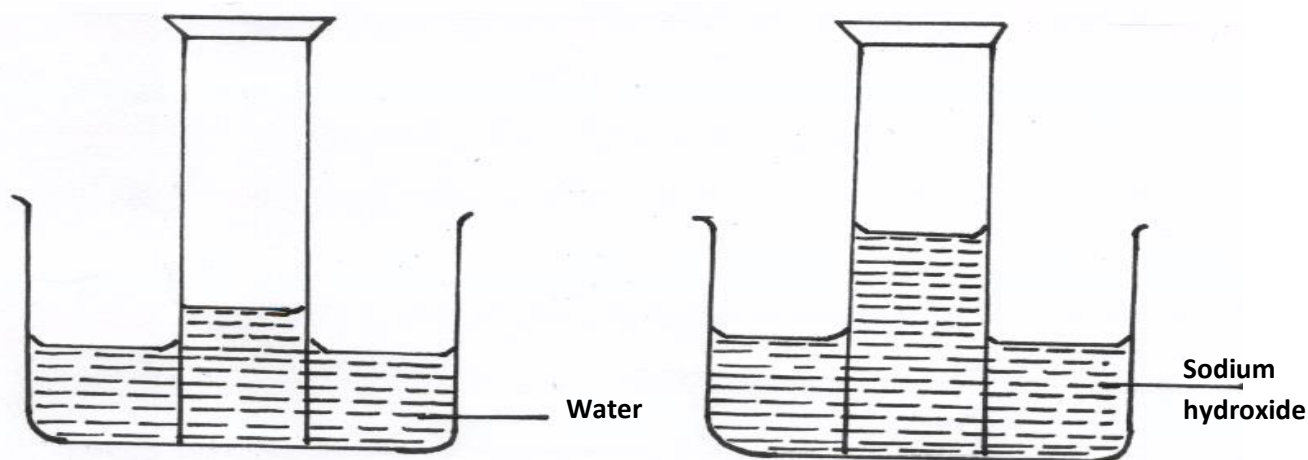
(i) Explain why it is necessary to add Calcium chloride (1mk)

(ii) Explain why sodium metal is not used in making the overhead electric cables yet it is a conductor of electricity (1mk)

(c) (i) Describe a simple chemical test that can be used to distinguish carbon (IV) oxide and Carbon(II) oxide gases. (1mk)

(ii) Give **one** use of carbon (II) Oxide (1mk)

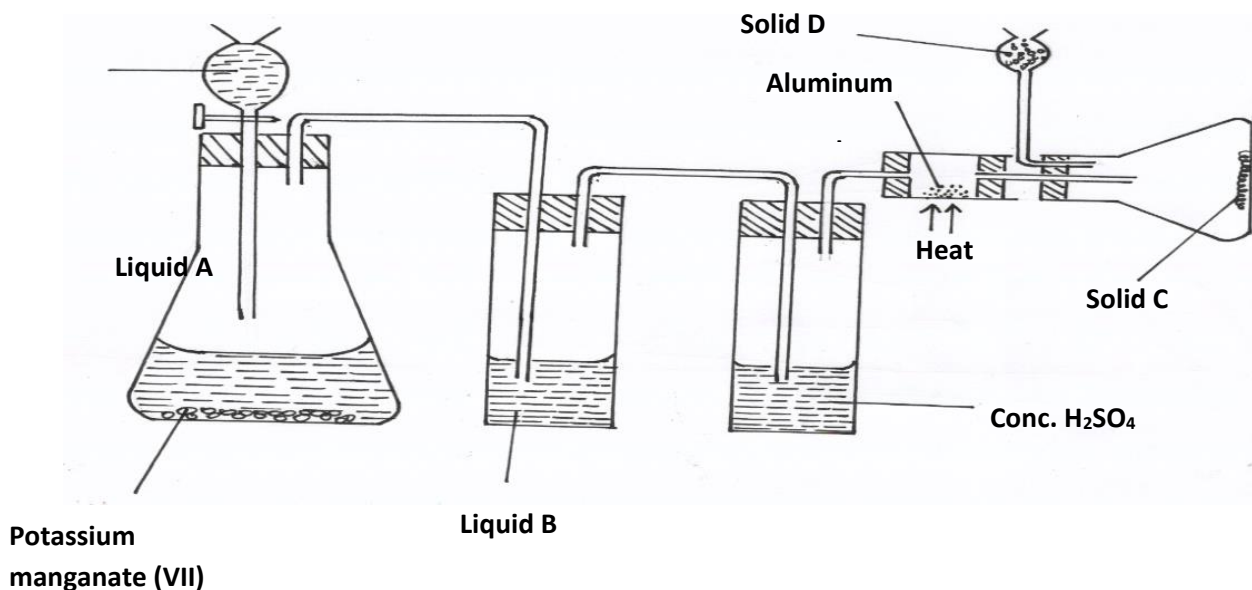
(d) A form two student inverted a gas jar full of carbon (IV) oxide over water and sodium hydroxide solution separately as shown below



Explain the observations made.

(2mks)

5.(a) Study the diagram below and use it to answer the questions that follow.



(i) Name liquids **A** and **B**

A.....

(1mk)

B.....

(1mk)

(ii) Suggest a suitable reagent that can be used as solid **D**

(1mk)

(iii) State the role of Solid **D**

(1mk)

(iv) Write a balanced chemical equation for the reaction in the conical flask

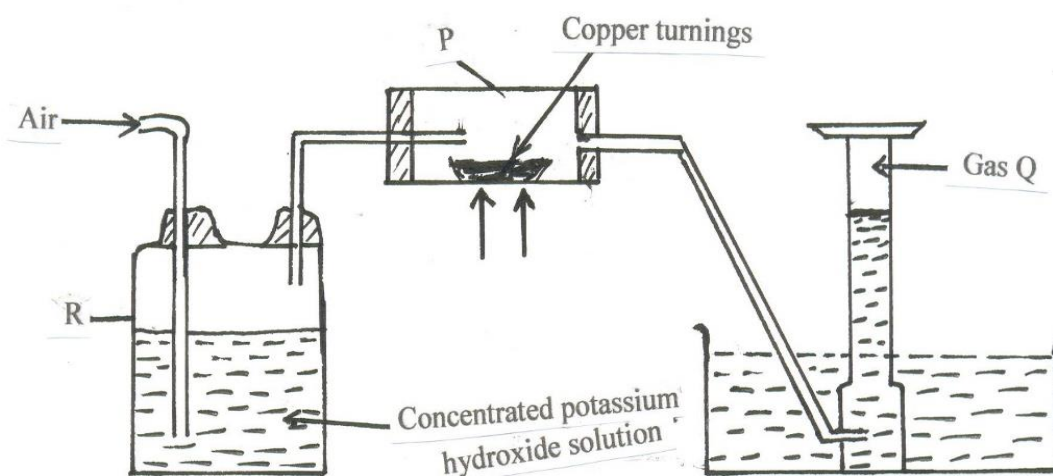
(1mk)

(v) Explain why solid **C** collects further away from the heated aluminium metals.

(1mk)

- (vi) In the combustion tube above, 0.675g of aluminium metal reacted completely with 1800cm³ of chlorine gas at room temperature. Determine the molecular formula of Solid C, given that its relative formula mass is 267 (Al= 27.0, Cl= 35.5 molar gas volume at r.t.p = 24.0 litres) **(3mks)**
- (b) The reaction between hot concentrated sodium hydroxide and chlorine gas produces Sodium Chlorate (V) as one of the products
- (i) Write the equation for the reaction. **(1mk)**
- (ii) Give **one** use of sodium chlorate.(V) **(1mk)**
- (c) Explain the difference between bleaching by chlorine and bleaching by sulphuric (IV)oxide gases. **(2mks)**

6. A. Study the diagram below that is used to prepare a gas Q.



- (i) (a) What component of air is eliminated in wash bottle labelled R? **(1 mark)**
- (b) Write the reaction equation for the reaction that eliminates the component of air in a(i) above. **(1 mark)**
- (ii) What component of air is removed in hard glass tube labelled P? **(1 mark)**
- (iii) Identify gas Q. **(1 mark)**

B. In an experiment 1.54g of nitrogen reacted with 3.53g of oxygen to form a compound.

N = 14, O = 16

- (i) Calculate the moles of nitrogen and oxygen that reacted. **(2 marks)**
- (ii) Determine the simplest formula of the compound formed between nitrogen and oxygen. **(2 marks)**
- (iii) Comment on the melting and boiling points of the compound in B(ii) above, explain. **(2 marks)**

7. In the preparation of Copper carbonate, copper was burnt in air and the product collected. Dilute sulphuric acid was added and the mixture filtered and cooled. Sodium carbonate was added to the filtrate and the content filtered. The residue was washed and dried to give a white powder.

- a) Give the chemical name of the product formed when magnesium burns in air **(1mk)**
- b) Write a chemical equation for the formation of product. **(1mk)**
- c) (i) Name filtrate collected after sodium carbonate was added **(1mk)**
(ii) Name the white powder. **(1mk)**
- d) Write chemical equation for the reaction between product in (a) and acid. **(1mk)**
- e) Write an ionic equation to show the formation of the white powder **(1mk)**
- f) Write an equation to show what happened when white powder is strongly heated. **(1mk)**
- g) Using a diagram, describe how a salt can be obtained from the filtrate in c(i) above **(3mks)**

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 2 PAPER 1

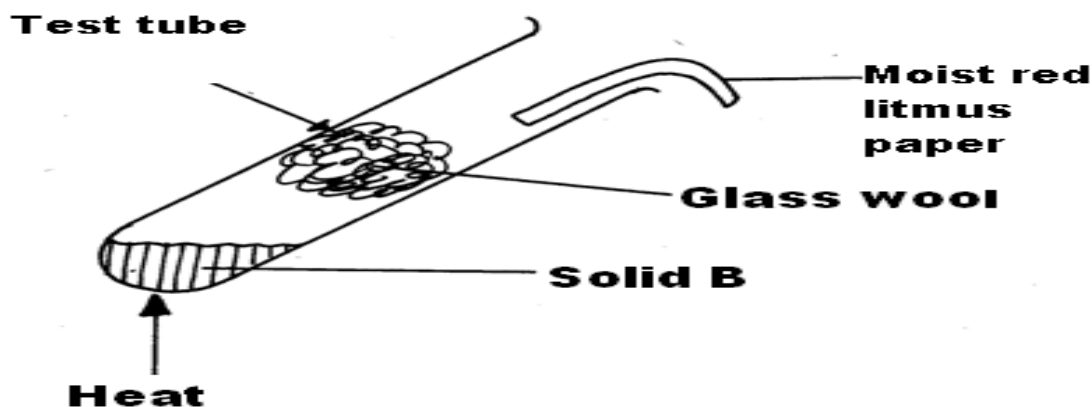
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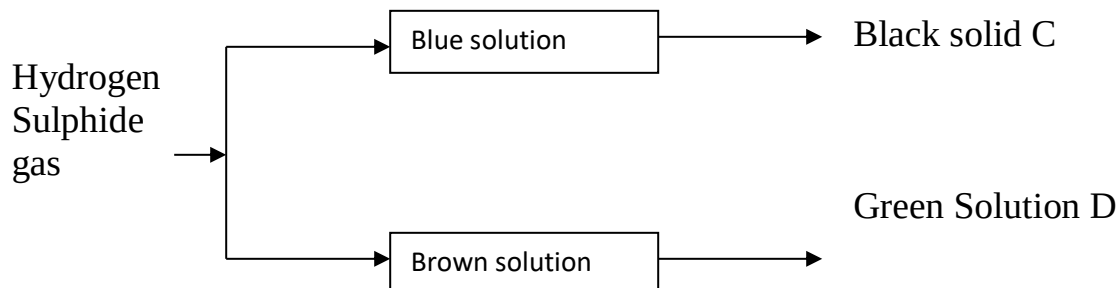
QUESTIONS

- 1) (a) State one disadvantage of using flower extracts as acid – base indicators. (1mk)
Name the indicator that can be used in the laboratory to tell the PH of lemon juice. (1mk)
Differentiate between strong and weak acids. (1mk)
- 2) (a) What are isotopes? (1mk)
(b) Determine the number of neutrons in $^{18}_8\text{O}$ (1mk)
- 3) .When magnesium is burnt in air it reacts with both oxygen and nitrogen gas giving a white ash. Write two equations for the reactions that take place. (1mk)
- 4) A solution contains 29.1g per litre of aluminium Sulphate. Calculate the number of Sulphate ions in 350cm^3 of the solution.
(Al = 27, S = 32, O = 16) Avogadro's constant = 6.0×10^{23} . (2mks)
- 5) When a solid B was heated in a test-tube, it gave off two gases. The two gases were separated by passing them through a plug of glass wool in a test-tube as shown below.

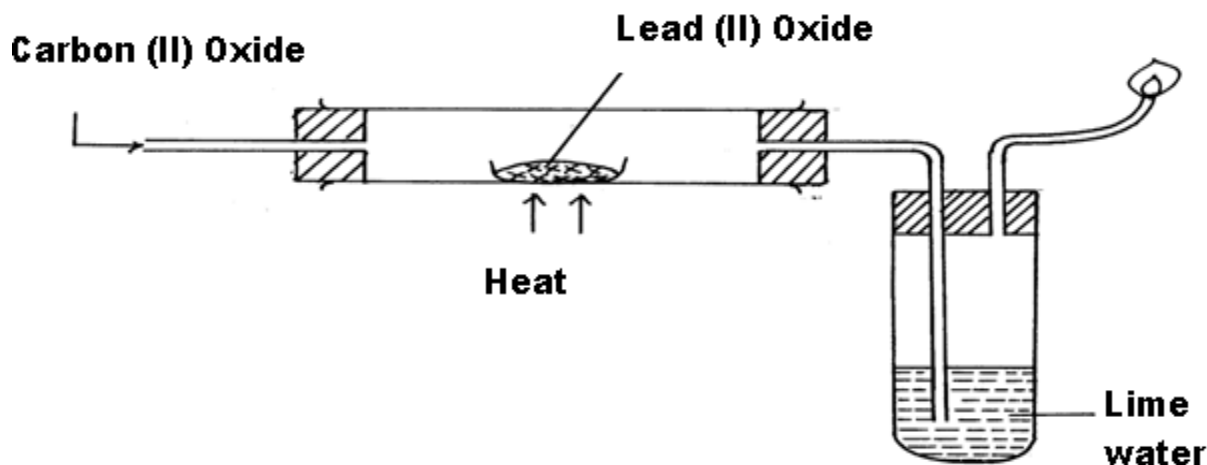


The first gas which evolved turned moist red litmus paper to blue. Later the other gas involved turned the litmus back to red.

- (a) Identify solid B (1mk)
 - (b) Write the equation for the reaction that take place in the test tube (1mk)
- 6) Hydrogen Sulphide gas was bubbled into two solutions of metallic nitrates as shown in the flow diagram below



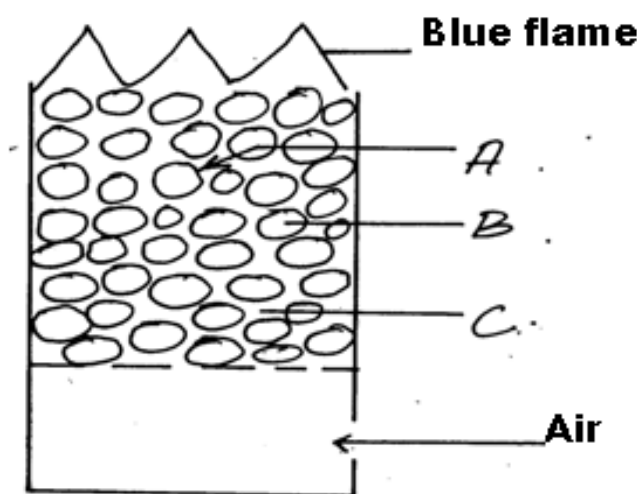
- (a) Identify the black solid C (1mk)
 - (b) Write an ionic equation for the formation of the green solution (1mk)
 - (c) State the property of Hydrogen Sulphide shown by the formation of solution D (1mk)
- 7) The apparatus shown below was used to investigate the effect of Carbon (II) Oxide on Lead (II) Oxide.



- a. State the observation made in the combustion tube during the experiment. (2mks)
 - b. Write the equation for the reaction that take place in test-tube E. (1mk)
- 8) (a) Lime water is also used to soften hard water. Why is this method not preferred to soften hard water. (1mk)
- a. Name a compound that causes temporary hardness of water. (1mk)
 - b. State one disadvantage of using hard water for domestic purpose. (1mk)
- 9) (a) Name the compound below
 $\text{CH}_3\text{CH}_2\text{CH} = \text{CH}_2$

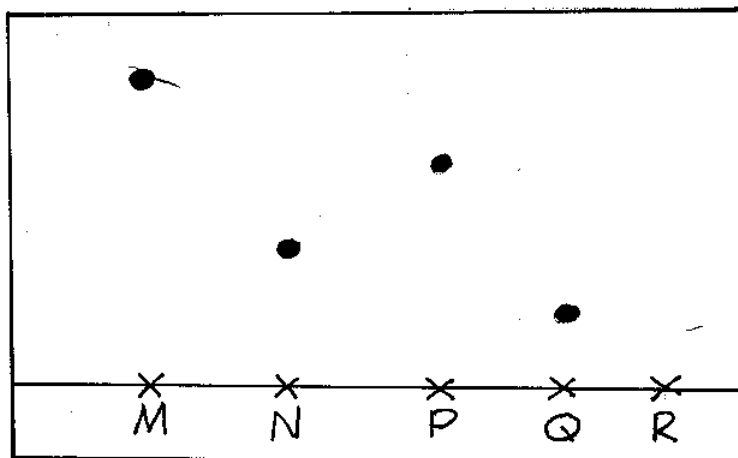
- (b) Draw and name other isomers of the compound in (a) above. (2mks)

- 10) A white solid dissolve in water to form a colourless solution. The colourless solution forms a white precipitate with Ammonia solution but dissolve in excess alkali. The colourless solution forms a white precipitate with Lead (II) Nitrate solution. The white Precipitate dissolve on warming to form a colourless solution.
Write the chemical formulae for the ion formed when the colourless solution react with excess ammonia solution. (1mk)
- (b) Write the name of the ion present in the white solid. (1mk)
- (c) What is an alkali (1mk)
- 11) The solubility of Potassium Manganate (VII) at 20°C is 13g per 100g of water and at 90°C is 60g per 100g of water.
- (a) Determine the mass of Pottassium (VII) Manganate present in 80g of saturated solution at 90°C. (1mk)
- (b) Calculate the mass of Pottassium (VII) Manganate that would crystallize out if the solution in (a) were cooled to 20°C. (2mks)
- 12) (a) Explain why concentrated Sulphuric (VI) acid is a poor electrolyte and has no effect on blue litmus paper whereas 2M Sulphuric (VI) acid conducts electricity and changes blue litmus paper red. (1mk)
- (b) What is a binary electrolyte. (1mk)
- 13) An element F has a relative atomic mass of 88. When a current of 0.5 amperes was passed through the fused chloride of F for 20 minutes and 20 seconds, 0.278g of F were deposited at the cathode. Determine the charge on ion of F (1Faraday = 96500C). (2mk)
- 14) Below is a cross- section of a charcoal burner

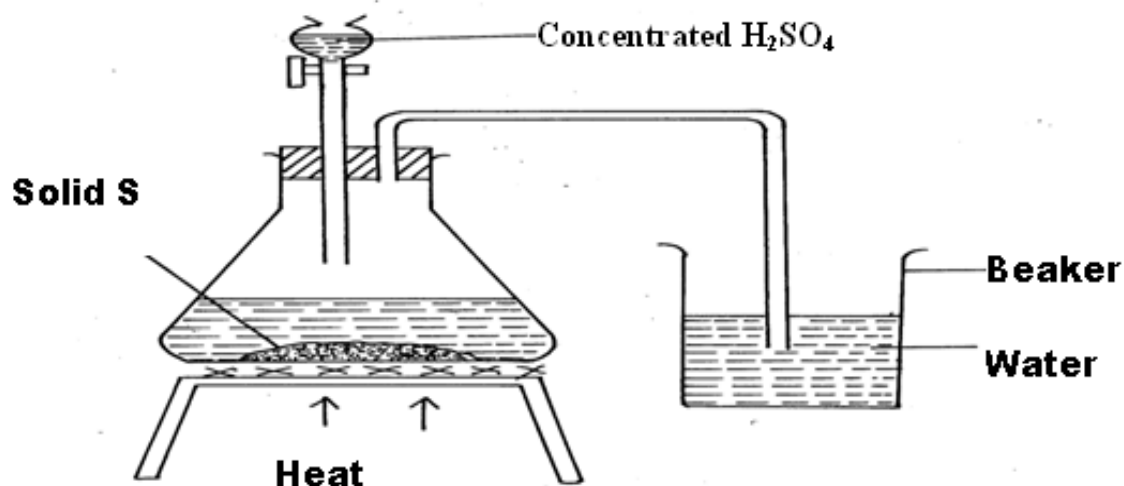


- (a) Charcoal is a form of impure carbon. Name allotropes of carbon. (1mk)
- b. Write an equation for the reaction taking place at the part marked B. (1mk)

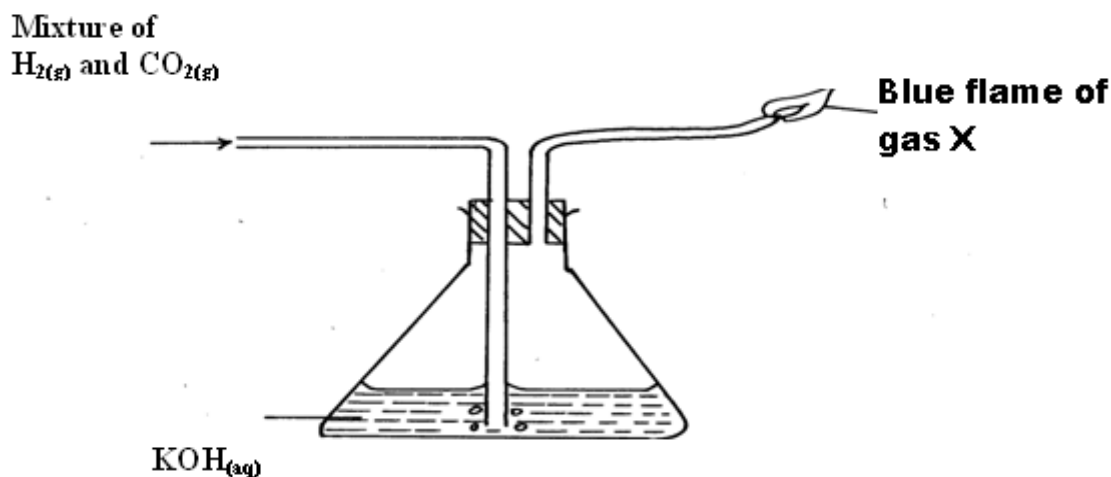
- 15) The diagram below represents paper chromatogram of four types of sugar.



- (a) Identify the most stable sugar. (1mk)
- (b) On the diagram, show the chromatogram of R. (2mks)
- 16) The empirical formula of a hydrocarbon is C_2H_3 . The hydrocarbon has a relative molecular Mass of 54. (H = 1, C = 12)
- (a) Determine the molecular formula of the hydrocarbon. (1mk)
- (b) Draw the structure formulae of the hydrocarbon in (a) (1mk)
- (c) To which homologous series does the hydrocarbon in (b) above belong? (1mk)
- 17) State three factors that increase the rate of reaction for the following reaction. (3mks)
- $$CaCO_{3(s)} + 2HCl_{(aq)} \longrightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(aq)}$$
- 18) In terms of structure and bonding explain the following
- (a) Melting point of Magnesium is higher than that of Sodium. (3mks)
- (b) Melting point of Chlorine is lower than that of Iodine. (1mk)
- 19) The set-up below was used to prepare a solution of hydrogen chloride gas

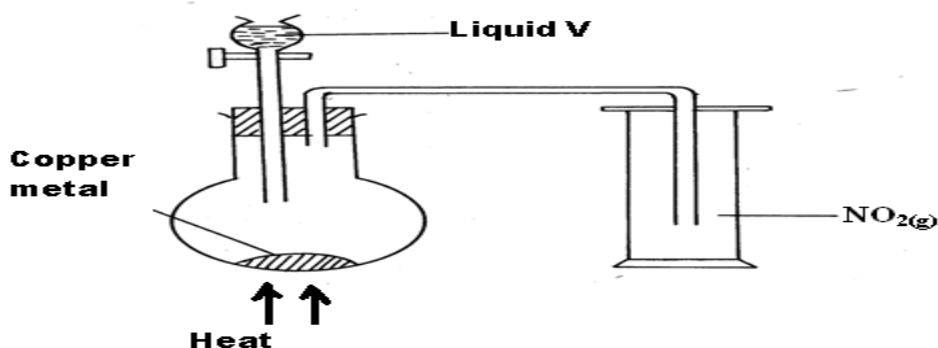


- a. Identify solid S (1mk)
 b. Identify one mistake in the set up. (1mk)
 Write an equation for the reaction taking place in the flask. (1mk)
- 20) (a) State Gay Lussac's law (1mk)
 (b) 10cm^3 of a gaseous hydrocarbon, C_xH_y required 30cm^3 of oxygen for complete combustion. If steam and 20cm^3 of Carbon (IV) oxide were produced, what is the value of x in C_xH_y . (2mks)
- 21) Starting with lead metal, describe how a dry sample of Lead(II) chloride can be prepared in the laboratory. (3mks)
- 22) An ion T^{2-} has an electronic arrangement of 2.8
 (a) What is the atomic number of the element. (1mk)
 b. To which group and period does the element belong to;
 i. Group _____ (1mk)
 ii. Period _____ (1mk)
- 23) Using dot (.) and cross (x) diagram show the type of bond present in hydrogen ion, H_3O^+
 (H = 1, O = 8) (2mks)
- 24) A mixture of Hydrogen gas and Carbon (IV) oxide are passed through Potassium hydroxide solution as shown below.



- State the observation made in the conical flask. (1mk)
- i. Write the equation for the reaction that takes place in:-
 (a) (i) the conical flask (1mk)
 (b) (ii) the burning of gas x (1mk)
- 25) 20cm^3 of a solution containing 4g per litre of Sodium hydroxide was neutralized by 8cm^3 of dilute Sulphuric (VI) acid. Calculate the concentration of the acid in moles per litre. (Na = 23, O = 16, H=1) (3mks)

- 26) Given that the hydration energies of $\text{Ca}^{2+}_{(\text{g})}$ and $\text{Cl}^{-}_{(\text{g})}$ are -1562KJ/Mole and -364KJ/Mole respectively. The heat of solution (ΔH_{soln}) for one Molw of CaCl_2 is -82.9 KJ/Mole . Determine the lattice energy for CaCl_2 . (2mks)
- 27) The diagram below is used to prepare nitrogen (IV) oxide gas.



- (a) Identify substance V (1mk)
- ii. State and explain one precaution taken when carrying out the experiment. (2mks)
- 28) Electrode potentials for the half cells are shown below. Use the information to answer the questions that follow.
- $$\text{Sn}^{2+}_{(\text{aq})} + 2\text{e}^{-} \longrightarrow \text{Sn}_{(\text{s})}; E^{\theta} = -0.14\text{V}$$
- $$\text{Cu}^{2+}_{(\text{aq})} + 2\text{e}^{-} \longrightarrow \text{Cu}_{(\text{s})}; E^{\theta} = -0.34\text{V}$$
- (a) Write the cell representation for the cell made up of two half cells. (1mk)
- (b) Write the cell equation for the cell reaction. (1mk)
- ii. Calculate the E^{θ} value for the cell. (1mk)
- 29) State the function of each of the following in the solvay process of production of Sodium Carbonate.
- (a) Coke (1mk)
- (b) Cold water on the carbonation. (1mk)
- (c) Ammonia a generator. (1mk)
- 30) (a) A student in form three was given two gases C_2H_6 and C_2H_4 . He added acidified Potassium Manganate (VII) to each solution. State the observations the student made. (2mks)
- (b) State one use of C_2H_4 . (1mk)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 2 PAPER 2

TIME: 2 HOURS

NAME..... INDEX NO.....

SCHOOL..... SIGN.....

DATE.....

QUESTIONS

- 1) (a) The table **below** shows the ions of elements **W**, **X**, **Y**, **Z** and their electron arrangement. The letters do not represent the actual symbols of the element.

Ion	Electron configuration
W ⁻	2,8,8
X ²⁺	2,8,8
Y ³⁺	2,8
Z ²⁻	2,8

- (i) Which two elements belong to the same period? Give a reason. (2mks)
- (ii) In which group of the periodic table does Y belong? (1mk)
- (iii) Write the formula of the compound formed between W and X (1mk)
- (iv) What type of bond is formed between W and X. Explain. (2mks)
- (b) (i) What is a coordinate bond. (1mk)
- (ii) Draw a dot (.) cross (X) diagram to show bonding in the Ammonium ion. NH_4^+ ion (N = 7, H = 1) (2mks)

Aluminum chloride and sodium chloride are both chlorides of period 3 elements.

(v) Use this information to explain the following observations.

I A solution of AlCl_3 in water turns blue litmus paper red while that of sodium chloride does not. (1 ½ mks)

(vi) II The melting point of sodium chloride (801°C) is higher than that of AlCl_3 (180°C). (1 ½ mks)

2) (a) Give the names of the following compounds.

(i) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ (1 mk)

(ii) $\text{CH}_3\text{CHCHCH}_2\text{CH}_3$ (1 mk)

Study the information in the table below and answer the questions that follow.

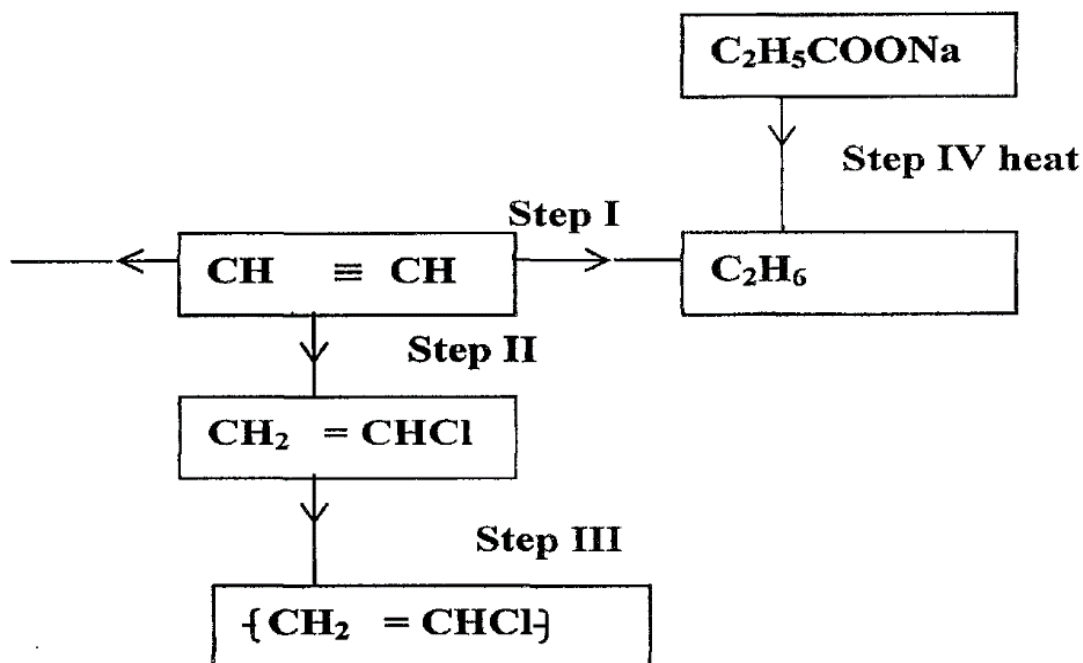
No. of carbon atoms per molecule	Relative molecular mass of hydrogen
2	28
3	42
4	56

(i) Write the general formula of the hydrocarbons in the table. (1 mk)

(ii) Predict the relative molecular mass of the hydrocarbon with 5 carbon atoms. (1mk)

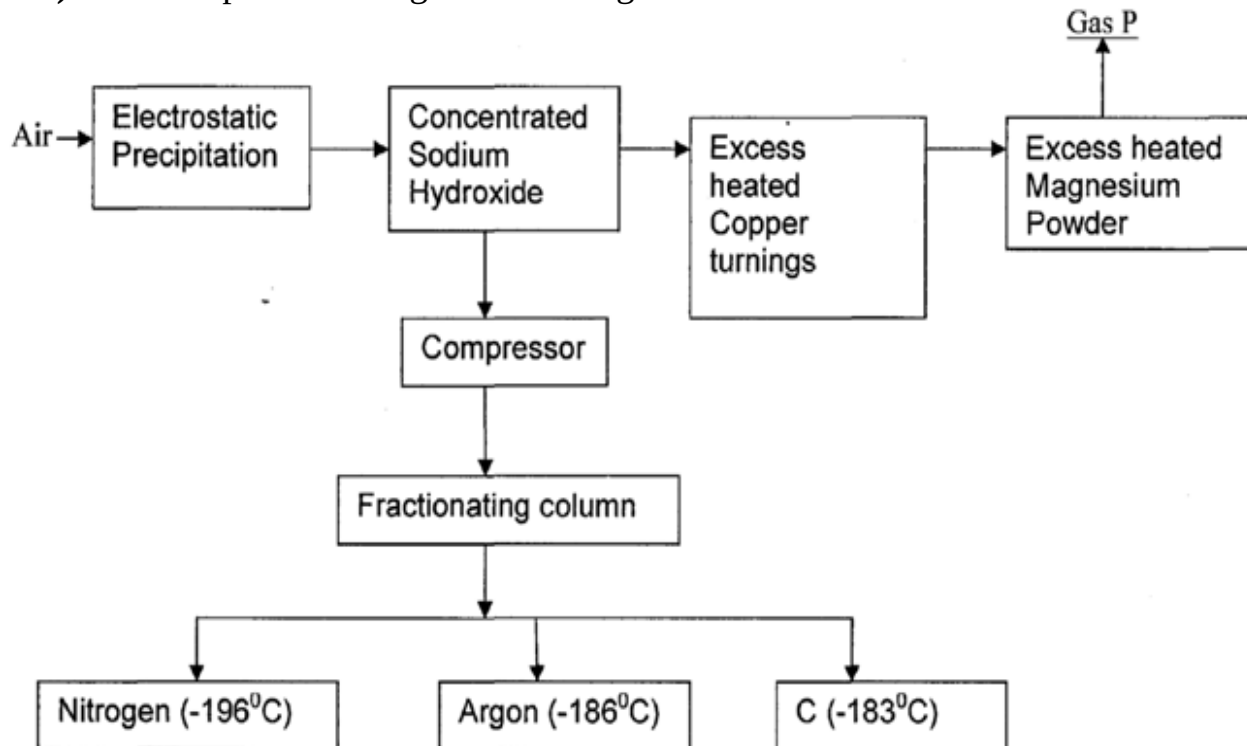
(iii) Determine the molecular formula of the hydrocarbon in (ii) and draw its structural formula. (2 mk)

Study the scheme given below and answer questions that follow.



- (iii) Name the reagent used in
- Step I (1 mk)
 - Step II (1 mk)
 - Step III (1 mk)
- (iv) Write an equation for complete combustion of $\text{CH} \equiv \text{CH}$ (1 mk)
- (v) Explain **one** disadvantage of the continued use of items in step III. (1 mk)

3) Air was passed through several reagents as shown in the flow chart below.



- (a) Name the major components of air. (2mks)
- (ii) (b) Write an equation for the reaction which takes place in the chamber with:
- Concentrated sodium hydroxide. (1mk)
 - Excess heated copper turnings. (1mk)
 - Excess heated magnesium powder. (1mk)

Name **one** gas which escapes from the chamber containing magnesium powder. Give a reason for your answer. (2mks)

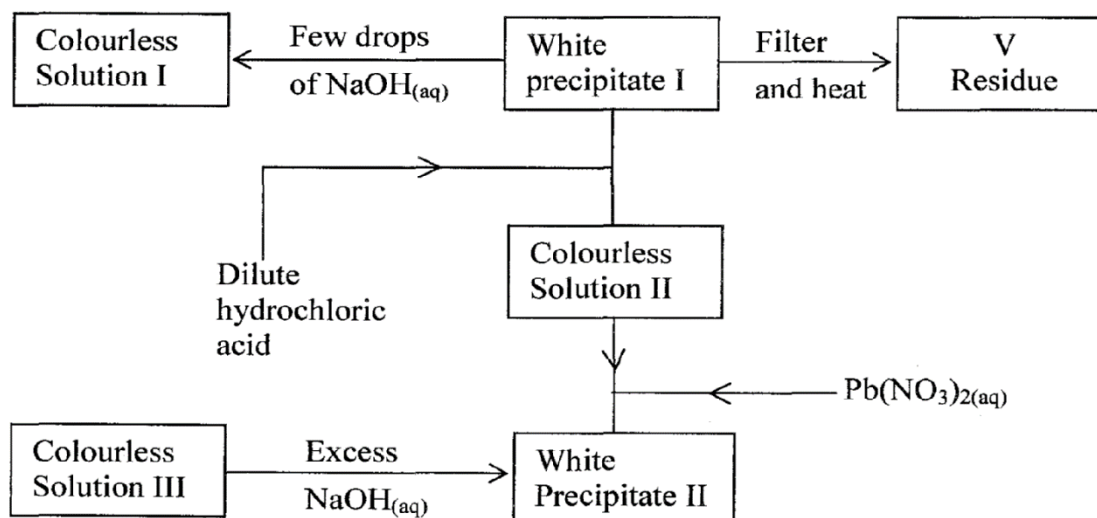
Name the substance that was eliminated by electrostatic precipitation. (1mk)

Name a reagent that can be used in place of concentrated sodium hydroxide. (1 mk)

Name substance C. (1mk)

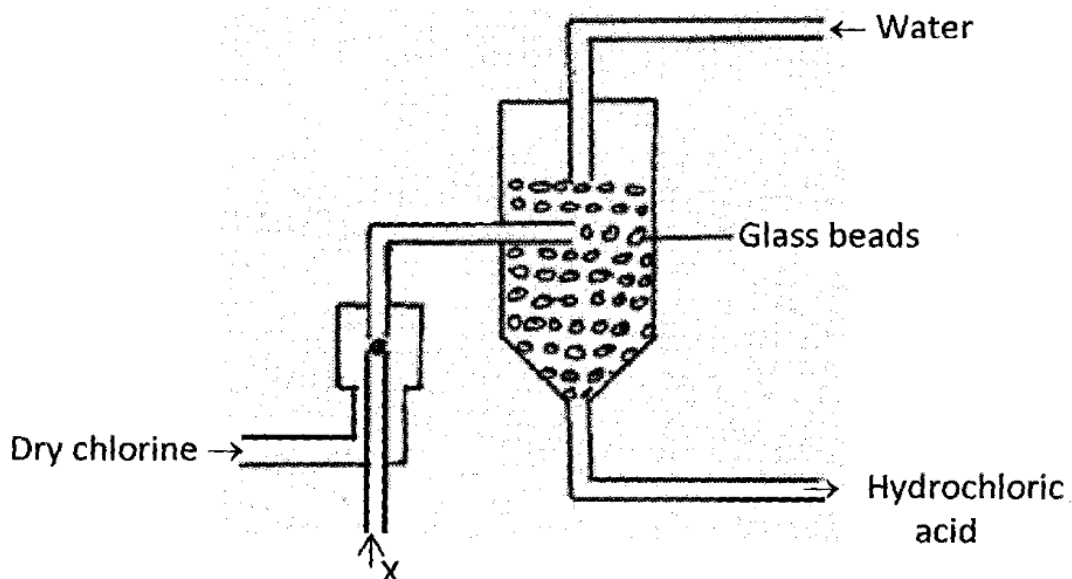
State **three** uses of gas C. (3mks)

4) (a) Study the flow chart **below** and answer the questions that follow.



