

CHEMISTRY MOCKS

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(BOTH PAPER 1 AND PAPER 2 ARE PRESENT IN EACH TRIAL)



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(SERIES 1)

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CHEMISTRY MOCKS

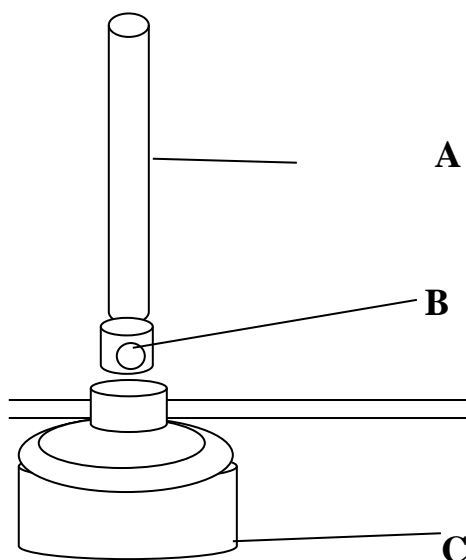
SERIES 1 TRIAL 1 PAPER 1

Kenya Certificate of Secondary Exams

TIME:2HRS

Answer all the questions

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

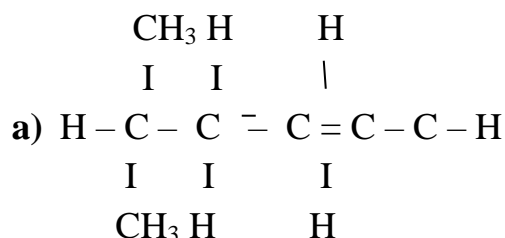


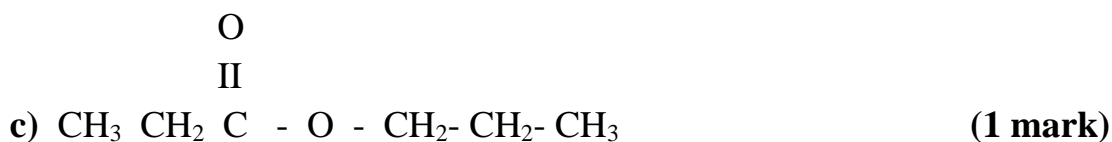
- a) Name the parts labelled
- A - (½ mark)
- B- (½ mark)
- b) Give one use of the part labelled B (1 mark)
2. Hydrated copper (II) sulphate exists as blue crystals while anhydrous copper (II) sulphate is a white powder. **Describe** a laboratory experiment that can be used to show that the action of 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)

4. (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)
5. Given zinc oxide, dilute nitric (V) acid and sodium carbonate solution. Briefly describe how you can prepare zinc carbonate (3 marks)
6. 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.

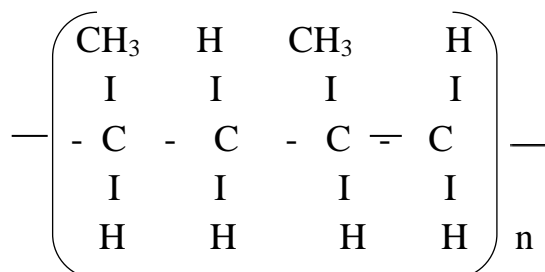
Element	Atomic size (nm)
S	0.160
T	0.180
V	0.930

- (i) Define the term ionization energy (1 mark)
- (ii) Which element is likely to have the highest ionization energy. Explain (2 marks)
7. 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)
8. (i) Give the IUPAC names for the following organic compounds (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)

9. 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)

10. 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)

11.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)

12. 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)

13. In the equation, below identify the reagent that acts as an acid in the forward reaction. Give a reason.



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

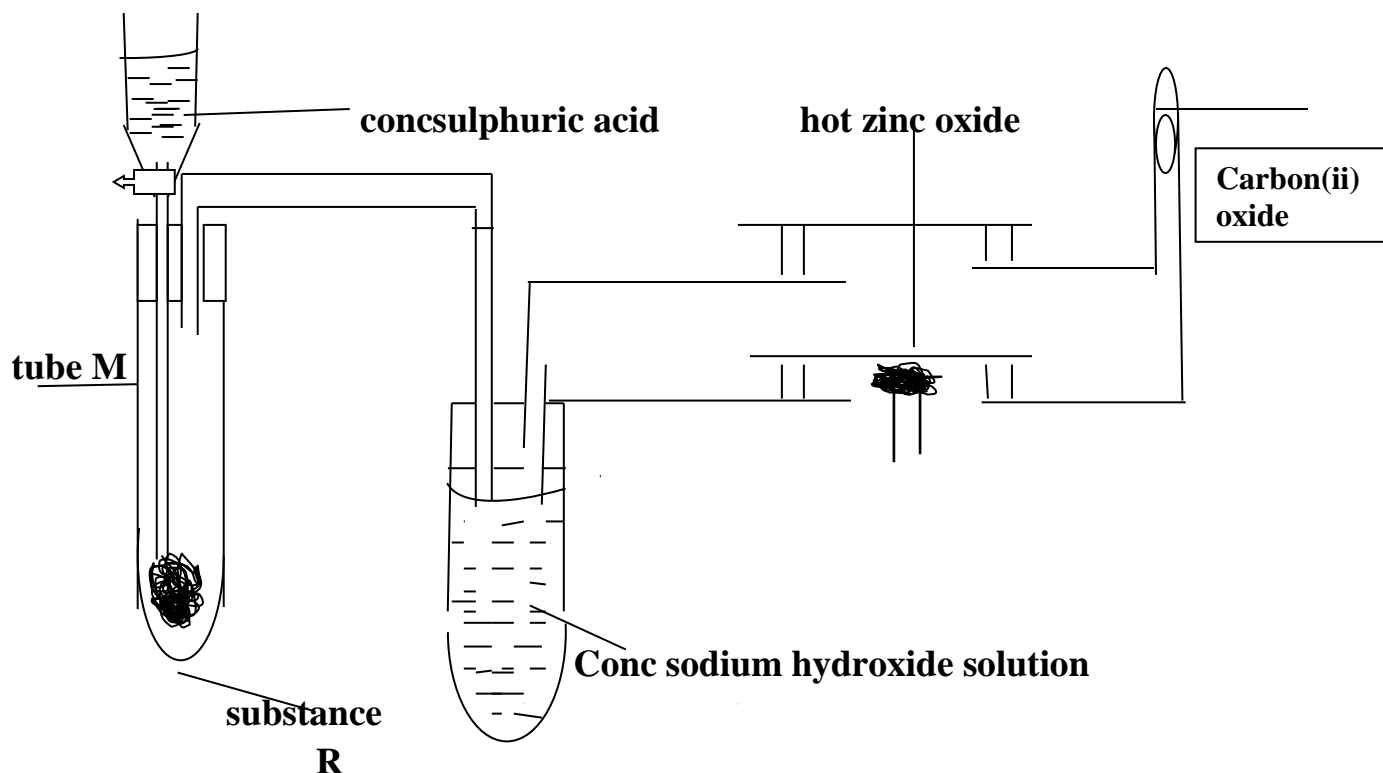
a) What is the name of the black solid and what is its function (1 mark)

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)

15. Explain the following observation, a one molar solution of nitric (III) acid (HNO_2) has a pH of 2 where as a one molar solution of chloric(I) acid (HClO) has a pH of 4.
(2 marks)

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



a) Identify substance **R**
(1 mark)

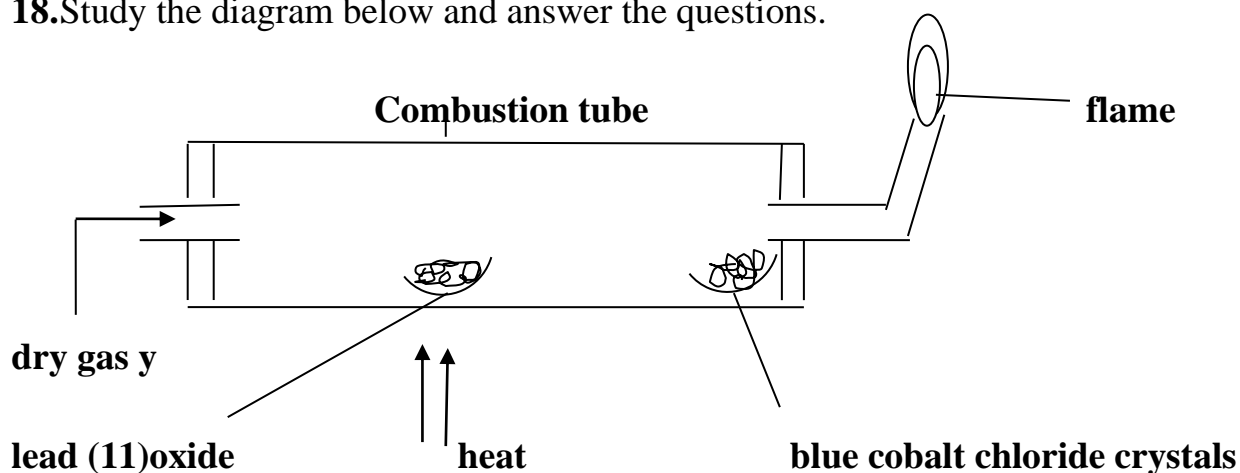
b) State the function of concentrated sodium hydroxide solution
(1 mark)

c) State the property of carbon (**II**) oxide gas demonstrated in the above set-up
(1 mark)

d) Write a balanced chemical equation for the reaction occurring in tube M.
(1 mark)

17. 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? ($\text{S} = 32$, $\text{O} = 16$)
(3 marks)

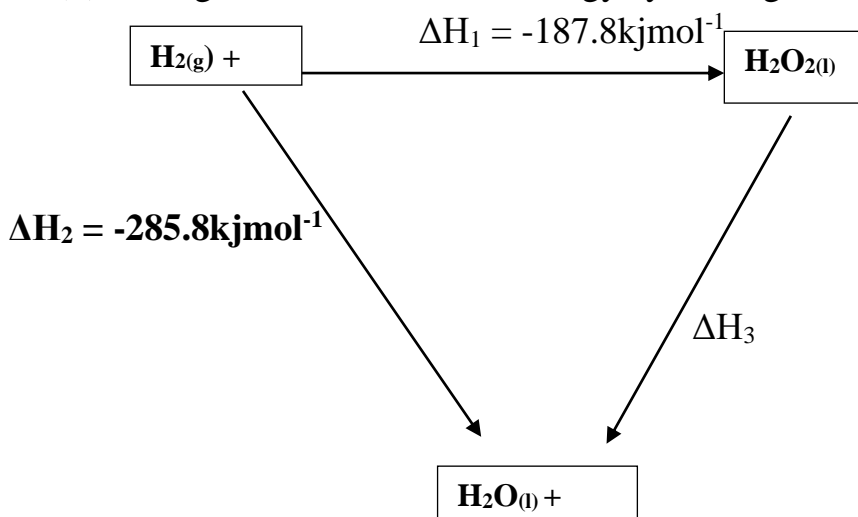
18. Study the diagram below and answer the questions.



- (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)

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

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



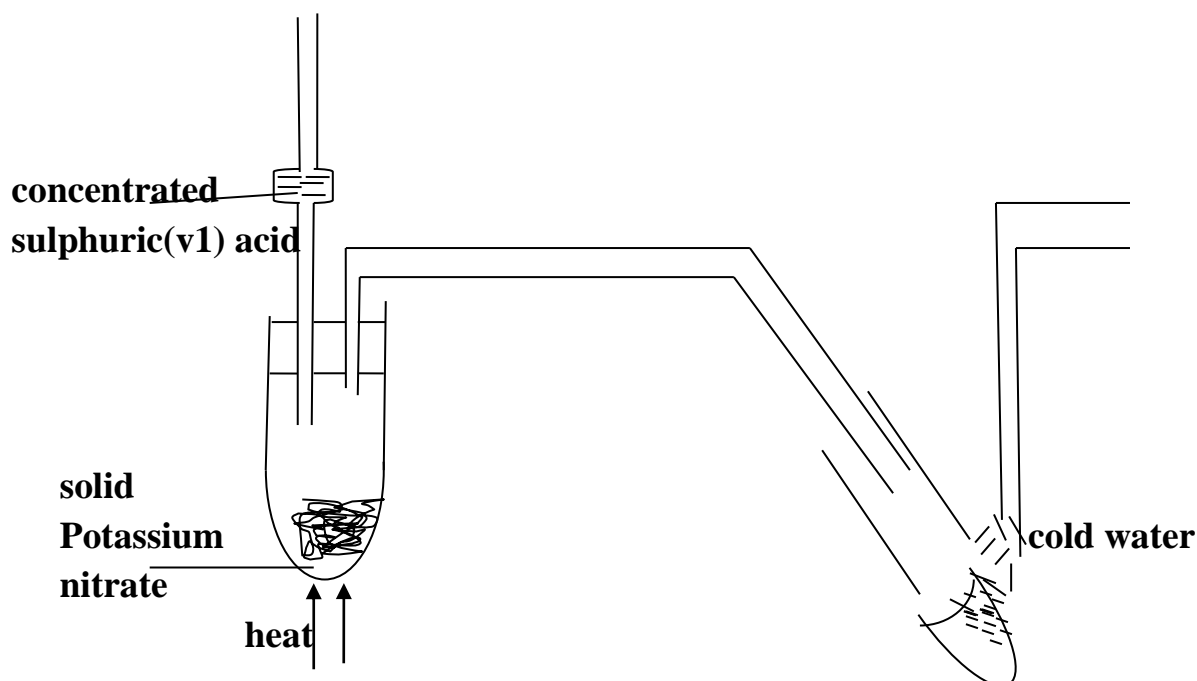
- a) Give the name of the enthalpy change ΔH_1 (1 mark)
- b) Determine the value of ΔH_3 (1 mark)