- (i) Residue V was yellow when hot and white when cold.
- (i) Identify
- I White precipitate I. (1mk)
- II Solution II. (1mk)
- III Residue V. (1mk)
- (ii) Write an ionic equation for the reaction of solution II with $\text{Pb}(\text{NO}_3)_2(\text{aq})$. (1 mk)
- (iii) Write observations that would be made when ammonia solution is added drop wise till in excess to the colourless solution II (1mk)
- (iv) (b) The diagram **below** represents a set-up for large scale manufacture of hydrochloric acid.

Study it and answer the questions that follow:



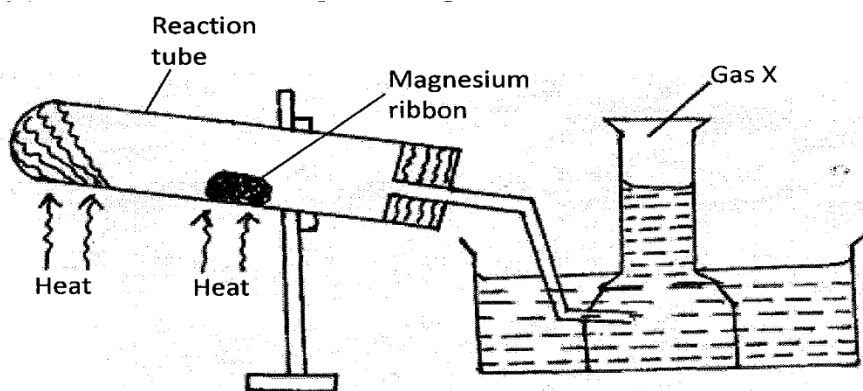
- (v) Name substance X. (1 mk)
- (vi) What is the purpose of glass beads? (1 mk)
- (vii) Give **one** source of substance X used in the above process. (1 mk)
- (viii) Give two use of hydrochloric acid. (2mks)

(c) The table below shows the ammeter readings obtained when two different electrolytes of the same concentration were tested.

Electrolyte	Ammeter reading (Amps)
Hydrochloric acid	4.0
Ethanoic acid	1.2

Why does Ethanoic acid give a lower ammeter reading? Explain your answer (2mks)

- 5) The set-up **below** was used to prepare and collect gas X. During the experiment cleaned magnesium ribbon was strongly heated before heating the wet glass wool.



- (a) Name gas X (1mk)
- (b) Why is magnesium ribbon cleaned before it is used? (1mk)
- (c) State one observation that would be noted in the reaction tube. (1mk)

Write the equation for the reaction in the reaction tube. (1mk)

State one industrial use of the solid product formed in the reaction tube. (1mk)

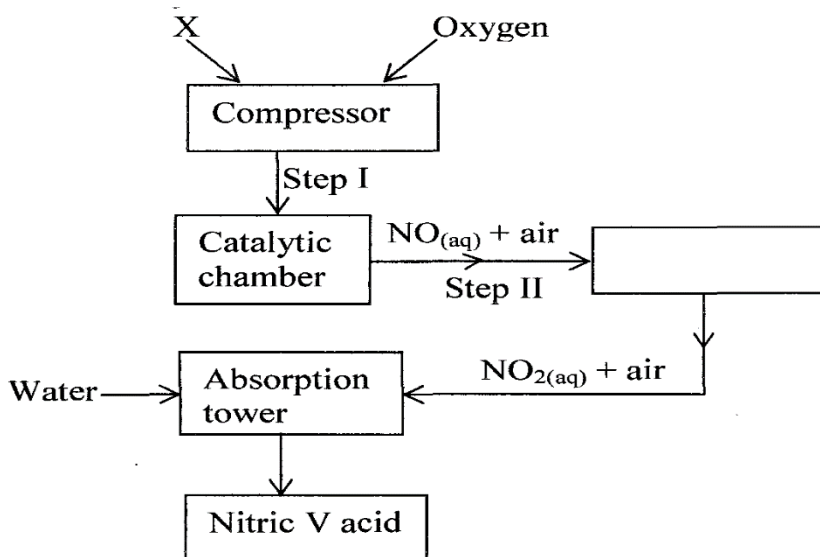
What precaution should be taken at the end of experiment? Explain. (2mks)

At the end of the experiment 96.0cm^3 of gas X were collected at 10°C and 1 atmosphere pressure. $\text{Mg} = 24$, $\text{M.G.V} = 22.4$, $T = 0^\circ\text{C}$ AT STP, $p = 1$ atmosphere at stp).

Determine the volume gas X would occupy at s.t.p? (2mks)

- (ii) Calculate the mass of magnesium ribbon used $\text{Mg} = 24$. (2 mks)

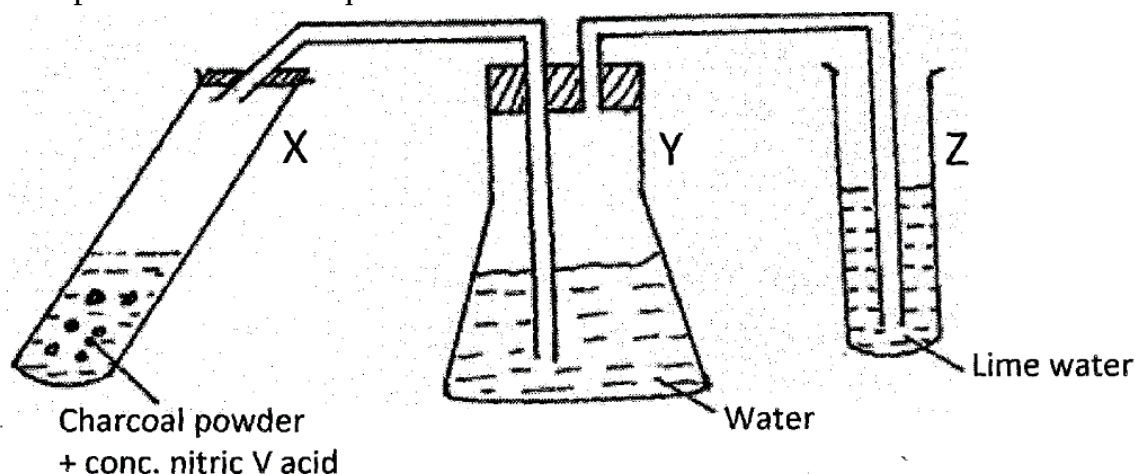
- 6) The flow chart **below** shows the large-scale manufacture of nitric (V) acid. Study it and answer the questions **below**.



- (a) Name substance X. (1mk)
- (b) Identify one source of X in this process. (1mk)
- (c) Write a balanced equation for the reaction which take place.
 - (i) At Step II. (1mk)
 - (ii) In the absorption tower. (1mk)
- (d) Name the catalyst used in this process. (1mk)

Why is it not advisable to store nitric (V) acid in a transparent bottle? (1 mk)

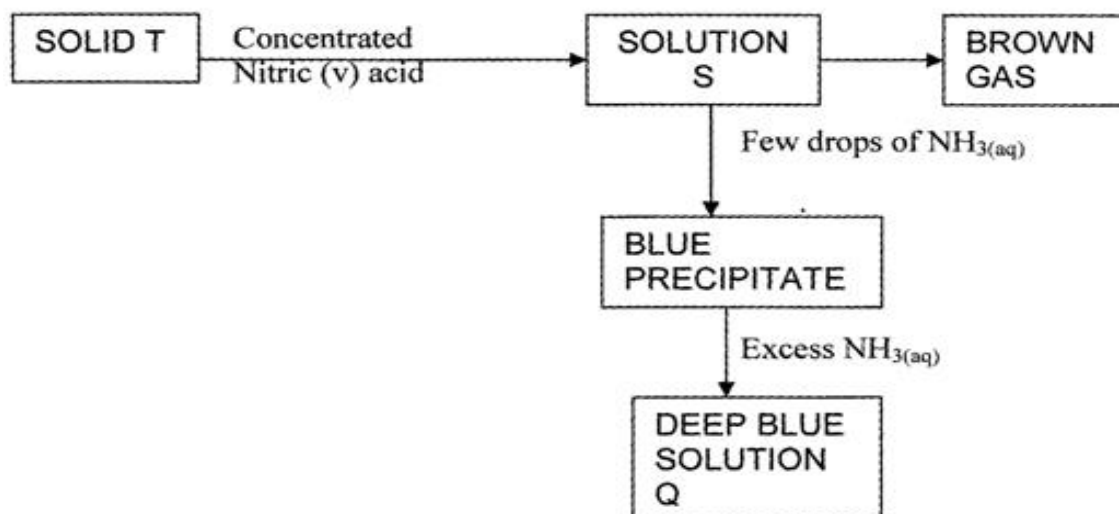
The apparatus **below** was arranged to investigate the properties of nitric (V) acid. Study the set-up and answer the questions that follow:



Explain what would be observed when blue and red litmus paper is dropped into flask Y after the experiment. (2 marks)

- (ii) Write an equation for the reaction in test tube X above. (1 mark)
- (iii) What gaseous products would be expected if concentrated sulphuric (VI) acid was used in place of conc. nitric (V) acid? (1 mark)

- 7) (a) Explain the following observation, giving an equation where necessary. When a sample of tap water is boiled for some time, a white precipitate is formed. (1mk)
- (b) A sample of hard water is *found* to contain 0.25g of calcium chloride and 0.24g of magnesium sulphate per litre.
- (i) Describe how this sample of water is softened by using anhydrous sodium carbonate (2mks)
- (ii) Calculate the mass of anhydrous sodium carbonate required to soften a litre of the water sample (Ca = 40, Mg = 24, Na = 23, O = 16, Cl = 35.5, S = 32 and C = 12) (3mks)
- (iii) Give two reasons why it is necessary / important to soften tap water supplied for domestic . (2mks)
- (c) Study the flow chart below and answer the questions that follow.



- (i) Identify solid T (1mk)
- (ii) Write an equation for the reaction between solid T and concentrated nitric (v) acid. (1mk)
- (iii) Write an equation for the reaction that produces solution Q. (1mk)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 3 PAPER 1

TIME: 2 HOURS

NAME..... INDEX NO.....

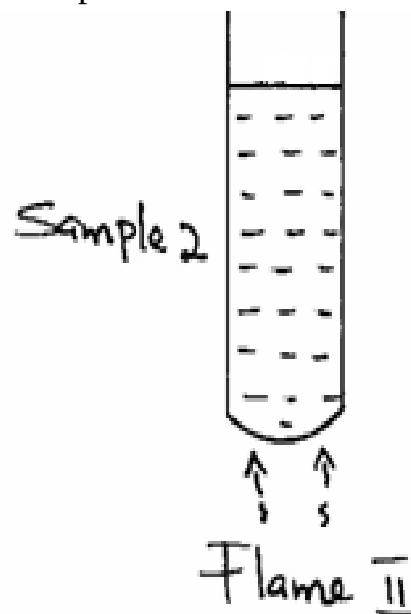
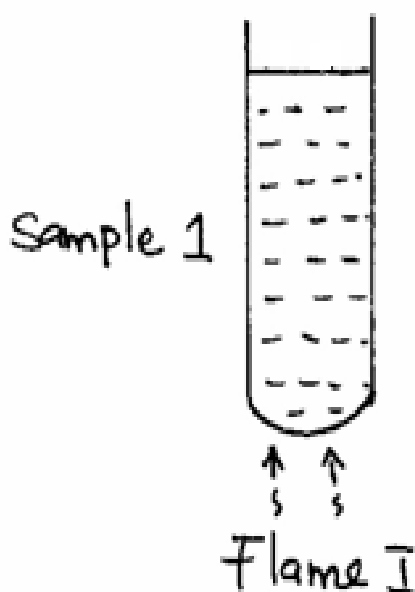
SCHOOL..... SIGN.....

DATE.....

QUESTIONS

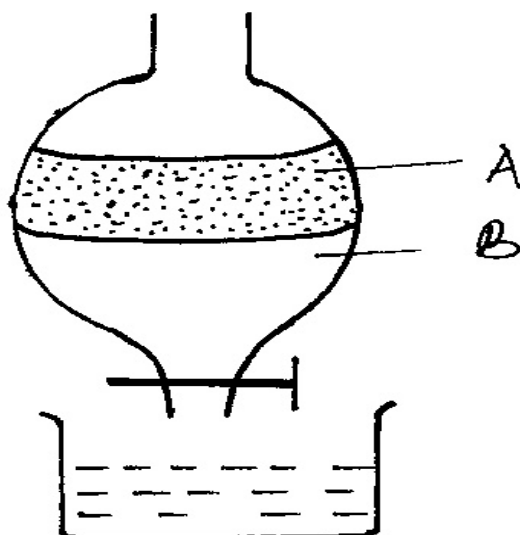
- 1) (a) A patient was given tablets with prescription 2 x 3 on the envelope. Clearly outline how the patient should take the tablets. (1 mark)

Two samples of equal volumes of water were put in 250cm³ beaker and heated for 10 minutes. Sample 1 registered a higher temperature than sample 2.



State the conditions under which flame I is produced in Bunsen burner. (1 mark)

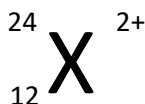
2) The apparatus below was used to separate a mixture of liquid A and B.



State two properties of the liquids that make it possible to separate them using such apparatus. **(2 marks)**

3) Describe how solid samples of salts can be obtained from a mixture of lead (II) chloride, sodium chloride and ammonium chloride. **(3 marks)**

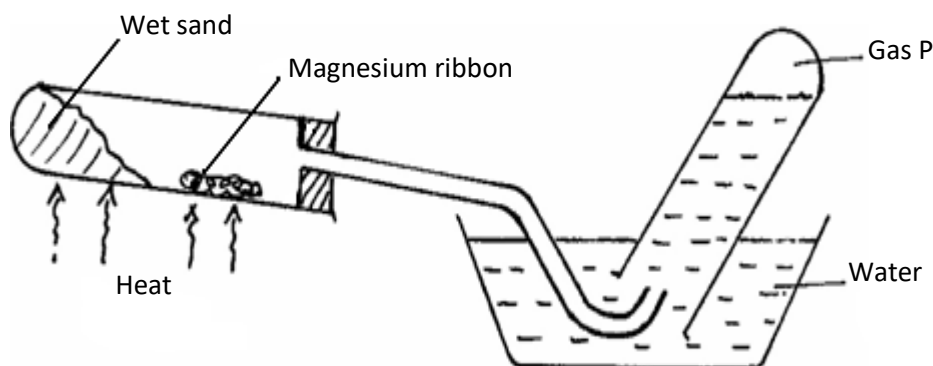
4) An ion of element χ is represented as:



(i) Write electronic configuration of ion of χ . **(1 mark)**

(ii) To which group does element χ belong? **(1 mark)**

5) The set-up below can be used to study the reaction of magnesium and steam.

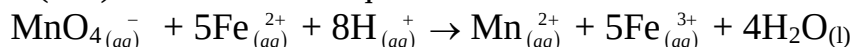


Name gas **P**. **(1 mark)**

How would you expect copper to behave compared to magnesium in the combustion tube? **(1 mark)**

Write the equation for the reaction between magnesium and steam. **(1 mark)**

- 6) An approximately χ molar solution of potassium manganate (VII) solution was standardized against precisely 0.1M iron (II) ammonium sulphate $[(\text{NH}_4)_3 \text{Fe} (\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}]$ solution. 25.0cm^3 of the solution of the iron (II) salt were oxidized by 24.15cm^3 of the manganate (VII) solution. The equation of the reaction is:

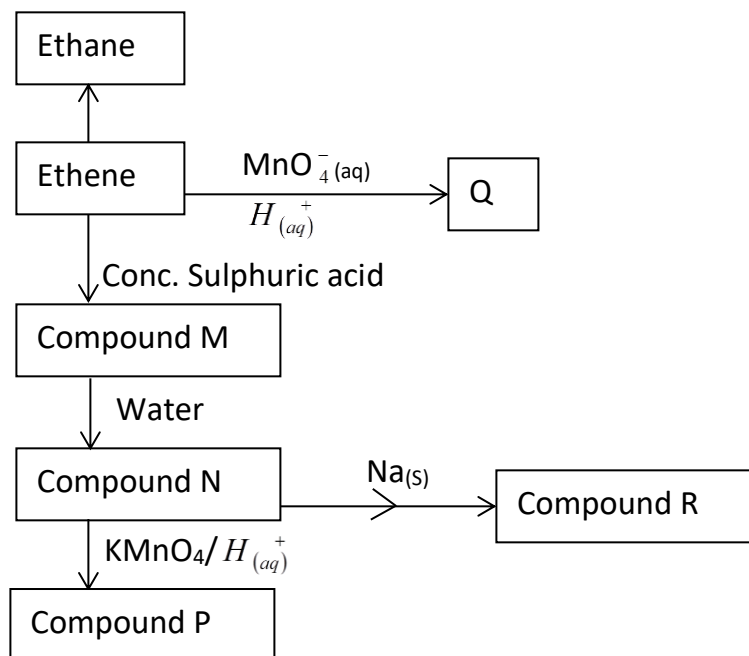


What is the molarity of the potassium manganate (III) solution? **(3 marks)**

- 7) During extraction of iron in the blast furnace, state the uses of the following in the furnace.

- Molten slag. **(1 mark)**
- Waste gases leaving the furnace. **(1 mark)**
- Limestone. **(1 mark)**

- 8) The flow chart below gives some reactions starting with ethane. Study it and answer the questions that follow.



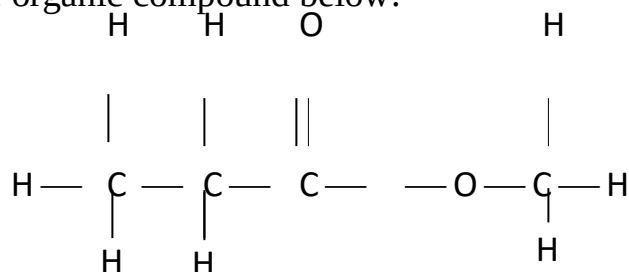
- a. Draw the structure of compounds:

P: **(1 mark)**

Q: **(1 mark)**

- (b) Write the name of Compound R. **(1 mark)**

9) Study the organic compound below:

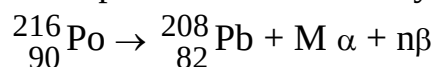


(a) In which homologous series does the compound belong to? (1 mark)

Name and draw the structures of two compounds that can be used to prepare the above compound. (3 marks)

10) (a) State **one** factor that can determine the stability of an atom. (1 mark)

(b) Radioactive polonium – 216 decay as shown below.



Find the value of M and n. (2 marks)

If after 112 days $\frac{1}{16}$ of polonium remained, calculate the half-life of polonium.

(1 mark)

11) A metal oxide has a formula M_2O_3 .

(a) Write an equation to show how M form an ion. (1 mark)

(b) Write the formula of the chloride of M. (1 mark)

12) The thermodynamic equation for the formation of ammonia in the Haber process is:



State and explain one way in which the yield of ammonia can be increased. (2 marks)

13) A certain carbonate, JCO_3 , reacts with dilute hydrochloric acid according to the equation below.



If 1g of the carbonate reacts completely with 20cm³ of 1M hydrochloric acid, calculate the relative atomic mass of J. (C = 12, O = 16). (4 marks)

14) (a) What is meant by the term solubility? (1 mark)

The mass of a solution A is 120g. This solution has 8g of salt A dissolved in it. The solubility of this salt is 25g/100g of water at 30°C. 55g of salt A are added to the solution at 30°C. How much of salt A will remain undissolved. (2 marks)

15) (a) Using electrons in the outermost energy level, draw the dot (•) and cross (X) diagrams to represent bonding in.

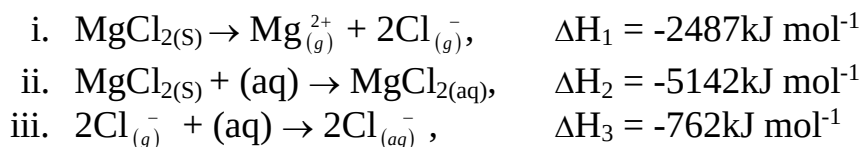
(i) C_2H_6 (C = 6, H = 1) (1 mark)

(ii) NH_4Cl (N = 7, H = 1, Cl = 17) (1 mark)

(b) The formula of a complex ion is $[\text{Cu}(\text{NH}_3)_4]^{2+}$ name the type of bond that is likely to exist between copper and ammonia in the complex. (1 mark)

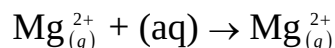
16) (a) State Hess's law. (1 mark)

(b) Study the information below and answer the questions that follow.



(a) Name the enthalpies H_1 and H_2 . (2 marks)

(b) Determine the enthalpy for the reaction: (2 marks)



17) (a) Give two reasons why carbon (IV) oxide is used as a fire extinguisher. (1 mark)

State the function of tartaric acid in baking powder. (2 marks)

18) (a) When an electric current of 0.5A was passed through a molten chloride of J for 32 minutes and 10 seconds, a mass of 0.44g of J was deposited at the cathode. (IF = 96500C).

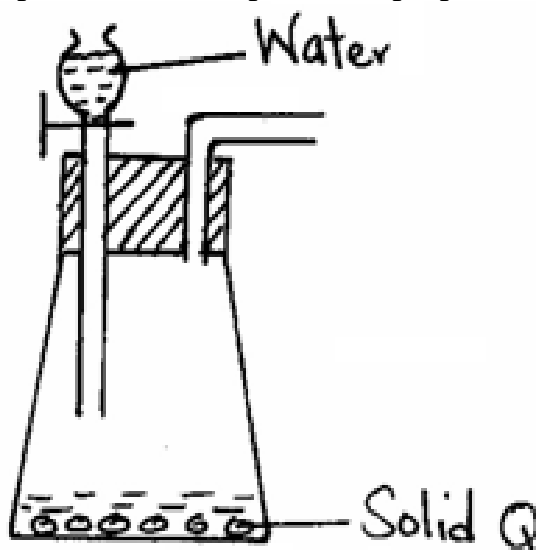
(a) Calculate the quantity of electricity used. (1 mark)

(b) Determine the value of x if the ion of metal J is represented as J^{x+} . (R.A.M of J = 44). (1 mark)

19) (a) What is meant by the term basicity of an acid. (1 mark)

(b) Describe briefly how potassium sulphate can be prepared using 50cm³ of 1M potassium hydroxide. (3 marks)

20) The diagram below represents a set-up used to prepare oxygen gas.



(a) Name substance Q. (1 mark)

(b) Complete the set-up to show how oxygen gas is collected. (1 mark)

(c) Write the equation for the reaction that occurs. (1 mark)

21) The table below shows some solutions and their PH values.

Solution	PH value
P	1.5
Q	6.0
R	14.0
S	8.0

Which of the above solution.

Is strongly basic. (1 mark)

Reacts with sodium carbonate more vigorously. (1 mark)

Is ammonia solution. (1 mark)

22) In an experiment, a jar containing sulphur (IV) oxide was inverted over another jar containing hydrogen sulphide gas.

(a) State and explain the observation that was made. (2 marks)

(b) State two conditions necessary for the reaction to take place. (2 marks)

23) Two reagents that can be used to prepare chlorine gas are potassium manganate (VII) and hydrochloric acid.

(a) Write an equation for the reaction. (1 mark)

Give the formula of another reagent that can be used instead of potassium manganate (VII). (1 mark)

Using an equation illustrate how chlorine bleach coloured substances. (1 mark)

24) (a) Distinguish between ionization energy and electron affinity. (2 marks)

(b) Explain why fluorine is more reactive than iodine. (2 marks)

25) 280cm³ of nitrogen gas diffuse through a porous plug in 70 seconds. How long will it take 400cm³ of carbon (IV) oxide gas to diffuse through the same porous plug.

(C = 12, O = 16, N = 7). (3 marks)

26) An iron spoon was to be electroplated with silver. Sketch the set-up that could be used. (2 marks)

27) Write the equation for decomposition of:

(a) Sodium nitrate. (1 mark)

(b) Copper (II) nitrate. (1 mark)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 3 PAPER 2

TIME: 2 HOURS

NAME..... INDEX NO.....

SCHOOL..... SIGN.....

DATE.....

QUESTIONS

1. Study the table below and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	A	B	C	D	E	F	G	H
Atomic no.	11	12	13	14	15	16	17	16
Boiling point (°C)	890	1110	2470	2360	280	445	-34.7	-186
Formulae of oxide		BO			E ₂ O ₃	FO ₂		xxxx
Boiling point of oxide (°C)	1193	3075	2045	1728	563	-72	-91	xxxx

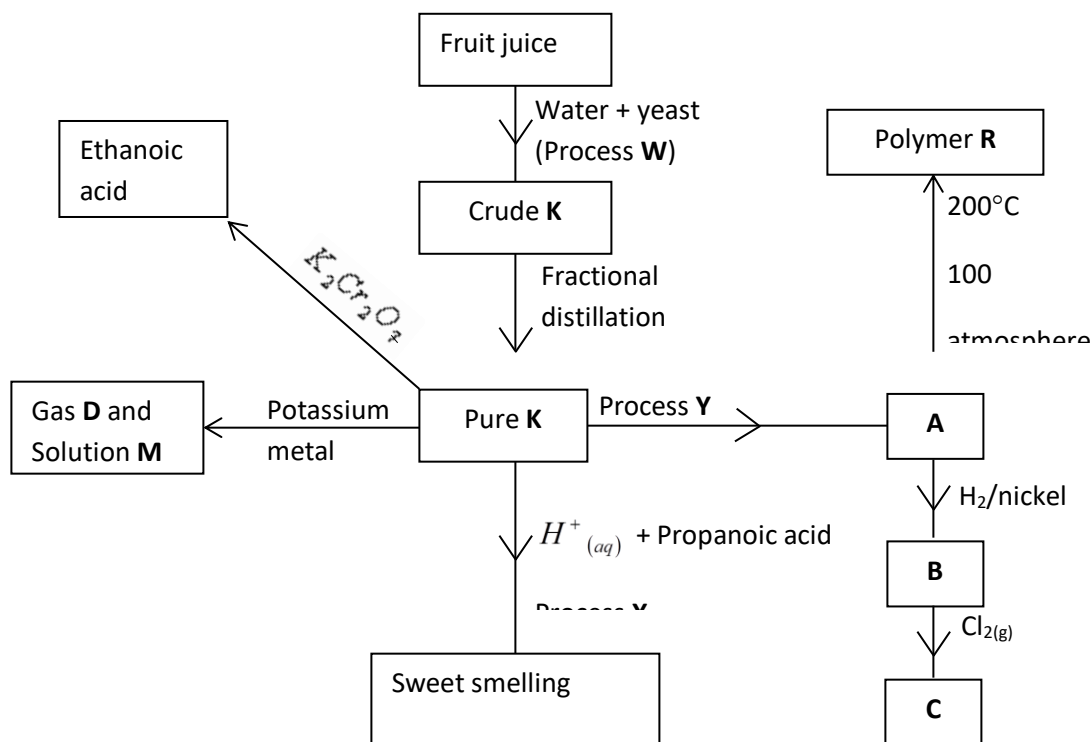
(a)(i) Write the electronic arrangement for ion of element C and F. (1 mark)

To which period and group do element B belongs. (1 mark)

Period

Group

- (b) Explain the difference in boiling points of element **B** and **F**. (2 marks)
 Write the formula of the compound formed between elements **B** and **G**. (1 mk)
 (d) The chloride of **A** has a higher boiling point than that of **C**. Explain. (2 mks)
 (e) Complete the table to show the formulae of the oxides. (2 marks)
 (f) Select an oxide that reacts with hydrochloric acid and potassium hydroxide. Explain. (1 mark)
 (g) Determine the oxidation state of **F** in its oxide. (1 mark)
2. Study the reaction scheme below and answer the question that follows.



- (a) (i) Give the names of the following substances. (2½ marks)

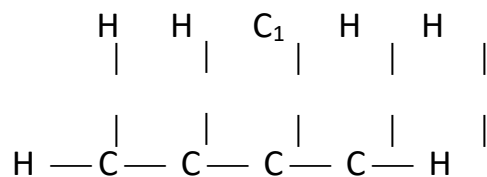
A
B
C
D
K

- (ii) Give the structural formula of substance **M**. (1 mark)

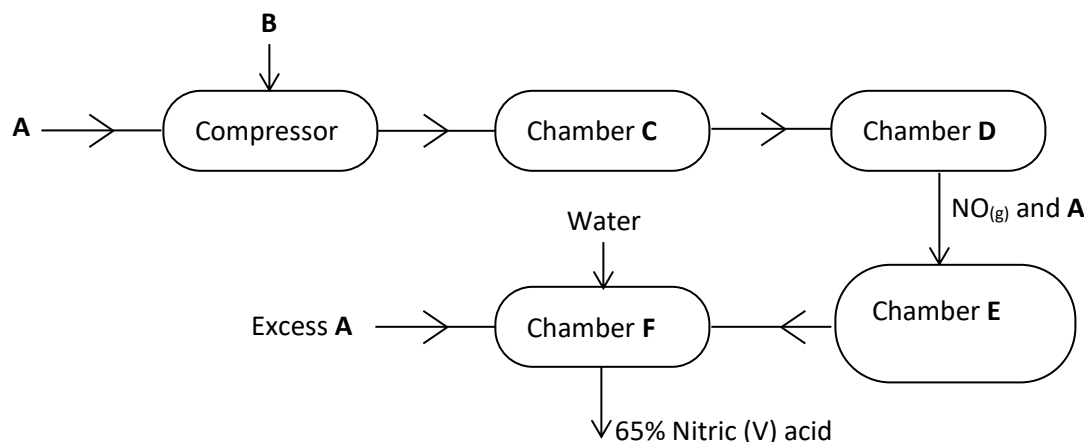
Name the processes marked as: (3 marks)

W
X
Y

- (b) The compound below was formed when one mole of a hydrocarbon reacted with one mole of chlorine gas.



- (i) Give the structure of the hydrocarbon. **(1 mark)**
- (ii) Draw and name two isomers of the hydrocarbon. **(2 marks)**
- (c) State **two** uses of ethane. **(1 mark)**
- (d) Draw and name substance **Z**. **(1 mark)**
3. The flow chart below illustrates the major steps in the manufacture of nitric (V) acid. Study it and answer the questions that follow.



- (a) Give reason for purifying the raw materials **A** and **B**. **(1 mark)**
- (b) Name the substances: **(1 mark)**
A
B
- (c) Name the parts labeled **D**, **E** and **F**. **(3 marks)**
- (d) Write chemical equations for the reactions taking place in:
 (i) Chamber **D**. **(1 mark)**
 (ii) Chamber **F**. **(1 mark)**
- (e) Name any other condition required in chamber **D** apart from maintaining temperature at 900°C. **(1 mark)**

- (f) A mixture that comes out is 65% nitric (V) acid and 35% water. How could the concentration of nitric (V) acid be increased? **(1 mark)**
- (g) Give **one** use of nitric (V) acid. **(1 mark)**
- (h) When copper metal is reacted with dilute nitric (V) acid, a brown gas is evolved. Explain. **(1 mark)**

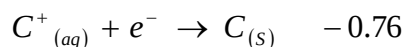
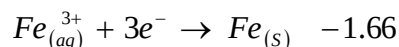
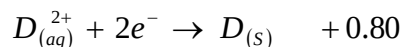
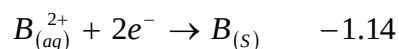
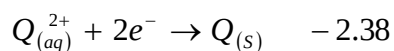
4.150g of powdered brass (an alloy of zinc and copper) were added to excess 0.5M hydrochloric acid in a conical flask placed on top of a pan balance. The changes in mass of the flask and its contents with time were recorded in the following table. This experiment was carried out at room temperature.

Time (in seconds)	0	10	20	30	40	50	60
Mass in grams of flask and its contents	255.0	253.0	251.9	251.2	251.1	251.0	251.0

- (a) Write an equation for the reaction that took place. **(1 mark)**
- (b) State and explain the relationship between the mass of the flask and its contents with time. **(2 marks)**
- (c) What observations was made in the flask at the end of the reaction? **(1 mark)**
- (d) (i) Plot a graph of mass of the flask and its contents against time. **(3 marks)**
 (ii) Using the graph determine rate of the reaction at the 20th second. **(2 ks)**
 (iii) How would the rate in 4d(ii) above be affected if the reaction was carried out using 0.5M hydrochloric acid at 45°C? Explain. **(2 marks)**

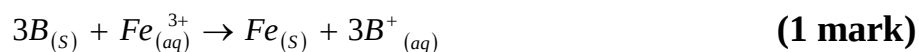
5.(a) Use the reduction potentials below to answer the questions that follow.

E⁰ (Volts)

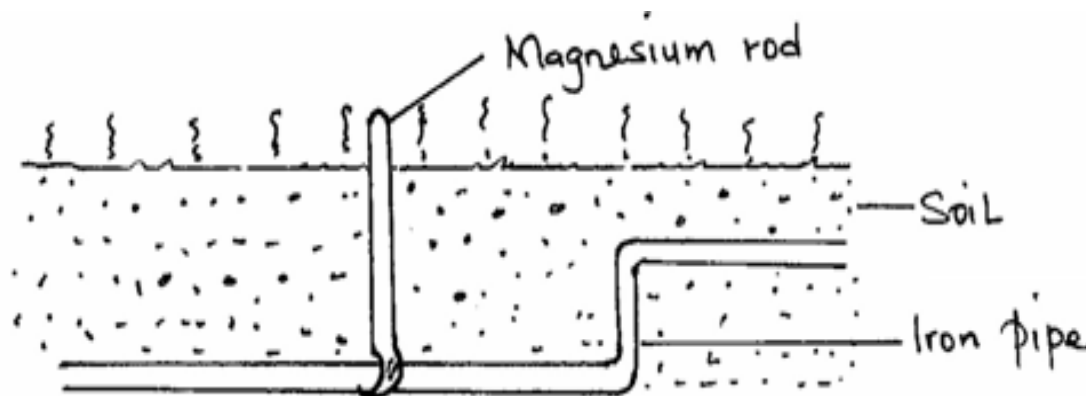


- (i) Select the strongest reducing agent. Explain. **(1 mark)**
- (ii) Calculate the e.m.f value of electrochemical cell obtained when elements **B** and **D** are paired together. **(1 mark)**

- (iii) Write an ionic equation for the reaction that occurs when metal Q is immersed into a solution containing $C^+_{(aq)}$ ions. (1 mark)
- (iv) State and explain whether the reaction given below occurs or not.

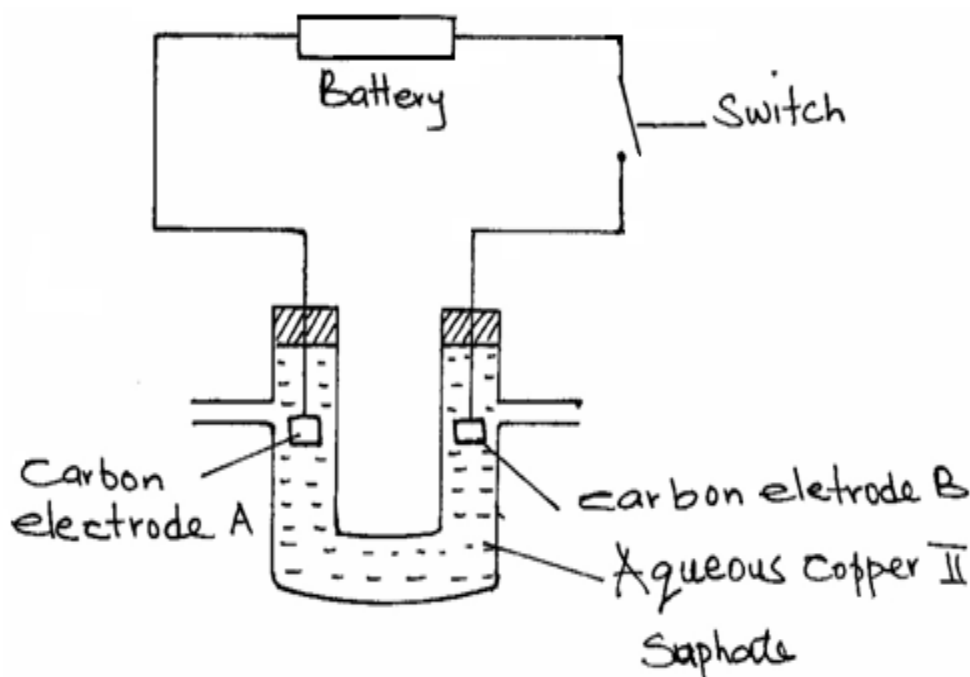


- (b) Magnesium metal was connected to an underground pipe made of iron as shown below:



Explain why it is necessary to carry out the process shown above. (2 marks)

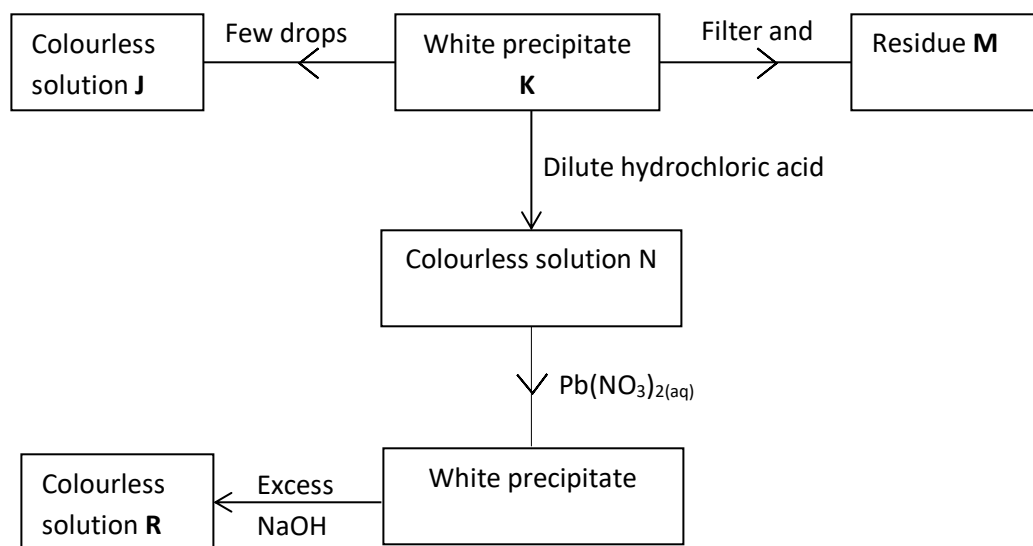
- (c) Aqueous copper (II) sulphate was electrolysed using the set up shown below.



- (i) When the switch was closed, a gas was produced at electrode B.
Which electrode is the anode?

- (ii) Write the half equation for the reaction at electrode B. (1 mark)

- (iii) State and explain the observation that will be made at electrode **A**. (1 mark)
- (iv) What happens to the PH of the electrolyte above during electrolysis? Explain. (1 mark)
- (d) If carbon electrodes were replaced with copper electrodes in the reaction in (a) above, write the equations of the reactions that would occur at the:
- (i) Anode. (1 mark)
- (ii) Cathode. (1 mark)
- (v) Name **one** industrial application of the above electrolysis. (1 mark)
6. Study the flow chart below and answer the questions that follow.

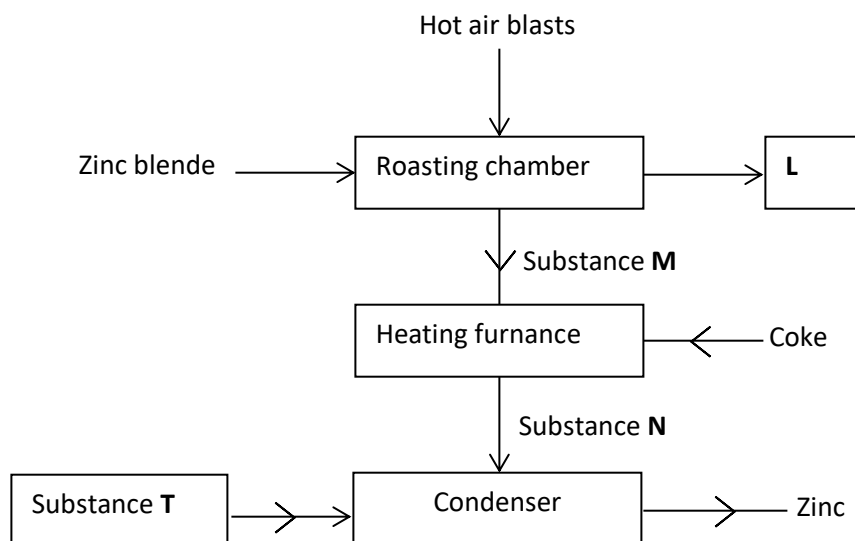


Residue **M** was yellow when hot and white when cold.

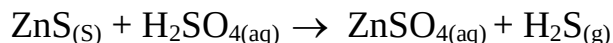
- (a) (i) Identify.
- I White precipitate **K** _____ (1 mark)
- II Solution **N** _____ (1 mark)
- III Residue **M** _____ (1 mark)
- (ii) Write an ionic equation for the reaction of solution **N** with $\text{Pb}(\text{NO}_3)_2(\text{aq})$. (1 mark)
- (iii) Write observations that would be made when ammonia solution is added dropwise till in excess to the colourless solution **N**. (1 mark)
- (b) Ammonia gas bubbled into water forms a solution which conducts electricity whereas the solution formed when it is bubbled through methylbenzene does not. Explain. (2 marks)

- (c) Boilers used for boiling hard water are normally covered with boilers scale after sometime.
- (i) What is the chemical name for boilers scales? (1 mark)
- (ii) How is the boiler scale removed? (1 mark)
- (d) Write the formula of the anion in solution J. (1 mark)

7. The flow chart below illustrates extraction of zinc from zinc blende. Study it and answer the questions that follow.



- (a) Give an equation for the reaction in the roasting furnace. (1 mark)
- (b) Name each of the substances marked L, T, N and M. (2 marks)
- (c) Why is it necessary to condense substance N? (1 mark)
- (d) Which other factory can be set up near the zinc extraction plant? Explain. (2 rks)
- (e) Give **one** use of zinc metal. (1 mark)
- (f) (i) Zinc sulphide and sulphuric acid react according to the following equation:



2.91g of zinc sulphide reacted with 100cm³ of 0.2M sulphuric acid.

Determine the reagent that was in excess. (Zn = 65.0, S = 32.0). (2 marks)

- (ii) Calculate the volume of hydrogen sulphide H₂S gas produced in the reaction above at r.t.p. (Molar gas volume 24dm³). (2 marks)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 4 PAPER 1

TIME: 2 HOURS

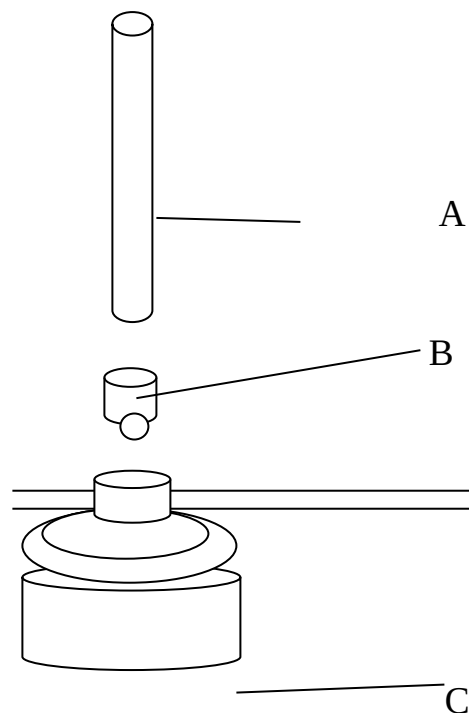
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DATE.....

QUESTIONS

1. The diagram below shows parts of a Bunsen burner.



- a) Name the parts labelled

(½ mark)

A

B

- b) Give one use of the part labelled B (1 mark)
2. Hydrated copper (II) sulphate exists as blue crystals while anhydrous copper (II) sulphate is a white powder. Describe a laboratory experiment that can be used to show that the action of heat on hydrated copper (II) sulphate is a reversible reaction (2 marks)
3. A piece of burning magnesium ribbon was placed in a gas jar full of Nitrogen gas. The product Q formed was then reacted with water.
- a) Write the chemical formula for the product Q (1 mark)
- b) Write the equation for the reaction between product Q and water (1 mark)
- c) Using dot (•) and cross (x) diagrams to represent electrons, draw the structure to show bonding in nitrogen molecule (1 mark)
1. (i) What are isotopes (1 mark)
- (ii) Element Y (not the actual symbol of the element) has two isotopes with mass number 6 and 7. If the relative atomic mass of Y is 6.94, determine the percentage abundance of each isotope (2 marks)
2. Given zinc oxide, dilute nitric (V) acid and sodium carbonate solution. Briefly describe how you can prepare zinc carbonate (3 marks)
3. The elements shown in the table below (not actual symbols) belong to a certain family of metals in the periodic table. Study the information and answer the questions that follow.

Element	Atomic size (nm)
S	0.160
T	0.180
V	0.930

- (i) Define the term ionization energy (1 mark)

(ii) Which element is likely to have the highest ionization energy. Explain

(2 marks)

4. A certain mass of copper (II) carbonate was strongly heated.

a) Write a balanced chemical equation for the reaction

(1 mark)

b) Given that 300cm³ of carbon(IV) oxide gas was collected at s.t.p. and this represents 83% yield, determine the mass of copper (II) carbonate heated. (molar gas volume = 22.4dm³, Cu=64, O=16, C=12)

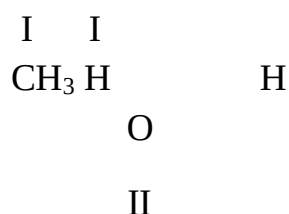
(3 marks)

5. (i) Give the IUPAC names for the following organic compounds



a) $\text{H} - \text{C} - \text{C} - \text{C} = \text{C} - \text{C} - \text{H}$

(1 mark)



b) $\text{CH}_3 \text{ CH}_2 \text{ CH}_2 \text{ C} - \text{OH}$

(1

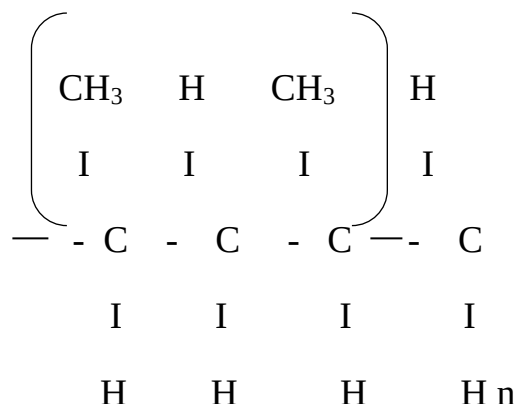
mark)



c) $\text{CH}_3 \text{ CH}_2 \text{ C} - \text{O} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$

(1 mark)

(ii) A polymer has the following structure



A sample of this polymer is found to have a molecular mass of 2184. Determine the number of monomers of the polymer. (C = 12, H = 1)

(3 marks)

6. During an experiment, chlorine was bubbled into a solution of sodium bromide in a beaker

a) State and explain one observation made (2 marks)

b) Write an ionic equation for the reaction that took place in the beaker (1 mark)

7. Hardness of water may be removed by either boiling or addition of chemicals.

a) Write down an equation to show how boiling removes hardness of water

(1 mark)

b) Name two chemicals that are used to remove hardness of water (2 marks)

8. i) Define solubility (1 mark)

ii) 115g of a saturated solution at 65°C is found to contain 65g of potassium nitrate.

Calculate the solubility of potassium nitrate at 65°C.

(2 marks)

9. The equation for the reversible reaction of Bismuth (III) chloride in water is



a) State Le chatelier's principle (1 mark)

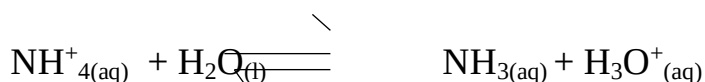
b) What would be the effect of adding NaOH pellets to the equilibrium mixture.

Explain.

(2 marks)

10. In the equation, below identify the reagent that acts as an acid in the forward reaction.

Give a reason.



(2 marks)

11. In preparation of oxygen gas, a student used hydrogen peroxide and added a black solid and collected the gas over water.

a) What is the name of the black solid and what is its function (1 mark)

b) During collection of the gas, why should the first bubbles be allowed to escape

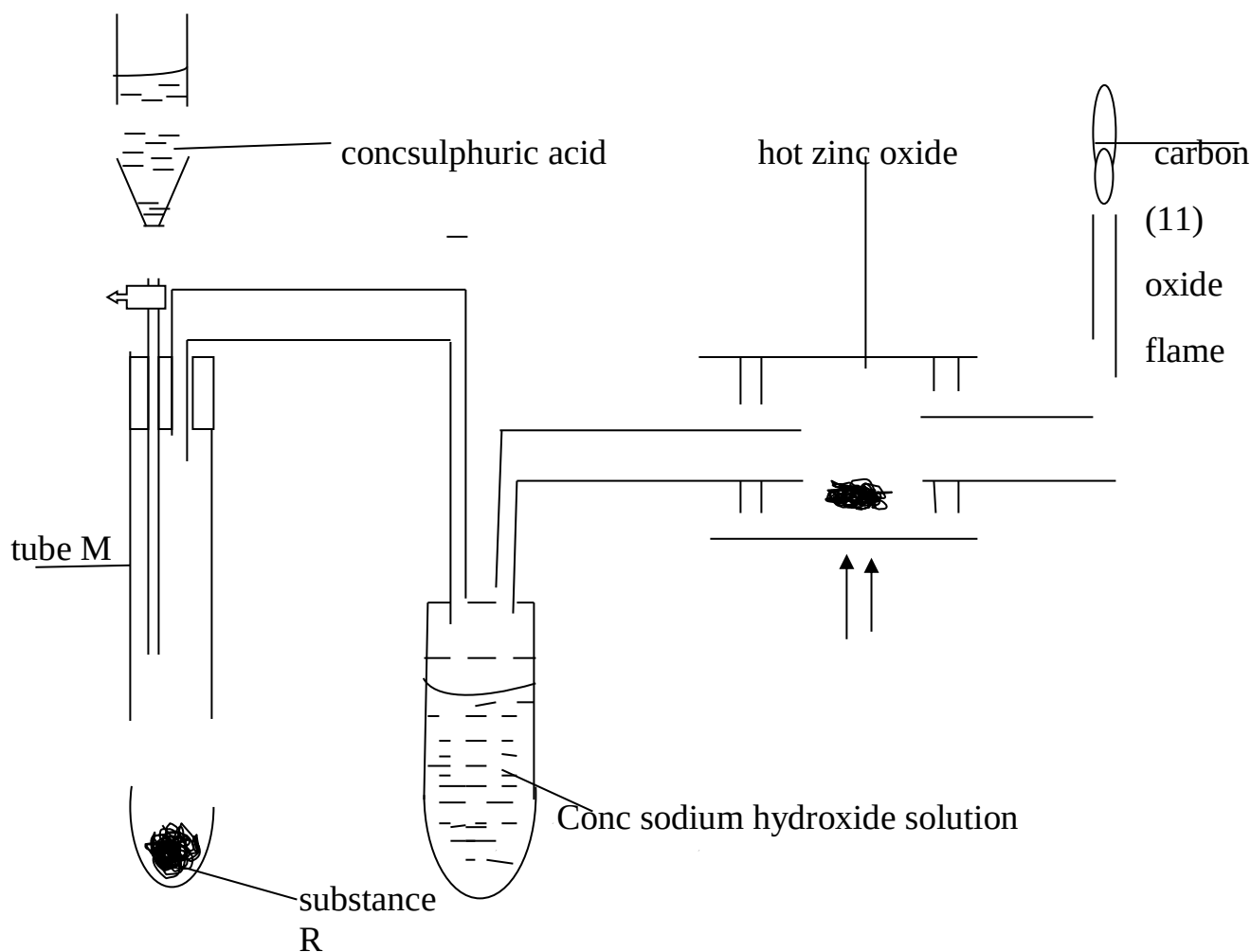
(1 mark)

c) Give one main advantage of collecting a gas over water. (1 mark)

12. Explain the following observation, a one molar solution of nitric (III) acid (1M HNO₂) has a pH of 2 whereas a one molar solution of chloric(I) acid (1M HOCl) pH of 4.

(2 marks)

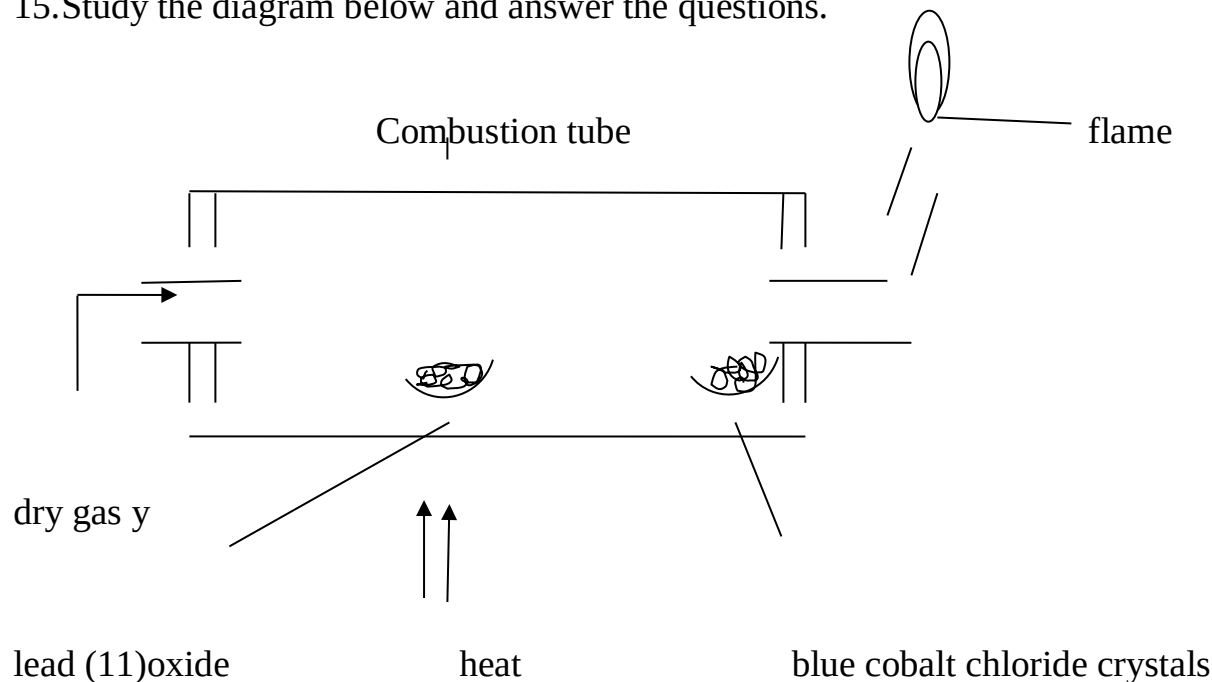
13.a) Study the set-up below and use it to answer the questions that follow.



- Identify substance R (1 mark)
- State the function of concentrated sodium hydroxide solution (1 mark)
- State the property of carbon (II) oxide gas demonstrated in the above set-up (1 mark)
- Write a balanced chemical equation for the reaction occurring in tube M. (1 mark)

14. 200cm^3 of oxygen diffused through a porous plug in 60 seconds. How long will it take 300cm^3 of sulphur (IV) oxide to diffuse through the same plug? (S = 32, O = 16) (3 marks)

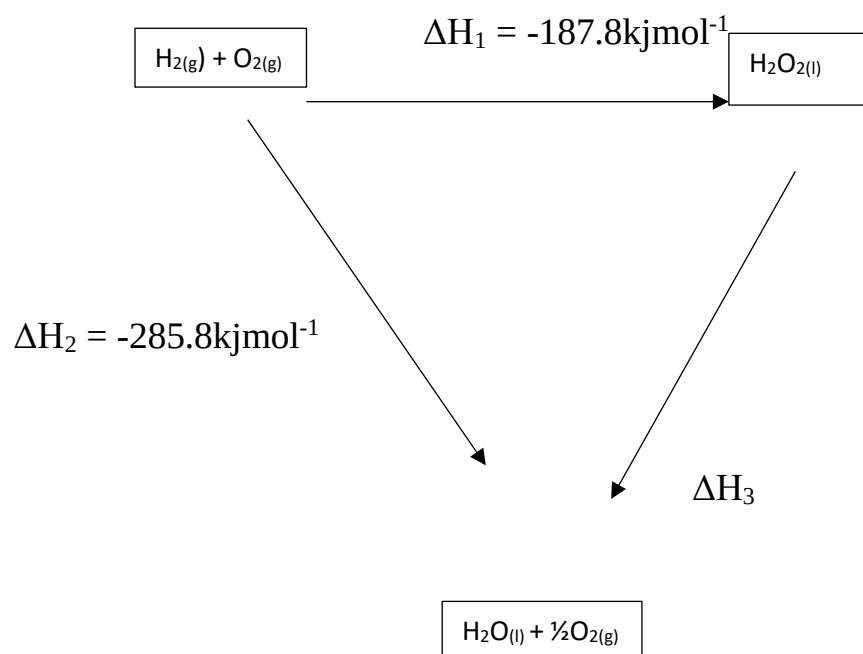
15. Study the diagram below and answer the questions.



- (i) Identify gas Y (1 mark)
- (ii) State and explain two observations made in the combustion tube. (2 mark)
- (iii) Write a chemical equation for the reaction between lead (II) oxide and gas Y (1 mark)

16.i) State Hess's law. (1 mark)

(ii) The figure below shows an energy cycle diagram.



a) Give the name of the enthalpy change ΔH_1

(1 mark)

b) Determine the value of ΔH_3

(1 mark)

17. The table below shows the pH values of some solutions.

Solutions	A	B	C	D
pH values	13.0	7.0	2.0	6.5

a) Which solution reacts vigorously with magnesium metal? Explain.

(1 mark)

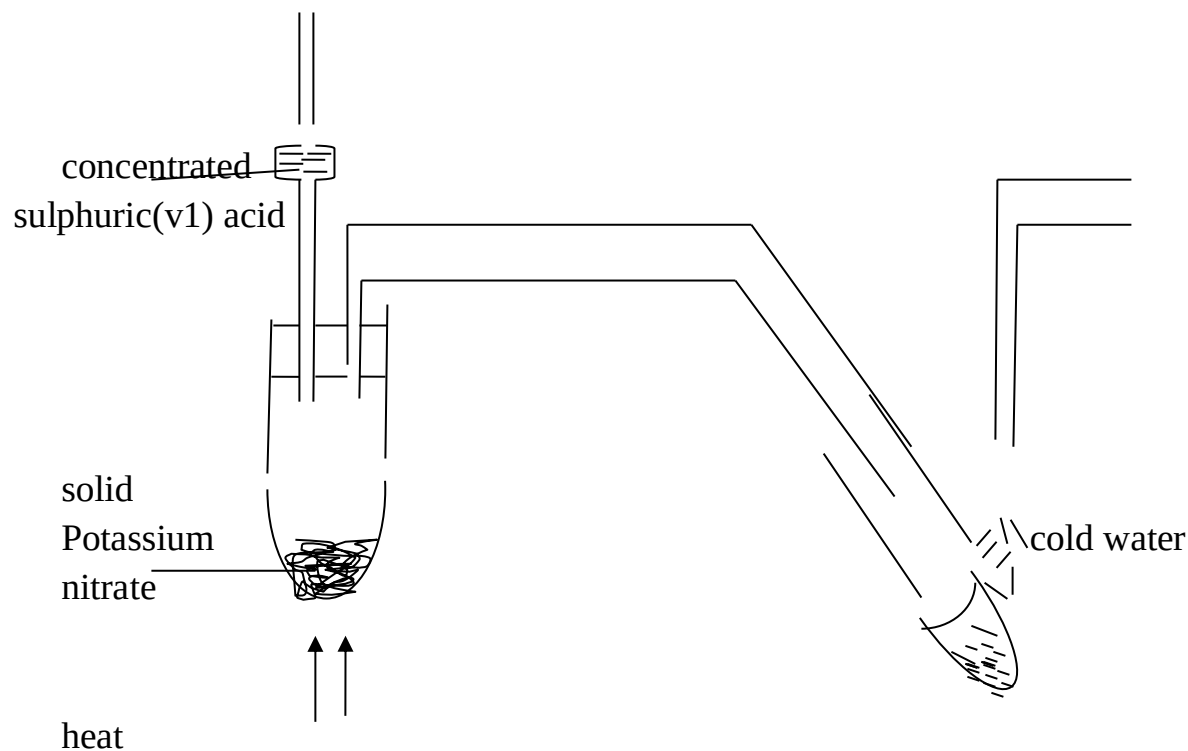
b) Which solution is likely to be that of lemon juice?

(1 mark)

c) Which solution is likely to produce green colour with the universal indicator.

(1 mark)

18. The diagram below shows a set-up that was used to prepare and collect a sample of nitric (V) acid in the laboratory.



a) Give a reason why it is possible to separate nitric acid from the sulphuric (VI) acid in the set-up

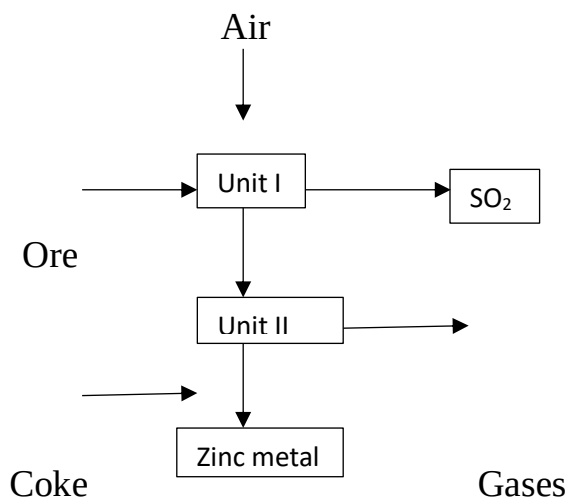
(1 mark)

b) Name another substance that can be used instead of potassium nitrate (1 mark)

c) Give one use of nitric (V) acid

(1 mark)

19. The flow chart below shows some processes involved in the industrial extraction of zinc metal.



a) Name one ore from which Zinc is extracted

(1 mark)

b) Write the equation of the reaction taking place in unit II

(1 mark)

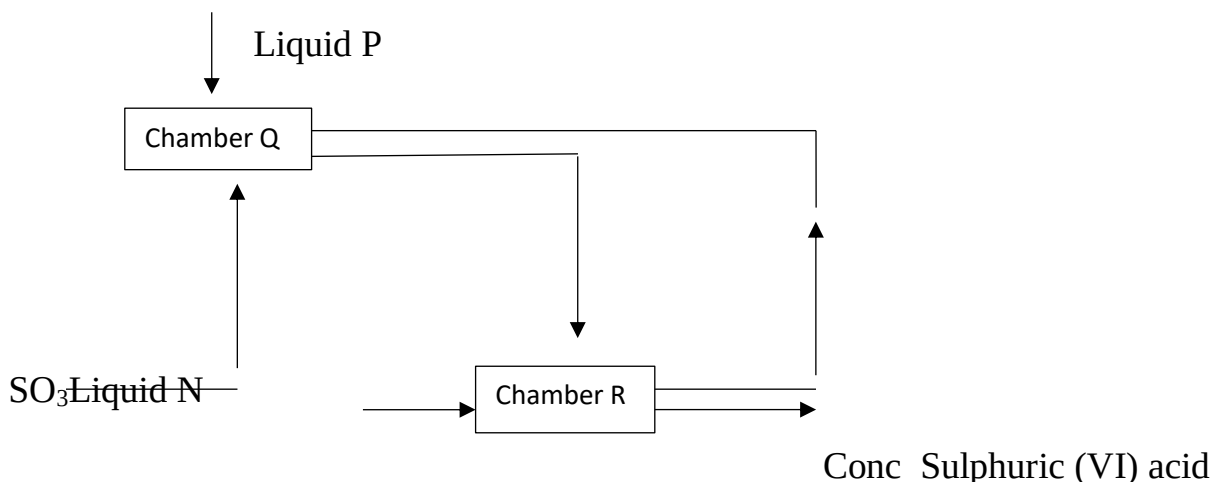
c) Name two uses of Zinc metal

(1 mark)

20. Thorium ${}^{232}_{90}\text{Th}$ undergoes two consecutive alpha decays followed by two consecutive beta decays to form the nuclide ${}^x_y\text{R}$. Identify the values of x and y .

(2 marks)

21. Below is part of the flow diagram of the contact process



a) Identify

(i) Liquid P
mark)

(1

(ii) Liquid N (1 mark)

b) Write the equation for the reaction taking place in chamber R
(1 mark)

22.a) Define the term oxidation state (1 mark)

b) Calculate the oxidation states of manganese and chromium in:

(i) MnO_2 (1 mark)

(ii) CrO_4^{2-} (1 mark)

23. When hydrogen sulphide gas is bubbled through a solution of iron (III) chlorides, a green solution and a yellow solid are formed. Explain the observations
(2 marks)

24. During purification of copper by Electrolysis, 1.48g of copper were deposited when a current was passed through copper (II) sulphate solution for $2\frac{1}{2}$ hours. Calculate the amount of current that was passed
(3 marks)

(Cu = 63.5, IF = 96500C)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 4 PAPER 2

TIME: 2 HOURS

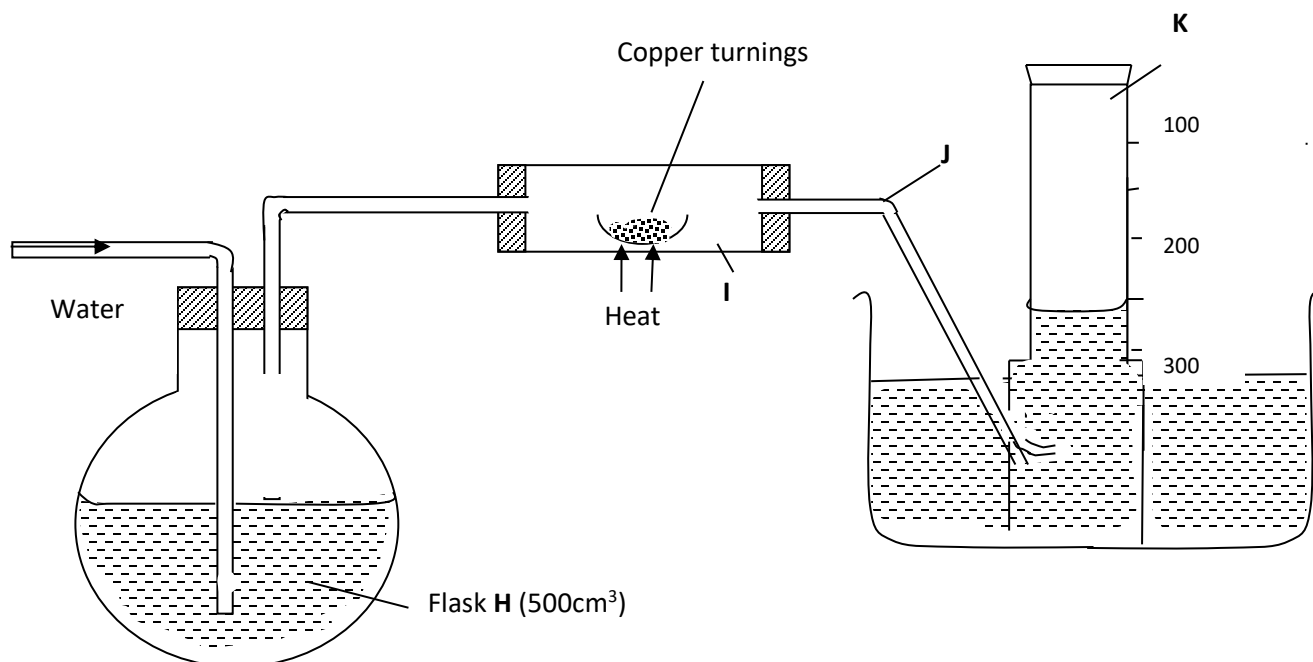
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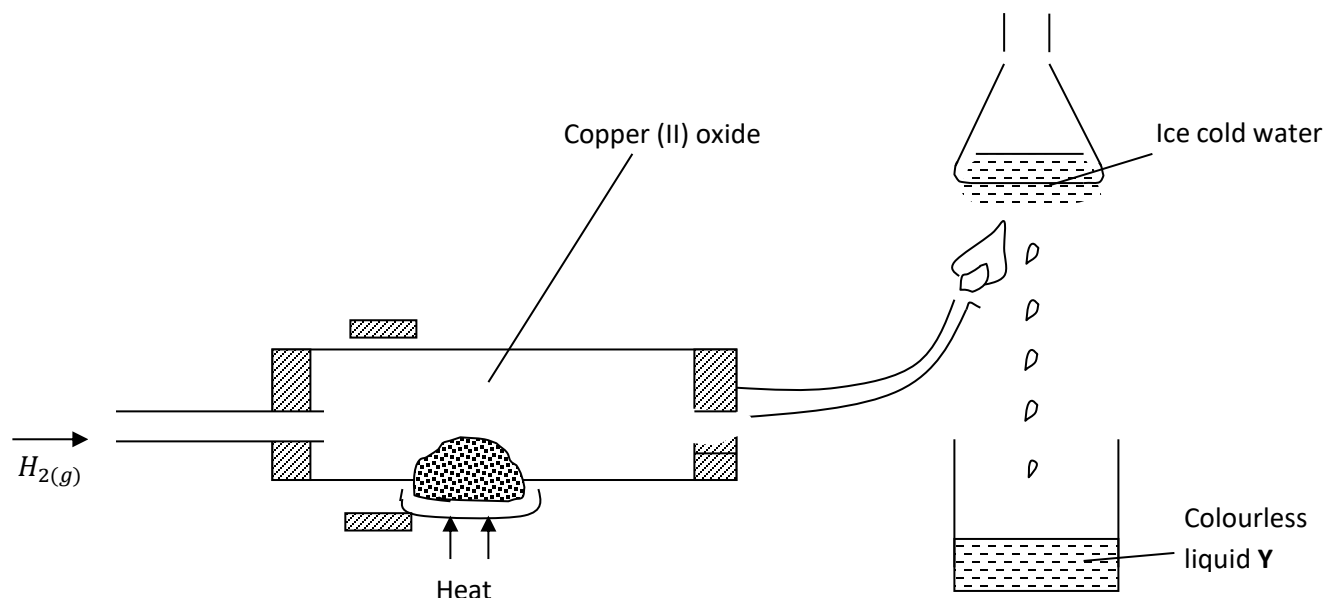
QUESTIONS

- 1.A. In an experiment to determine the percentage of oxygen in air, the apparatus below were set up. Study the set up and the information provided to answer the questions that follow.



A 500cm³ measuring cylinder **K** was filled with water and assembled for gas collection.

- Copper turnings were heated red hot and water was slowly passed into 500cm³ flask **H** until it reached the 500cm³ mark. A colourless gas was collected in **K**.
- What was the purpose of passing water into flask **H**? (1 mark)
 - What observations were made in the tube **I**? (1 mark)
 - Name one of the gases that is likely to be found in **J**. (1 mark)
 - What was the volume of the gas collected in the measuring cylinder at the end of the experiment? (1 mark)
 - Calculate the percentage of oxygen in air using the above results. (2 marks)
- B.** Study the diagram below and answer the questions that follow.



- Give **one** observation made in the combustion tube after some time. (1 mark)
 - Write an equation for the formation of the colourless liquid **Y**. (1 mark)
 - What was the aim of the above experiment as demonstrated in the combustion tube? Explain. (2 marks)
2. Use the information below to answer the questions that follow. The letters are not the actual symbols of the elements.

Element	Atomic No.	M.P ⁰ C	B.P ⁰ C	Ionic radius (nm)
P	11	98	890	0.095
Q	12	650	1110	0.065
R	13	660	2470	0.050
S	14	1410	2360	0.041
T	15	44.2 & 590	280	0.034
U	16	113 & 119	445	0.184
V	17	-101	-35	0.181
W	18	-189	-186	-

- (a) (i) Write the electronic configuration of the atoms represented by letters **T** and **W**. (1 mark)
- (ii) State the nature of the oxides of the elements represented by **Q** and **U**. (2 marks)
- (b) Why does the elements represented by the letters **T** and **U** have two values of melting points? (1 mark)
- (c) Explain the following observations in terms of structure and bonding.
- (i) There is an increase in boiling point from **P** to **R**. (2 marks)
- (ii) Element **S** has a high boiling point. (2 marks)
- (iii) There is a decrease in boiling points from **U** to **W**. (2 marks)
- (d) (i) Compare the atomic radius of **U** and **V**. (1 mark)
- (ii) What was the solubility of each salt at 65°C? (1 mark)
- (iii) 100g of a saturated solution of potassium nitrate at 70°C was cooled to 20°C. What mass of the crystals will be crystallized? (2 marks)
- (ii) Why is there no ionic radius for **W** reported in the table? (1 mark)
3. (a) The solubilities of potassium nitrate and potassium bromide at different temperatures was determined. The following data was obtained.

Temperature °C		0	10	20	30	40	50	60	70	80
Solubility g/100g H ₂ O	KNO ₃	5	15	26	43	61	83	105	135	165
	KBr	50	55	60	65	70	77	85	90	95

- (i) Draw solubility curves for both salts on the same axis. (3 marks)



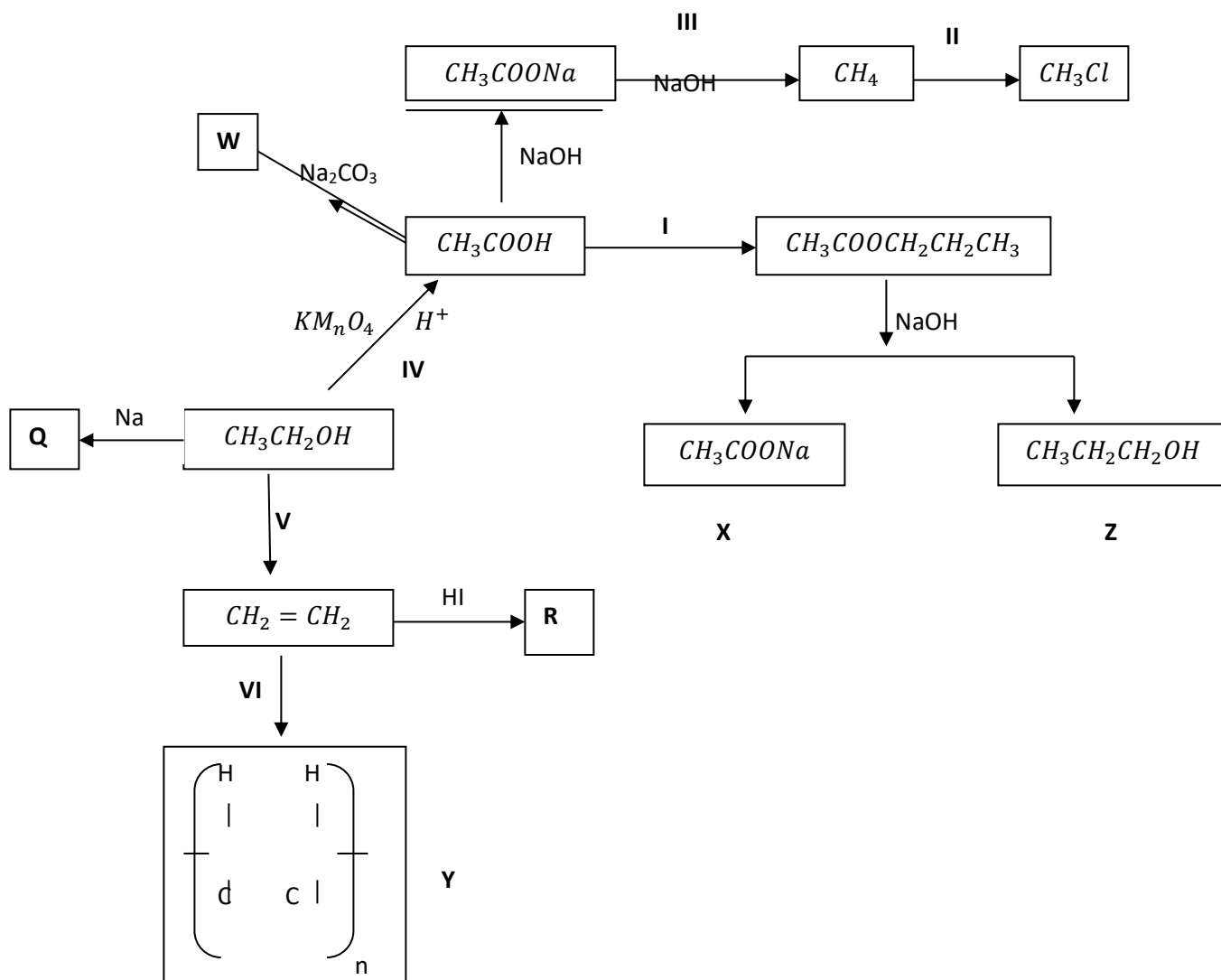
- (i) Write an equation for the formation of solid **A** and gas **B**. (1 mark)
- (ii) Name;

Solution C - (1 mark)

Solid D - (1 mark)

(c) Write the formula of the complex ion in solution E. (1 mark)

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



(a) Name substance. (3 marks)

X -

Q -

R -

(b) Write down an equation for the reaction represented by step III. (1 mark)

(c) What are the conditions and reagent required for steps?