20. 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

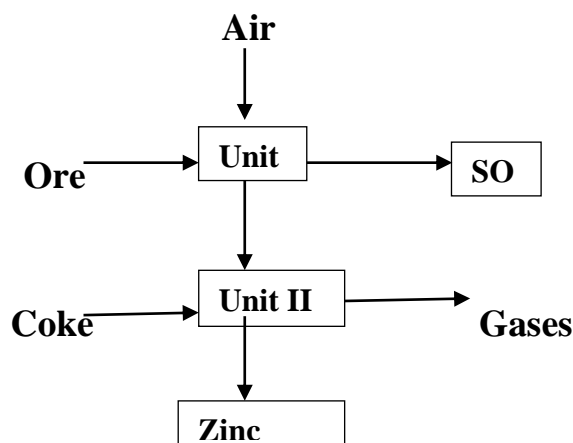
- a) Which solution reacts vigorously with magnesium metal? Explain. (1 mark)
- b) Which solution is likely to be that of lemon juice? (1 mark)
- c) Which solution is likely to produce green colour with the universal indicator. (1 mark)

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



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

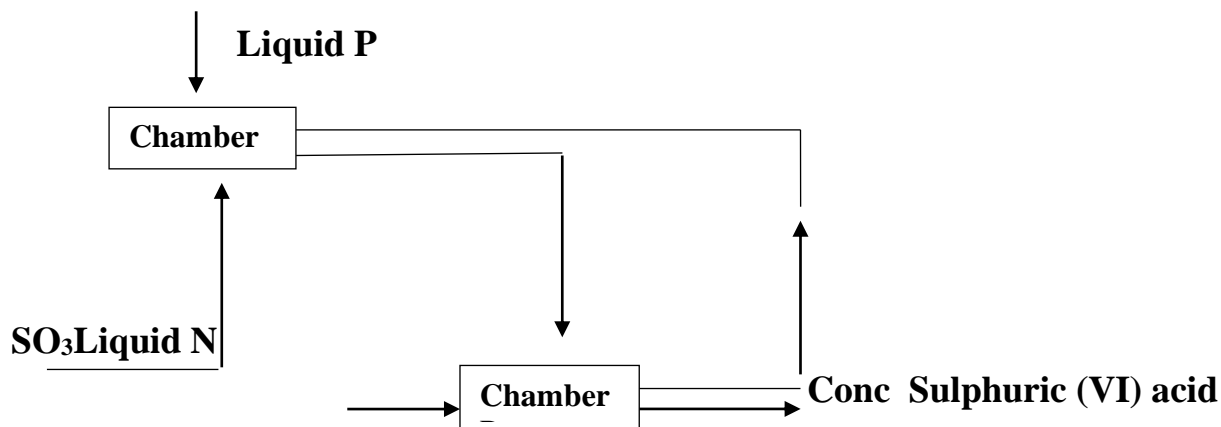
22. The flow chart below shows some processes involved in the industrial extraction of zinc metal.



- Name one ore from which Zinc is extracted (1 mark)
- Write the equation of the reaction taking place in unit II (1 mark)
- Name two uses of Zinc metal (1 mark)

23. 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)

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



a) Identify

(i) Liquid P (1 mark)

(ii) Liquid N (1 mark)

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

25.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^- (1 mark)

26. 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)

27. 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)

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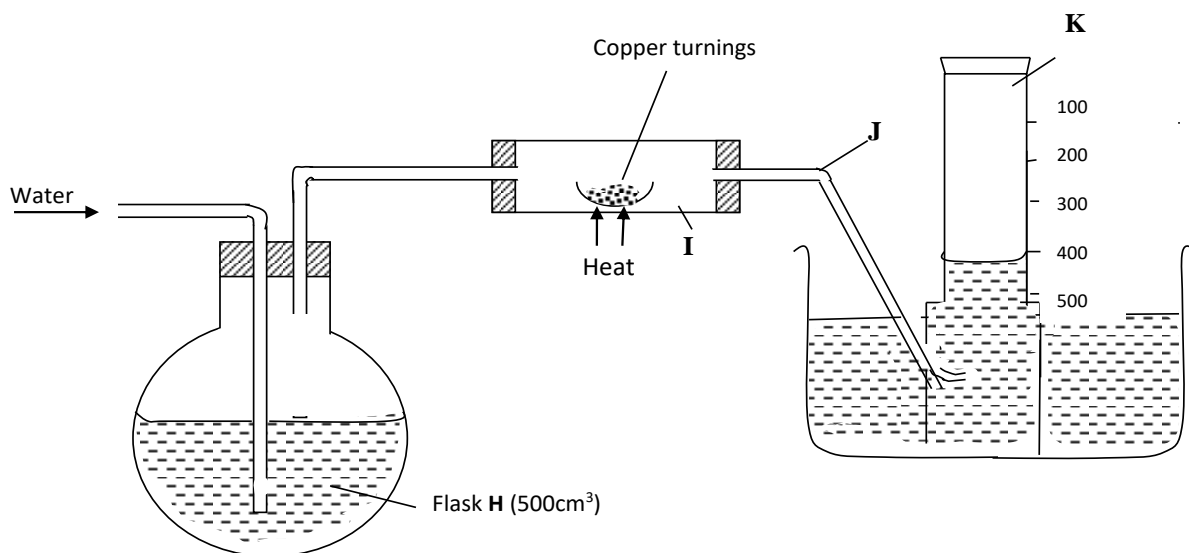
SERIES 1 TRIAL 1 PAPER 2

Kenya Certificate of Secondary Exams

TIME:2HRS

Answer all the questions

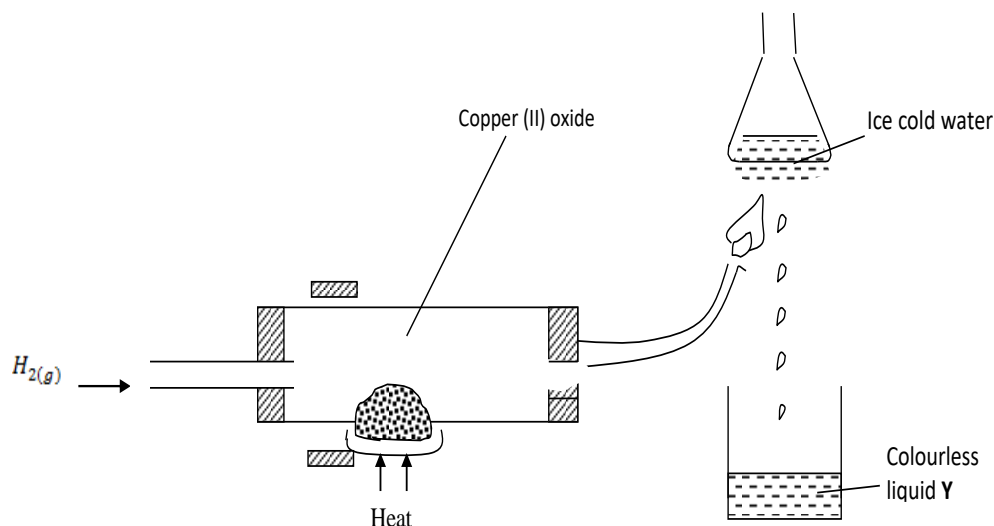
1. A. In an experiment to determine the percentage of oxygen in air, the apparatus below were set up. Study the set up and the information provided to answer the questions that follow.



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**.

- (i) What was the purpose of passing water into flask **H**? (1 mark)
- (ii) What observations were made in the tube **I**? (1 mark)
- (iii) Name one of the gases that is likely to be found in **J**. (1 mark)
- (iv) What was the volume of the gas collected in the measuring cylinder at the end of the experiment? (1 mark)
- (v) Calculate the percentage of oxygen in air using the above results. (2 marks)

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



(a) Give **one** observation made in the combustion tube after some time. **(1 mark)**

(b) Write an equation for the formation of the colourless liquid Y. **(1 mark)**

(c) 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 do the elements represented by the letters **T** and **U** have two values of melting points? **(1 mark)**

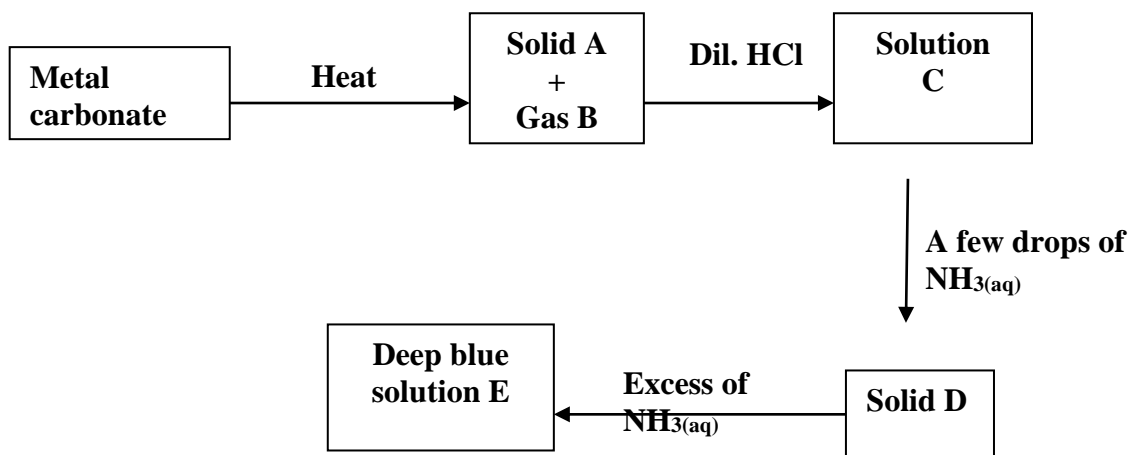
- (c) Explain the following observations in terms of structure and bonding.
- (i) There is an increase in boiling point from **P** to **R**. (2 marks)
- (ii) Element **S** has a high boiling point. (2 marks)
- (iii) There is a decrease in boiling points from **U** to **W**. (2 marks)
- (d)(i) Compare the atomic radius of **U** and **V**. (1 mark)
- (ii) 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 $^{\circ}\text{C}$		0	10	20	30	40	50	60	70	80
Solubility g/100g H_2O	KNO_3	5	15	26	43	61	83	105	135	165
	KBr	50	55	60	65	70	77	85	90	95

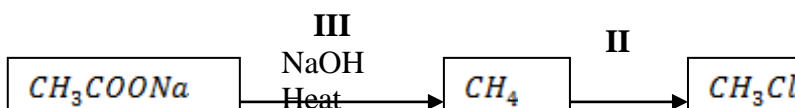
- (i) Draw solubility curves for both salts on the same axis. (3 marks)
(provide graph paper)
- (ii) What was the solubility of each salt at 65°C ? (1 mark)
- (iii) 100g of a saturated solution of potassium nitrate at 70°C was cooled to 20°C . What mass of the crystals will be crystallized? (2 marks)

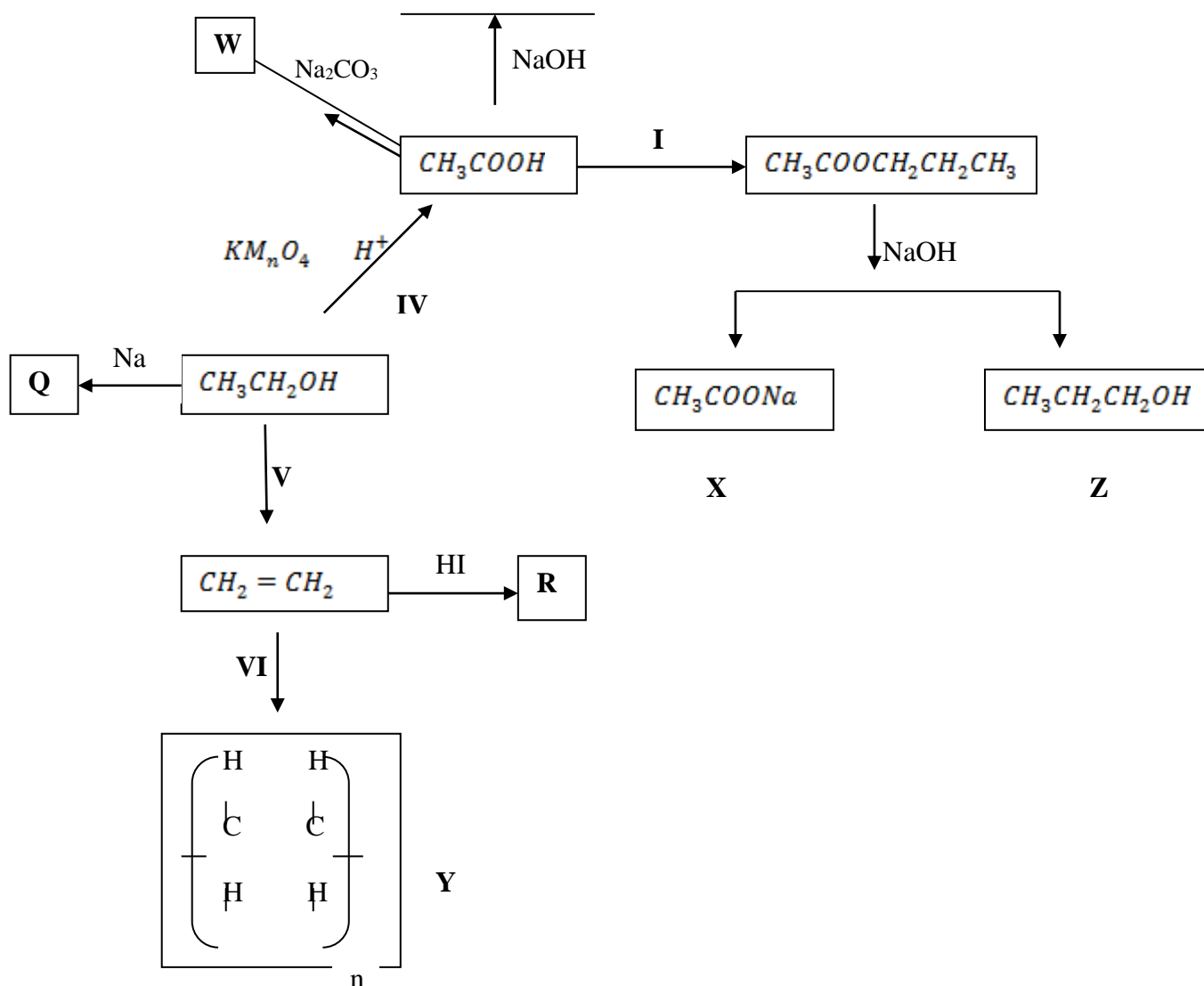
(b) Study the flow chart below and answer the questions that follow.