(i) **I** (2 marks)

Reagent -

Condition -

(ii) **IV** (2 marks)

Reagent -

Condition -

(b) Name the process represented by: (4 marks)

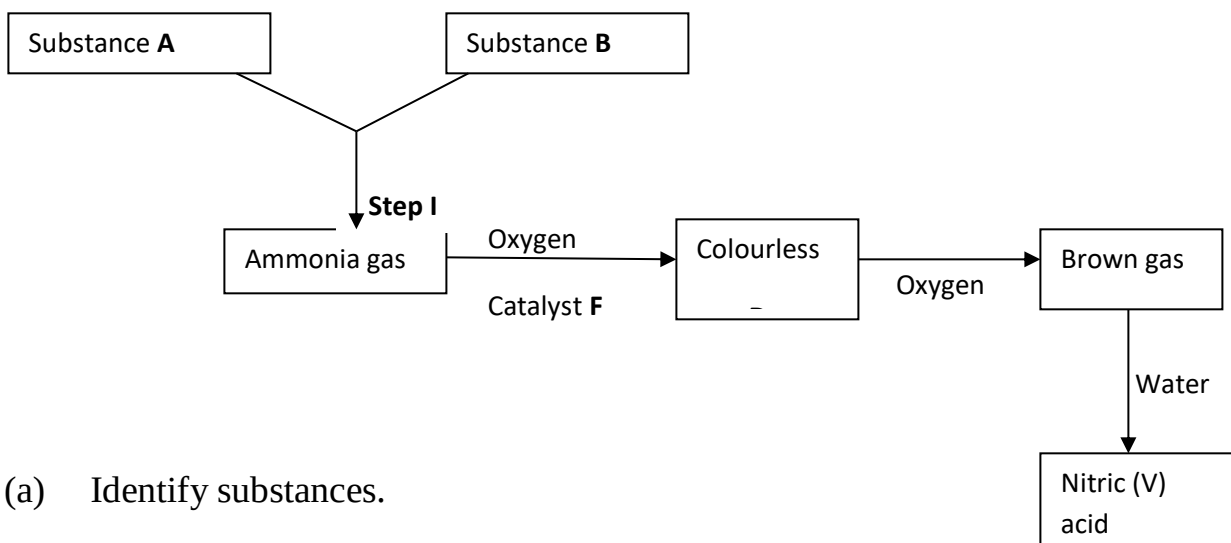
I -

II -

IV -

V -

5. **I.** Study the scheme below and answer the questions that follow.



(a) Identify substances.

A -

B -

D -

(b) State the catalyst necessary for; (2 marks)

Step I -

Step II -

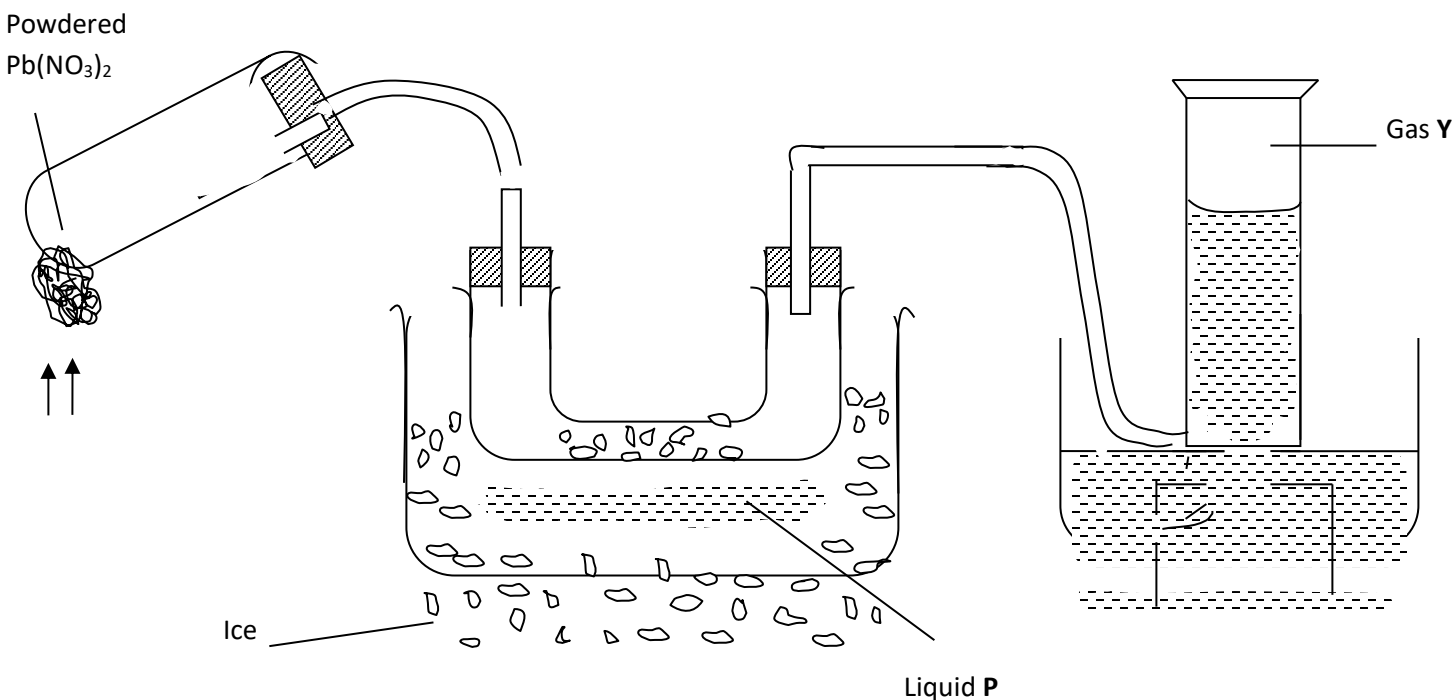
(c) Write an equation for the reaction taking place in step II. (1 mark)

(d) Write two balanced chemical equations for the reaction between chlorine gas and;

(i) Hot and concentrated sodium hydroxide. (1 mark)

(ii) Dilute and cold sodium hydroxide. (1 mark)

II. The diagram below shows an experiment in which the Lead (II) nitrate crystals are heated.



(a) Name; (2 marks)

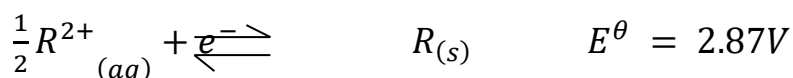
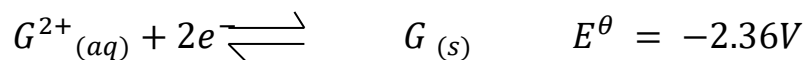
Liquid P -

Gas Y -

(b) Write a balanced chemical equation for the decomposition of Lead (II) nitrate. (1 mark)

(c) Explain how you can distinguish between nitrogen (II) oxide and nitrogen (I) oxide. (2 marks)

6. I. Study the standard electrode potentials given below and answer the questions that follow.



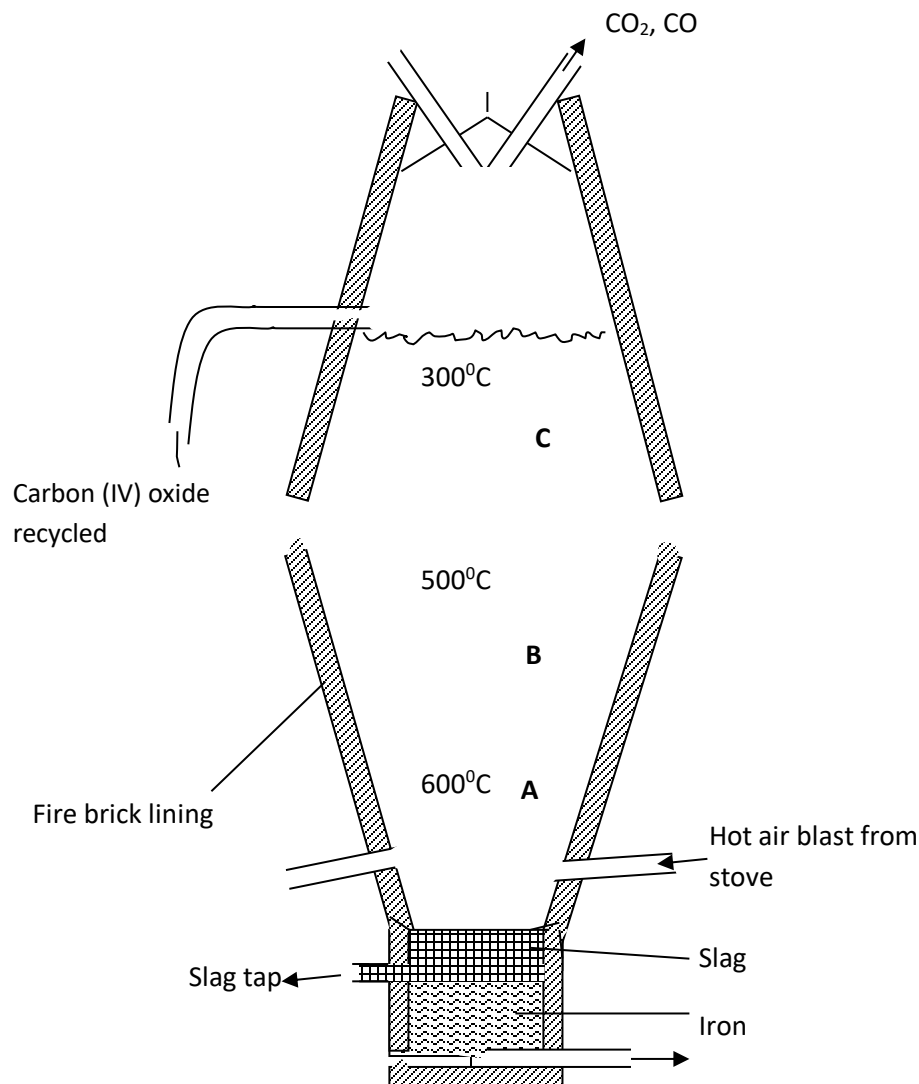
- (a) Identify the strongest:
- (i) Reducing agent (1 mark)
- (ii) Oxidizing agent (1 mark)
- (b) Calculate the e.m.f of a cell made of G and M. (2 marks)
- (c) Write the cell representation for the above cell in (b). (1 mark)
- (d) Draw a cell diagram for the cell in (b) above. (2 marks)
- (e) Write the cell reaction for the drawn cell diagram in (d) above. (1 mark)

- II. Electrolysis of aqueous solution of metal M resulted in the deposition of 1.07g of metal upon passage of a current of 1.32 amperes for 75 minutes.

(M = 52, 1F = 96500C)

- (i) Calculate the quantity of electricity passed through the cell. (1 mark)
- (ii) Calculate the charge on the metal ion. (3 marks)

7.Extraction of iron involves two main processes, smelting and refining. Below is the blast furnace which is used to smelt iron from its ore.



- (a) (i) What does the word smelt mean? **(1 mark)**
(ii) Name the reducing agent in the process. **(1 mark)**
(i) What is the role of the hot air blast in the process? **(2 marks)**
- (b) Write equations for the reactions that take place at the region marked A, B and C. **(3 marks)**
A -
B -
C -
- (c) What is the purpose of limestone in the extraction process? **(1 mark)**
(f) Write equations to show how impurities are removed from the ore. **(3 marks)**

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 5 PAPER 1

TIME: 2 HOURS

NAME..... INDEX NO.....

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DATE.....

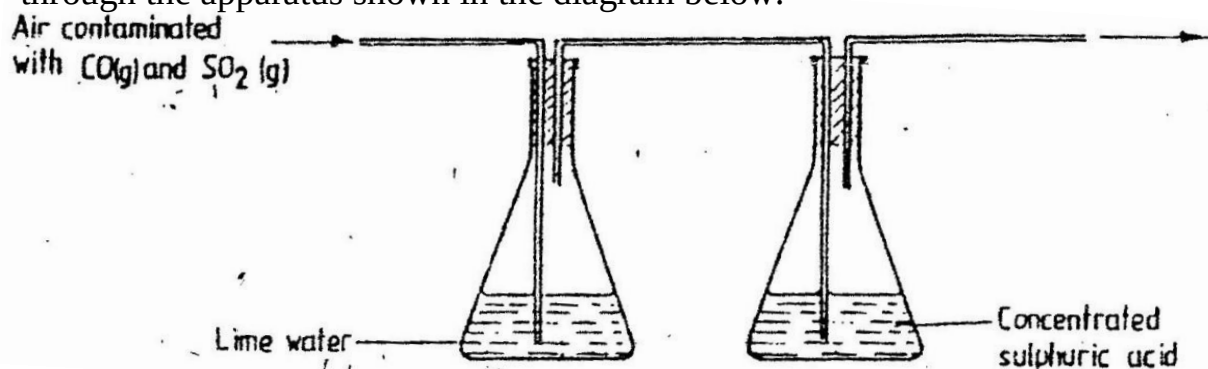
QUESTIONS

1. Complete the table below for the characteristics of the sub atomic particles. (2marks)

sub atomic particle	Relative mass	Electrical charge
Proton	1	
Neutron	1	

2. A sample of air contaminated with carbon monoxide and sulphur dioxide was passed

through the apparatus shown in the diagram below.



Which contaminant was removed by passing the contaminated air through the apparatus?.

Explain .

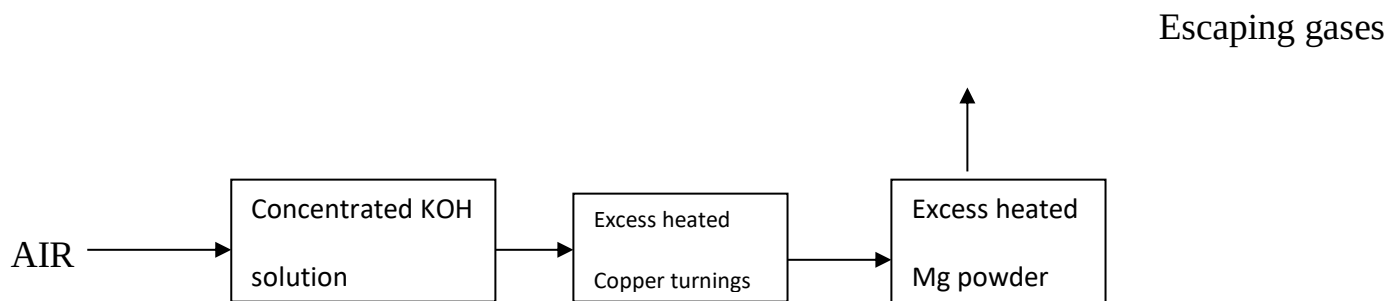
(2mks)

- 3 Explain how you would obtain solid lead carbonate from a mixture of lead carbonate and sodium carbonate powders. (3mks)
4. (a) Write an equation for the reaction that takes place when carbon (II) oxide gas is passed over heated lead(II)oxide. (1mk)
- (b) State **one** other use of carbon (II) oxide gas . (1mk)
5. Describe how the following reagents can be used to prepare copper (II) hydroxide , solid copper (II) sulphate, solid sodium hydroxide and distilled water. (3mks)
6. Aluminium metal is a good conductor and is used for overhead cables. State any other two properties that make aluminium suitable for this use . (2mks)
7. A given volume of ozone, (O₃) diffused from a certain apparatus in 96 seconds. Calculate the time taken by an equal volume of carbon (IV) oxide (CO₂) to diffuse under the same conditions (O = 16.0, C = 12.0) (3marks)
8. (a) What is meant by isomerism? (1mark)
- (b) Draw and name **two** isomers of butane. (2 marks)
- 9 The table below shows the relative molecular masses and the boiling points of methane and water

	Relative molecular mass	Boiling point(°C)
Methane	16	-161
Water	18	100

Explain why the boiling point of water is higher than that of methane. (2mks)

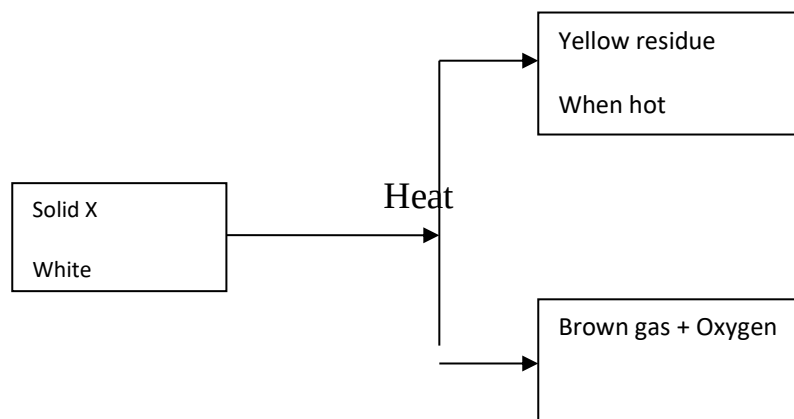
10. Air was passed through several reagents as shown in the flow chart below



- (a) Write an equation for the reaction, which takes place in chamber with magnesium powder (1mk)
- (b) Name one gas, which escapes from the chamber containing magnesium powder. Give a reason for your answer. (2mks)
11. (a) Other than the enthalpy of combustion, state **one** factor which should be considered when choosing a fuel. (1mk)

(b) The molar enthalpies of neutralization for dilute hydrochloric acid and dilute nitric (V) acid are -57.2KJ/mol while that of ethanoic acid is -55.2kJ/mol . Explain this observation. (2 marks)

12. a) Study the scheme below and answer the questions that follow.

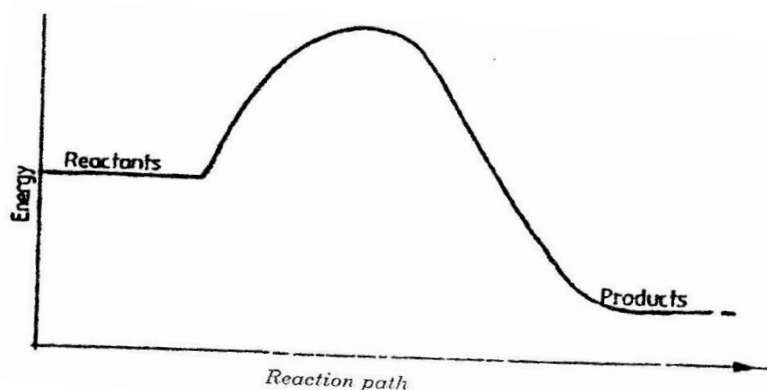


(a) Name (i) Solid X

(ii) The yellow residue (2 marks)

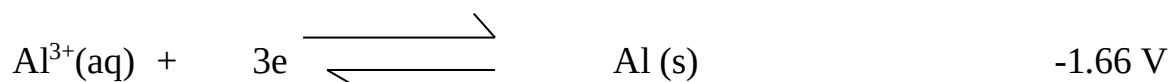
(b) Write an equation for the decomposition of the yellow solid (1mark)

13. Ammonia can be converted to nitrogen monoxide as shown in the equation below

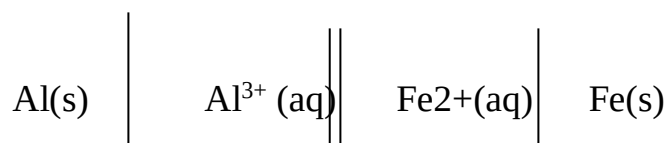


(a) Explain how an increase in temperature would affect the yield of nitrogen(II)oxide (2mks)

b) On the energy level diagram above sketch, the energy level diagram that would be obtained if the reaction is carried out in the presence of platinum catalyst. (1 mk)

$$\text{Zn}^{2+}(\text{aq}) + 2\text{e}^- \rightleftharpoons \text{Zn}(\text{s}) \quad -0.76 \text{ V}$$


a). Calculate the E value for the electrochemical cell below (2mks)



(b) Give a reason why aluminium metal would protect iron from rusting better than zinc metal. **(1mk)**

[illegible]

a) Select the:

(i) element which has the largest atomic radius. **(1mk)**

(ii) Most reactive non-metal . **(1mk)**

b) Show on the grid the position of the element J which forms J^{2-} ions with electronic configuration 2, 8, 8. **(1mk)**

16. A hydrocarbon slowly decolorizes bromine gas in the presence of sunlight but does not decolourise acidified potassium manganate (VII).

(i) Name the homologous series to which the hydrocarbon belongs . **(1mk)**

(ii) Give an example of a member of the homologous series named in (i) above. **(1mk)**

17. Atoms of element X exists as ${}^{14}_6\text{X}$ and ${}^{12}_6\text{X}$

(a) What name is given to the two types of atoms. **(1mk)**

(b) Use dot (·) and cross (x) diagrams to illustrate the atomic structure of ${}^{14}_6\text{X}$ **(2mks)**

18. 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.

Identify the cation and anion in solid C **(2marks)**

CATION.....

ANION.....

19. Complete the table below by inserting the missing information in the space provided **(2marks)**

Name of polymer	Name of monomer	One use of the polymer
	ethene	

20. In an experiment, soap solution was added to three separate samples of water. The table below shows the volumes of soap solution required to form lather with 100cm³ of each sample of water before and after boiling.

	Sample I	Sample II	Sample III
Volume of soap before water is boiled (cm ³)	27.0	3.0	10.6
Volume of soap after water is boiled (cm ³)	27.0	3.0	3.0

(a) Which water sample is likely to be soft? Explain. **(2mks)**

(b) Name the type of water hardness in sample III **(1mk)**

21. The reaction of ethane with chlorine gas gave a compound of formula C₂ H₅Cl.

- a) What condition is necessary for the above reaction to take place? (1mk)
- b) Draw the structural formulae of the compound C_2H_5Cl . and name it. (2mks)

22. Soot is one of the environmental pollutants .

- (i) Explain the term pollutant. (1mk)
- (ii) State how soot is formed from hydrocarbons. (1mk)

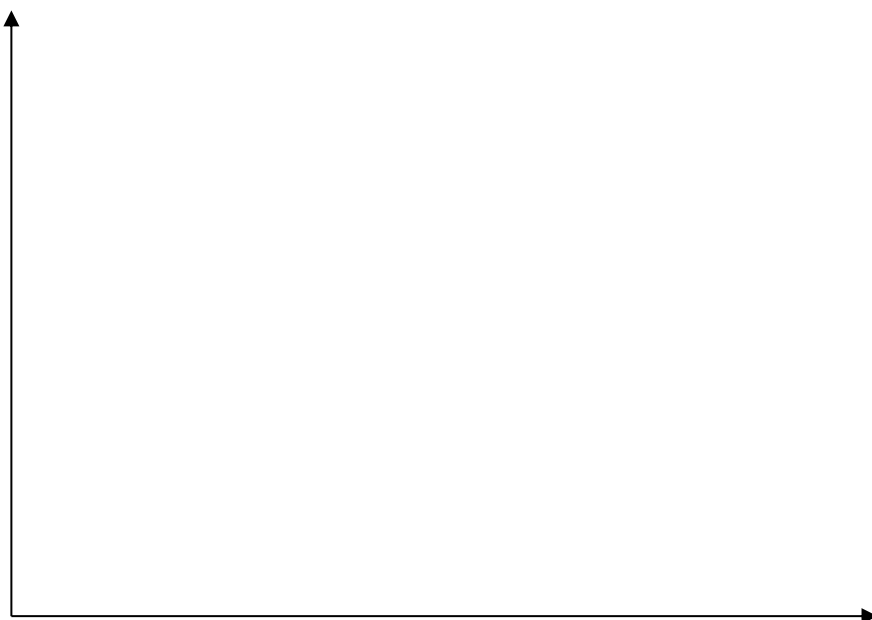
23. In an experiment, sulphur (Iv) oxide gas was bubbled into water followed by chlorine gas. The resulting colorless solution gave a white precipitate when mixed with a acidified barium chloride solution. Explain these observations. (3mks)

24. A compound has an empirical formula, C_3H_6O and a relative formula mass of 116. Determine its molecular formula ($H = 1.0$, $C = 12.0$, $O = 16.0$) (3mks)

25. The table below gives three experiments on the reaction of excess hydrochloric acid and 0.5g of calcium carbonate done under different conditions. In each the volume of gas was recorded at different time intervals.

Experiment	Form of Zinc	Sulphuric acid solution
I	Powder	0.8m
II	Powder	1.0m
III	chips	0.8m

On the axis below draw and label the three curves that could be obtained from such results. (3mks)



26. Crystals of sodium carbonate decahydrate ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) were exposed to air for about four days.

(i) State what was observed.

(1mk)

(ii) Name the process that took place.

(1mk)

(ii) Write an equation for the reaction that occurred.

(1mk)

27. Explain why molten calcium chloride conducts electricity while silicon (IV) oxide does not. **(2mks)**

28. Calculate the mass of sodium oxide, Na_2O , formed when 3.45 g of sodium burns in air. (Na =23, O=16). **(3mks)**

29. The table below gives the first ionization energy of three elements.

Element	A	B	C
1 st ionization energy(kJ/mol)	496	419	520

(i) define the term first ionization energy.

(1mk)

(ii) select the element that is the most reactive. Explain.

(2mks)

30. State the colour of the indicators in the solutions given in the table below: **(3mks)**

Indicator	Colour in	
	Acid	Base
Litmus	Red	
Methyl orange		Yellow
Phenolphthalein	Colourless	

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 5 PAPER 2

TIME: 2 HOURS

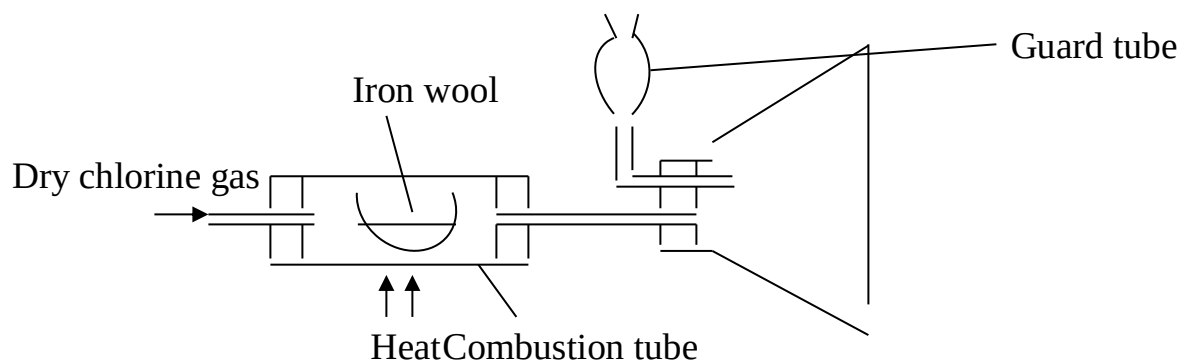
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SCHOOL..... SIGN.....

DATE.....

QUESTIONS

1. (a) Give the name of one reagent which when reacted with concentrated hydrochloric acid produces chlorine gas. (1mk)
- (b) A student set out to prepare Iron (III) Chloride using apparatus shown in the diagram below.



- (i) Explain why: it is necessary to pass chlorine gas through the apparatus before heating begins. (1mk)
- (ii) Calcium oxide would be preferred in the guard tube. Explain. (1mk)
- (iii) What property of Iron (III) Chloride makes it possible to be collected as shown in the diagram above? (1mk)

(iv) The total mass of Iron (III) Chloride formed was found to be 0.5g. Calculate the volume of chlorine gas that reacted with Iron. (Fe=56, Cl=35.5 and Molar gas volume at 298 = 24000cm³). (3mks)

(c) When hydrogen sulphide gas passed through a solution of Iron (III) Chloride, the following observations were made:-

- The colour of the solution changed from reddish brown to green.
- A yellow solid was deposited.

Explain these observations. (4mks)

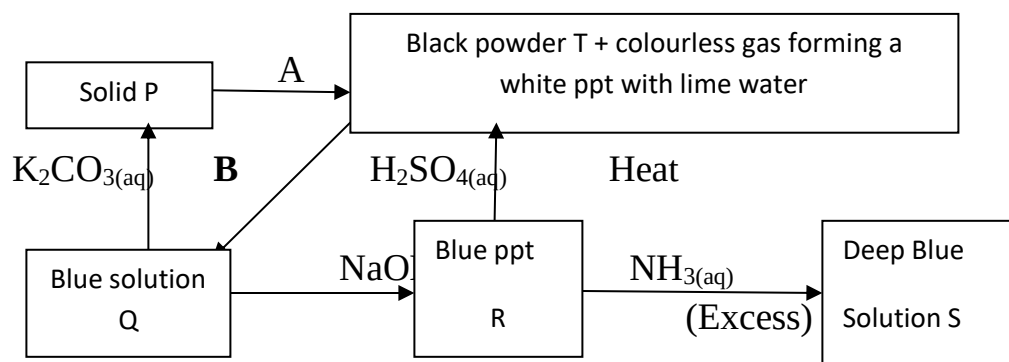
(d) State and explain the observations that would be made if a moist blue litmus paper was placed in a gas jar full of chlorine gas. (2mks)

2. The table below gives some elements of the periodic table and their atomic masses, atomic numbers and melting points. The letters are not the actual symbols of the elements.

Element	B	C	D	E	F	G	H	I	J	K
Atomic No	7	8	19	15	2	9	6	16	12	11
Atomic mass	14	16	39	31	4	19	12	32	40	23
Melting point (°C)	-209	-218	63.7	44	-272	-223	Vary	113	669	98

- Select **two** elements with oxidation states of -3 (1mk)
- Which elements represent the most powerful reducing agent. Explain (1mk)
- How does the atomic radius of D compare with that of K. Explain. (1mk)
- How do you compare the electrical conductivity of element D and J. Give your reason (1mk)
- Select **two** elements which when reacted form a compound that conducts electricity both in molten and aqueous state. (1mk)
- Select any two elements which when reacted form a compound that dissolves in water to form an acidic solution. (1mk)
- In which period and group do elements D and G belong? (1mk)
- Explain why the melting point of element K is higher than that of element D (1mk)
- How does the atomic radius of K and I compare. Explain (2mks)

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



(a) Name processes (2 mks)

i) A

ii) B

b) Name substances: (2mks)

(i) Solid P

(ii) Colourless gas

(b) Give balanced stoichiometric equations for the reactions:

(i) Producing solid P

(1mk)

(ii) Giving the blue precipitate R

(2mks)

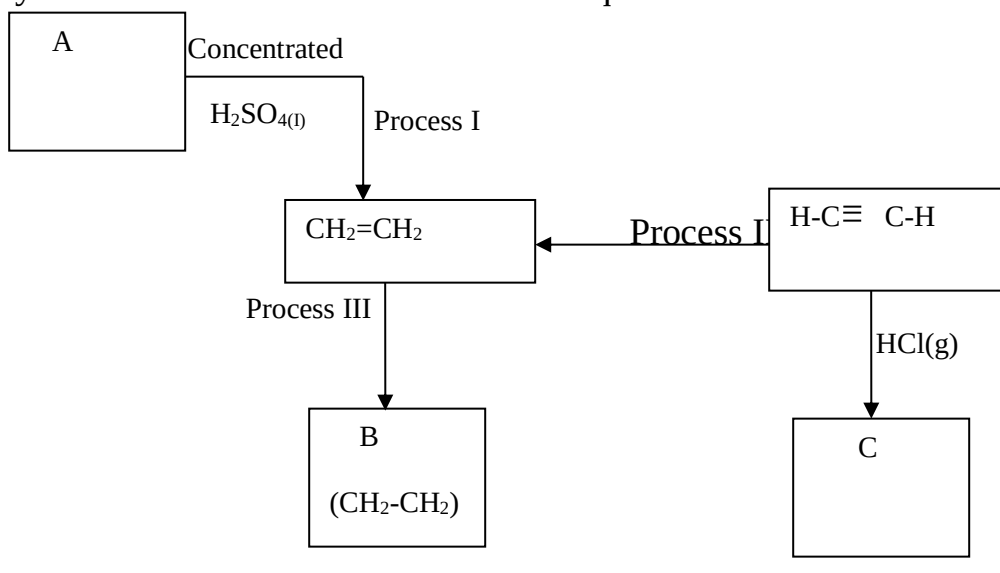
(iii) Thermal decomposition producing black powder T

(1mk)

(iii) Producing deep blue solution S

(2mks)

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



a)

- i) Name process I (1mk)
- ii) Name process II (1mk)
- iii) Name process III (1mk)
- iv) Give the conditions necessary for process I to occur.(1mk)
- v) Give the conditions necessary for process II to occur.(1mk)
- vi) Name compound C. (1mk)
- vii) Name the reagent A. (1mk)

b) Complete combustion of one mole of a hydrocarbon produced four moles of Carbon (IV) Oxide and four moles of water only .

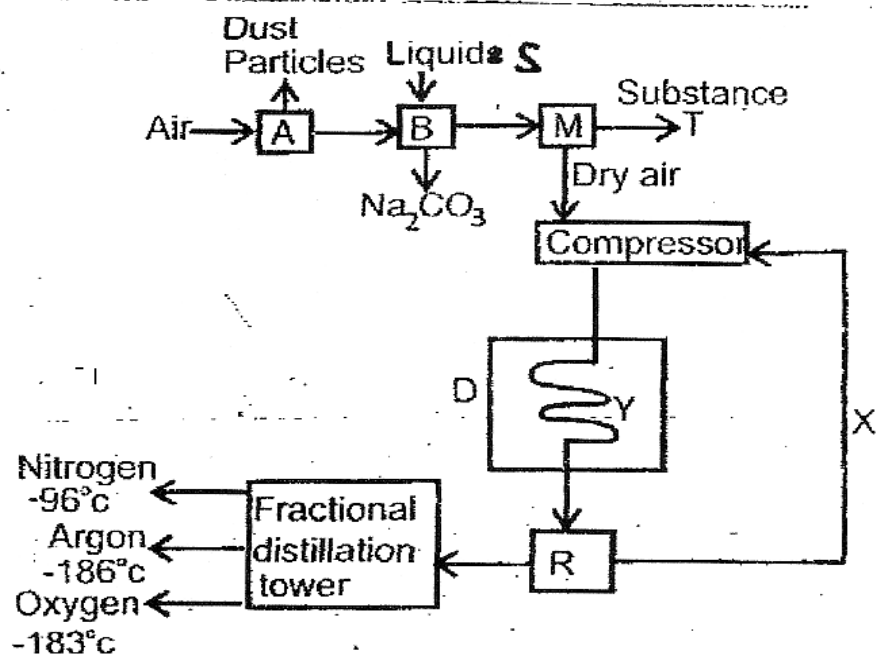
- i) Write the formula of the hydrocarbon. (1mk)
- ii) Write the equation for the combustion reaction. (1mk)

c) An organic compound T contains 50% Oxygen;12.5% Hydrogen and 37.5% Carbon.

The organic compound has a relative molecular mass of 32.

- i) Determine the molecular formula of the compound T. (3mks)
- ii) Draw the structural formula of the compound T. (1mk)

5. Fractional distillation of liquid air is used to produce oxygen gas used in hospitals to patients with breathing problems. Study it and then answer the questions that follow.



(a) What processes takes place in chambers:-

(4mks)

- A:
- B:
- C:
- D:

(b) Name: (2mks)

(i) Liquid S:

(ii) Substance T:

(c) Explain why part Y in chamber D is curved. (1mk)

(d) State two large scale use of oxygen gas other than the one mentioned. (2mks)

6. In an experiment to determine heat of displacement of Copper by Iron, 50cm³ of 0.2M Copper (II) Sulphate was reacted with excess iron fillings. The following results were obtained.

Initial temperature of Copper (II) Sulphate solution = 25.0°C

Final temperature of the solution = 31.0°C

Mass of iron = 1.0g

(Assume density of solution = 1.0g/cm³, specific heat capacity = 4.2Jg⁻¹K⁻¹)

a) Calculate;

i) Heat evolved during the reaction. (2 marks)

ii) Molar heat of displacement. (2 marks)

iii) Write a thermochemical equation for the reaction above. (2 marks)

iv) Why were iron fillings used in excess? (1 mark)

b) Draw an energy level diagram for the reaction. (3 marks)

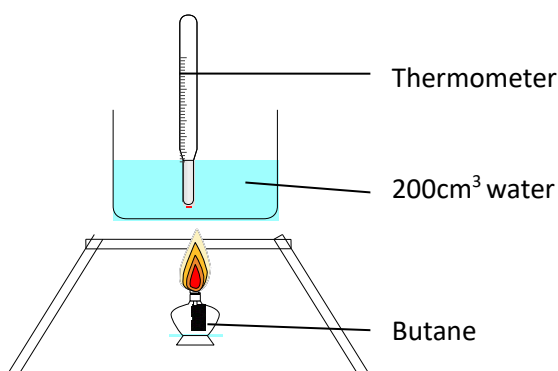
c) What is a fuel? (1 mark)

7. Butane is a gas at room temperature and pressure, it is used to melt bitumen to apply on roads.

a) Write an equation for complete combustion of butane. (1mk)

b) Define the term standard enthalpy of combustion. (1mk)

c) The set up below was used to determine the enthalpy change for combustion of butane.



The temperature rose from 22°C to 70°C when 1g of butane was burnt

Calculate the energy change and hence molar enthalpy. (specific heat capacity 4.2 kJ/kg/K, density 1 gcm⁻³) (2mks)

(d) Given the following enthalpies of combustion data:

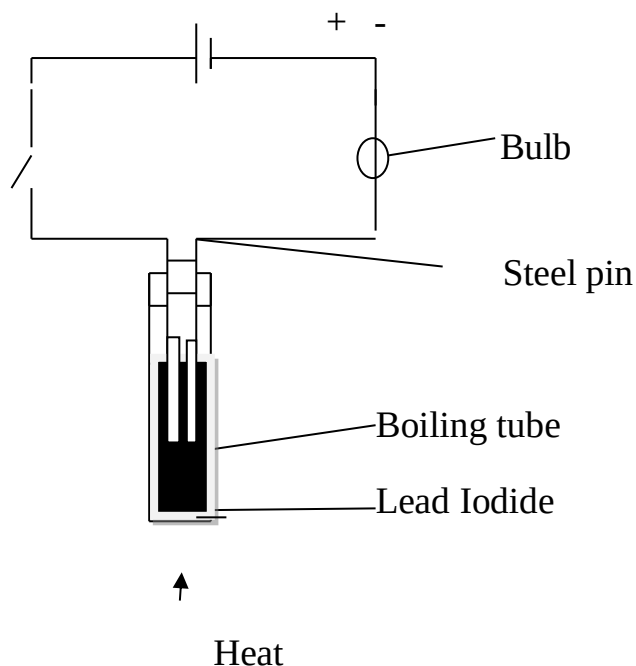
Carbon $\Delta H = -393 \text{ KJmol}^{-1}$

Hydrogen $\Delta H = -286 \text{ KJmol}^{-1}$

Butane $\Delta H = -232 \text{ KJmol}^{-1}$

Draw an energy cycle diagram and use it to calculate the enthalpy of formation of butane (4mks)

8. The diagram below shows a setup that was used by a student to investigate the effect of an electric current on molten lead (II) iodide.



- Explain what happens to lead iodide during the electrolysis. (2 marks)
- Give two reasons why solid lead (II) iodide does not conduct electricity? (2mks)
- Write equations to show the reaction taking place; (2 marks)
 - At the cathode
 - At the anode

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 6 PAPER 1

TIME: 2 HOURS

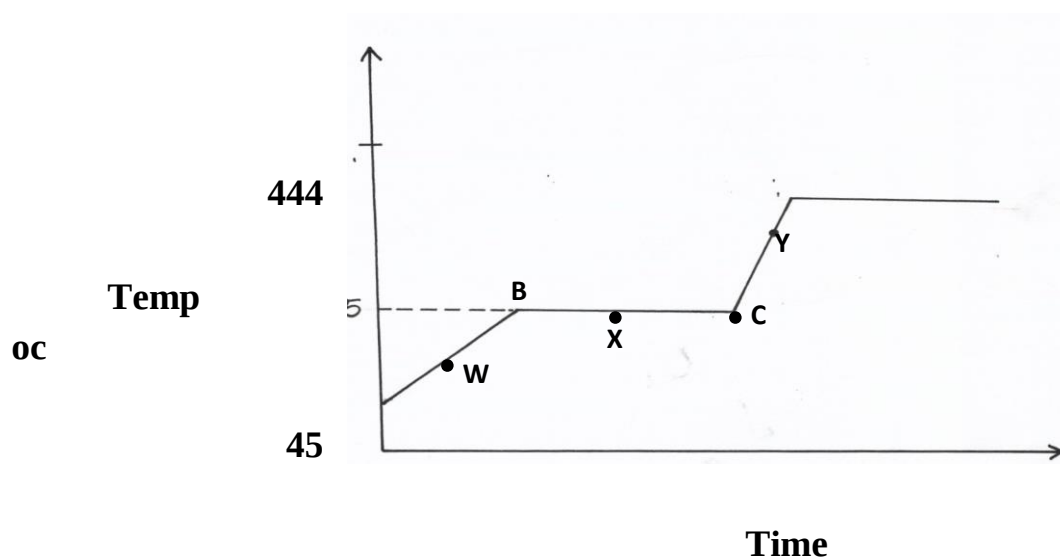
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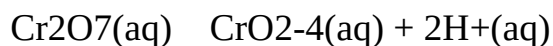
QUESTIONS

1. The diagram below shows the heating curve of a pure substance. Study it and answer the questions that follow.



- (a) What are the physical states of the substances at points W and Y. (2mks)
- (b) Explain why the temperature remains constant between points B and C. (2mks)

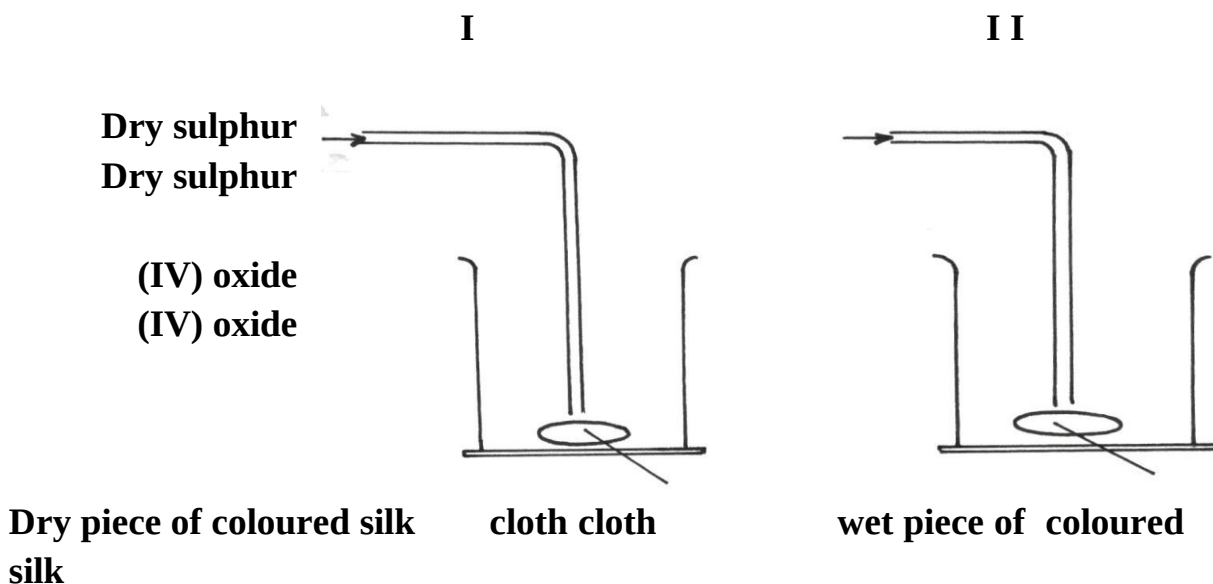
2. Consider the reaction below.



Using oxidation numbers, explain whether the above reaction is a redox reaction or not.

(3mks)

3. Dry sulphur (IV) oxide was passed through two pieces of coloured silk both in a gas jar as shown in the Diagram.



(a) State the observation in the gas jars.

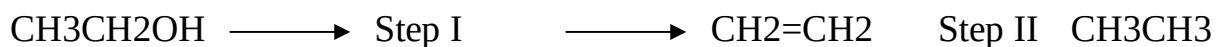
(2mks)

I.....
II.....

(b) Write equations to explain your observations in flask II.

(2mks)

4. The equations show some reactions. Use the equations to answer the following questions.



(a) Name the type of reaction in step I and II.

(2mks)

Step I

Step II

Explain why ethane burns with a more smoky flame than ethane.

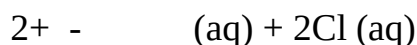
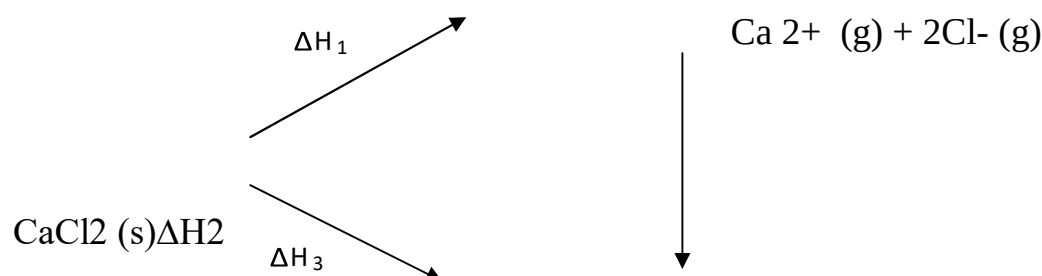
(2mks)

5. The third member of the alkenes is converted to its corresponding saturated hydrocarbon by hydrogenation. Using the bond energy values given below, answer the questions that follow.

Bond	Bond energy KJ/Mol
H- H	432
C= C	610
C- C	346
C- H	413

Determine the enthalpy change for the conversion of the third member of the alkenes to its corresponding saturated hydrocarbon by hydrogenation. **(3mks)**

6. (a) Graphite is a non metal most commonly used as an electrode. State **two** properties that make it suitable for use as an electrode. **(2mks)**
- (b) Graphite is an allotrope of carbon. Distinguish between allotropes and isotopes. **(2mks)**
7. Use the information in the energy cycle below to answer the questions that follow.



Ca

- (i) What is the name given to the energy changes. **(3mks)**

ΔH_1

ΔH_2

ΔH_3

- (ii) Given that $\Delta H_1 = 2237 \text{ KJ/Mol}$ and $\Delta H_2 = -2378 \text{ KJ/Mol}$, calculate the value of ΔH_3 . **(1mk)**

8. The 1st, 2nd and 3rd ionization energies in KJ/Mol of element G and R are given below.

Element	1 st I.E	2 nd I.E	3 rd I.E
G	520	7,300	9,500
R	420	3,100	4,800

(i) Define the term 1st ionization energy. (1mk)

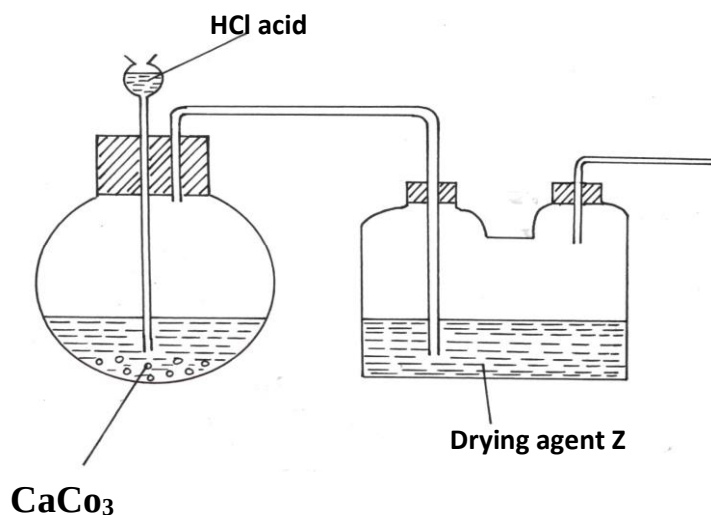
(ii) Apart from the decrease in energy levels, explain the big difference between the 1st and 2nd ionization energies. (1mk)

(iii) Calculate the amount of energy for the process.



9. When solid zinc carbonate was added to a solution of hydrogen chloride in methylbenzene, there was no observable change. On addition of some water to the mixture there was effervescence. Explain these observations. (2mks)

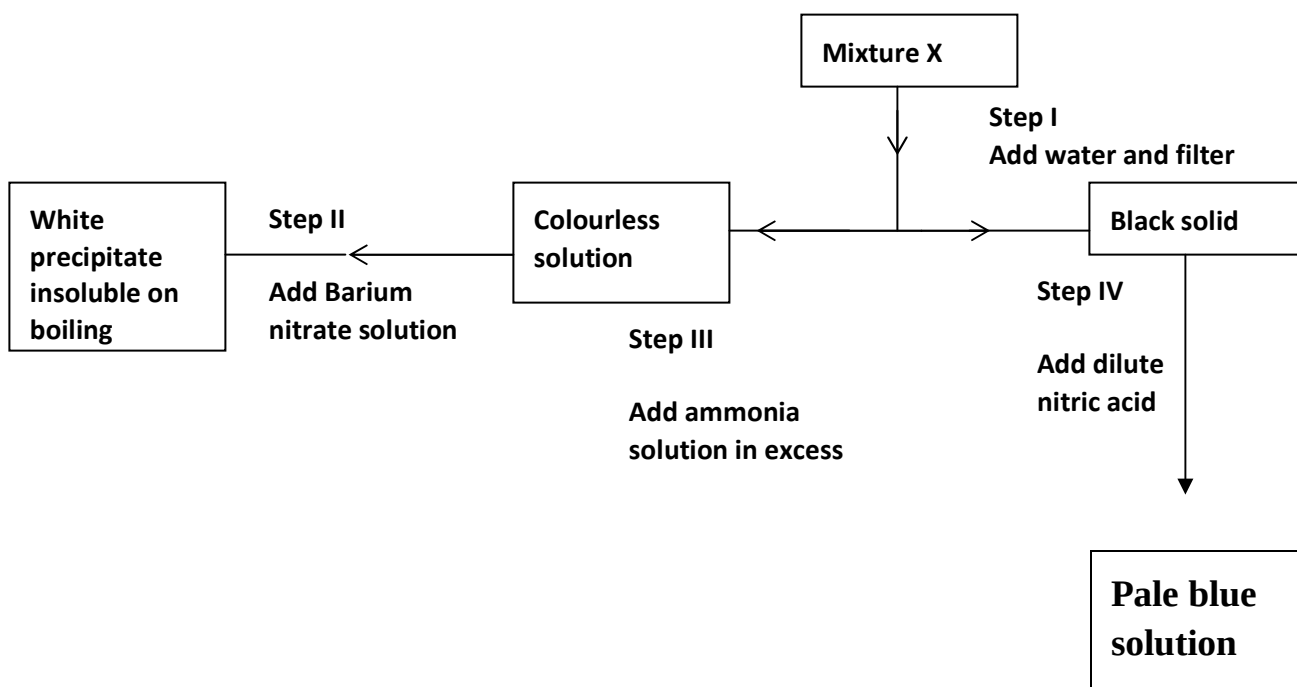
10. (a) The diagram below represents an incomplete set-up of apparatus that can be used to prepare dry carbon(iv) oxide gas. Complete the diagram and answer the questions that follow. (2mks)



White precipitate
insoluble on excess

- (i) Write an equation for the reaction that takes place. (1mk)
 (ii) Name liquid Z. (1mk)
 (b) State **two** advantages of using 'dry ice' over ordinary ice as a refrigerant. (2mk)

11. Study the chart below and answer the questions that follow.



(a) Name:

- (i) Cations present in mixture X. (1mk)
 (ii) Anions present in the solution. (1mk)

(b) Write an equation to show how the white precipitate in step III dissolves. (1mk)

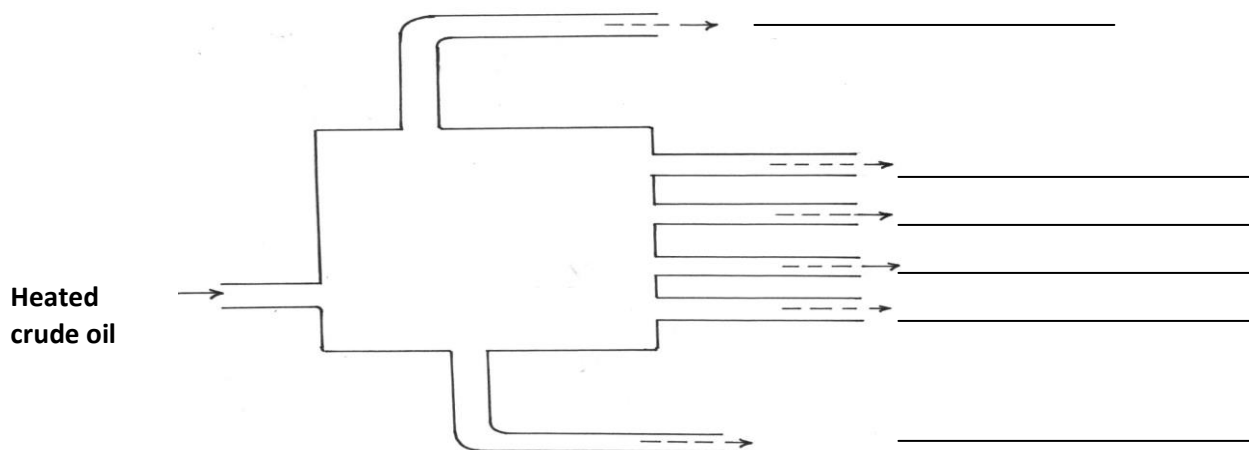
(c) Name the process outlined in step IV above. (1mk)

(i) A student intending to prepare lead (II) sulphate reacted lead metal with dilute sulphuric acid. However, he was not successful. Explain why he was not successful. (1mk)

(ii) Suggest a method the student could have used to prepare lead (II) sulphate. (2mks)

(iii) Write an ionic equation that would take place in (ii) above. (1mk)

12. In an experiment, ammonium chloride was heated in a test-tube. A moist red litmus paper placed at the mouth of the test-tube first changed blue then red. Explain these observations. **(2mks)**
13. An element **X** has two naturally occurring isotopes ^A_ZX and ^B_ZX . If its relative atomic mass is 21.8, calculate the percentage abundance of the more stable isotope. **(2mks)**
14. Fractional distillation of crude oil used to produce the following fractions; petrol, diesel, petroleum gases, kerosene, naphtha and bitumen. Below is a simplified diagram of a fractionating column used during the refining of crude oil.
- (i) On the diagram, write the names of these fractions in their correct positions. **(3mks)**



- (ii) Which fraction is used as a jet fuel? **(1mk)**
- (iii) What process is used to convert higher fractions to lower fractions? **(1mk)**
15. Carbon(iv)oxide and silicon(iv)oxide are both covalent oxides but carbon is a gas whereas silicon(iv)oxide is a solid with high melting point. Explain. **(2mks)**
16. The ability of hard water to conduct electricity falls when water is boiled but is not much affected when the water hardness is removed by addition of washing soda (sodium carbonate). Explain **(2mks)**
17. When sulphur is heated in a boiling tube in absence of air, the yellow crystals melts into golden yellow mobile liquid at 113°C . The liquid changes at 180°C into a dark brown very viscous liquid. More heating to about 400°C , produces a brown less viscous liquid.
- (a) Draw the molecular structure of sulphur in the yellow crystals. **(1mk)**
- (b) Explain why the molten liquid becomes viscous. **(1mk)**
- (c) If the brown liquid at 400°C is cooled rapidly by pouring it into cold water, which form of

sulphur is produced?

(1mk)

(d) State the observation made when sulphur is heated in a deflagrating spoon. (1mk)

18. The table below gives some information about certain chemical substances. The letters used are not the actual chemical symbols or formulae.

Substance	Melting point (°C)	Boiling point (°C)	Electrical conductivity		
			Of solid	Of liquid	In water
A	1540	3000	good	good	insoluble
B	-114	-85	poor	poor	good
C	712	1418	poor	good	good
D	-39	357	good	good	insoluble
E	2045	3000	poor	good	insoluble
F	1700	2776	poor	poor	insoluble

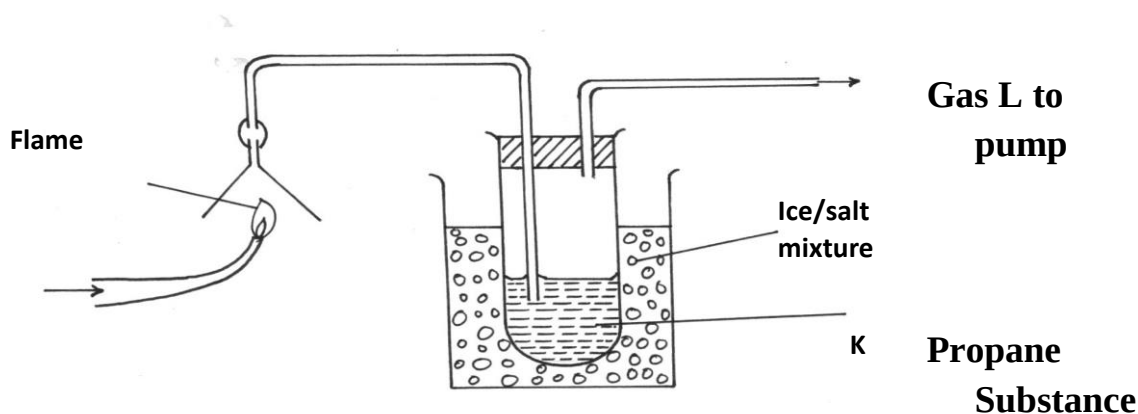
(a) From the table, select:-

(i) Two substances that cannot be elements. (1mk)

(ii) A substance that is likely to have giant atomic structure. (1mk)

(iii) A substance that is likely to consist of molecules and which produce ions when added to water. (1mk)

19. Study the diagram below and answer the questions that follow.

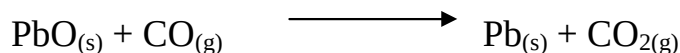


(i) Write the equation for the combustion of propane. (1mk)

(ii) The PH of substance **K** was found to be less than 7. Explain this observation. (1mk)

20. Explain how you would separate a mixture of nitrogen and oxygen gases given that their boiling points are -196°C and -183°C respectively. (2mks)

21. Dry carbon (iv) oxide gas reacts with heated lead(ii)oxide as shown in the equation below.

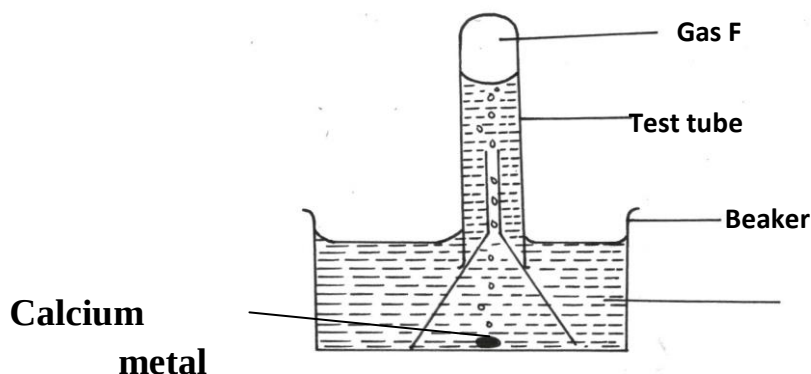


(a) Name the process undergone by the lead(ii)oxide. (1mk)

(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(IV)oxide gas in the above reaction. (1mk)

22. The set-up below was used to collect gas F, provided by the reaction between water and calcium metal.



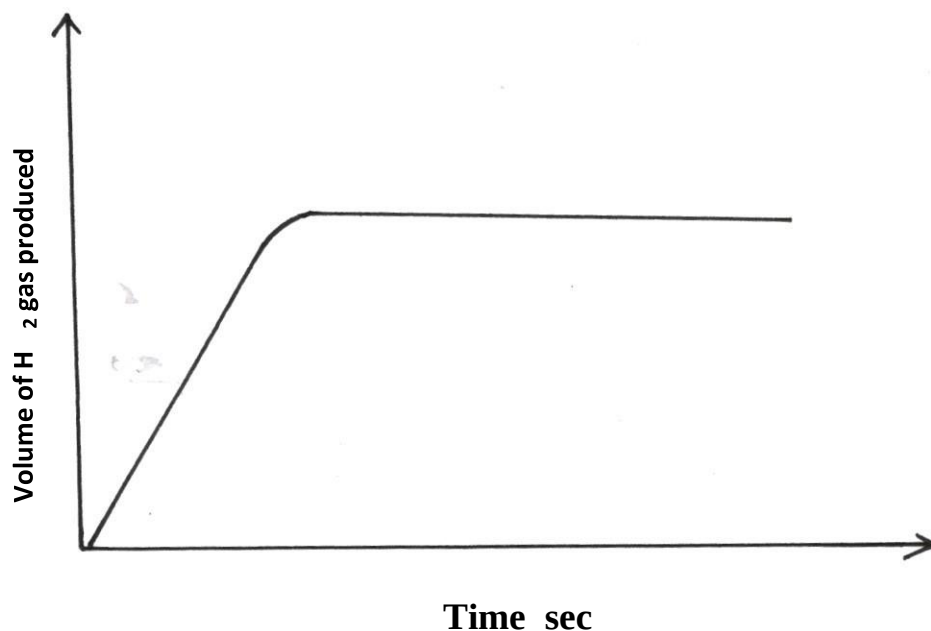
(a) Name gas F. (1mk)

(b) At the end of the experiment the solution was found to be a weak base. Explain why the solution is a weak base. (2mks)

(c) Give **one** laboratory use of the solution formed in the beaker. (1mk)

23. In terms of structure and bonding, explain why graphite is used as a lubricant. (2mks)

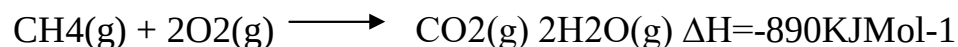
24. The reaction between a piece of magnesium ribbon with excess 2M hydrochloric acid was investigated at 25°C by measuring the volume of hydrogen gas produced as the reaction progressed. The sketch below represents the graph that was obtained.



(a) Name one piece of apparatus that may be used to measure the volume of hydrogen gas produced. (1mk)

(b) On the same diagram the curve that would be obtained if the experiment was repeated at 35°C. (1mk)

25. Methane reacts with oxygen according to the equation given below:-



Calculate the volume of methane which would produce 11.25 kJ when completely burnt at r.t.p. (molar volume of a gas at r.t.p = 24 litres) (2mks)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 6 PAPER 2

TIME: 2 HOURS

NAME..... INDEX NO.....

SCHOOL..... SIGN.....

DATE.....

QUESTIONS

1. Study the data in the table below and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Atomic Number	Atomic Radius	Melting Point(°C)	Boiling point (°C)
A	11	0.157	98	890
B	12	0.136	650	1110
C	13	0.125	660	2470
D	14	0.117	1410	2680
E	15	0.110	590	280
F	16	0.104	119	445
G	17	0.099	-101	-35
H	18	—	-189	-186

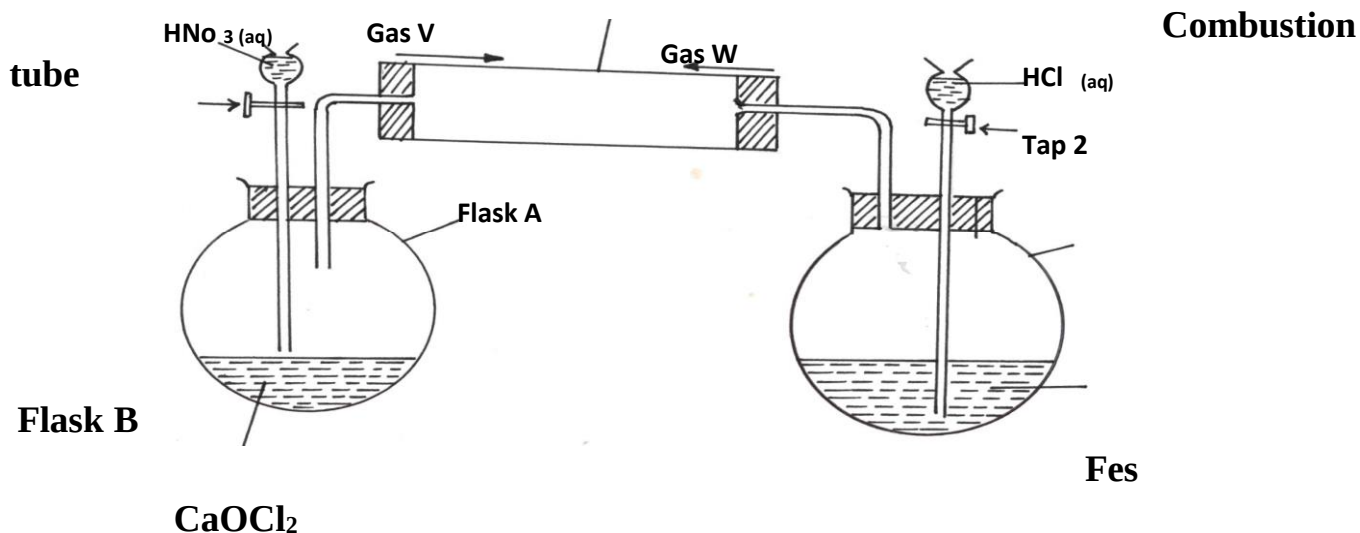
(a) (i) Write the electronic configuration of ions of:-

C (1mk)

F (1mk)

- (ii) Explain why there is a decrease in atomic radius from A to H. (2mks)
- (iii) State the nature of the chlorides of the elements represented by letters A and B compared to chlorides of the elements represented by letters C and D. (2mks)
- (iv) Give **one** element stored in:-
- (i) Water (1mk)
- (ii) Paraffin (1mk)
- (b) Explain the following observations in terms of structure and bonding.
- (i) There is an increase in boiling points from A to C. (1mk)
- (ii) Element D has a high boiling points. (1mk)
- (c) Explain why element A to C are good conductors of both electricity and heat while the rest are poor. (1mk)
- (d) State the difference in reactivity with air between elements A to C and elements D to F. (1mk)

2. A student in Magondo High School set up the following arrangement to prepare and react gases V and W. Use it to answer the questions that follow. (H=1, S=32, Cl=35.5)



Tap 1 and 2 were opened at the same time.

- (i) Write a balanced equation for the chemical reaction that took place in the flask A. (1mk)
- (ii) State and explain the observations that were made in flask B and combustion tube.

Flask B (2mks)

Combustion tube (2mks)

- (iii) Mark on the diagram, the approximate position where reaction occurred in the combustion tube.

Explain your answer.

(2mks)

- (iv) State **one** possible objective of this experiment other than testing whether gas V reacts with W. (1mk)

- (v) State **one** precaution which should be taken when carrying out the experiment. (1mk)

(b) In another experiment, bleaching powder CaOCl_2 was replaced with sodium sulphite. Referring to C only, state the difference between the observations made in this case and the previous observations. (2mks)

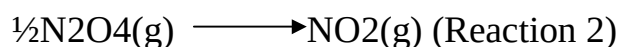
3. Nitrogen(IV)oxide undergoes self-addition reaction in which a dynamic chemical equilibrium is reached.



Reaction 1

- I. (i) What is meant by a dynamic equilibrium? (1mk)

- (ii) State the enthalpy change for the reaction represented below. (1mk)



II. State and explain how each of the following would affect the position of equilibrium in Reaction 1.

- (i) Increase in temperature (1mk)

- (ii) Increase in pressure (1mk)

III State and explain how each of the following would affect the rate at which equilibrium would be reached in Reaction 1.

- (i) A decrease in temperature (1mk)

- (ii) A decrease in pressure (1mk)

- (b) (i) Use the information given below to obtain the standard enthalpy for the reaction.



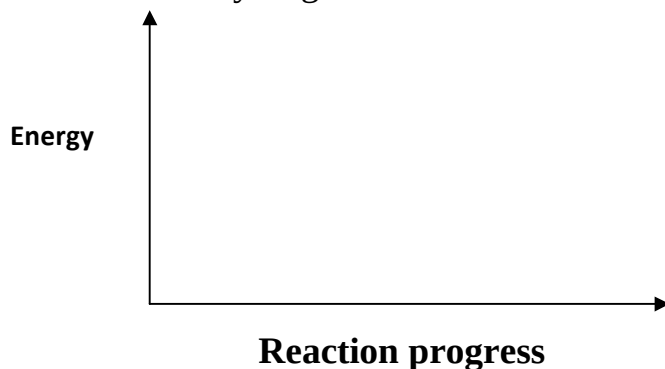
Enthalpy of formation of ethane,
 $[(\text{CH}_2=\text{CH}_2) = +52.3\text{KJmol}^{-1}]$

Enthalpy of formation of hydrogen
 chloride.

$[(\text{HCl}) = -65\text{KJmol}^{-1}]$

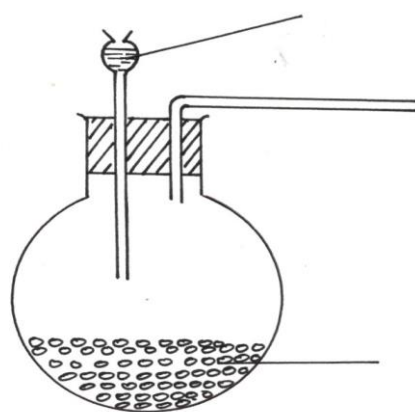
Enthalpy of formation of $[\text{CH}_3\text{CH}_2\text{Cl} = -1039\text{KJmol}^{-1}]$ (2mks)

(ii) Represent on the energy axes provided below, the energy change for the reaction between ethane and hydrogen chloride. (1mk)



(iii) State the values of temperature that are referred to as standard states when considering enthalpies. (1mk)

3. (a) The diagram below is part of a set-up used to prepare and collect dry chloride gas in the laboratory.



Concentrated

Hydrochloric acid

Potassium manganate (VII)

(i) Complete the diagram to show how to dry chloride gas and collect it. (1mk)

(ii) Write a balanced equation for the reaction that took place in the flask shown above. (1mk)

(iii) In reference to equation in b(ii) above, explain using oxidation numbers which element is reduced. (2mks)

(iv) Write an equation to show how chloride can be obtained from bleaching powder, CaOCl_2 . (1mk)

(b) In another experiment a student bubbled chlorine gas through water for some time and pale yellow solution was formed. This solution turned colourless after a few days. The colourless solution was found to conduct electricity.

(i) Explain why the original solution was pale yellow. (1mk)

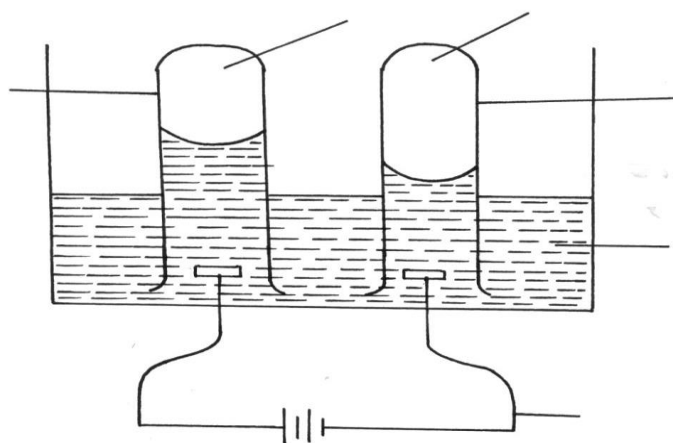
(ii) State and explain the conditions that enables the pale yellow solution to turn colourless. (1mk)

(iii) Why did the colourless solution conduct electricity. (1mk)

(c) (i) Explain why fluorine is more reactive than chlorine. (F=9, Cl=17) (1mk)

(ii) State **one** use of chlorine. (1mk)

5.(a) The diagram below shows a set-up used to electrolyze brine (concentrated sodium chloride) solution using inert electrodes and collect the gaseous products.



(i) List **two** examples of inert electrodes. (1mk)

Write an overall equation for the reaction. (1mk)

(ii) Explain why the volume of gas X is less than that of Y. (1mk)

(iii) After sometime a gas C, that is different from X starts collecting in tube R. Identify gas C and explain why it is formed instead of X. (1mk)

(iv) Show on the diagram the anode and cathode. (1mk)

(b) A student in one of the school in Trans-mara East District set-up an electrochemical cell consisting of Aluminium and copper half-cells. The electrolyte in each of the half-cells contained 1M sulphate ions and the metals were thoroughly cleaned before use.

(i) Draw a well labelled diagram to represent the electrochemical cell in (b) above. (2mks)

(ii) Show on the diagram the direction of the flow of electron. (1mk)

The standard electrode potentials of copper and aluminium half-cell are +0.34V and -1.66V respectively. Determine the electromotive force (E^θ) of the cell made up of two half-cells. (1mk)

- (iii) What is meant by standard electrode potential? (1mk)
- (iv) Explain **one** major problem of aluminium half-cell. (1mk)
6. (a) Sulphur can be extracted from hydrogen sulphide gas dissolved in crude oil (petroleum oil) as an impurity. The reaction can be represented as: $\text{SO}_2(\text{g}) + 2\text{H}_2\text{S}(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + 3\text{S}(\text{s})$ This reaction occurs in the cold.
- (i) State the observations that would be made during the reaction. (1mk)
- (ii) Which of the **two** gases is a stronger reducing agent. Explain your answer. (1mk)
- (iii) Explain how hydrogen sulphide is formed as an impurity in crude oil. (1mk)
- (iv) Suggest a reason why kerosene sometimes appears pale yellow. (1mk)
- (v) Name **two** major pollutants that result from the burning of pale yellow kerosene. (2mks)
- (b) (i) The yield of sulphur in the above reaction is 75%. Calculate the mass of hydrogen sulphide required to produce 48 tonnes of sulphur. (3mks)
- (ii) State and explain the observations that would be made if a sample of sulphur is heated with concentrated nitric acid. (3mks)
7. Study the reaction scheme (flow chart) given below and answer question that follow.
- (a) (i) Name the substances:-
- U..... (½mk)
- M (½mk)
- (ii) Write the molecular formula of substance
- Q (1mk)
- T (1mk)
- (iii) Draw and give the systematic name of the two isomers of Q. (2mks)
- (iv) Give the structural formulae of substances V and P. (2mks)
- (v) Write a balanced equation for the reaction producing salt A. (1mk)
- (vi) State the functions of sulphuric acid in steps III and IV.
- Step III (½mk)
- Step IV (½mk)
- (vii) Name the process taking place in steps V and VI.
- Step V (½mk)
- Step VI (½mk)
- (viii) State **one** major problem caused by Q on the environment. (1mk)
- (b) Explain how methane CH_4 can be obtained from solid T. (1mk)
- (c) State how step V can be reversed and give the observation. (2mks)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 7 PAPER 1

TIME: 2 HOURS

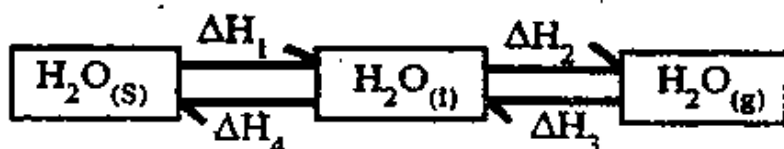
NAME..... INDEX NO.....

SCHOOL..... SIGN.....

DATE.....

QUESTIONS

- Gas X was found to decolorize moist litmus paper. A colorless solution of potassium Bromide turned red-brown when gas X was passed through it.
 - What is observed when gas x is passed through potassium iodide solution.(1mark)
 - Write an equation to accompany the observation in (a) above. (1 mark)
- An organic compound J has the following percentage by mass, carbon, 64.86%, hydrogen, 13.51% and the rest oxygen. The relative molecular mass of the compound is 74. Work out the molecular formula of compound J. [C=12. H=1 O=16] (3 marks)
- The scheme below shows the energy changes that are involved between ice, water and steam. Study it then answer the questions that follow

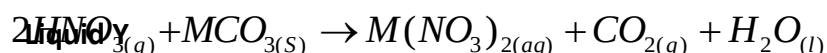


- What name is given to the process represented by energy change ΔH_4 ? (1 mark)
- What is the sign of ΔH_3 ? Give a reason (2 marks)

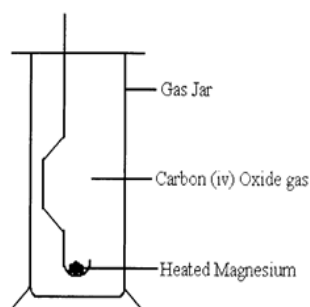
4. A fixed mass of a gas has a volume of 250cm^3 at a temperature 27°C and 750mmHg pressure. Calculate the volume the gas would occupy at 42°C and 750mmHg pressure. ($0^\circ\text{C} = 273\text{K}$) **(3 marks)**
5. Complete the table below to show the number of the sub-atomic particles of the given nuclides. X and Y are not actual chemical symbols. **{3 marks}**

	Number of		
Particle	Protons	Neutrons	Electrons
${}^{34}_{16}\text{X}^{-2}$			
${}^{56}_{26}\text{Y}^{+3}$			

6. 100cm^3 of 2M nitric acid reacted with 12.5g of a carbonate of metal M. (MCO_3) according to the following equation



- a) Calculate the number of moles of MCO_3 that reacted with nitric acid. **(2 marks)**
- b) Calculate the relative molecular mass of MCO_3 **(2 marks)**
7. (a) Name the substance formed when soap is used to wash in hard water **(1 mark)**
- (b) Give one advantage of drinking hard water **(1 mark)**
8. The diagram below a heated magnesium metal lowered inside a gas jar of carbon (IV) oxide.



Study it and answer the questions that follow.

- (i) State **two** observations that can be made during and after the experiment **(2 marks)**
- (ii) Write a balanced chemical equation for that reaction **(1 mark)**
9. The pH values of some solutions labeled E to I are given in the table below. Use the information to answer the questions that follow.

pH	14.0	1.0	8.0	6.5	7.0
Solution	E	F	G	H	I

(a) Identify the solution with the highest concentration of hydroxide ions **(1 mark)**

(b). Which solution can be used as a remedy for acid indigestion in the stomach? **(1 mark)**

(c) Which solution would react most vigorously with magnesium metal? **(1 mark)**

10. 120cm^3 of nitrogen gas diffuses through a membrane in forty seconds. How long will it take 240cm^3 of carbon (IV) oxide to diffuse through the same membrane (C=12, N=14, O=16) **(3 marks)**

11. The table below shows the relative atomic masses and the percentage abundance of the isotopes L_1 and L_2 of element L.