- (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 -

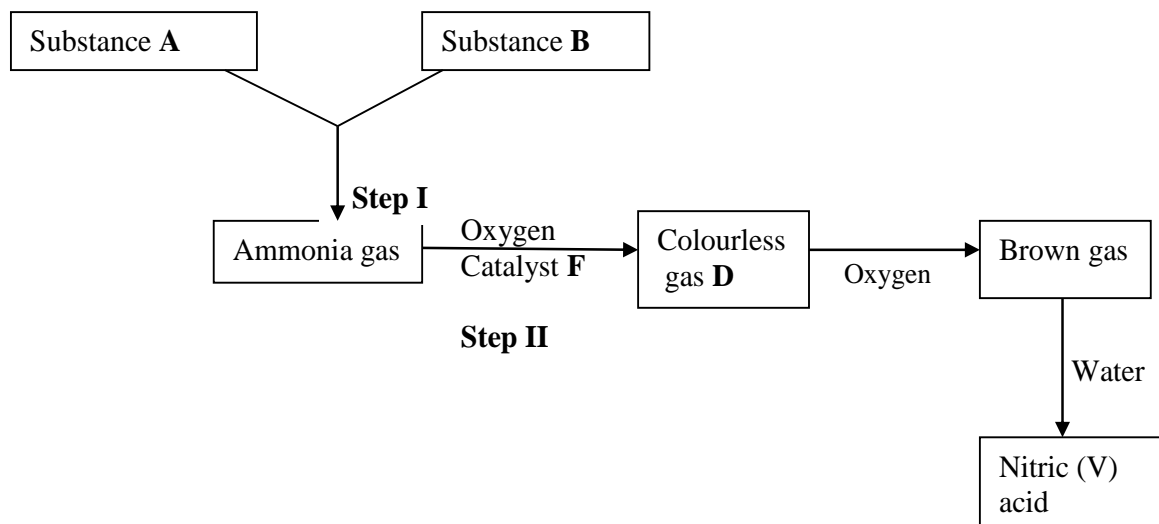
Condition -

(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.

(3 marks)

- 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.

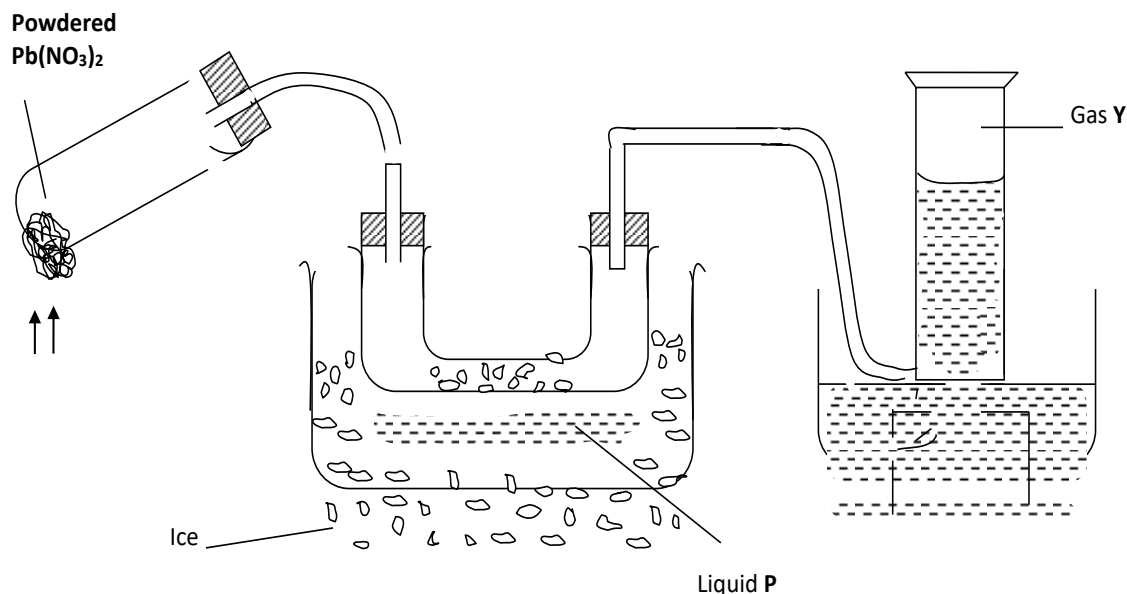
(1 mark)

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

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

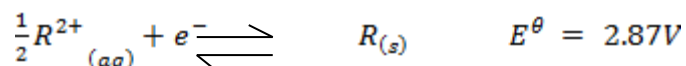
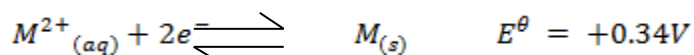
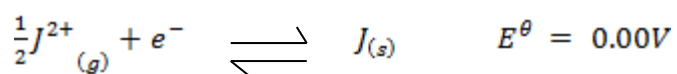
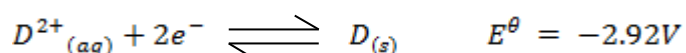
(ii) Dilute and cold sodium hydroxide. **(1 mark)**

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



- (a) Name; (2 marks)
- (i) Liquid **P** -
- (ii) 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)

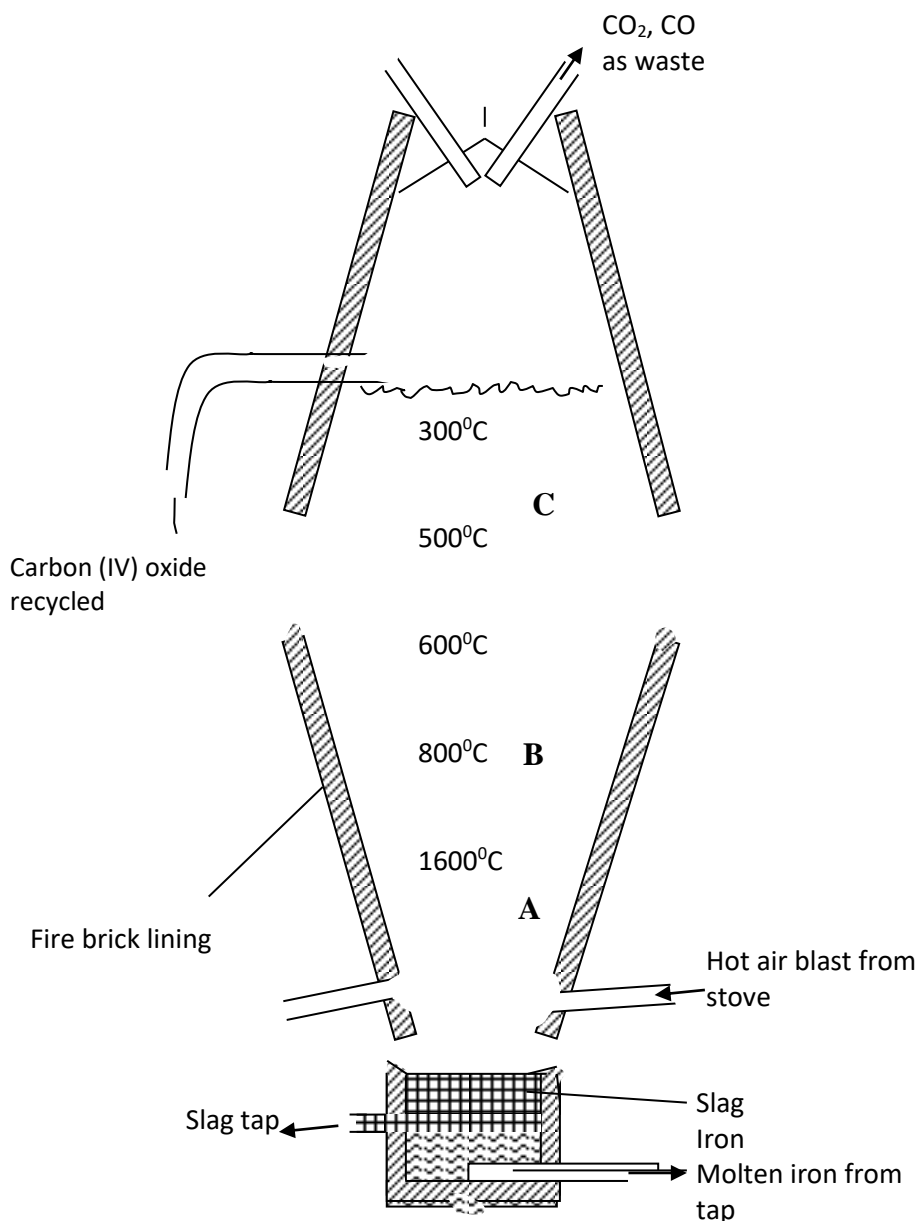
II. Electrolysis of aqueous solution of metal M resulted in the deposition of 1.07g of metal upon passage of a current of 1.32 amperes for 75 minutes.

($M = 52$, $1F = 96500C$)

(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)

(iii) 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)

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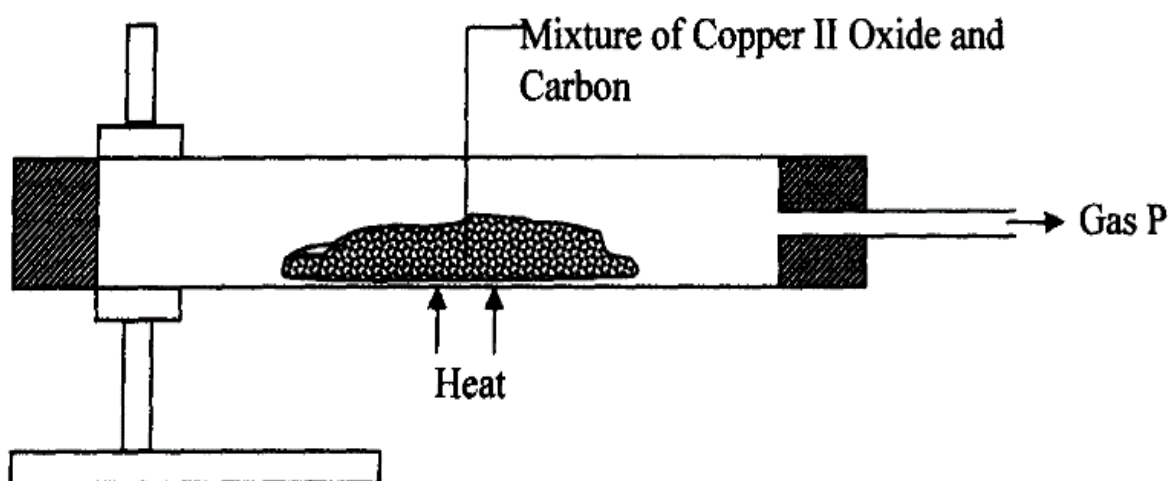
SERIES 1 TRIAL 2 PAPER 1

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TIME:2HRS

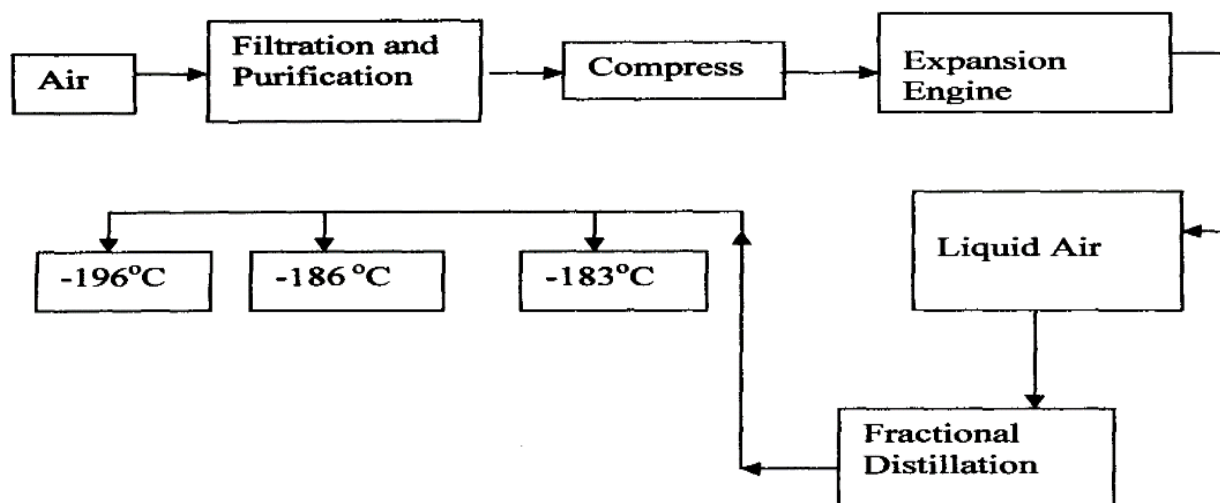
Answer all the questions

1. Write an equation to show the effect of heat on the nitrate of: - **(2marks)**
 - (i) Potassium
 - (ii) Silver
2. Study the diagram below and use it to answer the questions that follow.