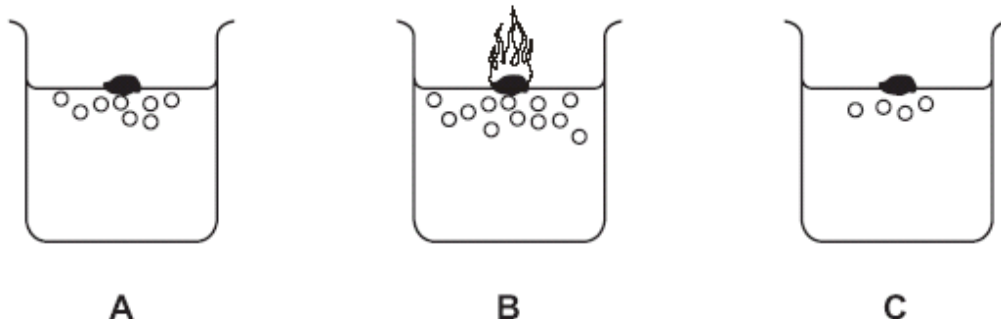
Isotope	Relative atomic mass	% abundance
L_1	62.93	69.09
L_2	64.93	30.91

Calculate the relative atomic mass of element L **(3 marks)**

12. Use the information in the table about group 1 elements to answer the questions that follow

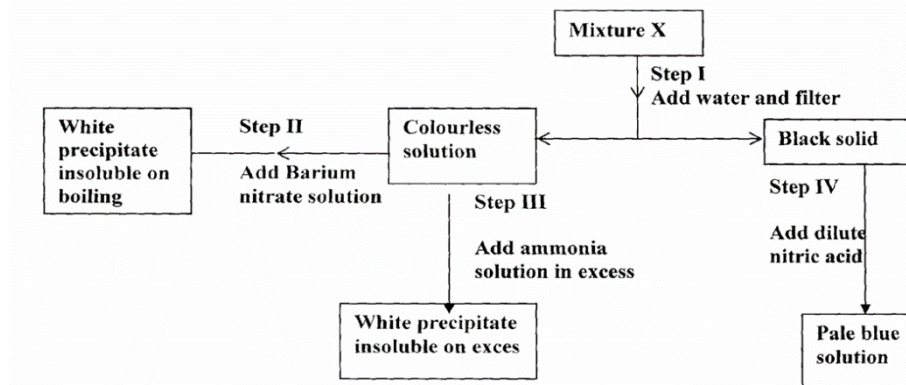
Element	Atomic radius(nm)
Lithium	0.123
Sodium	0.157
Potassium	0.203

When the group 1 elements react with water, hydrogen gas is given off. The diagram shows the reaction of the above three elements with water



- (a) What is the general name of the group one elements (1 mark)
- (b) Which one of these elements A, B or C is Lithium? (1 mark)
- (c) Apart from fizzing describe **two** things that you would see when sodium reacts with water. (2 marks)

13. Study the chart below and answer the questions that follow.



- (a) Name: (1 mark)
- (i) Cations present in mixture X. (1 mark)
- (ii) Anions present in the solution. (1 mark)
- (b) Write an equation to show how the white precipitate in step III dissolves (1 mark)
- (c) Name the process outlined in step IV above. (1 mark)

14. Use the information in the table below to answer the questions that follow

Element	Sodium	Magnesium	Phosphorus	Chlorine
Electric conductivity	Good	Good	Poor	Poor
M.P (°C)	98	660	44/115	-173

- (a) Explain why both Sodium and Magnesium conducts electricity while phosphorus and chlorine do not. (1 mark)
- (b) Suggest a reason why phosphorus has been assigned two melting point values (1 mark)
- (c) Explain why atomic radii of elements in period 3 decreases generally from left to right in the periodic table (1 mark)

15. In an experiment, soap solution was added to three samples of water. The results below shows the volume of soap solution required to lather with 500cm³ of each water sample before and after boiling.

	Sample 1	Sample 2	Sample 3
Volume of soap used before water boiled	26.0	14.0	4.0
Volume of soap after water boiled	26.0	4.0	4.0

(i). Which water samples are likely to be soft (1 mark)

(ii) Explain the change in volume of soap solution used in sample 2 (1 mark)

16. Describe how the following reagents can be used to prepare lead sulphate. Solid potassium sulphate, solid lead carbonate, dilute nitric acid and distilled water. (3 marks)

17. Using dots (.) and crosses(x) to represent -electrons show the bonding between oxygen and carbon to form carbon (ii) oxide. (1 mark)

18. 10g of ethanol (C_2H_5OH) were completely burnt in air. The heat evolved caused the temperature of 400cm^3 of water to change from 20°C to 85°C . Calculate the molar enthalpy of combustion of ethanol.

($H = 1$, $C = 12$, $O = 16$. Specific heat capacity of water = $4.2\text{ Jkg}^{-1}\text{K}^{-1}$) (3 marks)

19. The structures below represent two cleansing agents where R is along hydrocarbon chain. Which of the two cleansing agents is suitable for washing in water containing Calcium ions. Give a reason (2 marks)

20. Give the IUPAC name of the following organic compounds; (2 marks)

a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

b) $\begin{array}{c} \text{CH}_3\text{CHCH}_2\text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$

21. The products formed by action of heat on nitrates of element A, B and C are shown below

Nitrate	Products formed
A	Metal oxide + Nitrogen (IV) Oxide + Oxygen
B	Metal + Oxygen (IV) Oxide
C	Metal nitrate + oxygen

(a) Arrange the metals in order of reactivity

(1 mark)

(b) Which element forms a soluble carbonate

(1 mark)

Give an example of B

(1 mark)

22. Propane C_3H_8 and Carbon(IV)oxide diffuses at the same rate under the same conditions. Explain

(1 mark)

23. Although there are large reserves of iron and aluminium ores in the world, both metals are recycled.

I. State one social benefit of recycling

{1 mark}

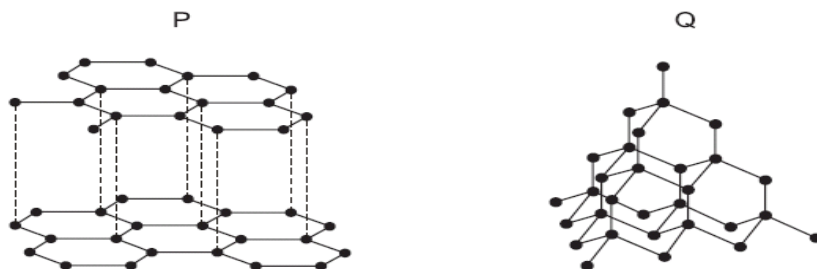
II. Why is it particularly easy to separate iron from other scrap metals?

{1mark}

III. It is cheaper to recycle aluminum than it is to extract the metal from its ore. Give a reason.

{1 mark}

24. The diagrams show the structures of two forms, P and Q, of a solid element.



What are suitable uses of P and Q, based on their structures?

(2 marks)

25. Fertilizers are added to the soil to improve crop yields. A farmer has a choice of two fertilizers, ammonium nitrate NH_4NO_3 or diammonium hydrogen phosphate $(NH_4)_2HPO_4$

(i) Show by calculation which of these fertilizers contains the greater percentage of nitrogen by mass

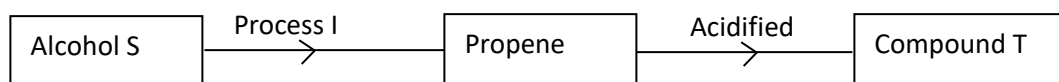
(3 marks)

(N=14, H=1, O=16, P=31)

(ii) State one major problem caused when the nitrates from fertilizers leach from the soil into streams and rivers

(1 mark)

26. Study the flow chart below.



(a). Write the structural formula of alcohol S.

(1 mark)

(b) Name

(i) compound T

(1 mark)

(ii) process I

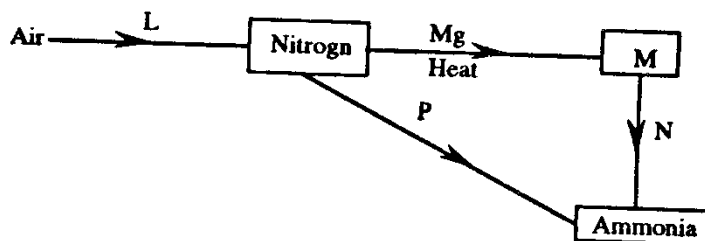
(1 mark)

27. Students are advised to use a non-luminous flame for heating in the laboratory.

(a) How does a Bunsen burner produce a non-luminous flame? (1 mark)

(b) Give one reason why the advice is given to students. (1 mark)

28. Study the diagram below and answer the questions



(i) What is the process involved in step L (1 mark)

(ii) Explain how process N and P can be affected (2marks)

29. In an experiment to determine the solubility of solid Y in water at 30°C the following results were obtained.

Mass of empty evaporating dish = 26.2g

Mass of evaporating dish + saturated solution = 42.4g

Mass of evaporating dish + dry solid = 30.4g

Use the data to calculate the solubility of Y at 30°C grams of Y per 100g water.

(3 marks)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 7 PAPER 2

TIME: 2 HOURS

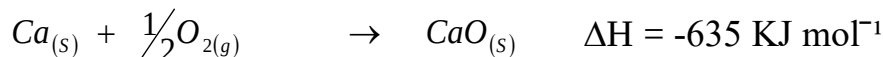
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DATE.....

QUESTIONS

1. (a) Use the information below to answer the questions that follow.



Calculate the enthalpy change for the reaction.



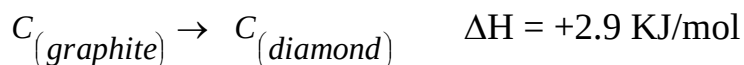
(b) State **one** factor that should be considered when choosing a fuel for cooking. (1 mark)

(c) The following data was obtained during an experiment to determine the molar heat of combustion of ethanol.

Volume of water used	= 500cm ³
Initial temperature of water	= 25°C
Final temperature of water	= 44.5°C
Mass of ethanol + lamp before burning	= 121.5g
Mass of ethanol + lamp after burning	= 120.0g

Calculate the

- (i) Heat evolved during the experiment (density of water = 1g/cm^3 , specific heat capacity of water = $4.2\text{Jg}^{-1}\text{K}^{-1}$). (1 mark)
- (ii) Molar heat of combustion of ethanol (C = 12, O = 16, H = 1). (2 marks)
- (d) Write the thermo equation for the complete combustion of ethanol. (1 mark)
- (e) At 298K and one atmosphere pressure, graphite changes into diamond according to the equation.



In the space provided, sketch a simple energy level diagram for the above change. (2 marks)

- (f). Study the information in the table below then answer the questions that follows.

Bond	Bond energy (kJmol^{-1})
H – H	435
Cl – Cl	243
H – Cl	431

Calculate the enthalpy change for the reaction.



2. (a) At 25°C 50g of substance X were added to 100g of water to make a saturated solution.

What is meant a saturated solution? (1 mark)

- (b) The table **below** gives the solubilities of substance X at different temperatures.

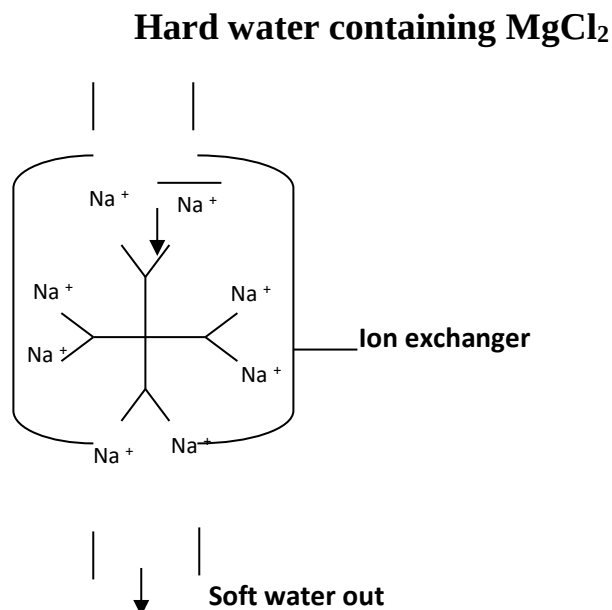
Temperature $^\circ\text{C}$	14	24	33	40	46	52
Solubility g/100g H_2O	24	36	50	62	72	90

- (i). Plot a graph of the solubility of substance X (vertical axis) against temperature. (3 marks)

- (ii) Using the graph.

- I. Determine the solubility of substance X at 20°C . (1 mark)
- II. Determine the mass of substance X that remained undissolved given that 90g of substance X were added to 100cm^3 of water and warmed to 35°C . (2 marks)
- III. Calculate the molarity of the solution at 30°C . (Relative formula mass of X = 122.5). (3 marks)

(c) The figure below shows an ion exchanger used to soften hard water



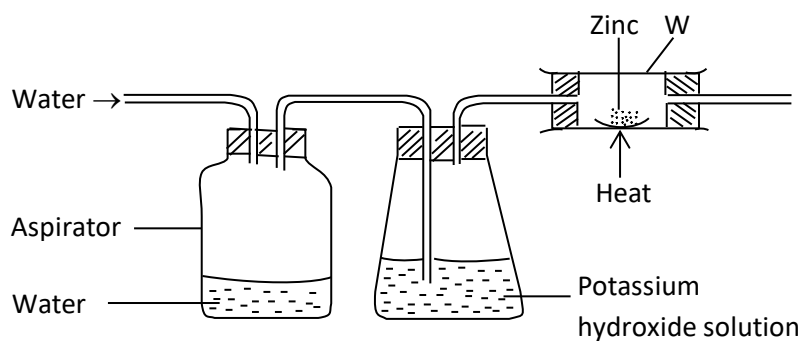
(i) Draw the ion exchanger and show how it will appear at the end of softening process.

(2 marks)

(ii) How is the ion exchanger recharged after exhaustion

(1 mark)

3.(a) Below is an incomplete diagram of a set-up of the apparatus used to obtain nitrogen gas from the air.



(i) Complete the diagram to show how nitrogen gas is collected.

(1 mark)

(ii) State the role of the following:

I Water entering the aspirator.

(1 mark)

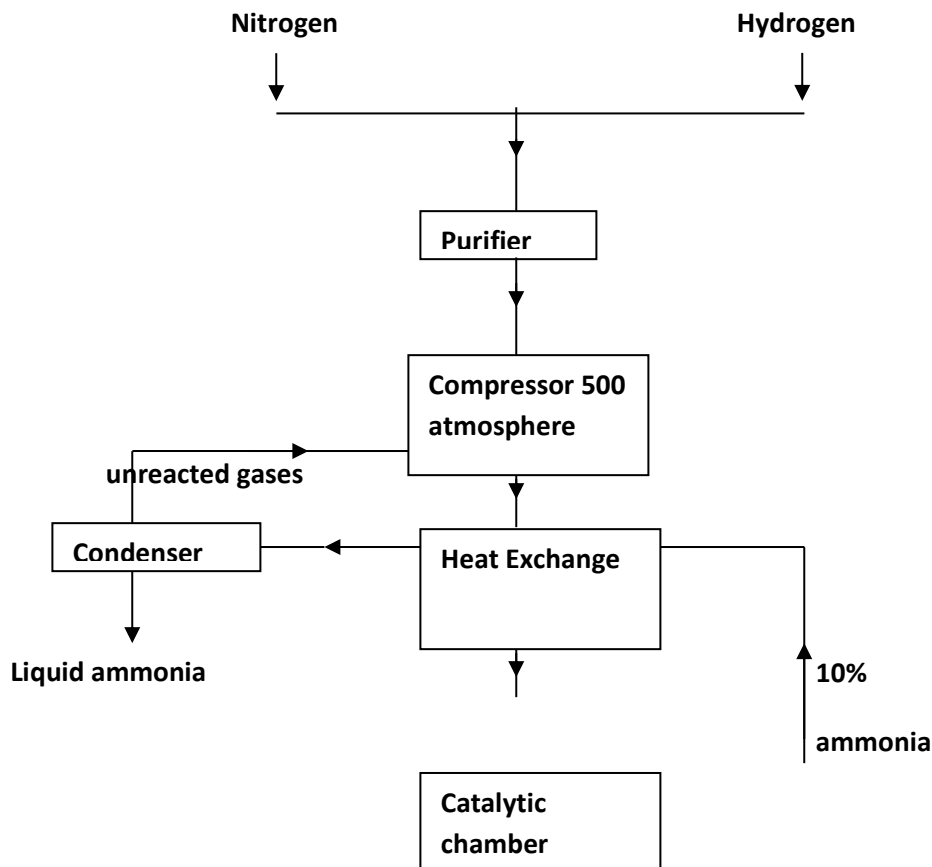
II Potassium hydroxide solution.

(1 mark)

(iii). Write a chemical equation for the reaction that takes place in combustion tube.

(1 mark)

(b).The diagram below represents the Haber's process for the manufacture of ammonia. Study it and answer the questions that follow.



- (i) Name any **two** impurities removed by the purifier. (2 marks)
 (ii) Name the catalyst used in the process (1 mark)
 (iii) In the Haber's process the conversion of nitrogen and hydrogen into ammonia is only 10%.

The remaining unreacted gases are recycled. What is the advantage of recycling.

(1mark)

- iv) A part from the catalyst and pressure of 500 atmospheres, name any other condition required for this process. (1mark)

- (c) Give any **two** uses of ammonia (1 mark)

- d) In the manufacture of nitric (V) Acid from ammonia and air, ammonia is catalytically oxidized to nitrogen (II) oxide

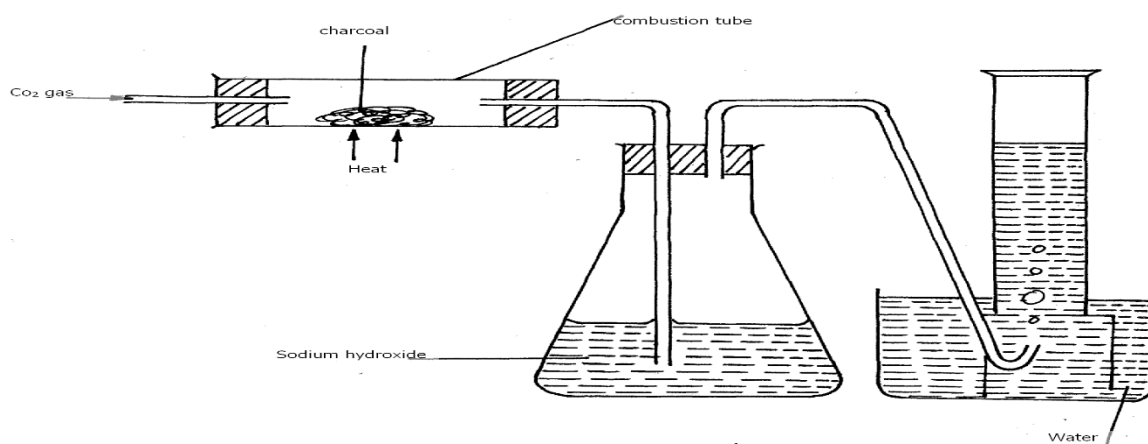
- (i) Name the catalyst used in the reaction. (1mark)

- (ii) Write a balanced chemical equation for the reaction between ammonia and air.

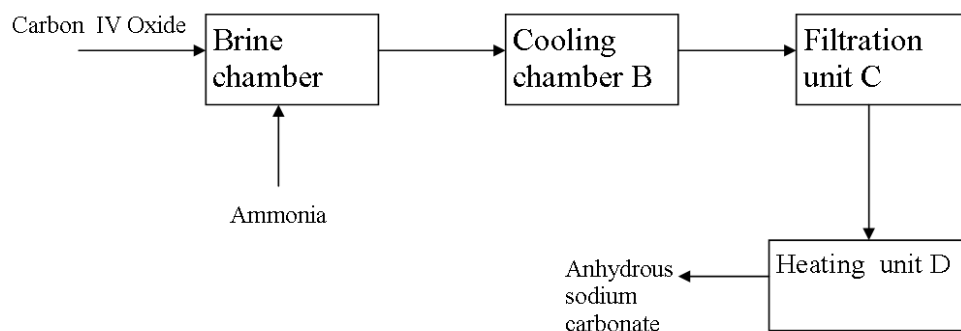
(1mark)

- (iii) State **one** environmental problem likely to be faced in an area where nitric (v) acid manufacturing plant is located. (1 mark)

4. In an experiment, carbon (IV) Oxide gas was passed over heated charcoal and the gas produced collected as shown in the diagram below.

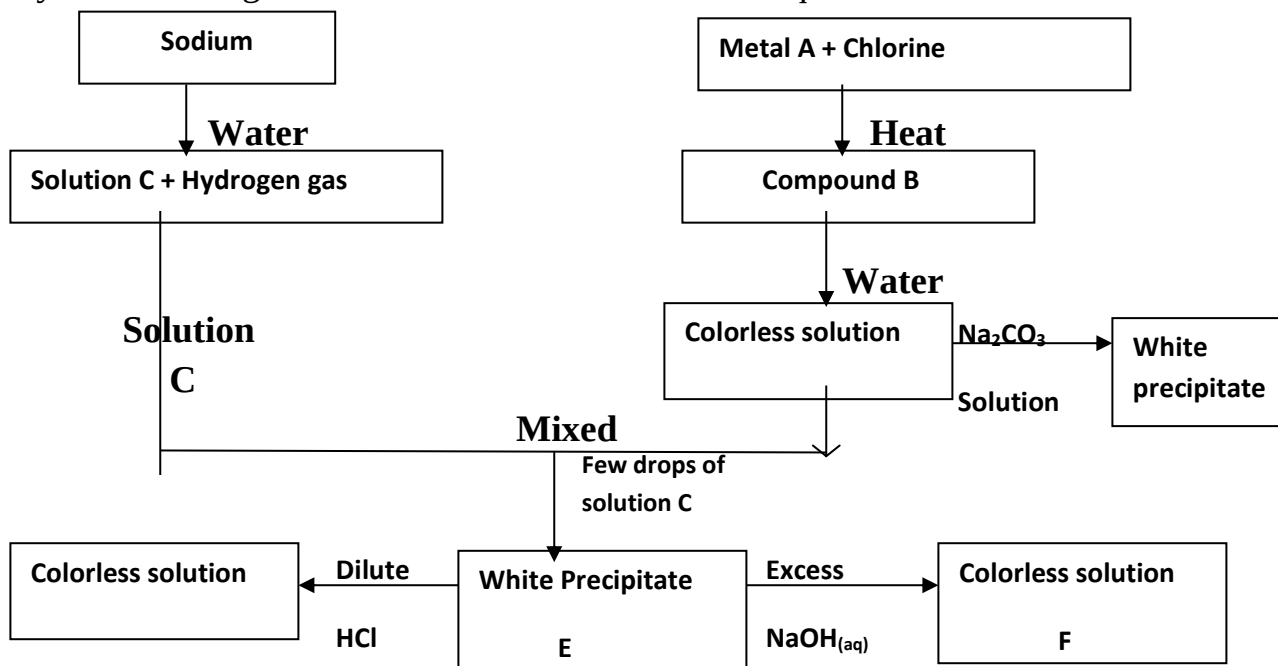


- (i) Write an equation for the reaction that took place in the combustion tube . (1 mark)
 - (ii) Name another chemical substance that can be instead of sodium hydroxide . (1 mark)
 - (iii) Describe a simple chemical test to distinguish between carbon (II) Oxide and carbon (IV) Oxide (2 marks)
 - (iv) What is the purpose of sodium hydroxide in the above set-up (1 mark)
 - (v) What property of the gas makes it possible to be collected as shown above? (1 mark)
 - (vi) State one use of carbon (II) oxide (1 mark)
- (b) In order to prepare sodium carbonate in the laboratory, students passed carbon (IV) oxide and ammonia gas into brine as shown in the flow diagram below. Use it to answer the questions that follow:



- (i) Why is the mixture obtained in chamber A cooled down in chamber B? (1 mark)
- (ii) Write an equation for the reaction that recurs in the heating chamber D (1 mark)
- (iii) Give a reason why it is difficult to prepare potassium carbonate by the same method. (1 mark)

5. Study the flow diagram below and use it to answer the questions that follow.



(a) Give the name and formula of the following.

(i) White precipitate E

Name (1 mark)

Formula (1 mark)

(ii) Colourless solution F

Name (1 mark)

Formula (1 mark)

(b) What property is exhibited by white precipitate E when it reacts with Sodium hydroxide and HCl acid. (1mark)

(c) Write an ionic equation for the reaction between white precipitate E and excess sodium hydroxide solution. (1 mark)

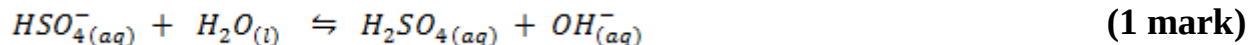
(d) You are provided with.

- Potassium carbonate solid
- Zinc hydroxide
- Nitric (v) acid
- Distilled water

State briefly how you would prepare solid zinc carbonate using the reagents given. (3 marks)

(e) Distinguish between a weak acid and a strong acid giving an example of each. (1 mark)

(f). Identify an acid in the forward reaction given by the equation below:

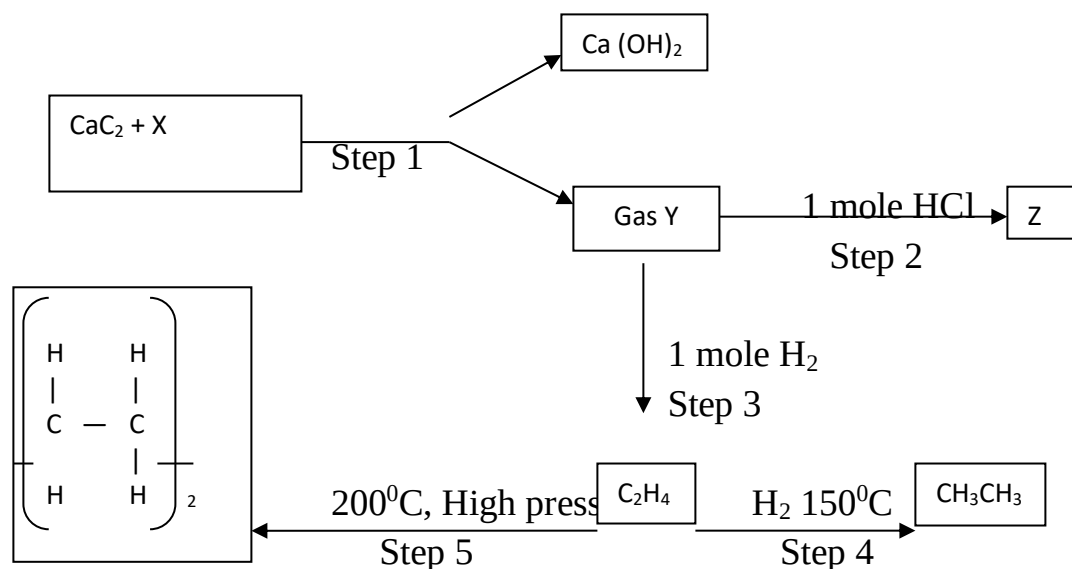


6. The grid below shows part of the periodic table. Use it to answer the questions that follow. The letters do not represent actual symbols.

				S	U	V
P	R			T	X	W
Q						

- (a) Which of the elements has the largest atomic radius? Explain. (2 marks)
- (b) Identify the most reactive non-metal. Explain. (2 marks)
- (c) Compare the atomic radius of P and R. (1 mark)
- (d) Give the formula of one stable ion with an electron arrangement of 2.8 which is:
- (d) Negativity charged divalent ion. (2 marks)
- (e) Positively charged monovalent.
- (e) Given that the mass number of W is 40. Write down the composition of its nucleus. (1 mark)
- (f) Write the formula of the compounds formed between.
- (i) Element R and X. (1 mark)
- (ii) Give **one** property of the structure formed when R and X bond. (1 mark)

7. Study the diagram below and answer the questions that follow.

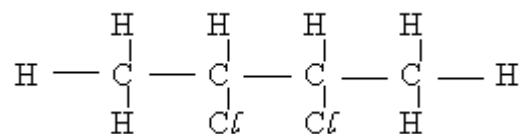


- (i) Identify reagent X. (1 mark)

(ii) Draw the structural formula of gas Y. (1 mark)

(iii) What name is given to the process that takes place in step 5? (1 mark)

(b) An organic compound T reacts with chlorine gas in the presence of u.v light to form compound U. The structural formula of compound U is shown below.



Name the organic compound T and draw its structural formula. (2marks)

(c).The structure below represents two cleansing agents, L₁ and L₂.



(i) Identify each of the two cleansing agents, L₁ and L₂.

L₁ (½mark)

L₂ (½mark)

(ii). State a disadvantage of each of the above cleansing agents.

L₁ (½mark)

L₂ (½mark)

(d) In an experiment an organic compound was reacted with absolute ethanol in the presence of concentrated sulphuric (VI) acid to form a compound whose formula is CH₃CH₂CH₂COOCH₂CH₃. Name

I. The type of reaction that took place. (1 mark)

II. The name of the organic compound to which the compound belonged. (1 mark)

(e) Write the structural formula and give the systematic name of the acid used in the above experiment. (1 mark)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 8 PAPER 1

TIME: 2 HOURS

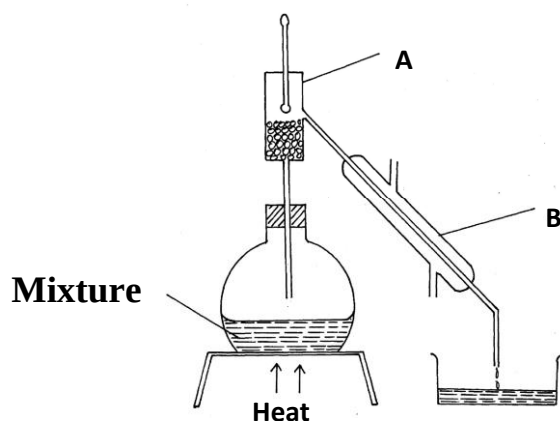
NAME..... INDEX NO.....

SCHOOL..... SIGN.....

DATE.....

QUESTIONS

1. The diagram below shows a set-up of apparatus used to separate immisible liquids.

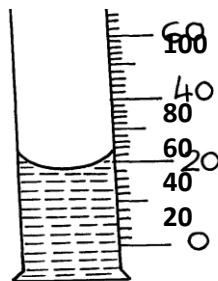


- (a) Name the parts labelled A and B (1mk)
- (b) State the function of the part labeled A. (1mk)
- (c) State the property of the mixture that makes it suitable to be separated by the method above. (1mk)

2. Study the information in the table below and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Atomic Number	Melting point (°C)
L	11	97.8
M	13	660
R	19	63.7

- (i) Write the formulae of carbonate R and M (1mk)
- (ii) Describe how the carbonate of M can be obtained from a mixture of carbonate R and M. (2mks)
- (iii) R is more reactive than L. Explain (1mk)
3. In an Experiment, concentrated sulphuric acid was put in a beaker and exposed to air for one week as shown below.



- (i) What observation was made after one week . Explain. (2mks)
- (ii) What property of sulphuric acid was being investigated in the experiment. (1mk)
4. a) Define the term solubility. (1mk)
- b) A form four student wanted to determine the solubility of potassium nitrate. He obtained the following results.

Mass of evaporating dish = 15.13g

Mass of evaporating dish and solution. = 36.51g

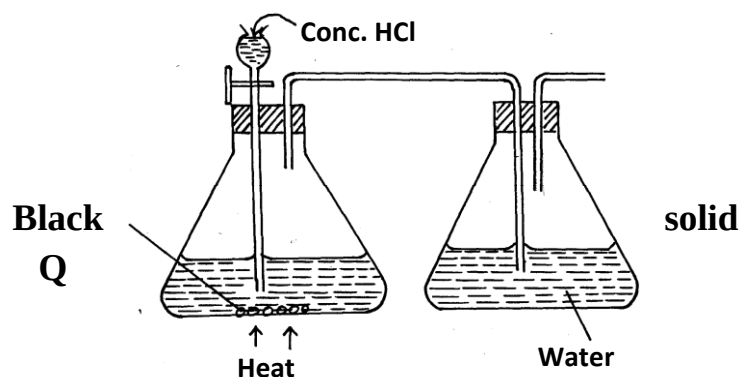
Mass of evaporating dish and salt = 19.41g

Use the information above to calculate the solubility of potassium nitrate. (3mks)

5. The table below shows the standard electrode potentials of two elements P and Q.

Half reactions	E^θ (v)
$P^{2+} (aq) + 2e^- \rightleftharpoons P (s)$	-2.37
$Q^{2+}(aq) + 2e^- \rightleftharpoons Q (s)$	-0.402

- (i) Draw a well labelled diagram of a cell that could be constructed from the pair of elements. **(2mks)**
- (ii) Calculate the e.m.f of the cell above. **(1mk)**
6. The diagram shows an incomplete set-up for the laboratory preparation and collection of chlorine gas. Study it and answer the questions that follow.

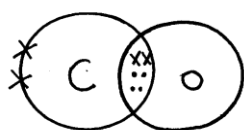


- (a) Complete the set-up to show how dry chlorine gas is collected. **(2mks)**
- (b) Name substance Q. **(1mk)**

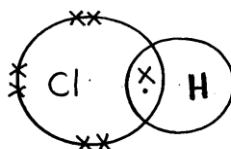
7. If aqueous lead (II) nitrate is added to aqueous solution potassium iodide, a bright yellow precipitate is formed.

- (i) Write down the formula of the precipitate formed. **(1mk)**
- (ii) Write an ionic equation for the reaction above. **(1mk)**
8. Zinc carbonate decomposes on heating producing a gaseous product and a residue. What volume of the gaseous product at s.t.p is produced from 2.5 g of the carbonate? ($Zn = 65, C=12, O=16$ M.G.V at s.t.p = 22400cm^3) **(3mks)**

9. Identify the type of bond formed in (i) and (ii). (2mks)



(I)

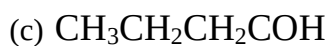


(II)

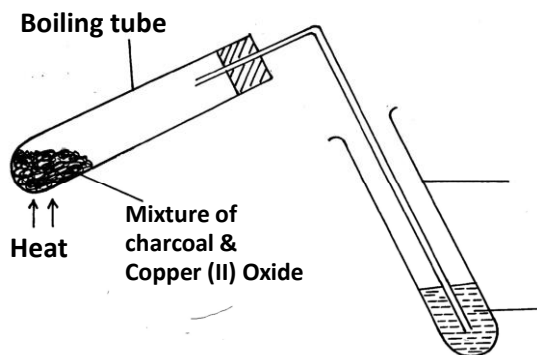
(I).....

(II).....

10. Give the systematic name of the following compounds. (3mks)



11. The set up below was used to investigate a chemical property of carbon. Study it and answer the questions that follow.



Test tube

Lime water

- (i) What observations were made on heating the mixture. (2mks)
- (ii) What is the industrial application of carbon in terms of property investigated above. (1mk)

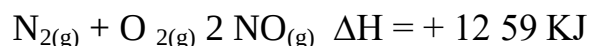
12 In an experiment, a few drops of concentrated nitric (IV) acid were added to aqueous Iron (II) sulphate in a test tube. excess sodium hydroxide solution was then added to the mixture.

(a) State the observations that were made when:

- (i) Concentrated nitric (V) acid was added to aqueous Iron (II) sulphate (1mk)
- (ii) Excess sodium hydroxide was added to the mixture. (1mk)

(b) Write an ionic equation for the reaction that occurred in a(ii) above. (1mk)

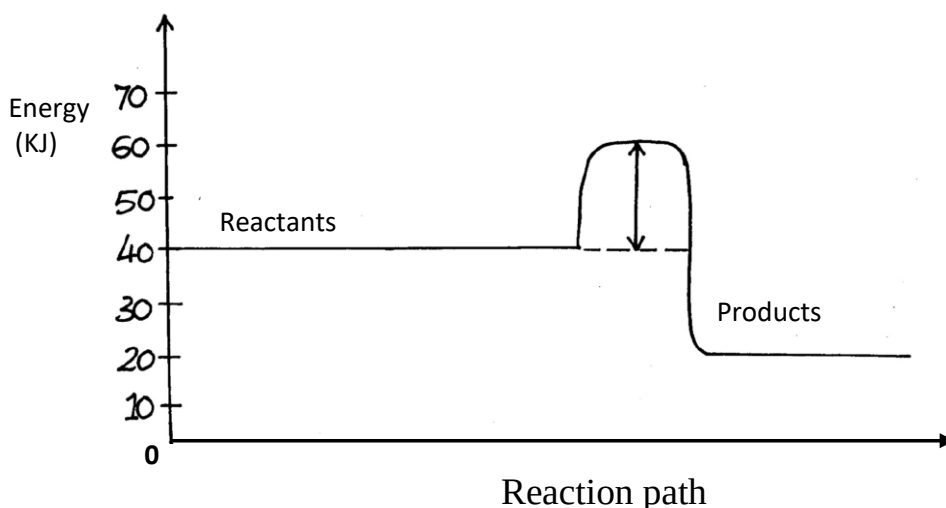
13. Consider the reaction represented by the equation:



Explain the effect of the following on the reaction;

- (a) An increase in pressure (1mk)
- (b) Increase in temperature (2mk)

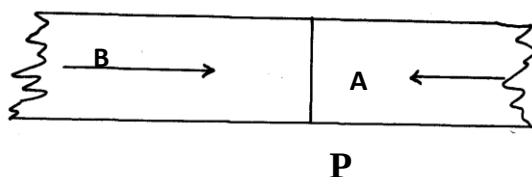
14. Study the energy level below and answer the questions that follow.