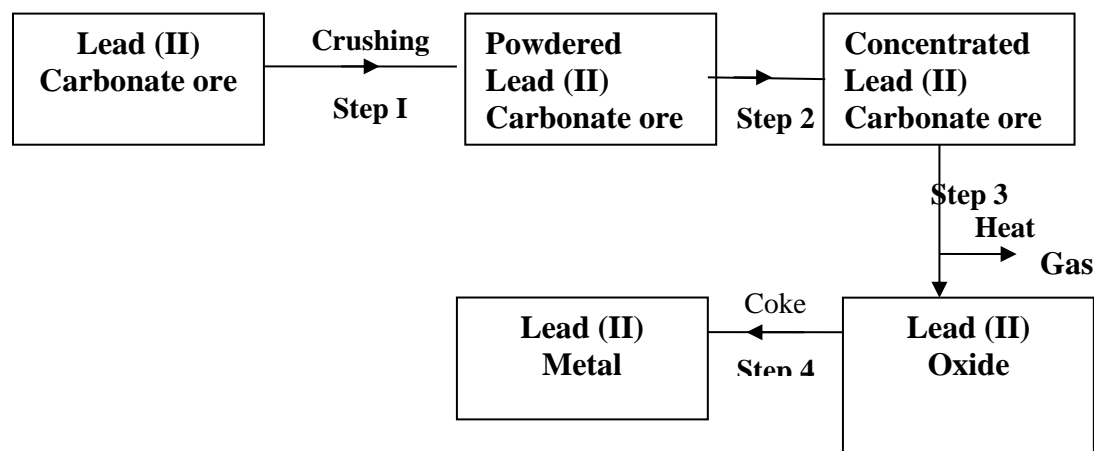
- (a) State the observation made in the combustion tube. **(1mark)**
 - (b) Write an equation for the reaction that took place in the combustion tube **(1mark)**
 - (c) Name gas **P** **(1mark)**
3. A typical electrolysis cell used a current of 40,000 amperes. Calculate the mass (in Kg of aluminum produced in one hour. ($Al = 27$) (Faraday = 96500 Coulombs). **(3marks)**

4. Oxygen is obtained on large scale by the fractional distillation of air as shown on the flow chart below.



- Identify the substance that is removed at the filtration stage. (1mark)
- Explain why Carbon (IV) oxide and water are removed before liquefaction of air. (1mark)
- Identify the component that is collected at -186°C . (1mark)

5. The flow chart below shows steps used in the extraction of zinc from one of its ores.



- Name the process that is used in **step 2** to concentrate the ore. (1mark)
 - Write an equation for the reaction which takes place in **step 3**. (1mark)
 - Name **one** use of lead. (1mark)
6. In an attempt to prepare a gas, a student added concentrated hydrochloric acid to Potassium manganate (VII). The products were then passed through two wash bottles containing water and concentrated sulphuric acid
- Name the gas prepared (1mark)
 - State the purpose of wash bottle:
 - Containing water? (1mark)

(ii) Containing concentrated sulphuric acid? (1mark)

7. Starting with 50 cm³ of 2M sodium hydroxide, describe how a solid sample of pure sodium sulphate crystals can be prepared in the laboratory. (3 marks)

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

E							E	K
	F					L		
G	H		J			N	P	
M							W	

a) Why is it possible to place element E in both group I and VII? (1mark)

b) What type of structure formed when element N and P react? (1mark)

c) Why do most of the elements react? (1mark)

9. The table below gives information about the major alkanes which are constituents of crude oil. Study it and answer the questions that follow:.

Constituent	Boiling point °C
Gases	Below 40
Petrol	40-175
Kerosene	175-250
Diesel	250-350
Lubricating oil	350-400
Bitumen	Above 400

i) Why is petrol highly flammable than diesel? (1mark)

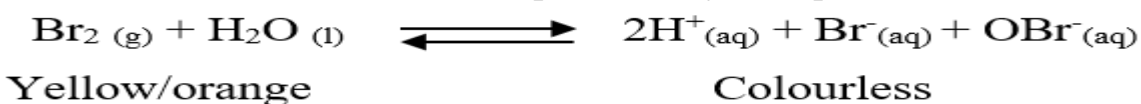
ii) Explain why alkenes and alkynes are not contained in crude oil. (1mark)

iii) Give one use of bitumen. (1mark)

10 (a) Explain the importance of the high percentage of nitrogen in air. **(1mark)**

(b) Why is nitrogen used for storage of semen in artificial insemination?(1mark)

11. A solution of bromine gas in water is an example of a chemical reaction in a state of balance. The reaction involved is represented by the equation below:



State and explain the observations made when hydrochloric acid is added to the mixture. **(2marks)**

12. Concentrated hydrochloric acid that is 35% pure has a density of 1.18g/cm³.

Calculate its concentration in moles per litre. (H=1.0 Cl=35.5) **(3marks)**

13 a) State the reason for using Argon in electric light bulbs. **(1mark)**

b) 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	Electronic configuration	Boiling point
X	2.7	-188°C
Y	2.8.7	-35°C
Z	2.8.8.7	59°C

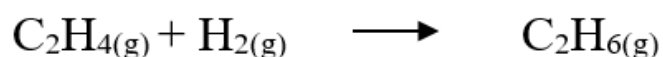
i) What is the general name given to the group in which the elements? **(1mark)**

ii) Identify the element that is a solid at room temperature. Explain **(1mark)**

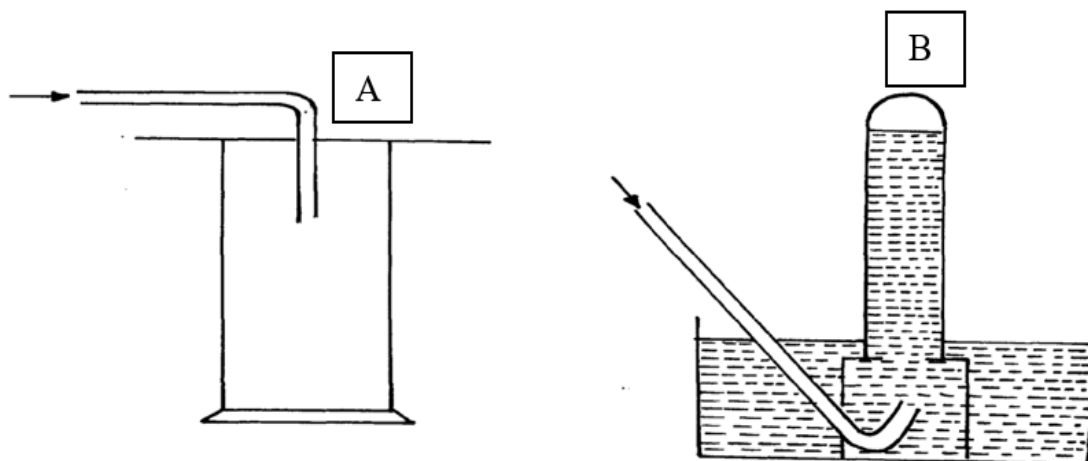
14. Bond energies for some bonds are tabulated below: -

BOND	BOND ENERGY KJ/mol
H – H	436
C = C	610
C- H	410
C - C	345

Use the bond energies to estimate the enthalpy for the reaction. **(3marks)**



15. The diagram below shows three methods for collecting gases in the laboratory



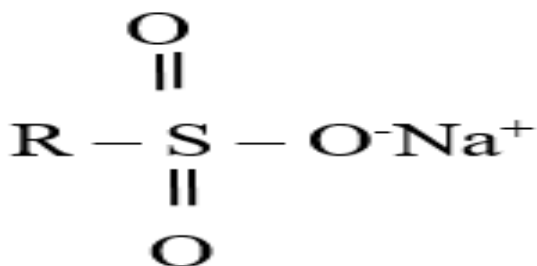
(a) Name the methods **A** and **B**. **(1mark)**

A-

B-

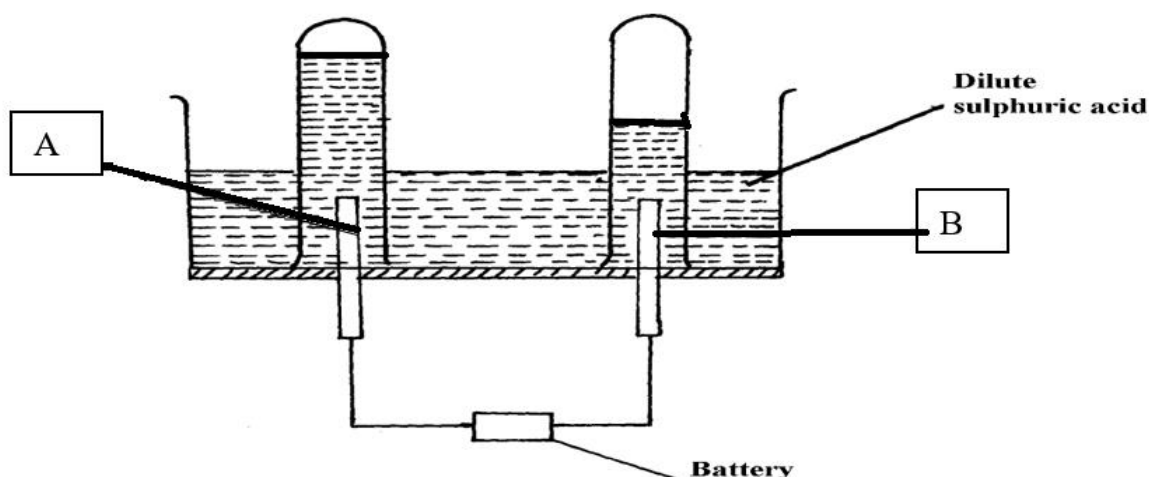
(b) From the methods above, identify **one** that is suitable for collecting Sulphur (IV) oxide. Explain. **(2 mark)**

16. The structure below represents a cleansing agent.



- a) State the type of cleansing agent represented above. (1 mark)
- b) State two disadvantage of using the other type cleansing agent. (2 marks)

17. The diagram below represents a set-up that can be used for the electrolysis of dilute sulphuric acid



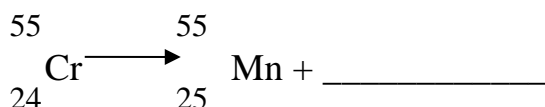
- (a) Name the electrodes **A** and **B**. (1mark)
- A-
- B-

- (b) Write an equation for the reaction taking place at electrode **B**. (1mark)
- (c) What happens to the concentration dilute sulphuric acid as the reaction continues? (1mark)

18.(a) State the graham's law of diffusion. (1mark)

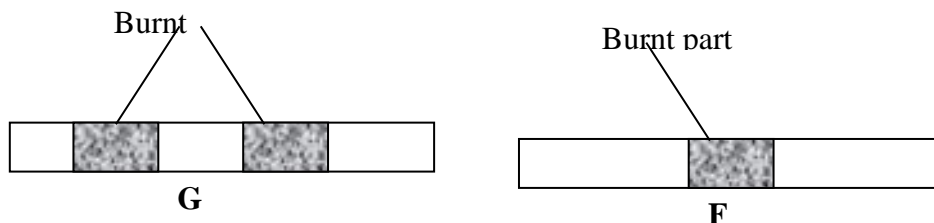
- (b) Calculate the relative formula mass of gas X given that the time taken by equal volume of nitrogen gas and gas X to diffuse through the same hole is 10 seconds and 20 seconds respectively. (2mks)

19. (a) Complete the following nuclear equation. (1mark)



- (b) 100g of a radioactive substance was reduced to 12.5g within 15.6 years. Determine the half-life of the substance. (2marks)

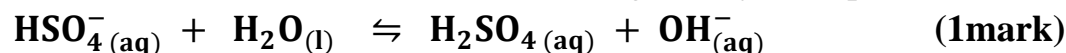
20. Wooden splints **F** and **G** were placed in different zones of a Bunsen burner flame. The diagram below gives the observations that were made.



(a) Explain the difference between **F** and **G**. (1mark)

(b) Name the type of flame that was used in the above experiment. (1mark)

21.(a) Identify the acid and base in the forward reaction given by the equation below:



Acid -

Base-

b) Using the above equation and your answer in (a) above, define the term acid.

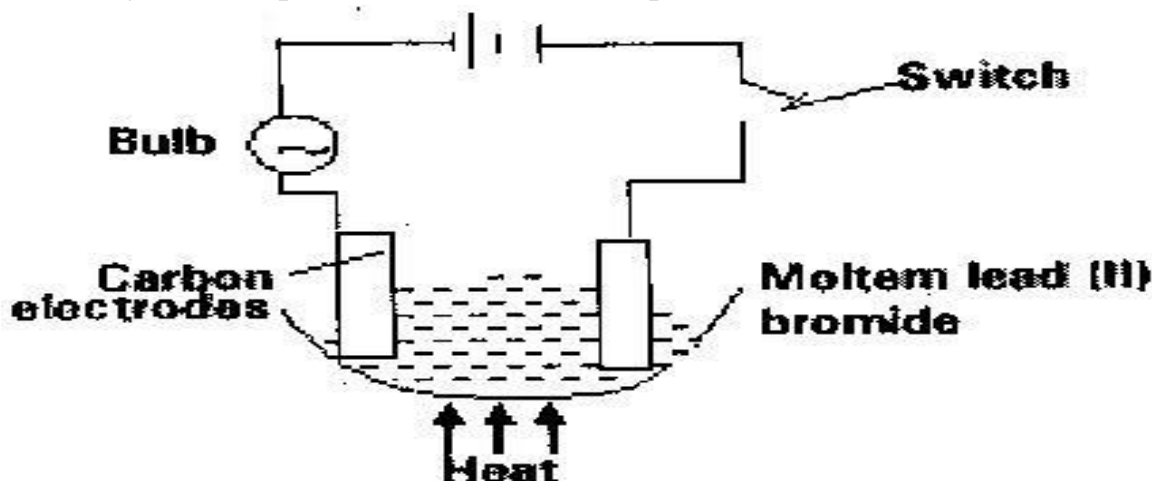
(1mark)

22 Sulphur exists in two crystalline forms.

a) Name **one** crystalline form of Sulphur. (1mk)

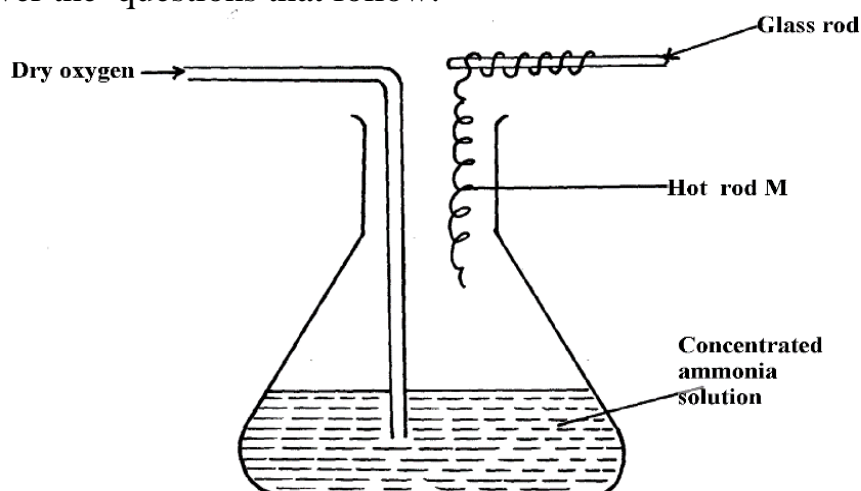
b) State **two** uses of Sulphur. (2mks)

23. Study the set up below and answer the questions that flows

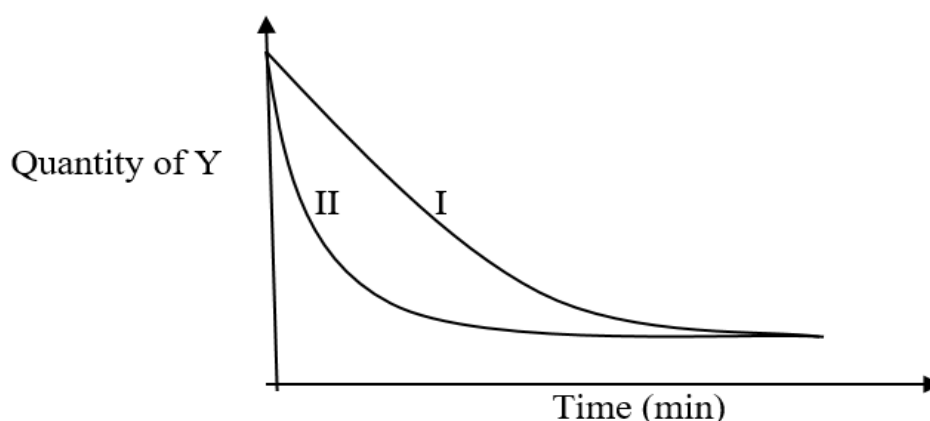


State all the observations that would be made when the circuit is completed (3 marks)

24. The diagram below shows the catalytic oxidation of ammonia gas. Use it to answer the questions that follow: -



- a) What metal could rod **M** be made of? (1mark)
- b) State and explain **two** observations made inside the conical flask. (2marks)
25. State two distinctive features of a dynamic equilibrium. (2marks)
26. **3.1** of an organic compound containing Carbon hydrogen and oxygen only produced 4.4g of Carbon (IV) oxide and 2.0g of water on complete combustion.
- (a) Calculate its empirical formula. (2 marks)
- (b) Calculate its molecular formula if its formula mass is 62. (1 mark)
27. (i) Nitric (V) acid prepared in the laboratory is yellow in colour. What causes the yellow colour? (1 mark)
- (ii) State any two observations that would be made when concentrated nitric(V) acid is added to copper turnings. (2 marks)
28. The curves below were obtained when equal volumes of HCl acid of same concentration were reacted with 25.0g of Mabel chips. In one case, the acid was first warmed to a high temperature.



- (a) Which curve represents the reaction involving warm hydrochloric acid?(1 mark)
- (b) Suppose a graph of volume of CO_2 produced against time was plotted, draw on the same axes a sketch to show the graphs of the reaction above and label them as warm acid and cold acid. (2 mark)

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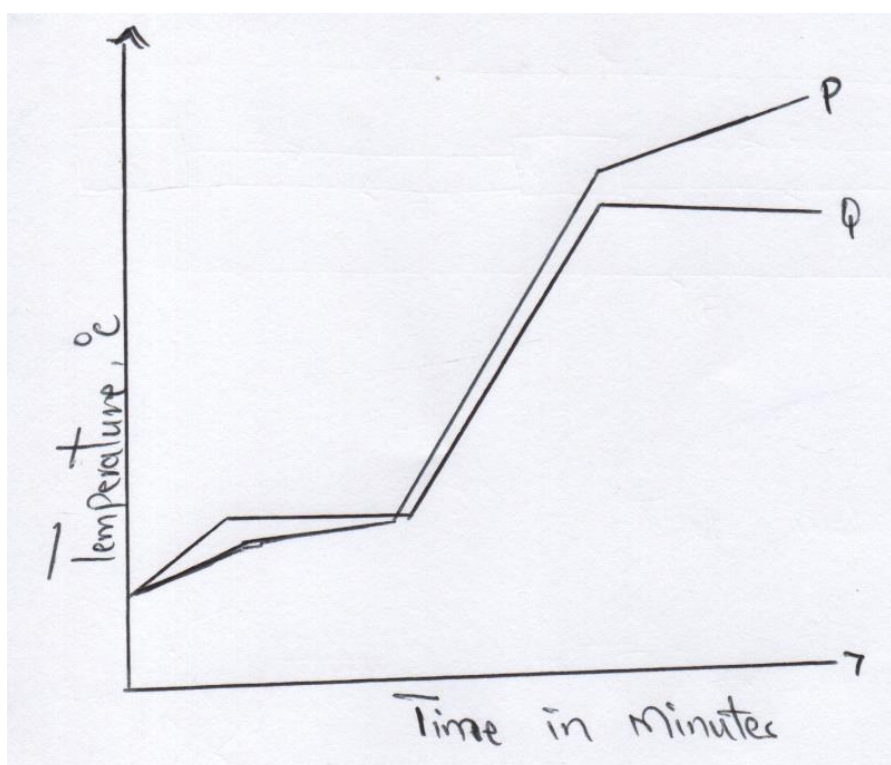
SERIES 1 TRIAL 2 PAPER 2

Kenya Certificate of Secondary Education.

TIME:2HRS

Answer all the questions

1. (a) The curves below represent the variation of temperature with time when pure and impure samples of a solid were heated separately.



- (i) (a) Which curve shows the variation in temperature for the pure solid? Explain. (2mks)

- (ii) State the effect of impurities on the melting and boiling points of a pure substance.

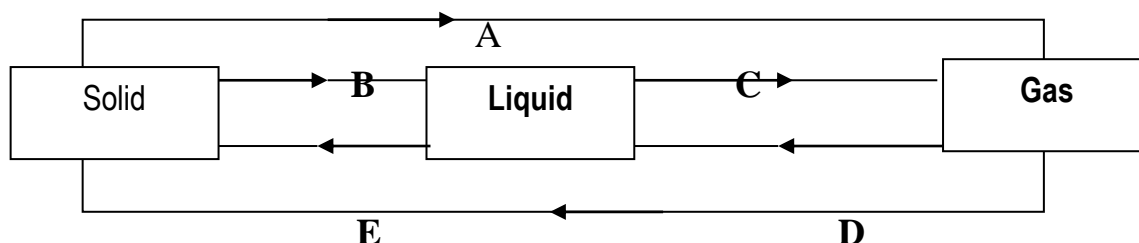
I. Melting points

($\frac{1}{2}$ mk)

II. Boilling points

($\frac{1}{2}$ mk)

(b) The diagram below shows the relationship between the physical states of matter.



i) Identify the processes **B** and **D**.

(2mks)

B-

D-

ii) Name process **A**

(1mk)

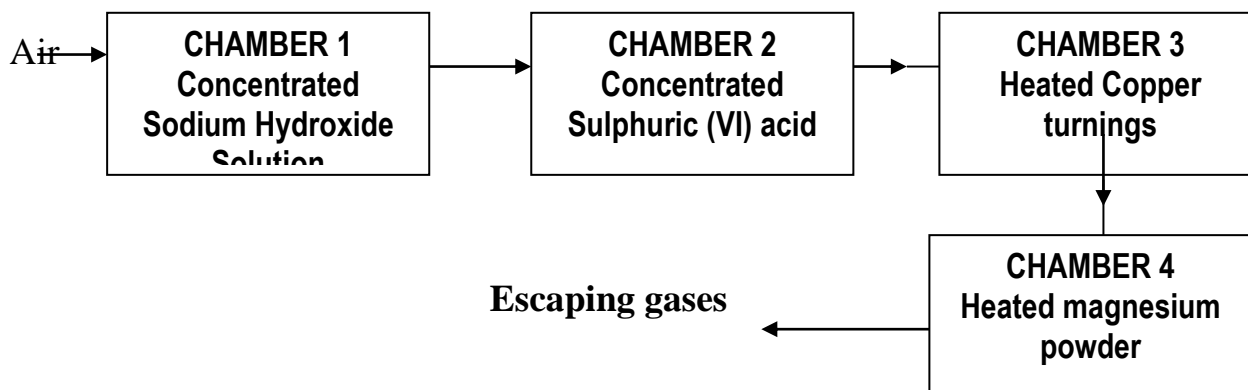
iii) State two substances in chemistry that undergo the process **A**

(1mk)

iv) Is the process **E** exothermic or endothermic? Explain

(1mk)

2. Air was passed through several reagents as shown below



(a) Name the main inactive component of air

(1mk)

(b) Name the components of air that are removed in the following chambers

(3mks)

I. Chamber 1

II. Chamber 3

III. Chamber 4

c) What is the purpose of passing air through concentrated sulphuric (1v) acid.

(1mk)

d) Write a chemical equation for the reaction which takes place in :-

I. chamber 1

(1mk)

II. Chamber4

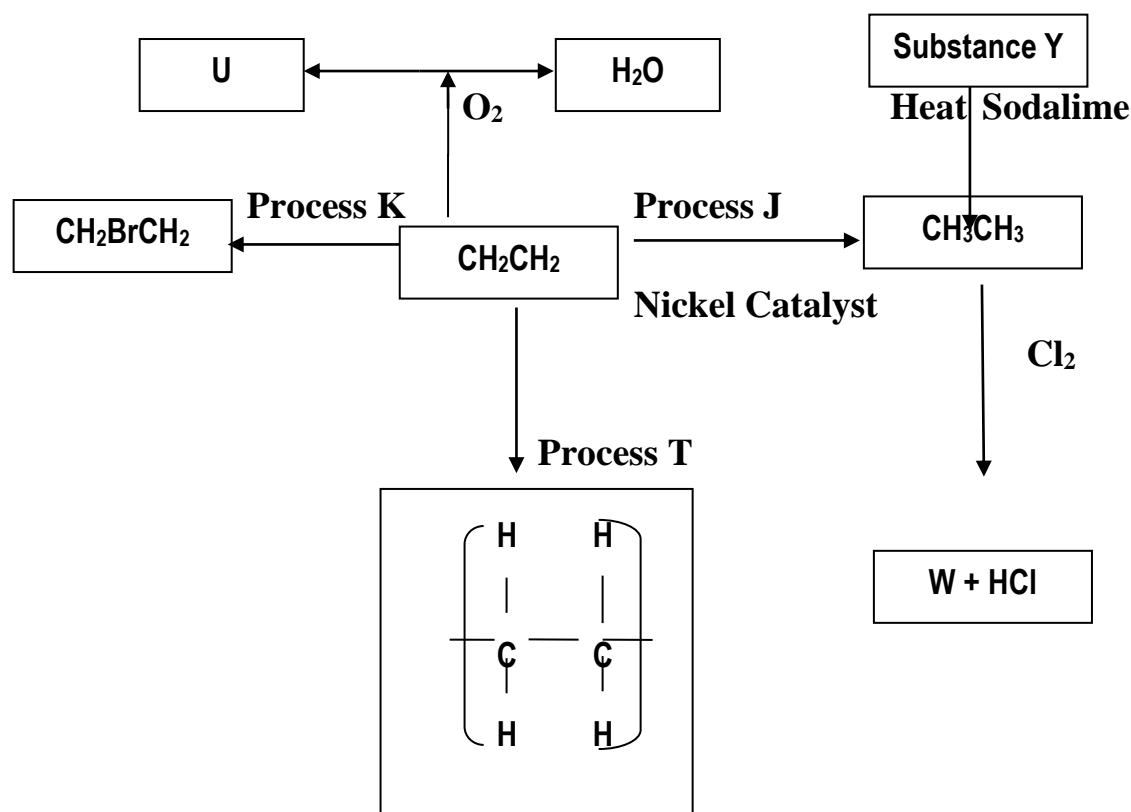
(1mk)

e) State and explain the observation made in chamber 3 during reaction (2mks)

f) Name one gas which escapes from the scheme above (1mk)

3. (a) Draw and name two isomers of Pentane (2mks)

(b) Study the flow diagram below and then answer the questions that follow.