- (i) State and explain whether the reaction represented in the diagram is endothermic or exothermic. (1mk)
- (ii) From the diagram, determine;

- I the activation energy (1mk)
 II enthalpy of reaction (1mk)
15. Explain why when heating substances with non-luminous flame, tubes should not be placed very close to the top of the chimney. (2mks)
16. State Graham's law of diffusion. (1mk)

(b) Two gases A and B diffuses from two opposite ends of the glass tube as shown. After 12 seconds gas B was detected at point P and A was detected 4 seconds later



Calculate the relative molecular mass of A given that the relative molecular mass of B is 2. (2mks)

17. Starting with copper metal, describe how a sample of crystals of copper (II) chloride may be prepared in the laboratory. (3mks)

18. Thorium ${}_{90}^{232}\text{Th}$ undergoes two consecutive alpha decays followed by two consecutive beta decays

x

to form the nuclide **Ra**. Identify the values of x and y (3mks)

y

19. Explain why the reaction between 1g of calcium carbonate and 1M hydrochloric acid is faster than the reaction between 1 g of calcium carbonate and 1M butanoic acid. (2mks)
20. A hydrocarbon gas Y in which the percentage of hydrogen by mass is 14.3% occupies a volume of 2.24dm^3 at s.t.p and weighs 7g
- (i) Determine the empirical formula of y. (C= 12,H=10) (1 ½ mks)
- (ii) Give the structural molecular formula of Y. (1 ½ mks)

21. When magnesium was burnt in air, a solid mixture was formed. On addition of water to the mixture a Gas which turned moist red litmus paper blue was evolved. Explain these observations(2mks)
22. In an experiment to prepare nitrogen (I) oxide, ammonium nitrate was gently heated in a flask.
- (a) State and explain how the gas collected. (1mk)
- (b) A sample of the gas was tested with damp blue and red litmus papers. What observations were made? (1mk)
23. Complete the table below. (2mks)

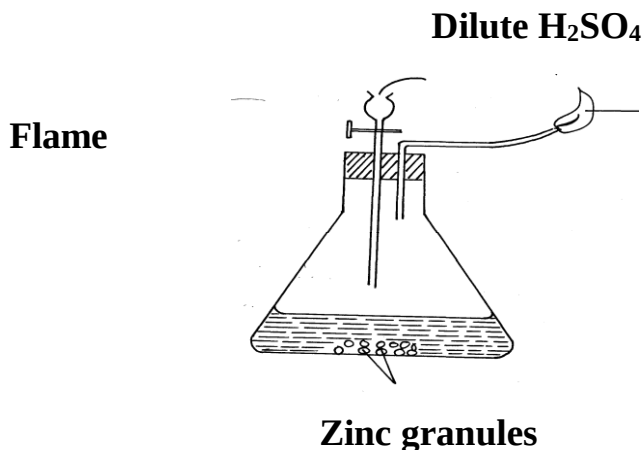
Element	Latin Name	Symbol
_____	Plumbum	_____
Copper	_____	Cu
Potassium	_____	K

24. The grid below is part of the periodic table. Use it to answer the questions that follow. (The letters do not represent the actual symbols of elements.)

						R	S	
N	Q						T	U
P								

- (a) Indicate in the grid the position of an element represented by letter V, whose atomic number is 14. (1mk)
- (b) Select a letter which represents a monoatomic gas. (1mk)
- (c) write an equation for the reaction between Q and T (1mk)

25. In an Experiment, dilute hydrochloric acid was added to sodium hydroxide solution drop – wise. The concentration of sodium hydroxide was noted at regular time intervals.
- (i) Sketch a graph of concentration (y-axis) against time interval to show how the concentration of sodium hydroxide changes. **(2mks)**
- (ii) Explain the shape of the curve sketched above. **(1mk)**
26. A compound whose general formula is $M(OH)_3$ reacts as shown by the equations below.
- $$M(OH)_3(s) + OH^-(aq) \longrightarrow M(OH)_4^-(aq)$$
- $$M(OH)_3(s) + 3H^+(aq) \longrightarrow M^{3+}(aq) + 3H_2O(l)$$
- (i) what name is given to the compounds which behave like $M(OH)_3$ in the two reactions above? **(1mk)**
- (ii) name two elements whose hydroxides behave like that of M. **(1mk)**
27. Below is a set-up of apparatus used to prepare hydrogen gas in the laboratory study it and answer the questions that follow.



- (a) Write the chemical equation for the two reactions taking place in the above set up. **(2 mks)**
- (b) State the chemical test for hydrogen gas. **(1mk)**
28. Draw a well labelled diagram to illustrate how copper metal is purified. **(3mks)**
29. (a) What are alkali metals. **(1mk)**
- (b) Explain why potassium atom is larger than a Sodium atom. **(1mk)**

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 8 PAPER 2

TIME: 2 HOURS

NAME..... INDEX NO.....

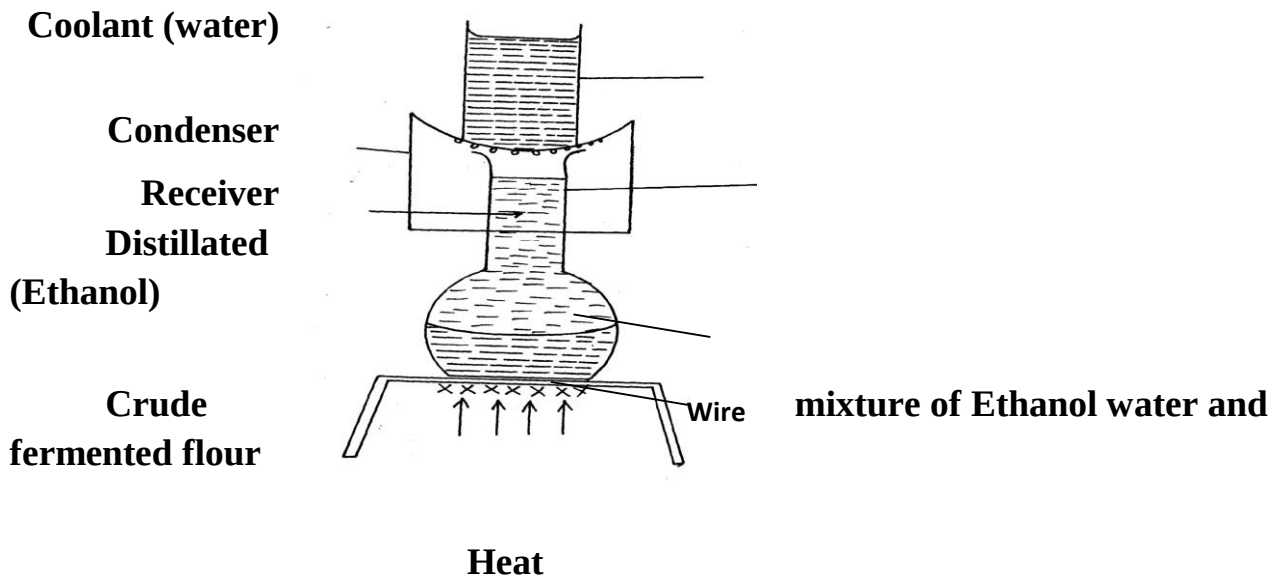
SCHOOL..... SIGN.....

DATE.....

QUESTIONS

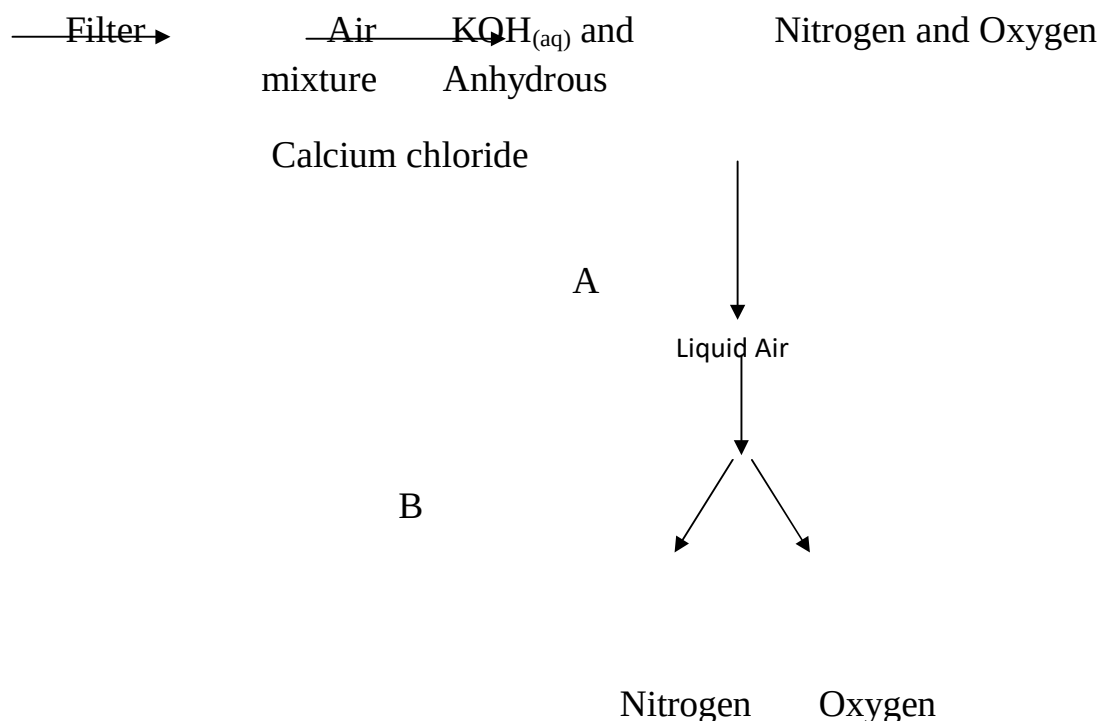
1. (a) What is a saturated solution? (1mk)

(b) The diagram below represents an arrangement for a large scale manufacture of ethanol for domestic consumption.



(i) Name the process by which ethanol is obtained from the crude oil. (1mk)

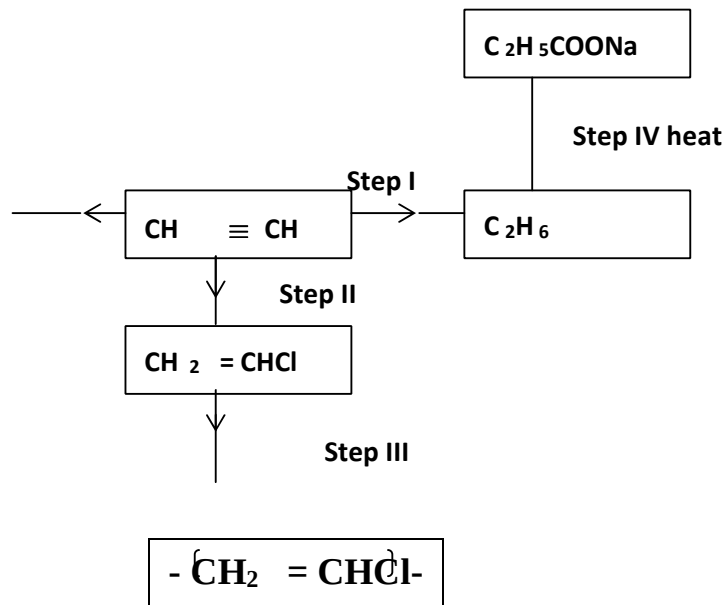
- (ii) Suggest **two** reasons why water is a coolant in this process. (2mks)
- (iii) Why is it possible to separate ethanol from the mixture by this process. (1mk)
- (c) (i) Describe how the mixture of Ammonium chloride, sodium chloride and lead II chloride can be separated if all the components of the mixture are to be recovered. (3mks)
- (ii) The following process shows how Nitrogen and Oxygen can be obtained from air.



- I. Name the processes
- A (1mk)
- B (1mk)
- II. What is the purpose of
- Potassium hydroxide solution $\text{KOH}_{(aq)}$ in the process. (1mk)
- Anhydrous Calcium Chloride solid. (1mk)
2. (a) Give the names of the following compounds.
- (i) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ (1mk)
- (ii) $\text{CH}_3\text{CH}_2\text{COOH}$ (1mk)
- (b) Study the information in the table below and answer the questions that follow.

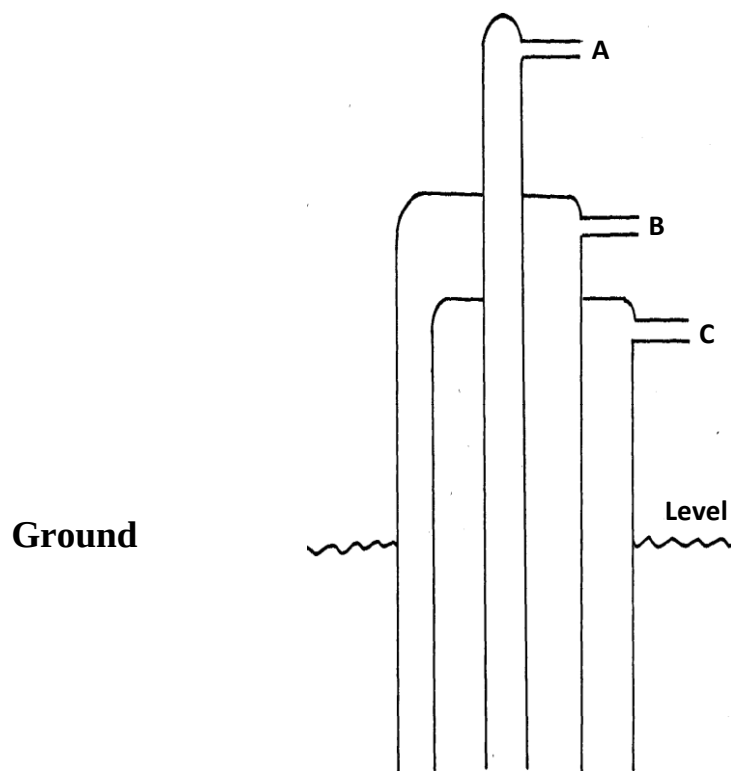
No. of carbon atoms per molecule	Relative molecular mass of hydrogen
2	28
3	42
4	56

- (i) Write the general formula of the hydrocarbons in the table. (1mk)
- (ii) Predict the relative molecular mass of the hydrocarbon with 5 carbon atoms. (1mk)
- (iii) Determine the molecular formula of the hydrocarbon in (ii) and draw its structural formula. (2mks)
- (c) Study the scheme given below and answer questions that follow.



- (i) Name the reagent used in
- Step I..... (1mk)
- Step II..... (1mk)
- Step III (1mk)
- (ii) Write an equation for complete combustion of $\text{CH}\equiv\text{CH}$. (1mk)
- (iii) Explain **one** disadvantage of the continued use of items in step III. (1mk)

3. (a) The diagram below represents the extraction of sulphur by the frasch process.



(i) Identify and state the use of the substances that pass through tubes A and C. (2mks)

A.....

C.....

(ii) Rhombic and monoclinic are Allotropes of sulphur. They are inter convertible as shown below.

96 C

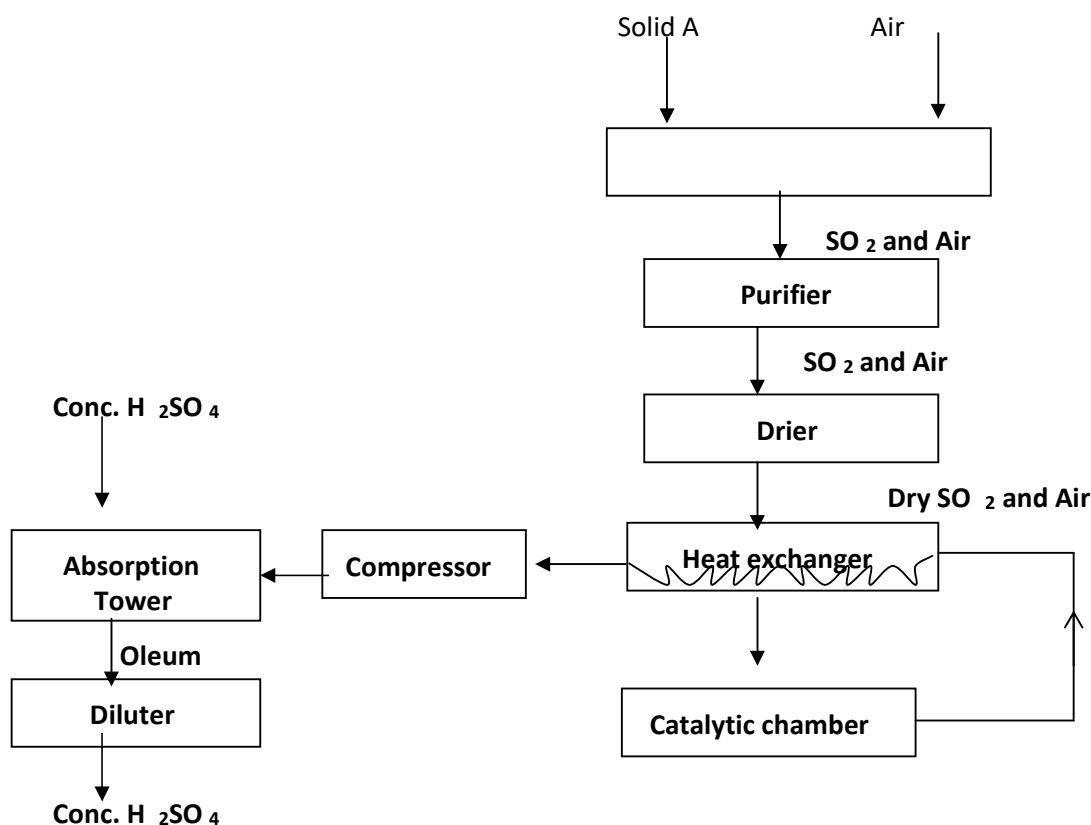
Rhombic

Monoclinic

I. What does the temperature 96°C represent. (1mk)

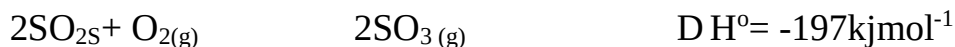
II. State the differences in crystalline appearances between rhombic and monoclinic crystals. (1mk)

(b) The following scheme represents the steps followed in the contact process, study it and answer the questions which follow.



- (i) Name **three** possible identities of solid A. (1mk)
- (ii) Name **two** impurities removed by the purifier. (1mk)
- (iii) Why is it necessary to remove impurities. (1mk)

(c) The following chemical equation shows a reaction taking place in the catalytic chamber/convertor.



- (i) How would the following factors affect the production of sulphur (IV) oxide.
- I Increase in temperature. (1mk)
- II Decrease in pressure (1mk)
- (ii) Name the catalyst which is commonly used in this process and why? (1mk)
- (iii) State and explain one environmental effect of sulphur (IV) oxide in the atmosphere. (2mks)

4. The grid below represents part of the periodic table. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

A								K
B	D				G		I	
				F		H		L
C	E						J	

(a) (i) Which letter represents an element that is least reactive. **(1mk)**

(ii) Why are elements D and E referred to as alkali earth metals. **(1mk)**

(b) How does the atomic radius of F and H compare? **(2mks)**

(c) Select **two** letters representing a pair of elements that would react most explosively. **(2mks)**

(d) Write an equation showing how D forms its ions. **(1mk)**

(e) Write the formulae of

(i) Bromide of D **½ mk)**

(ii) Sulphate of C **½ mk)**

(f) What type of bonding exists between

(i) E and I **(½ mk)**

(ii) G and J **(½ mk)**

(g) Explain why the melting point of J is higher than that of I. **(1mk)**

(h) The 1st, 2nd and 3rd ionization energies in KJ/mol of element B and C are given below.

Element	1 st I.E	2 nd I.E	3 rd I.E
B	520	7,300	9,500
C	420	3,100	4,800

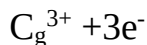
(i) What is the 1st ionization energy. **(1mk)**

(ii) Apart from the decrease in energy levels, explain the difference between 1st and 2nd

Ionization energies.

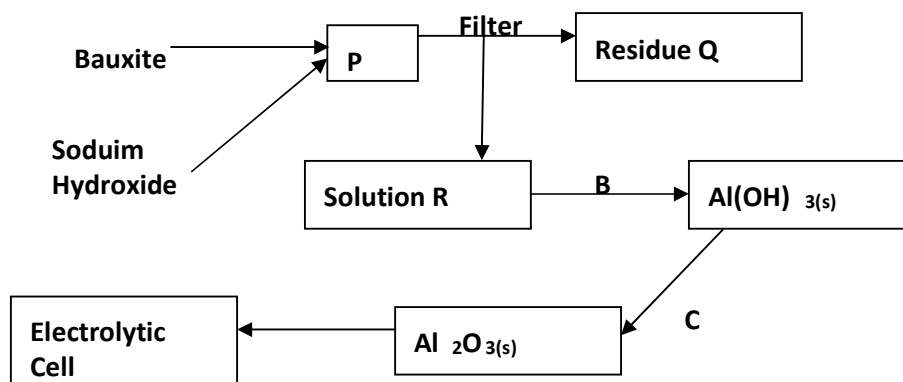
(1mk)

(iii) Calculate the amount of energy in KJ/mol for the process.



(1mk)

5. The flow chart below illustrates the major steps in extraction of aluminium from bauxite.



(a) (i) Give the chemical formula of bauxite.

(1mk)

(ii) Write the equation for the reaction in chamber P.

(1mk)

(iii) Write the formula of the main impurity in chamber Q.

(1mk)

(iv) (Name and explain the process that takes place at B.

(2mks)

(b) state the role of cryolite(Na_2AlF_6) in the extraction of alluminium

(2mrks)

(c) Write an equation for the reaction taking place at :

i) Anode

(1mrk)

ii) Cathode

(1mrk)

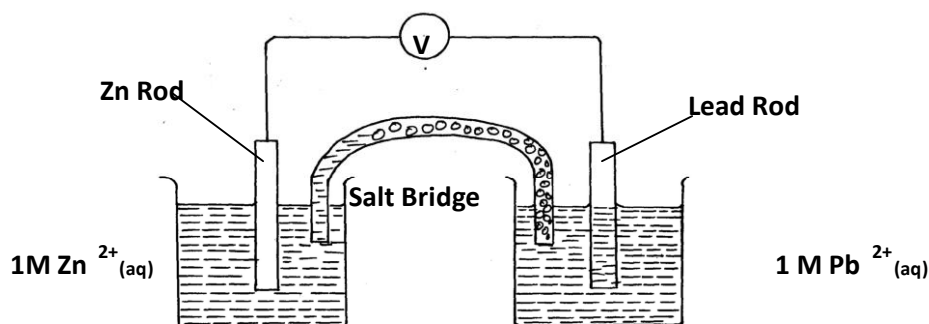
(d) Give two properties which make alluminium and its alloys suitable for making aircraft bodies.

(2mrks)

6. Use the standard electrode potentials given below to answer the questions that follow:

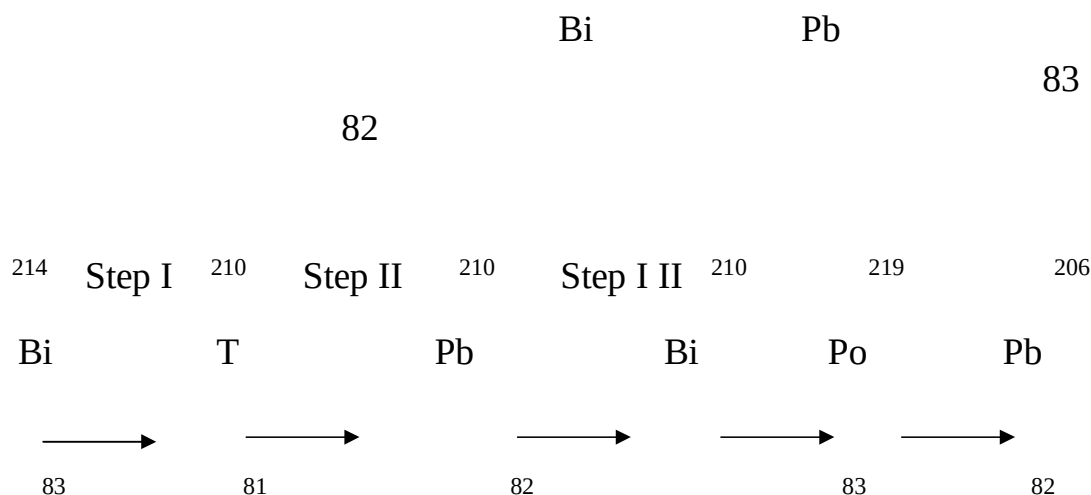
+	-	$E^\theta V$
$Ag_{(aq)} + e^-$	$\longrightarrow$	$Ag_{(s)} + 0.80$
$Cu^{2+}_{(aq)} + 2e^-$	$\longrightarrow$	$Cu_{(s)} + 0.34$
$Pb^{2+}_{(aq)} + 2e^-$	$\longrightarrow$	$Pb_{(s)} - 0.13$
$Zn^{2+}_{(aq)} + 2e^-$	$\longrightarrow$	$Zn_{(s)} - 0.76$

- (a) Select **two** half-cells which when combined give the lowest workable cell.(lowest e.m.f) **(1mk)**
- (b) Calculate the e.m.f of the cell formed by combining the two half-cells in (a) above. **(1mk)**
- (c) (i) Select the strongest oxidizing agent. **(½ mk)**
 (ii) Strongest reducing agent. **(½ mk)**
- (d) A cell was set up using lead and zinc electrodes as shown below.



- (i) Write the half equation for the half-cell in which oxidation occurs. **(1mk)**
 (ii) Write the overall cell equation. **(1mk)**
 (iii) What is the role of the salt bridge. **(2mks)**
- (e) An iron cup was electroplated using chromium. The chromium electrode and the iron cup was thoroughly cleaned and weighed before being dipped into the electrolyte.
- (i) Why was it necessary to clean the metals before dipping them into the electrolyte. **(1mk)**
- (ii) A current of 0.75 A was passed through the solution for one hour and four minutes. The mass of chromium deposited on the cup was 0.52g (1Faraday=96500C) Cr=52
- I. Calculate the quantity of electricity. **(1mk)**
- II. How many mole of chromium were deposited. **(1mk)**
- III. Calculate the quantity of electricity to deposit one mole of chromium. **(1mk)**
- IV. Calculate the number of Faradays required to deposit one mole of chromium and hence deduce the charge of ion. **(2mks)**

- (ii) Below is a radioactive decay series starting from ^{214} and ending at ^{206}



I. Identify the particles emitted in Steps I and II.

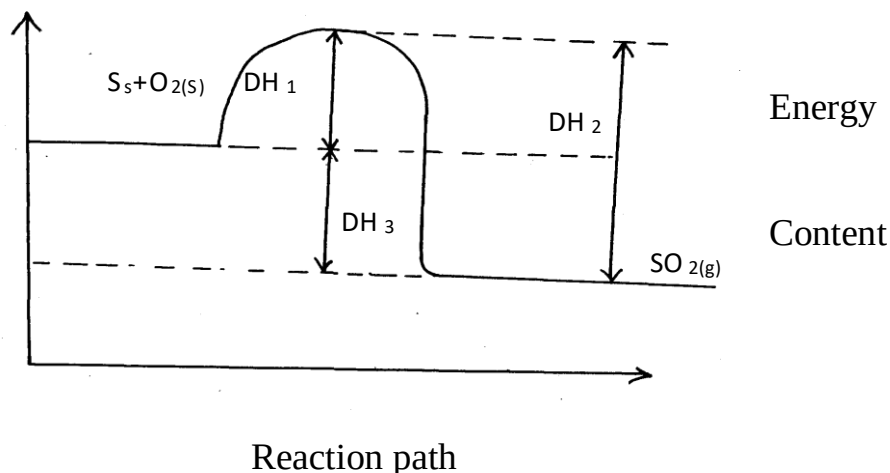
Step I

Step II

II. Write the nuclear equation which takes place in step V.

(1mk)

(c) (i) Sulphur burns in air to form sulphur IV oxide. A simple energy level diagram for the reaction is given below. Study it and answer the questions that follow.



(i) What do the following represent

DH_1 (1mk)

DH_3 (1mk)

(ii) Write an expression for DH_3 in terms of DH_1 and DH_2 . (1mk)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 9 PAPER 1

TIME: 2 HOURS

NAME..... INDEX NO.....

SCHOOL..... SIGN.....

DATE.....

QUESTIONS

- 1) The atomic number of sulphur is 16. Write the electron arrangement of sulphur in the following: (2 Marks)

a. H_2S ;

b. SO_3^{2-} ;

- 2) State **one** use of sodium hydrogen carbonate. (1 Mark)

- 3) Calcium oxide can be used to dry ammonia gas.

Explain why calcium oxide is not used to dry hydrogen chloride gas. (2 Marks)

Name **one** drying agent for hydrogen chloride gas. (1 Mark)

- 4) Using dots (·) and crosses (x) to represent electrons, show bonding in the compounds formed when the following elements react: (Si=14, Na=11, Cl=17).

Sodium and chlorine. (1 Mark)

Silicon and chlorine. (1 Mark)

- 5) Zinc oxide reacts with acids and alkalis.

a. Write the equation for the reaction between zinc oxide and:

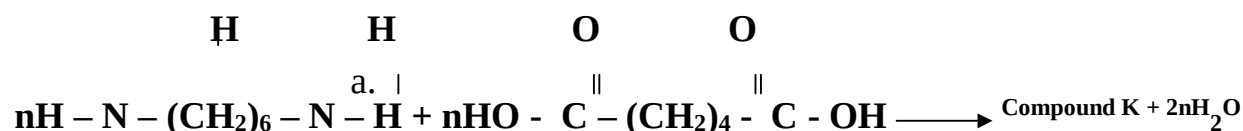
Dilute sulphuric acid. (1 Mark)

Sodium hydroxide solution. (1 Mark)

- b. What property of zinc is shown by the reactions in (a) above? (1 Mark)
- 6) Determine the oxidation state of sulphur in the following compounds. (2 Marks)
- H_2S
- $\text{Na}_2\text{S}_2\text{O}_3$
- 7) A certain carbonate XCO_3 , reacts with dilute hydrochloric acid according to the equation given below:
- $$\text{XCO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \longrightarrow \text{XCl}_2(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$$
- If 4g of the carbonate reacts completely with 40cm^3 of 2M hydrochloric acid, calculate the relative atomic mass of X. (C=12.0, O=16.0, Cl=35.5). (3 Marks)
- 8) (a) Distinguish between a deliquescent and a inflorescent substance. (2 Marks)
- (b) Give **one** use of hygroscopic substances in the laboratory. (1 Mark)
- 9) (a) What is meant by the terms: (2 Marks)
- a. Isotopes
- b. Mass number
- 10) The formulae for a chloride of phosphorus is PCl_3 . What is the formula of its sulphide? (1 Mark)
- 11) What is the name given to each of the following:
- Ability of a metal to be made into a sheet; (1 Mark)
- Minimum energy required for a chemical reaction to start; (1 Mark)
- Type of force that holds molecules of argon together? (1 Mark)
- a.
- 12) Draw the structures and give the names of three alkanes having molecular formula of C_6H_{12} . (3 Marks)
- 13) A beaker contained 95.0cm^3 of aqueous copper (ii) sulphate at 43.7°C . When a scrap iron metal was added to the solution, the temperature rose to 49.6°C .
- Write an ionic equation for the reaction that took place. (1 Mark)
- a. Given that the mass of copper deposited was 5.83g, calculate the molar enthalpy change in
- b. KJmole^{-1} . (Specific heat capacity of solution = $4.2\text{Jg}^{-1}\text{k}^{-1}$, density of solution = 1.0gcm^{-3} ,
- c. Cu=63.5). (2 Marks)

- 14) a) Draw the structure of compound K formed in the following reaction.

(1 Mark)



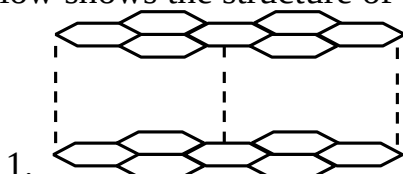
- b) Give **one** use of compound K.

(1 Mark)

- 15) a) What is meant by allotropy?

(1 Mark)

The diagram below shows the structure of one allotropes of carbon.



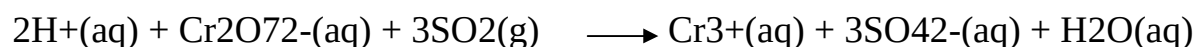
- b. Identify the allotrope

(½ Mark)

- c. State **one** property of the above allotrope and explain how it is related to its structure. (1½Mark)

- 16) Pentane and ethanol are miscible. Describe how water can be used to separate a mixture of pentane and ethanol. (3 Marks)

- 17) In the redox reaction below:



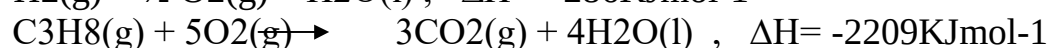
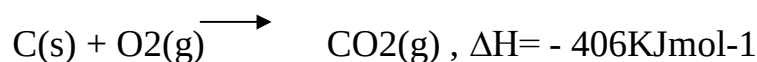
Identify the reducing agent, explain your answer.

(2 Marks)

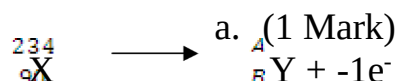
- 18) 60cm³ of oxygen gas diffused through a porous hole in 50seconds. How long will it take 80cm³ of sulphur(iv)oxide to diffuse through the same hole under the same conditions (S=32.0 , O=16). (3 Marks)

- 19) Calculate the heat of formation of propane from the following data.

(2 Marks)



- 20) a) Find the value of A and B in the following equation.

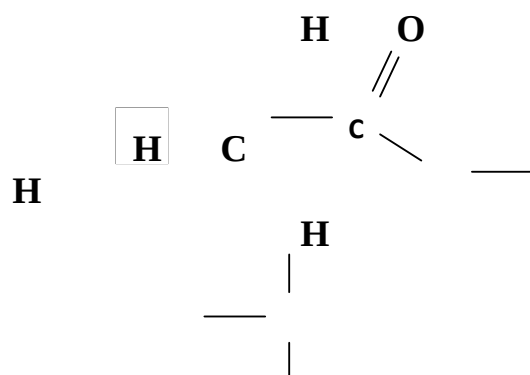


a. (1 Mark)

- 21) A certain radioactive element has a half-life of 6000 years. How long did it take to decay until only 25% of the original amount remained? (2 Marks)

- 22) a) Differentiate between thermosoftening and thermosetting plastics. (1 Mark)

- 23) In the test for the chloride was in solution, a littler nitric acid is added followed by silver nitrate solution. Why is nitric acid added? **(1 Mark)**
- 24) The structure of ethanoic acid is:



What is the total number of electrons used for bonding in a molecule of ethanoic acid? Give reasons. (2 Marks)

When a few drops of aqueous ammonia were added to copper(ii) nitrate solution, light blue precipitate was formed. On addition of more aqueous ammonia, a deep blue solution was formed.

Identify the substance responsible for the:

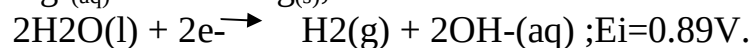
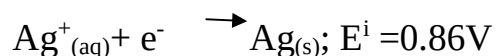
Light blue precipitate

(1 Mark)

Deep blue solution

(1 Mark)

- 25) When a current of 0.82A was passed for 5 hours through an aqueous solution of metal Z, 2.65g of the metal was deposited. Determine the charge on the ions of metal Z. (1 faraday=96500coulombs; relative atomic mass of Z=52). **(3 Marks)**
- 26) The standard reduction potentials of two half cells are:



Calculate the e.m.f of the cell formed by the above two half-cells **(1 Mark)**

- a. Draw a labelled diagram of an electrochemical cell that can be constructed using the two half-cells. **(3 Marks)**

- 27) The ionisation energies for three elements X,Y, and Z are shown in the table below:

Element	X	Y	Z
Ionisation energy (KJ/mole)	419	318	394

- a. What is meant by ionisation energy? (1 Mark)
- b. Which element is the strongest reducing agent? Give a reason. (2 Marks)

28) a) What condition is necessary for an equilibrium to be established? **(1 Mark)**

When calcium carbonate is heated, the equilibrium shown below is established

- a. $\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$
- b. How would the position of the equilibrium be affected if a small amount of dilute potassium hydroxide is added to the equilibrium mixture? Explain. **(2 Marks)**

29) Some animal and vegetable oils are used to make margarine and soap. Give reagents and conditions necessary for converting oils into:

- a. Margarine **(2 Marks)**
- b. Soap **(1 Mark)**

30) Classify the following processes as either chemical or physical. **(3 Marks)**

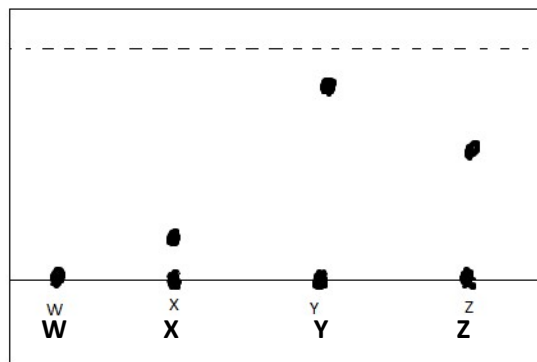
Process	Type of change
(a) Souring of milk	
Obtaining butane from crude oil	
Heating copper(ii)sulphate crystals	

31) A sample of fertiliser is suspected to be calcium ammonium nitrate. Describe chemical tests for each of the following ions in the sample.

- a. Calcium ions **(2 Marks)**
- b. Ammonium ions **(1 Mark)**

State the **two** ions that cause hardness in water. **(1 Mark)**

32) The diagram below represents an incomplete paper chromatogram of pure dyes X, Y, Z and mixture W.



Mixture

W contains dyes Y and Z only.

Complete the chromatogram to show how mixture W separates.

(2 Marks)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 9 PAPER 2

TIME: 2 HOURS

NAME..... INDEX NO.....

SCHOOL..... SIGN.....

DATE.....

QUESTIONS

1. The table below gives information on four elements by letters A, B, C and D. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Electronic arrangement	Atomic radius (nm)	Ionic radius (nm)
A	2.8.2	0.136	0.065
B	2.8.7	0.099	0.181
C	2.8.8.1	0.203	0.133
D	2.8.8.2	0.174	0.099

- (a) Which **two** elements have two similar chemical properties? Explain. (2 Marks)
- (b) What is the most likely formula of the oxide of B? (½ Mark)
- (c) Which element is a non-metal? (1 Mark)
- (d) Which one of the elements is the strongest.
- (i) Reducing agent? (1 Mark)
- (ii) Oxidising agent? (1 Mark)
- (e) Explain why ionic radius of D is less than that of C. (1 Mark)
- (f) Explain why the ionic radius of B is bigger than its atomic radius. (1 Mark)

(g) Give the chemical family to which the element.

(i) A and D belong

(½ Mark)

(ii) B belong

(½ Mark)

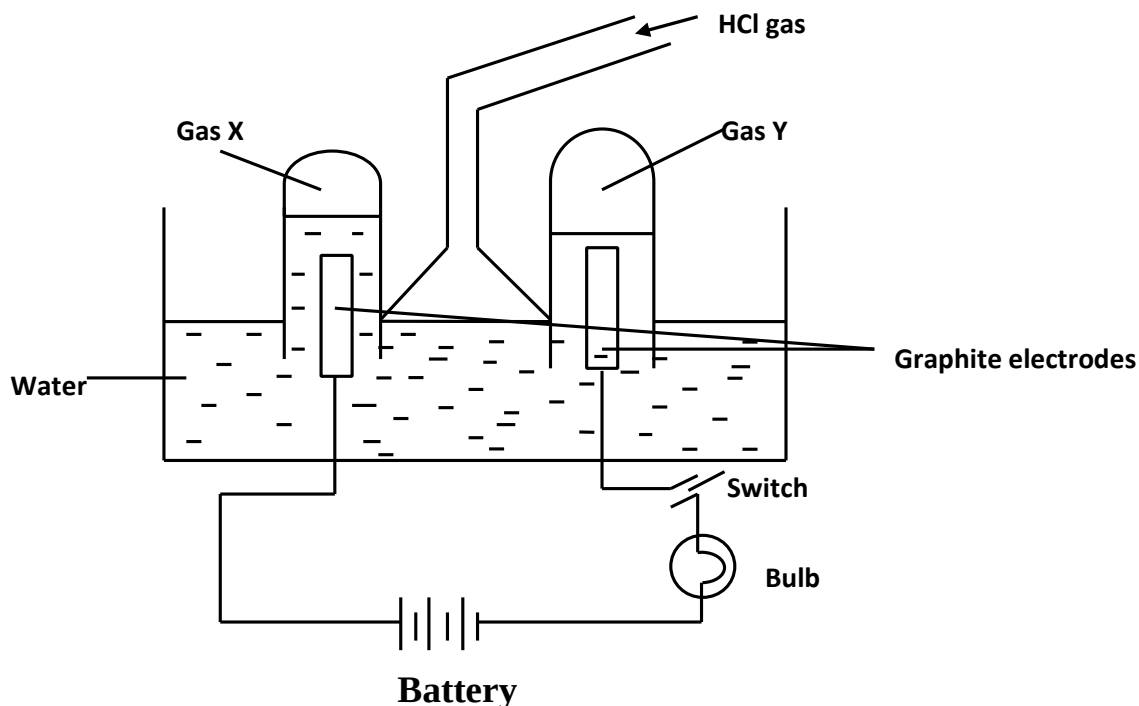
(iii) C belong

(½ Mark)

(h) State any **two** uses of element B.