(i) Name process J, K and T (3mks)

J-

K-

T-

(ii) State the reagents necessary for processes J and K (1mk)

(iii) Name substances U, W, S and Y (2mks)

U -

W -

S -

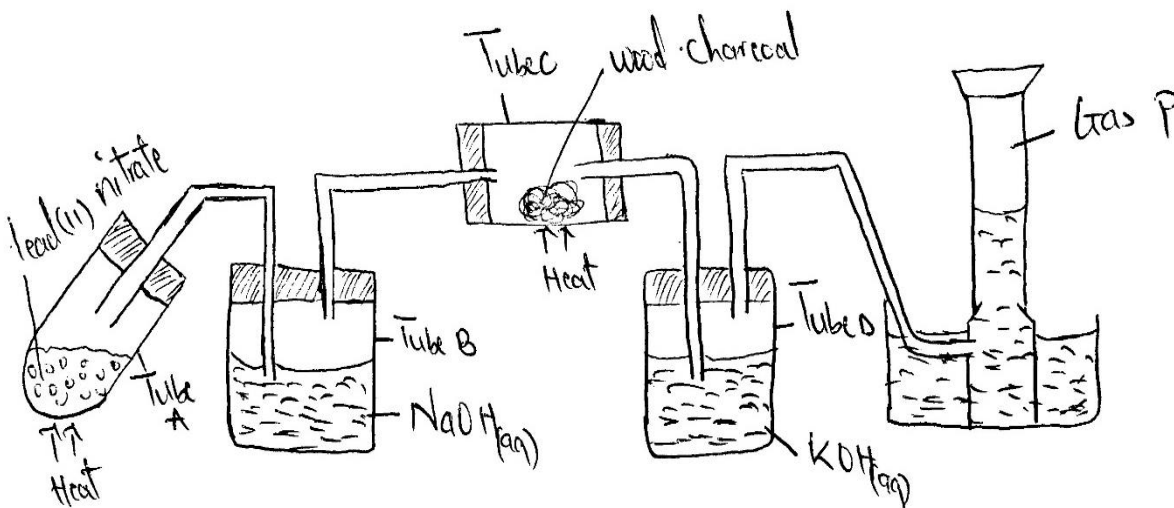
Y-

C) Describe how burning can distinguish CH_2CH_2 from CH_3CH_3 (2mks)

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

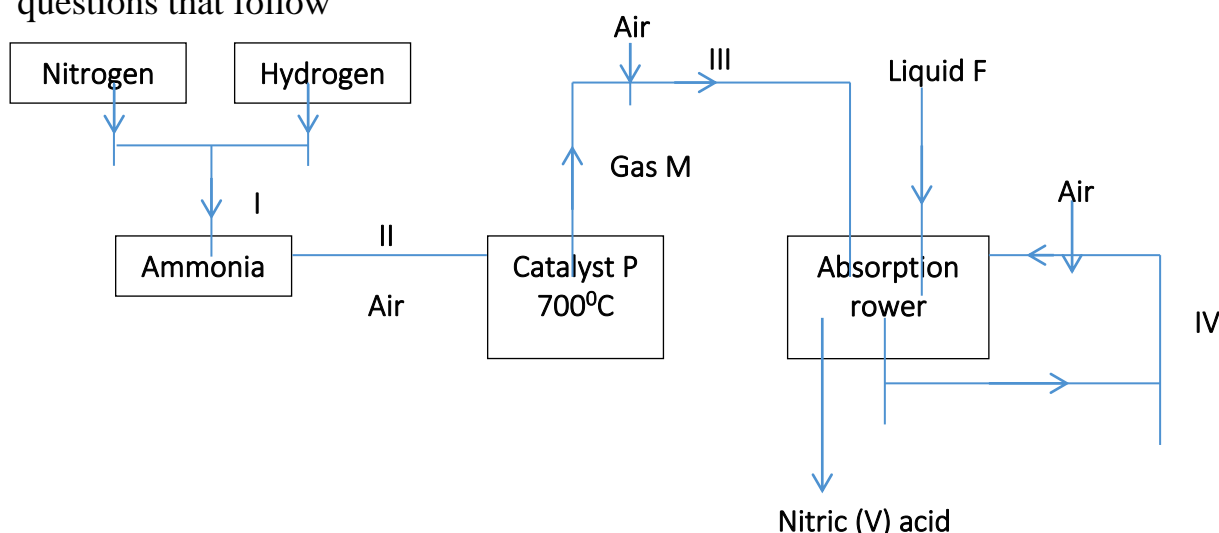
C								T
						U		
X	K		M			Q	W	
	Y					P		Z
J								

- Identify the elements in period 1 (1mk)
 - With a reason, identify the element with the largest atomic radius (2mks)
 - Draw the atomic structure of element Q (1mks)
 - Write down the electronic configurations of elements Y and W
Y-
W-
 - Element G forms an ion G^{3-} and its ionic configuration 2.8.8. indicate its position on the grid above (1mk)
 - Identify an element whose oxide reacts with both acids and alkalis (1mk)
 - Write down the chemical formular of the compound formed between elements K and W (1mk)
 - Draw the bonding in the compound formed in (g) (i) above using dots (.) and crosses (x) to represent electrons (1mk)
 - Compare the atomic radius elements X and K. Explain (2mks)
- 5 (a) Study the diagram below and answer the questions that follow



- Write a chemical equation for the reaction in tube A (1mk)
- Name the two salts formed in tube B (1mk)
- State the observation made in tube C (1mk)
- What is the purpose of potassium hydroxide in tube D. (1mk)
- Name gas P (1mk)

(b) The flow chart below shows some industrial processes. Use it to answer the questions that follow



(i) Give the source of the following raw materials

- a) Nitrogen gas (1/2mk)
- b) Hydrogen gas (1/2mk)

ii) Name the following substances;

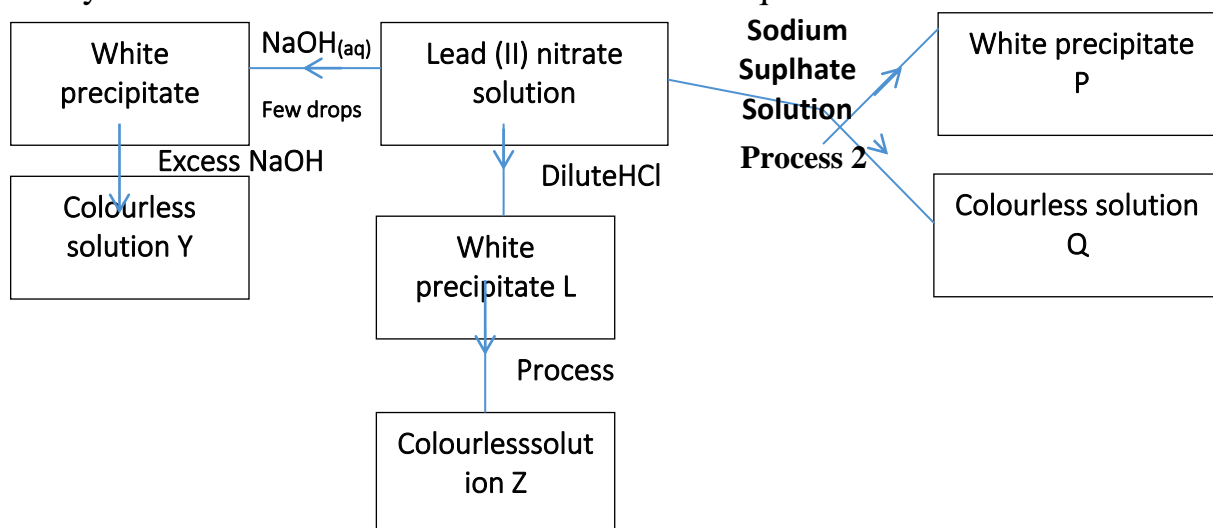
- a) Catalyst **P** (1/2 mk)
- b) Gas **M** (1/2 mk)
- c) Liquid **F** (1/2mk)

iii) Write the chemical equations for; formation of gas M. (1mk)

The reaction in the absorption tower (1mk)

iv) State one use of nitric (v) acid (1/2mk)

6. Study the reaction scheme below and answer the questions that follow



a) Write the chemical formular of compounds P and Q

i) P -

ii) Q -

(2mks)

b) Write an ionic equation for the process that produces white precipitate P (1mk)

c) Name process 2 (1mk)

d) Name the process that separated **P** and **Q** (1mk)

P-

Q-

e) Write a balanced chemical equation for the formation of white precipitate **L**. (1mk)

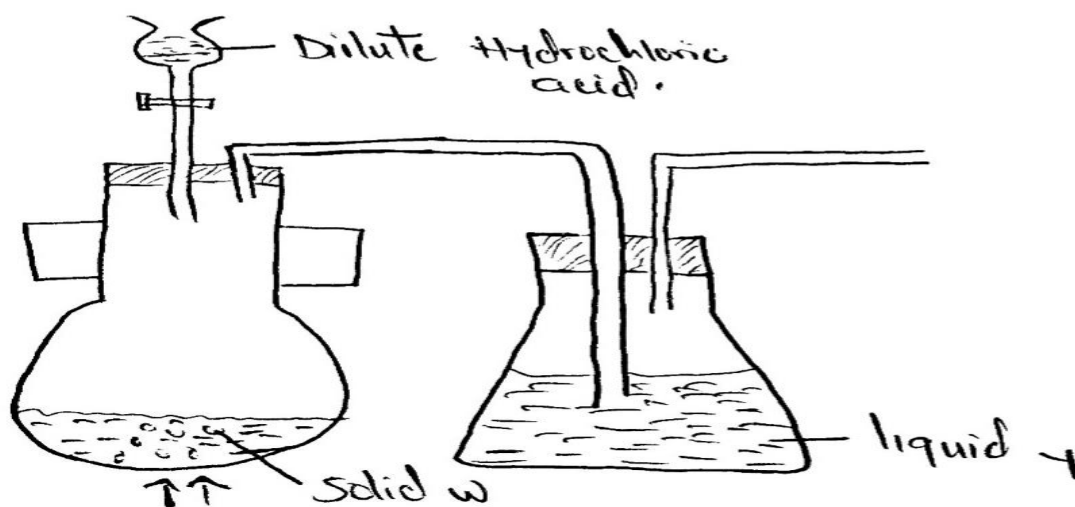
f) State the condition required for process **3** (1mk)

g) What physical process is exhibited in process **3** (1mk)

h) Name the anion present in colourless solution **Z** (1mk)

i) Write the formula of the complex ion present in colourless solution **Y** (1mk)

7. Below is a set of apparatus that was used to obtain a dry sample of sulphur(iv)oxide gas



a) Name;

i) Solid **W** (1mk)

(ii) The apparatus containing dilute hydrochloric acid (1mk)

b) State the role of Liquid **Y** (1mk)

c) Complete the diagram to show how the gas could have been collected (1mk)

d) A sample of sulphur(iv)oxide gas was passed through freshly prepared iron(III)sulphate solution. State and explain the observation made (2mks)

e) 50cm^3 of 2M Hydrochloric acid was used during the above experiment. Determine the volume of sulphur(iv)oxide gas produced at r.t.p (molar gas volume = 24dm^3)

8. In an experiment, 40cm^3 of 0.1 M sodium hydroxide solution was placed in a suitable apparatus and 5.0cm^3 portions of hydrochloric acid were added. The resulting mixture was stirred with a thermometer and the temperature taken after each addition. Both solutions were initially at 20°C

Volume of HCL (cm ³)	5	10	15	20	25	30	35	40	45
Temperature (°c)	21.5	22.5	24.0	25.0	26.0	27.0	27.5	27.5	27.0

- a) i.** Plot a graph of temperature against volume of the acid added **(4mks)**
ii) Use the graph to determine the concentration in moles per litre of the hydrochloric acid **(2mks)**
- b) i)** Calculate the heat change for the reaction **(1½mk)**
ii) Molar enthalpy of neutralization of hydrochloric acid by sodium hydroxide solution (density of solution 1g/cm³ specific heat capacity 4.2 kJ/kg) **(1½mks)**
- c)** Write the thermochemical equation for the reaction **(1mk)**
d) Draw an energy level diagram for the reaction **(1mk)**

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CHEMISTRY MOCKS

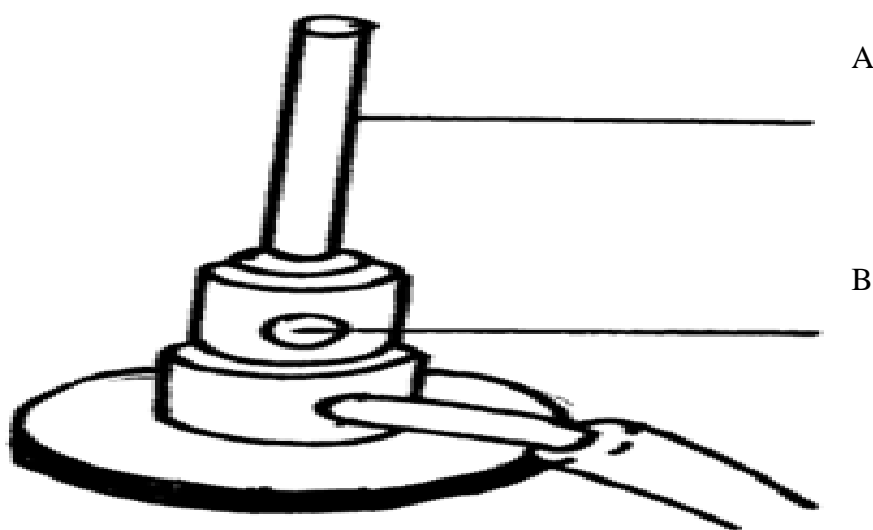
SERIES 1 TRIAL 3 PAPER 1

Kenya Certificate of Secondary Education.

TIME:2HRS

Answer all the questions

1. The diagram below shows a Bunsen burner which is used as a source of heat in the laboratory.



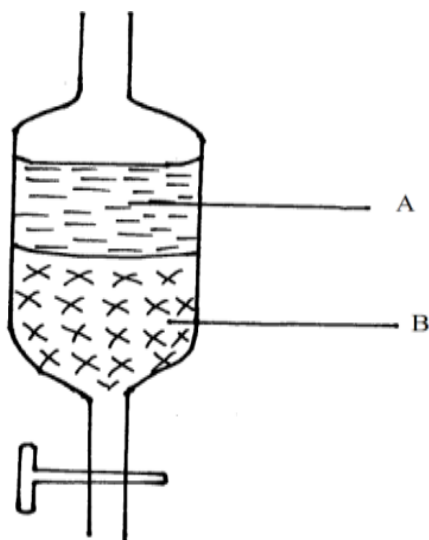
- a) Name the parts labeled: (2 marks)

A-

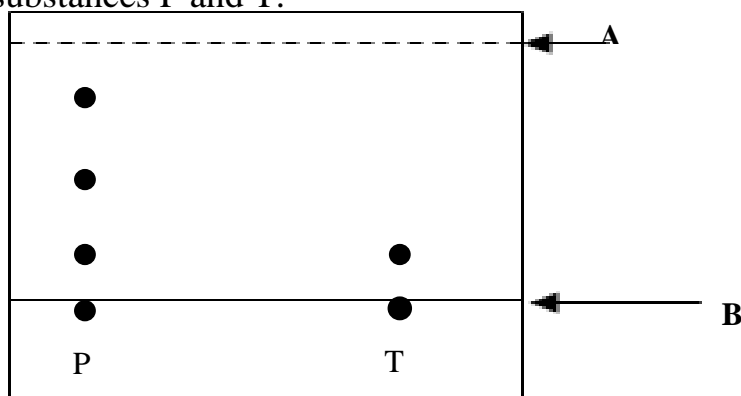
B-

- b) Explain how the hotness of a non-luminous flame can be increased. (1 mark)

2. In an experiment to separate a mixture of two immiscible liquids A and B, a form four student set the apparatus as shown below.

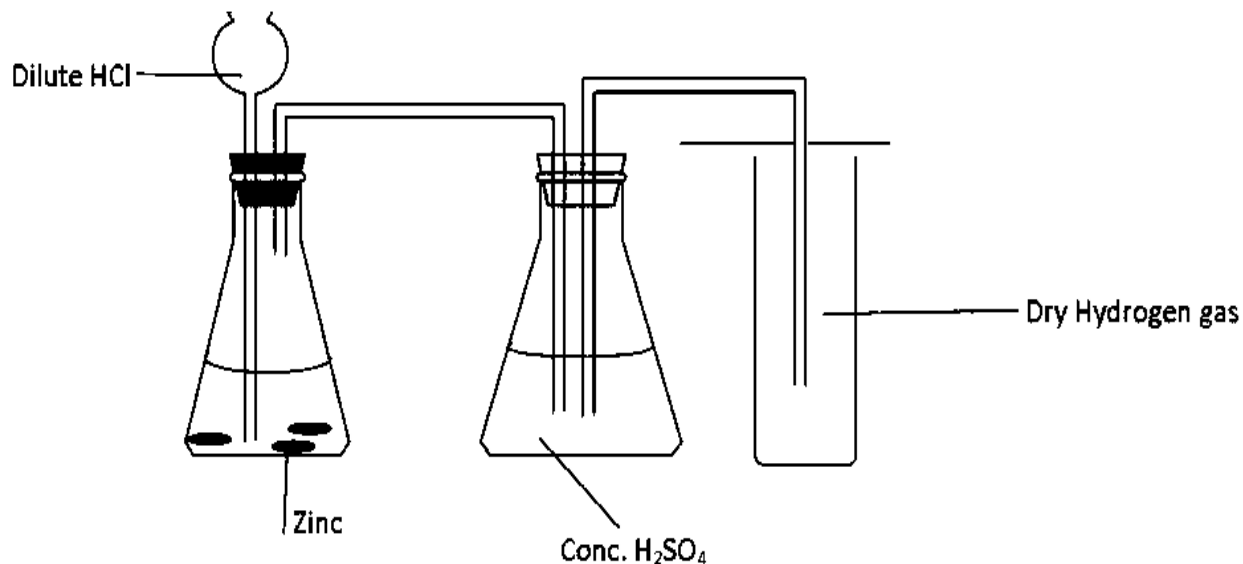


- a) Name the above apparatus. _ (1 mark)
b) Which liquid is denser? (1 mark)
c) Name one other method that can be used to separate the above mixture (1 mark)
3. The following chromatogram shows the results obtained after separating substances P and T.



- a) Name lines; (1 mark)
A_
B_
b) Name the possible solvent that can be used in the above process. (1 mark)
c) Which of the two substances is pure? (1 mark)

4. A form four student arranged the apparatus as shown below with the aim of collecting dry hydrogen gas.



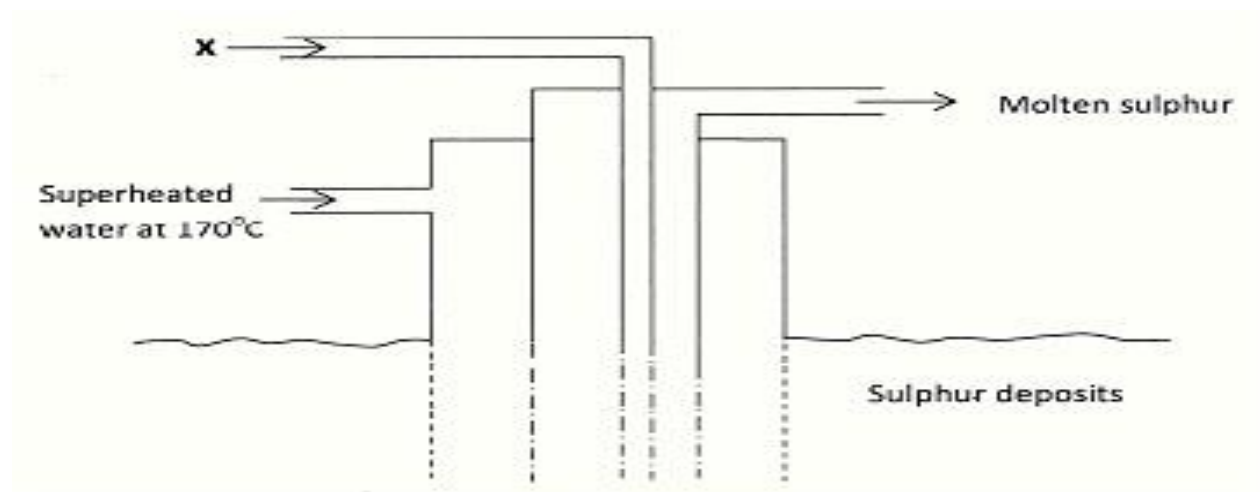
Identify with reasons **two** mistakes in the above set-up. **(3 marks)**

5. The table below shows elements and their atomic numbers. The letters do not represent the actual symbols of the elements.

Element	A	B	C	D	E	F	G
Atomic number	11	10	20	13	14	6	8

- From the given letters, select two elements with the same chemical properties. **(1 mark)**
 - Write the formula of the compound formed when element E reacts with element G. **(1 mark)**
 - Identify the most stable element and give a reason for your answer. **(1 mark)**
6. When magnesium burns in air, it forms two products. When one of the products dissolves in water, a colorless gas that turns red litmus paper blue is formed.
- Name the product that dissolves in water to produce a colorless gas. **(1 mark)**
 - Write an equation for the formation of the colorless gas. **(1 mark)**
 - State any one use of the colorless gas. **(1 mark)**
7. A student was given a mixture ammonium chloride, copper (II) oxide and sodium chloride. Describe how the student would separate the mixture **(3 marks)**

8. When small amount of carbon (IV) oxide is passed through lime water, a white precipitate is formed. When excess carbon (IV) oxide is bubbled through, the white precipitate dissolves to form a colorless solution.
- Name the white precipitate. (1 mark)
 - Explain using chemical equations why the white precipitate dissolves in excess of carbon(IV) oxide. (1 mark)
 - What will happen of the above colorless solution is boiled. (1 mark)
9. Write equations to show the effect of heat on each of the following.
- Sodium hydrogen carbonate. (1 mark)
 - Silver nitrate (1 mark)
 - Sodium nitrate (1 mark)
10. a) State the Graham's law of diffusion. (1 mark)
- (b) A sample of unknown gas Z was shown by analysis to contain sulphur and oxygen. The gas requires 28.3 seconds to diffuse through an aperture into a vacuum. An identical amount of oxygen gas passes through the same aperture in 20 seconds. Determine the molar mass of gas Z. (O=16, S=32). (2 marks)
11. When a hydrated sample of $\text{CaSO}_4 \cdot x\text{H}_2\text{O}$ was heated until there all the water was lost, the following data was obtained.
- Mass of the crucible = 30.296g
 Mass of crucible + hydrated salt = 33.111g
 Mass of crucible + anhydrous salt = 32.781g
 Determine the empirical formula of the hydrated salt. (Ca=40, S=32, O=16, H=1) (3 marks)
12. The empirical formula of a compound is C_2H_5 . When 11.6g of the compound was allowed to evaporate; it occupied 4.8 dm^3 at room temperature and pressure. What is its molecular formula? (MGV = 24 dm^3) (3marks)
13. The diagram below shows an industrial process that is used in extraction of sulphur.



- What is the name given to the above industrial process? (1 mark)

- b) Identify substance X. (1mark)
 c) What is the role of super-heated water? (1mark)

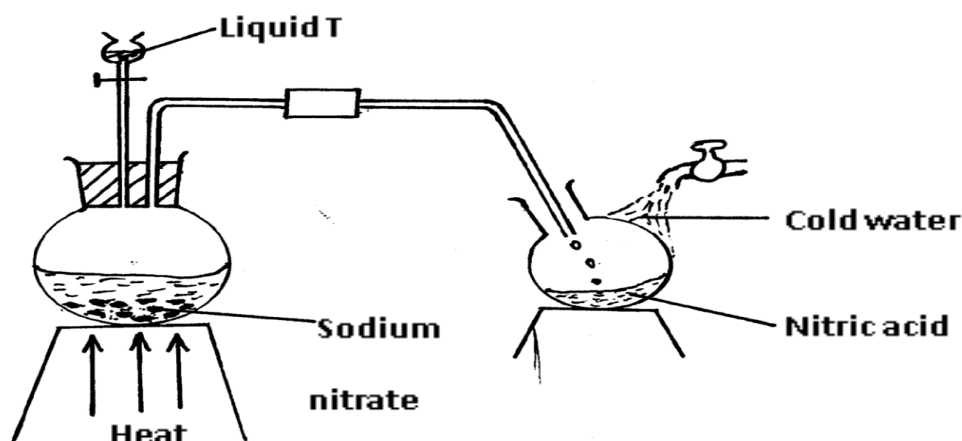
14. a) Give the systematic names for the following compounds.

i) $\text{CH}_3\text{CH}_2\text{CHCH}_2$ _ (1/2 mark)

ii) $\text{CH}_3\text{CH}_2\text{CH}_3$ _ (1/2 mark)

b) Describe one chemical process that can be used to distinguish between the substances named in (a) above. (2 marks)

15. The set-up below was used to prepare Nitric(V) acid in the laboratory.

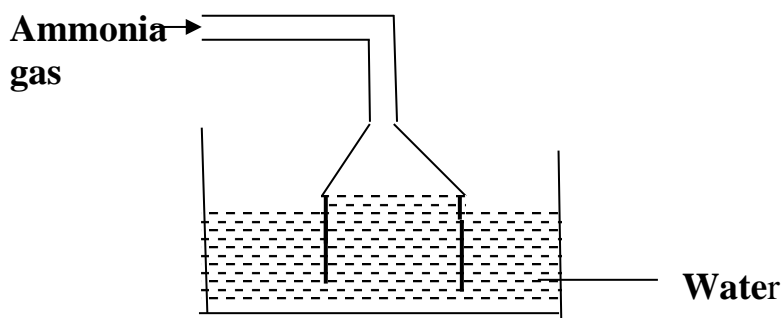


a) Name liquid T. (1 mark)

Write an equation for the reaction taking place in the flask. (1 mark)

b) State the reason why nitric(V) acid collected is brown in colour and explain how the brown colour can be removed. (1 mark)

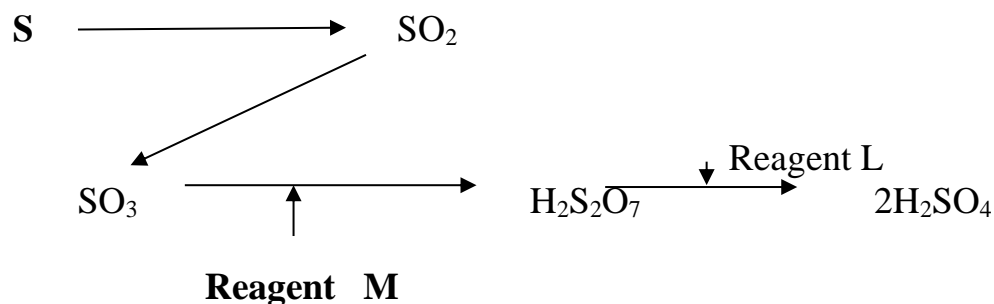
16. Ammonia gas was passed into water as shown below.



a) What is the use of the inverted funnel? (1 mark)

b) State and explain the observation made when a red litmus paper is dipped into the above solution. (1 mark)

17. Study the flow chart below showing the reaction involved in the preparation of sulphuric (IV) acid and answer the questions that follow.



a) Name the reagents.

L- _

(1/2mk)

M- _

(1/2mk)

b) Write the equation for the reaction between reagent M and $\text{H}_2\text{S}_2\text{O}_7$

(1mk)

c) State one industrial use of sulphuric(VI) acid.