(1 Mark)

2. Study the diagram below and answer the questions that follow.



When some hydrogen gas is allowed into the water and the mixture stirred the bulb lights up and gases X and Y are formed.

(a) Name gas X..... (½ Mark)

(b) gas Y.....(½ Mark)

(c) Write the chemical equations of how each of the gases is formed.

Gas X

(1 Mark)

Gas Y

(1 Mark)

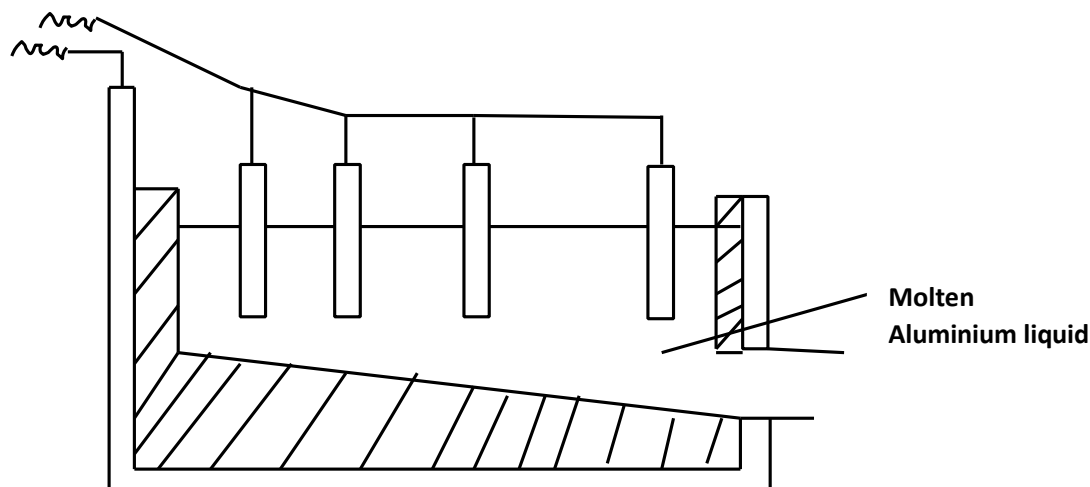
(d) State any **two** uses of gas X.

(1 Mark)

(e) Explain why the bulb does not light before the hydrogen chloride gas is let into water. (1 Mark)

(f) Explain using equations why the volume of gas X is less than that of gas Y. (2 Marks)

3. The extraction of aluminium from its ore takes place in two stages, purification stage and electrolysis stage. The diagram below shows the set up for the electrolysis stage.



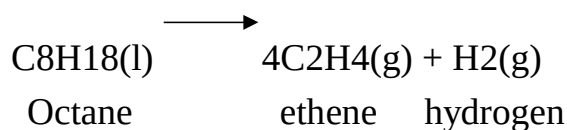
- (a) Name the ore from which aluminium is extracted. (½ Mark)
- (b) Name **one** impurity which is removed at purification stage. (½ Mark)
- (c) Label on the diagram each of the following:
- Anode (½ Mark)
- Cathode (½ Mark)
- Region containing the electrolyte (½ Mark)
- (d) The melting point of aluminium oxide is 2054°C but electrolysis is done between 800°C - 900°C .
- (i) Why is the electrolysis not carried out at 2054°C .? (1 Mark)
- (ii) What is done to lower the temperature of the electrolysis cell to 800°C - 900°C ? (1 Mark)
- (iii) The aluminium which is produced is tapped off as liquid. What does this imply about its melting point? (1 Mark)
- (e) A typical electrolysis cell uses a current of 40000 amperes. Calculate the mass (in kilograms) of aluminium produced in one hour. (2 Marks)

4. The table below gives the volume of the gas provided when different volumes of 2M hydrochloric acid were reacted with 0.6g of magnesium powder at room temperature.

Volume of 2M hydrochloric acid (cm^3)	Volume of gas (cm^3)
0	0
10	240
20	480
30	600
40	600
50	600

- (a) Write an equation for the reaction between magnesium and hydrochloric acid, (1 Mark)
- (b) On the grid provided, plot a graph of the volume of gas produced (vertical axis) against the volume of acid added (note the reaction comes to completion, the volume of the gas produced directly proportional to the volume of the acid added). (3 Marks)
- (c) From the graph determine:
- (i) The volume of the gas produced if 12.5cm^3 of 2M hydrochloric acid had been used. (1 Mark)
 - (ii) The volume of 2M hydrochloric acid which when reacted completely with 0.6g of magnesium powder. (1 Mark)
- (d) On the same graph paper sketch the curve of the reaction when reacted with,
- (i) 0.6 g of magnesium ribbon were used instead of magnesium powder with 2M hydrochloric acid. (1 Mark)
 - (ii) 3M hydrochloric acid was used instead of 2M hydrochloric acid. (1 Mk)
 - (iii) 0.6g of magnesium powder were used with 2M hydrochloric acid at a lower temperature than the original temperature of the 2M hydrochloric acid in the first case (1 Mark)
- (e) Given that one mole of the gas occupied 24000cm^3 at room temperature, calculate the relative atomic mass of magnesium. (2 Marks)
- (f) State and explain the effect on the rate of bubbling of the gas if :
- (i) 0.6g of Magnesium ribbon was used instead of magnesium powder. (1 Mrk)
 - (ii) 3M hydrochloric acid was used instead of 2M hydrochloric acid. (1 Mark)
 - (iii) When 0.6g of magnesium powder is used 2M hydrochloric acid at a lower temperature instead of the temperature of the initial experiment. (1 Mark)

5. Petrol (octane) a long hydrocarbon alkane can be converted to ethene and hydrogen gas mixtures as follows:



- (a)(i) What do we call the process by which the products are obtained from octane? (½ Mark)
- (ii) Give **two** conditions needed in this reaction. (1 Mark)
- (b) Unleaded fuel is now widely used and has to be used in modern cars fitted with catalytic converters.

- (i) State the merits of unleaded petrol over 'leaded' petrol. (1 Mark)
- (ii) What is the role of the catalytic converter? (1 Mark)
- (iii) Why wouldn't the converters work with leaded petrol? (1 Mark)
- (iv) List **four** air pollutants produced by leaded petrol fuel used in automobile engines or any other petrol propelled engine. (2 Mark)

6. A natural element represented by letter Y has two types of atoms. The composition of the particles is as summarised below:

Type of atom	Nucleons present	% composition
${}^{29}_{13}\text{Y}$	29, 34	69.1
${}^{65}_{29}\text{Y}$	29, _____	30.9

- (a) Complete the missing number. (½ Mark)
- (b) What is the name assigned to these two types of atoms? (½ Mark)
- (c) Which atom has the least percentage of abundance? (½ Mark)
- (d) Calculate the relative atomic mass of Y. (2 Marks)
- (e) Explain what is made by nuclear particles giving examples where possible. (1½ Marks)
7. a) State Graham's law of gas diffusion. (1 Mark)
- b) 60cm^3 of oxygen gas diffuses through a porous plug in 50 seconds. How long would it take 60cm^3 of sulphur (iv) oxide gas to diffuse through the same plug under the same condition? (S=32, O=16). (2 Marks)
8. Below is a list of potential differences obtained when metals X, Y, Z, K and L are used in the following electrochemical cell.
Metal(s)/metal ion (aq)//copper(ii)ions/copper.

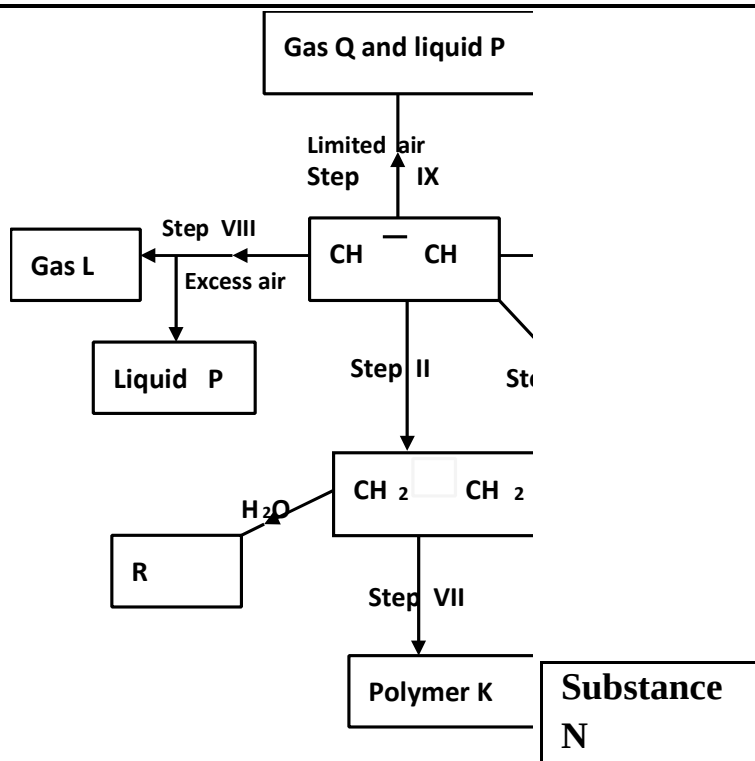
Metal	(volts)
X(Valence 2)	-1.10
Y	-0.46
Z	0.00
K	+0.45
L(Valence 2)	+1.16

- (a) What is metal Z? Explain. (1 Mark)

- (b) Which **two** of the above metals in an electrochemical cell would produce the largest electromotive force across the cell? What is this electromotive force?
(2 Marks)
- (c) Write the cell equation of the pair of metals that will produce the largest potential difference. (1 Mark)
- (d) Write the cell equation of the pair of metals that will produce the largest negative potential difference. Determine this voltage. (3 Marks)
9. a) A mass of 56g a saturated solution of salt X at 25°C yield 14g of the solid when b) Bromine reacts with hydrogen to form hydrogen bromide gas as shown below:

$$\text{H}_2(\text{g}) + \text{Br}_2(\text{g}) \rightleftharpoons 2\text{HBr}(\text{g}) \quad \Delta H = -128\text{Kj}$$
- (i) Determine the molar heat of the above reaction. (1 Mark)
- (ii) Write the equation for the above case that show the molar heat of formation of hydrogen bromide gas. (½ Mark)
- c) State and explain the effect of the following on the equilibrium of the reaction indicated below.
- $$\text{H}_{2(\text{g})} + \text{Cl}_{2(\text{g})} \rightleftharpoons 2\text{HCl}_{(\text{g})} \quad \Delta H = -108\text{KJ}.$$
- (i) Increase in pressure. (1 Mark)
- (ii) Increase in temperature. (1 Mark)
- (iii) Removal of chlorine gas. (1 Mark)
10. a) A sample of mass of X grammes of a radioactive isotope decays to 50 grammes in 100 days. The half life of the isotope is 25days. Calculate the initial mass of the isotope X. (2 Marks)

Study the scheme given below and answer the questions that follow;



b) Name the reagents used in:

Step I..... (½ Mark)

Step II..... (½ Mark)

Step III..... (½ Mark)

Step IV..... (½ Mark)

Step VII..... (½ Mark) c)

Identify substance:

L (½ Mark)

P (½ Mark)

Q (½ Mark)

N (½ Mark) K

..... (½ Mark)

R (½ Mark)

d) Draw structural formula for the following substances

R (½ Mark)

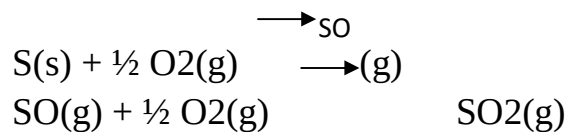
K (½ Mark)

N (½ Mark)

e) State **one** disadvantage of continued use of substance K. (½ Mark)

11. a) 0.1mole of sodium chloride was dissolved in 100cm^3 of water. Calculate the concentration of this aqueous solution in grams per dm^3 (Na=23, Cl=35.5). (2Marks)

b) Draw reaction cycles for the cases shown below. (2Marks)



KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 10 PAPER 1

TIME: 2 HOURS

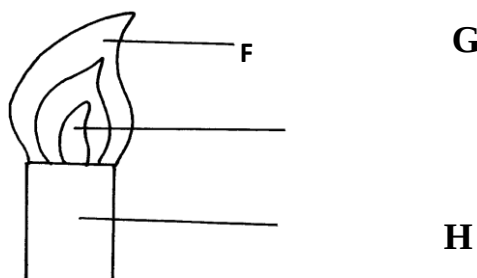
NAME..... INDEX NO.....

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DATE.....

QUESTIONS

1. State **three** properties common to both ammonia and calcium hydroxide solutions but different from solution of sulphur (IV) oxide in water. (3mks)
2. Describe a simple test that can be carried out in the laboratory to distinguish between manganese (IV) oxide and copper (II) oxide. (3mks)
3. Write any **three** balanced equations of possible reactions that take place when excess magnesium metal is burnt in air. (3mks)
4. In the figure below:



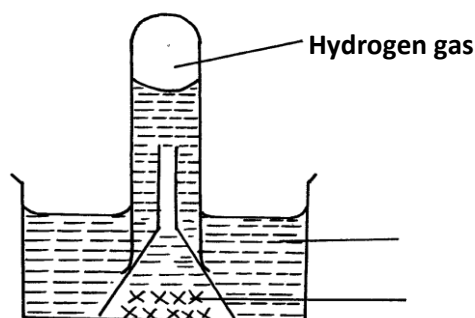
- (a) Name the parts labeled F, G, and H. (1 ½mks)

F.....

G.....

H.....

- (b) Describe an experiment that would confirm that region labeled G is unsuitable for heating. (1½mks)
5. Give names of the following processes used to: (2mks)
- (a) Obtain a solvent from a saturated solution.
 - (b) Remove steam from air
 - (c) Separate zinc carbonate from water
 - (d) Separate a mixture of nitrogen and helium.
6. Define the following terms:
- (a) Anion (1mk)
 - (b) Atomic number (1mk)
 - (c) Isotopes (1mk)
7. (a) Explain why the following combination of reagents is unsuitable for the laboratory preparation of hydrogen.
- (i) Zinc + dilute nitric acid. (½mk)
 - (ii) Lead + dilute hydrochloric acid. (½mk)
 - (iii) Copper + Dilute sulphuric acid. (½mk)
 - (iv) Potassium + dilute sulphuric acid. (½mk)
- (b) The diagram below was used to obtain hydrogen in the laboratory.



Reagent Q

Calcium metal

Name reagent Q.

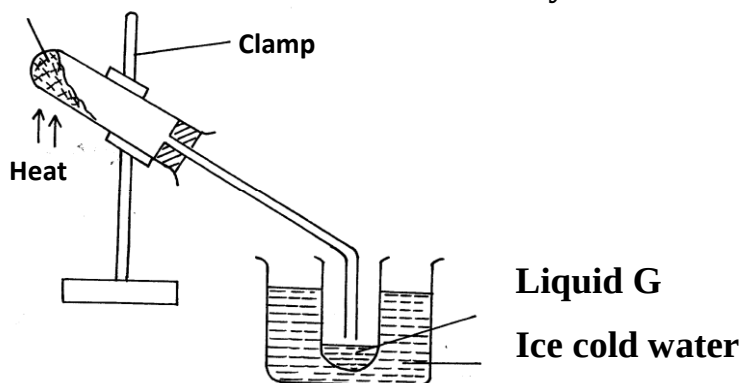
(1mk)

8. The diagram below is a set up used to investigate the effect of heat on hydrated copper(II) sulphate.

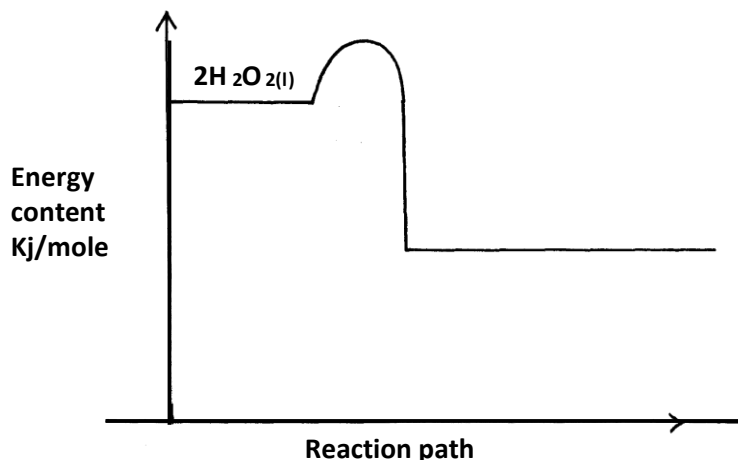
Study the diagram and answer the questions that follow.

Copper (II) sulphate

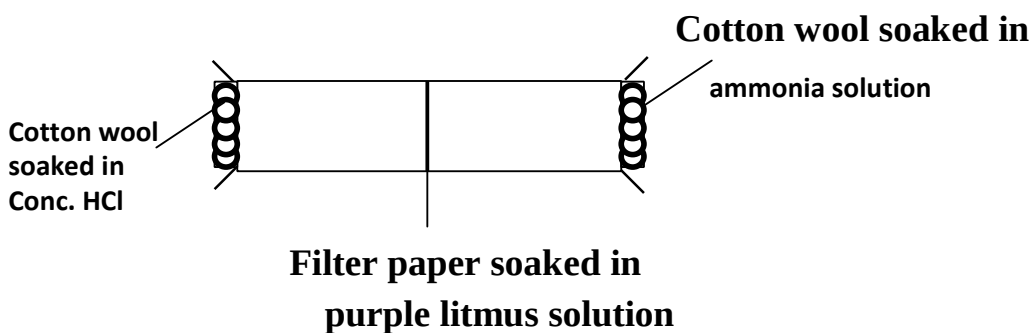
crystals



- (a) Why is boiling tube slanted as shown? (1mk)
- (b) What is observed in the boiling tube. (1mk)
- (c) Identify liquid **G**. (1mk)
9. In a reaction, an alkanol **B** was converted to pent-2-ene.
- (a) Give the structural formula of alkanol **B**. (1mk)
- (b) Name (i) the type of reaction that converts alkanol **B** to pent-2-ene (1mk)
- (ii) The reagent used. (1mk)
10. In an experiment to study properties of carbon, a small amount of charcoal is placed in a boiling tube.
- 5.0cm³ of concentrated nitric acid is added. The mixture is then heated.
- (a) What observations are made? (1mk)
- (b) Write an equation for the reaction that took place in the boiling tube. (1mk)
- (c) What property of carbon is shown in this reaction? (1mk)
11. 0.5g of Manganese (IV) oxide were added to 50 cm³ of 3.5M hydrogen peroxide. The temperature of the solution rose from 21°C to 64 °C. The information was represented on an energy level diagram as shown.

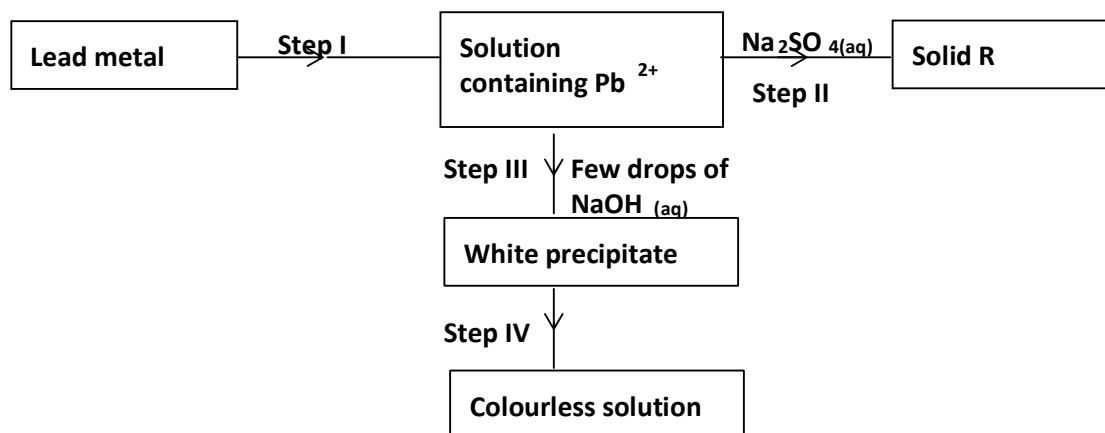


- (a) Determine the number of moles of hydrogen peroxide that decomposed (1mk)
- (b) Calculate the molar enthalpy of decomposition of hydrogen peroxide (1mk)
- (c) On the same set of axes above sketch the curve that would be obtained if manganese (IV) oxide was not used and other conditions remained constant.
12. The electronic arrangement of two stable ions Q^{2+} and P^{2-} are 2.8.8 and 2.8.8 respectively.
- (a) Write the electron arrangement of neutral atoms **Q** and **P**. (2mks)
- (b) What is the most likely structure of an oxide element **P**? (1mk)
13. The set up below was used by a student. Filter paper soaked in purple litmus solution was placed in the middle of the combustion tube.



- (i) What is the main aim of the experiment. (1mk)
- (ii) State the **first** observation likely to have been made in the tube. Explain the observation. (2mks)

14. Study the flow chart below and use it to answer the questions that follow:



(a) Identify the reagent used in step I. (1mk)

(b) Name solid A. (1mk)

(c) Explain the observation in step IV. (1mk)

15. In an experiment 1.2g of granulated zinc were reacted with excess 2.0M sulphuric acid. The time taken for the reaction to be completed was recorded. The experiment was repeated using 1.2g of zinc powder.

(a) In which experiment was the time taken shorter? Explain your answer. (2mks)

(b) The mass of remaining mass of zinc was measured as time moved until when the reaction was over. Sketch on the set of axes and label the two curves obtained that would represent the mass of the

remaining zinc. (1mk)

Experiment I represents granulated zinc.

Experiment II represents zinc powder.

16. When a current of 2.0 amperes was passed through a cell containing aqueous solution of T^{2+} ions of metal T for 9 minutes the mass of the cathode increased by 0.36g. (1 Faraday = 96,500 coulombs)

(a) Calculate the quantity of electricity used. (1mk)

(b) Determine the relative atomic mass of metal T. (1mk)

(c) Explain whether metal T is less or more reactive than hydrogen gas. (1mk)

17. 60 cm³ of ozone (O₃) diffused through a semi permeable membrane in 80 seconds. Calculate the time taken for 90 cm³ of nitrogen (IV) oxide (NO₂) to diffuse under the same conditions. (O=16, N=14).

(3mks)

18. Some salts may be classified as double salts or basic salts. Trona with the formula $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3$ is an example of a double salt. An example of a basic salt is basic magnesium carbonate with formula $\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2$.

(a) What is meant by a double salt? (1mk)

(b) Write equations of reactions that occur when dilute hydrochloric acid is reacted with: (2mks)

(i) Trona

(ii) Basic magnesium carbonate

19. The thermochemical equation below shows a dynamic equilibrium between hydrogen iodide gas and its elements:



(a) Explain how the following changes would affect the production of hydrogen iodide.

(i) increase in temperature

(ii) decrease in pressure. (2mks)

(b) Calculate the molar enthalpy for formation of $\text{HI}(\text{g})$. (1mk)

20. A hydrated salt has the following composition by mass. Iron is 20.2%, oxygen is 23.0% sulphur is 11.5%, water 45.3%. Its relative formula mass is 278. Determine the formula of the hydrated salt.

(Fe=56, S=32.0, O=16, H=1) (3mks)

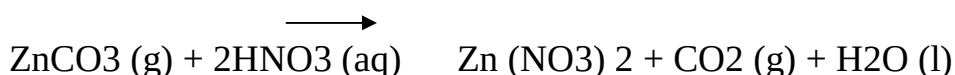
21. Chlorine water is a mixture of some elements and compounds.

(a) Write down the formula of two elements found in chlorine water. (1mk)

(b) Name any **two** compounds in chlorine water. (1mk)

(c) State any **two** chemical properties of chlorine water. (1mk)

22. Calculate the mass of zinc carbonate that would remain if 17.0g of zinc carbonate was reacted with 50 cm³ of 4M nitric acid. The equation of the reaction is:



(Zn=65.4, C=12.0, O=16.0) (3mks)

23. A solution of bromine in methyl benzene turns colourless when butane gas is passed through it.
- (a) What type of reaction takes place? (1mk)
- (b) Write equation of the reaction which takes place. (1mk)
24. Explain this observation:
- When hydrogen chloride gas is dissolved in water, the solution conducts electricity while a solution of hydrogen chloride gas in propanone does not conduct electricity. (2mks)
- 233
25. Francium Fr decays by emission 4 beta particles to form protactium (Pa) 87
- (a) Write the equation for the nuclear reaction undergone by one radioisotope of Francium. (1mk)
- (b) State **two** differences between chemical and nuclear reactions. (2mks)
26. A sealed glass tube containing 250 cm^3 of nitrogen gas at r.t.p was immersed in boiling water. Calculate the pressure inside the tube if the volume of the gas does not change due to expansion of glass. (Room pressure=760mmHg, room temperature=298K). (3mks)
27. (a) Write down the electron arrangement for an atom of element U which has a mass number 14 and contains 8 neutrons. (1mk)
- (b) Draw the structure of an atom of A given in (a) above. (2mks)
28. Chlorine and hydrogen sulphide gases introduced into sealed tube as shown:
- (a) State the observation that would be made in the tube. Explain. (1mk)
- (b) Both chlorine and hydrogen sulphide gas can be prepared using hydrochloric acid as one of the reagents. Write two separate equations showing how each gas can be prepared using $\text{HCl}_{(\text{aq})}$ as one of the reagents.
- $\text{Cl}_{2(\text{g})}$ (1mk)
- $\text{H}_2\text{S}_{(\text{g})}$ (1mk)

KCSE FINAL PREDICTION

CHEMISTRY

TRIAL 10 PAPER 2

TIME: 2 HOURS

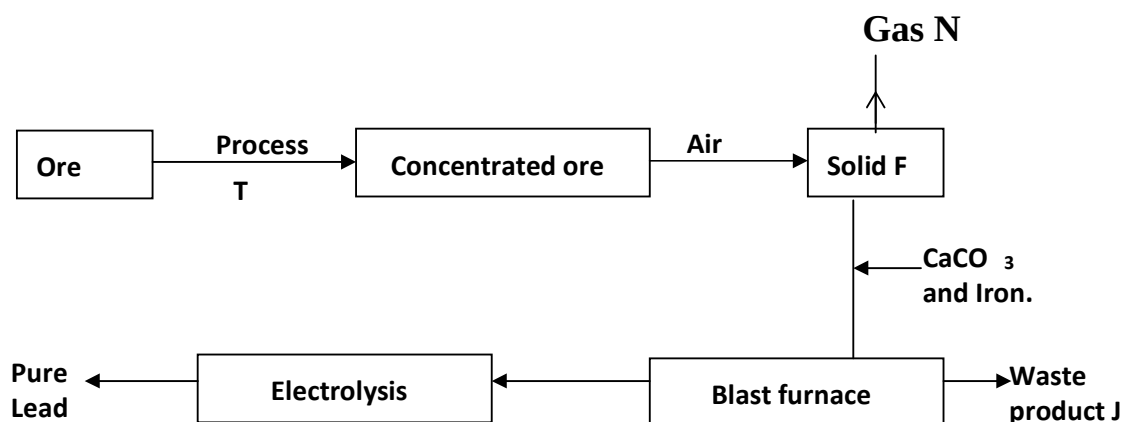
NAME..... INDEX NO.....

SCHOOL..... SIGN.....

DATE.....

QUESTIONS

1. (a) What is an ore? (1mk)
 (b) Name any **two** ores of lead. (1mk)
 (c) The flow chart below summarizes the process of extraction of lead from a chief ore.



- (i) Identify process T (1mk)
 (ii) Give the name of: (2mks)

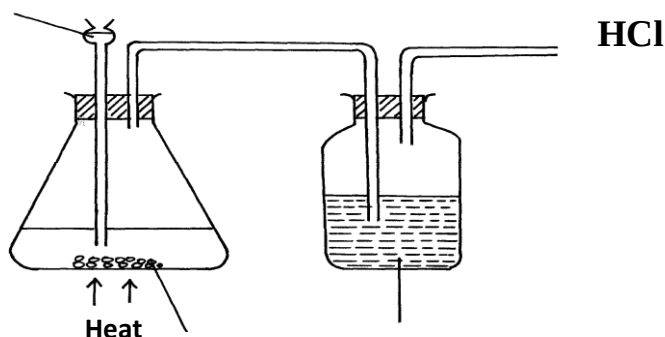
Gas N.....

Solid F.....

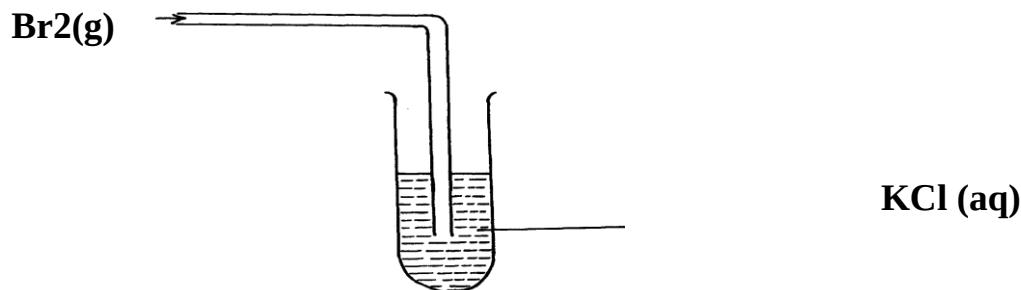
- (iii) Give **two** functions of CaCO_3 in the extraction process. (2mks)
- (iv) Write an equation to show how waste product **J** is formed. (1mk)
- (v) Pure lead can be obtained by electrolysis. Identify the anode and cathode for the process. (1mk)
- (vi) State **two** uses of lead. (2mks)

2. The set up below was used to prepare chlorine gas.

Conc.



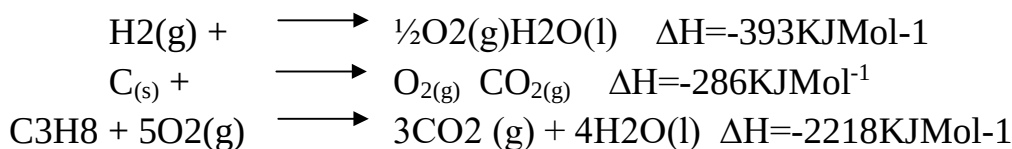
- (i) Identify solid **M** (1mk)
- (ii) What is the role of water in the experiment? (1mk)
- (iii) Complete the set up to show how dry chlorine gas can be collected. (2mks)
- (iv) Write a chemical equation to show how chlorine gas is formed. (1mk)
- (v) Chlorine reacts with cold dilute sodium hydroxide to form a bleaching agent. Name the bleaching agent. (1mk)
- (vi) Give an equation to show how chlorine forms bleaching powder. (1mk)
- (vii) Other than bleaching, state two other uses of chlorine gas. (2mks)
- (viii) Study the diagram below.



State and explain the observation made after sometime. (2mks)

3. (a) Define standard heat of combustion of a substance. **(1mk)**

(b) Study the heats of combustion shown below.



(i) Draw an energy cycle diagram linking heat of formation of propane with its heat of combustion and the heat of combustion of the constituent elements. **(2mks)**

(ii) Use the information above to calculate the heat of formation of propane. **(2mks)**

(c) A given amount of propane was used to heat one litre of water. The temperature of the water rose from 25°C to 50.5 °C. (S.H.C of water = 4.2Jgk⁻¹)

(i) Calculate the heat change for the reaction. **(2mks)**

(ii) Find the mass of propane burnt (C=12, H=1) **(2mks)**

(d) Calculate the calorific value of propane. **(2mks)**

(e) Apart from heating value, state two other factors to consider when choosing a fuel. **(2mks)**

4. Study the periodic grid below and answer the questions which follow. The letters do not represent actual symbols of the elements.

P				F				
S	T		C	E		U	X	Z
		N					Y	

(i) To which category of elements does element **N** belong? **(1mk)**

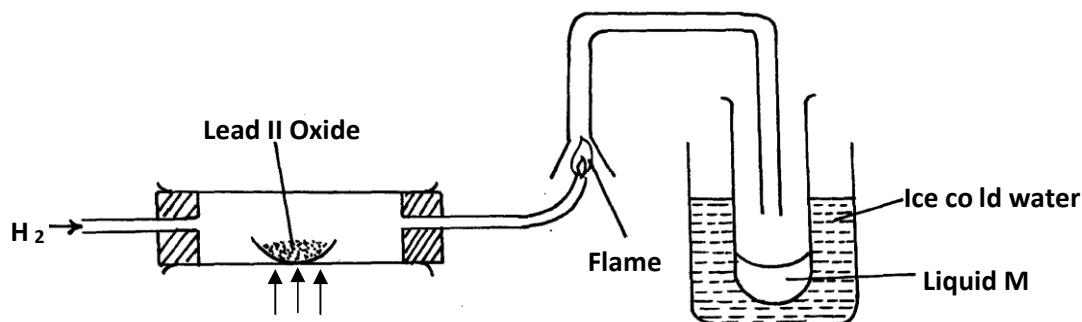
(ii) Compare the atomic radius of element **U** and **X**. Explain. **(2mks)**

(iii) An ion A^{3-} has a configuration of 2.8. Place element **A** on the grid above. **(1mk)**

(iv) Which of the group 1 elements will require the greatest amount of energy to remove the outermost electron. Explain. **(2mks)**

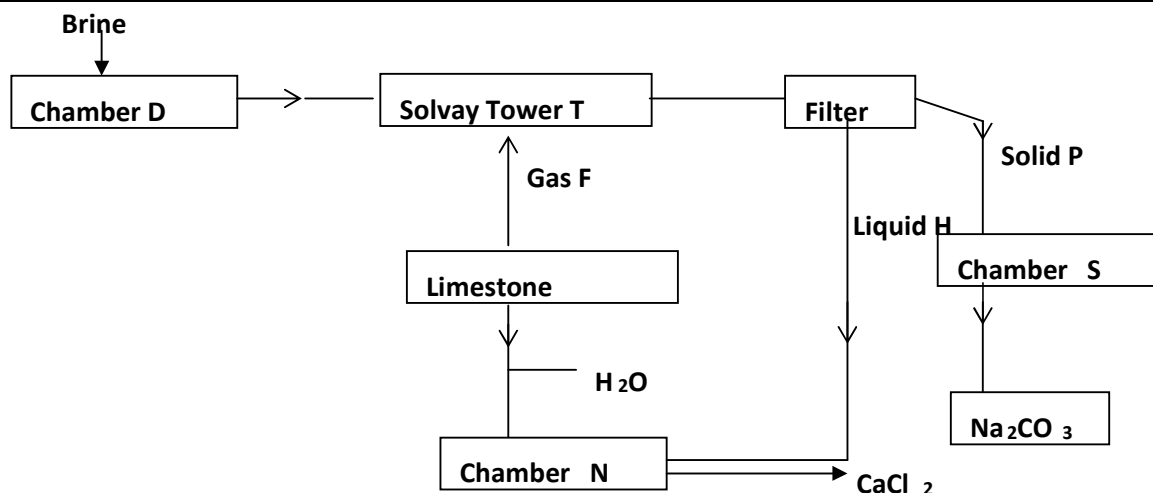
- (v) Why is element Z used in light bulbs? (1mk)
- (vi) Write the formula of the phosphate of element T. (1mk)
- (vii) State the type of structure found in the oxide of element F. (1mk)
- (ix) What is atomicity? (1mk)

5. Study the diagram below and answer the questions which follow.



- (i) State **two** observations made when hydrogen gas pass over hot lead II oxide. (2mks)
- (ii) Write the equation for the reaction which occurs in the combustion tube. (1mk)
- (iii) What property of hydrogen is shown in the experiment above. (1mk)
- (iv) Identify liquid M. (1mk)
- (v) What type of reaction occurs when hydrogen gas reacts with butene? (1mk)
- (vi) State the condition required for the reaction (v) above. (1mk)
- (vii) Apart from hydrogen peroxide, state **two** other reagents that can be used to prepare oxygen gas. (1mk)
- (viii) Write an equation to show how hydrogen gas is formed from the reagents chosen in (vii) above. (1mk)

Study the flow chart below and answer the questions which follow.



(a) Identify (3mks)

(i) Gas **F**

(ii) Liquid **H**

(iii) Solid **P**

(b) State **one** use of calcium chloride. (1mk)

(c) Give **two** reasons why such a plant should be cited near a river. (2mks)

(d) Write equations for the reactions occurring in chamber: (2mks)

(i) **N**

(ii) **S**

(e) Using an ionic equation, explain how sodium carbonate is used to soften hard water. (1mk)

(f) Explain how ammoniacal brine is formed. (1mk)

(g) State **one** use of sodium hydrogen carbonate. (1mk)

6. (a) Study the reduction potentials below.

Half cell	E^{θ} (volts)
$A^{2+}(aq) + 2e^{-}$	+0.34
$B^{+}(aq) + e^{-}$	-2.92
$\frac{1}{2}C_2(g) + e^{-}$	+2.87

(i) Identify the weakest oxidizing agent. (1mk)

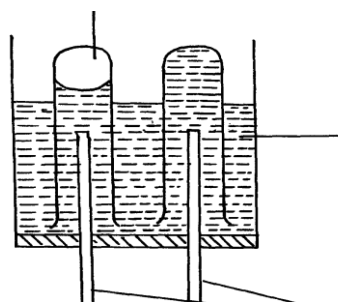
(ii) Calculate the e.m.f of the cell that would produce the highest output of voltage. (2mks)

(iii) Write the cell diagram for the cell formed above.

(1mk)

(b) Study the electrolytic cell below.

Gas A



Copper II sulphate Solution

(i) Identify the anode and cathode on the diagram.

(1mk)

(ii) Write an equation to show how gas A is formed.

(1mk)

(iii) State **two** changes that occur in the electrolyte after the experiment.

(2mks)

(iv) What is electroplating?

(1mk)

(v) Write the equation at the anode if copper electrodes were used.

(1mk)

(vi) In electrolysis of dilute magnesium sulphate, using inert electrodes, a current of 2A was passed for $1\frac{1}{4}$ hours. Calculate the volume of the gas produced at the anode at s.t.p.

(1F=96500, M.G.V=22.4 L)

(3mks)

THE END

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