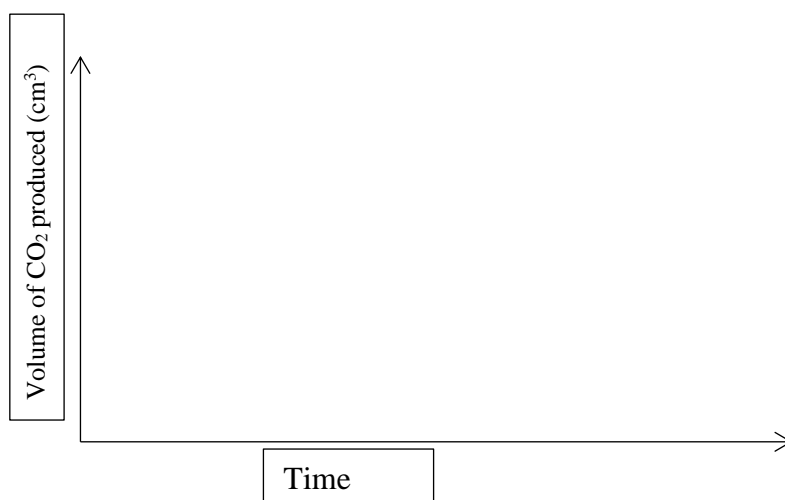
(1 mark)

18.a) What is meant by the term strong acid?

(1 mark)

c) In an experiment, 40cm^3 of 0.5M sulphuric (VI) acid was reacted with excess sodium carbonate and the volume of carbon (IV) oxide produced recorded with time. In another experiment, 40cm^3 of 0.5M ethanoic acid was reacted with excess sodium carbonate and the volume of carbon (IV) oxide produced recorded with time. On the grid below, sketch and label the curves if the volumes of carbon (IV) oxide were plotted against time on the same axis.

(2 marks)



19. Hydrogen chloride gas is soluble in both water and methylbenzene. State and explain the observation made when a small piece of magnesium ribbon is placed in each of the solutions.

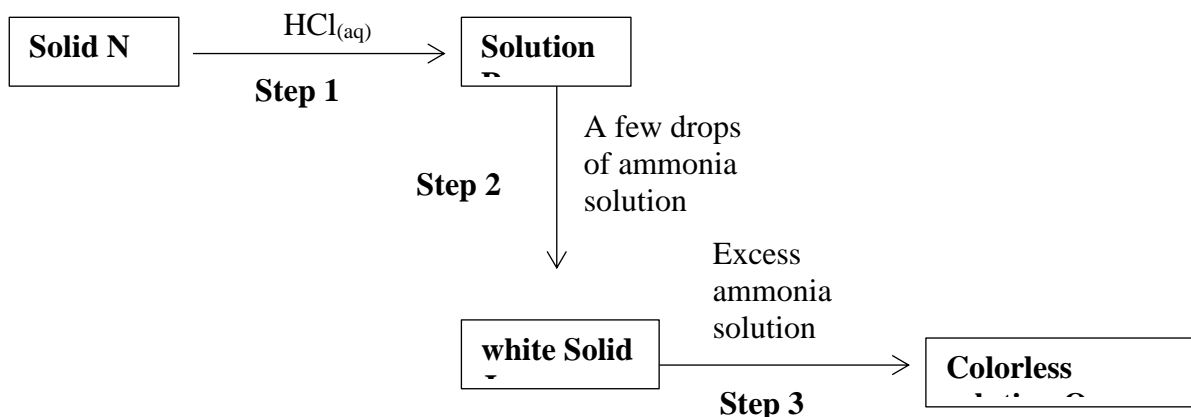
a) Solution of HCl(g) in methylbenzene

(1½ marks)

b) Solution of HCl(g) in water.

(1½ marks)

20. The scheme below shows a reaction sequence starting with solid N. study it and answer the questions that follows.

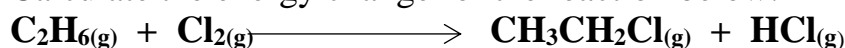


- a) Name the cation present in solid N. (1 mark)
- b) Write the formula of the complex ion in the colorless solution Q. (1 mark)
- c) Write an ionic equation for the reaction in step 2. (1 mark)
21. Reagent bottles labelled H_2SO_4 solution, K_2CO_3 solution and NaCl solution had labels accidentally removed. A packet of blue litmus paper is lying near a long with a rack of test-tubes, without using any other material explain how you would go about labeling the bottles correctly. (3marks)
22. Some bond energies are given below;

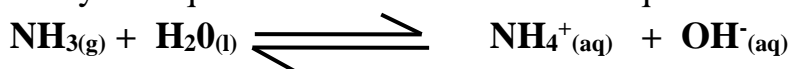
Bond	Energy (kJmol^{-1})
C-C	348
C-H	414
Cl-Cl	243
C-Cl	432
H-Cl	340

Calculate the energy change for the reaction below.

(3 marks)



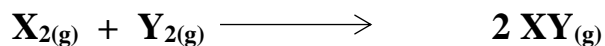
23. a) What is fractional crystallization? (1 mark)
- (b) The solubility of copper (II) sulphate is 55g/100g of water at 75°C and 19g/100g of water at 15°C . What mass of crystals would be deposited, if 150g of a saturated solution is cooled from 75°C to 15°C . (2 marks)
24. Study the equation below and answer the question that follows.



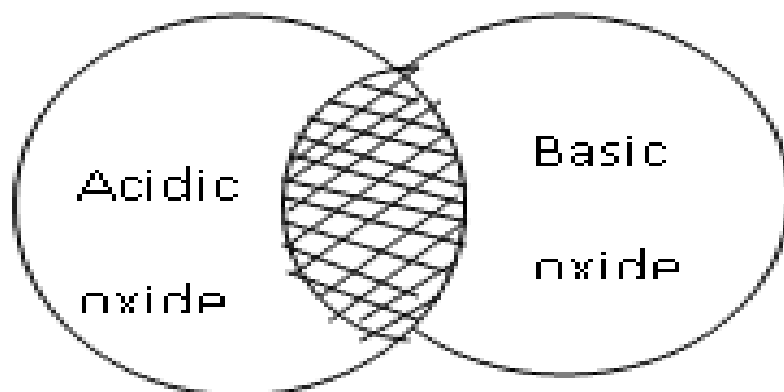
Identify two species that acts as an acid. Give a reason for your answer. (3 marks)

25. Using well labeled diagrams, explain how water hardness can be removed by ion exchange method. (3 marks)

26. Substances X and Y consists of molecules X_2 and Y_2 respectively. When the two elements react, they form a molecule of XY . The X-X bonds are as strong as Y-Y bonds. But the X-Y bond is stronger than both X-X and Y-Y bonds.



- a) Is the above reaction exothermic or endothermic? Give a reason for your answer. (2 marks)
- b) Draw an energy level diagram for the reaction in (a) above. (1 mark)
27. The diagram below shows acidic and basic oxides fit in a general family of oxides.



- a) State the name given to the type of oxides that would be placed in the shaded region. (1 mark)
- b) Name two oxides that could be placed on the shaded region. (2 marks)

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DATE.....

CHEMISTRY MOCKS

SERIES 1 TRIAL 3 PAPER 2

Kenya Certificate of Secondary Education.

TIME:2HRS

Answer all the 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)

(ii)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)

(c) Write the formula of the compound formed between elements **B** and **G**(1 mark)

(d)The chloride of **A** has a higher boiling point than that of **C**. Explain. (2 marks)

(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.

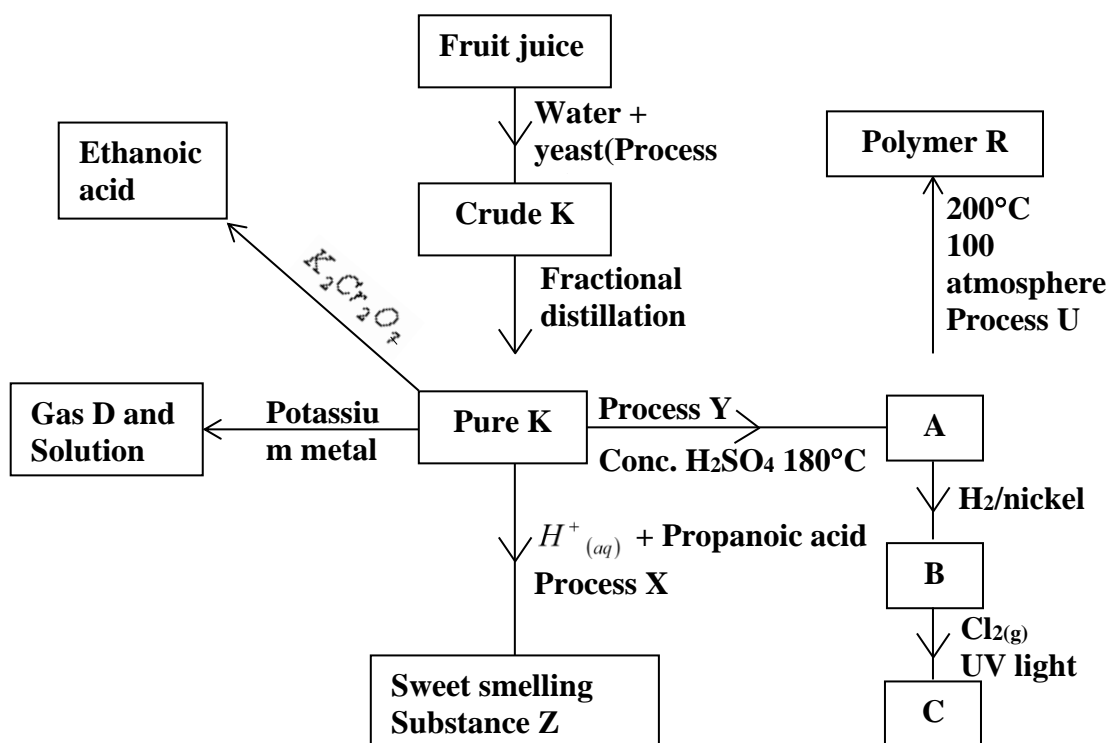
Explain.

(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)

(iii) Name the processes marked as:

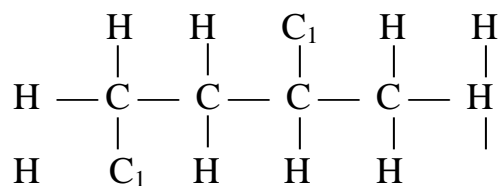
(3 marks)

W-

X-

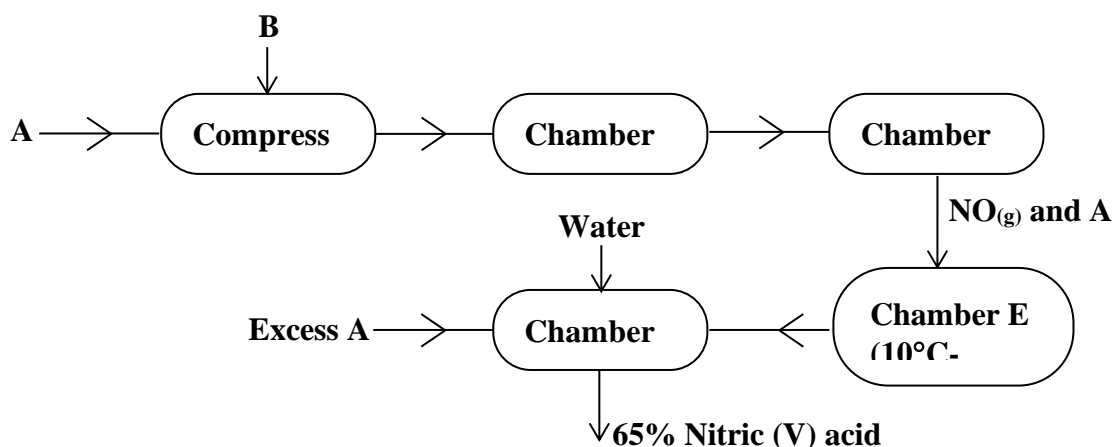
Y-

- (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
E
F
 (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 were made in the flask at the end of the reaction? (1 mark)

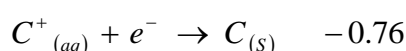
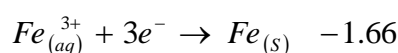
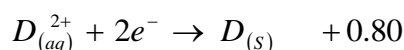
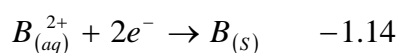
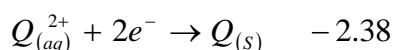
(d)(i) Plot a graph of mass of the flask and its contents against time. (3 marks)
(provide graph paper)

(ii) Using the graph determine rate of the reaction at the 20th second. (2 marks)

(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)

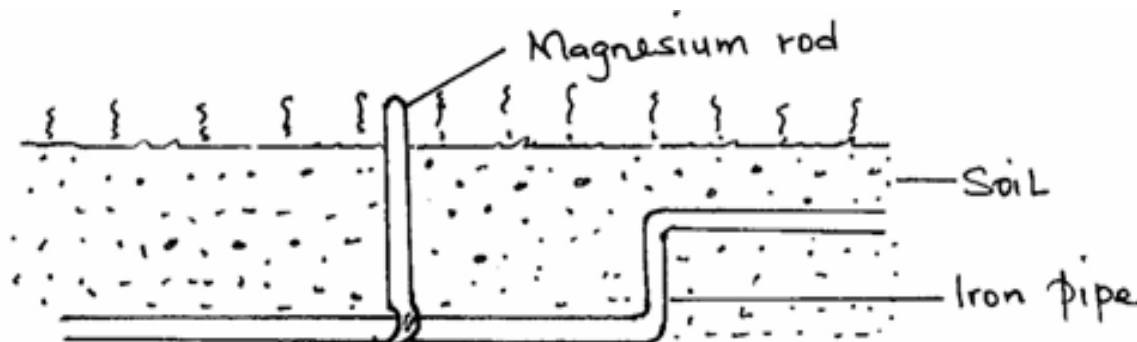
(ii) Calculate the e.m.f value of electrochemical cell obtained when elements **B** and **D** are paired together. (1 mark)

(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.

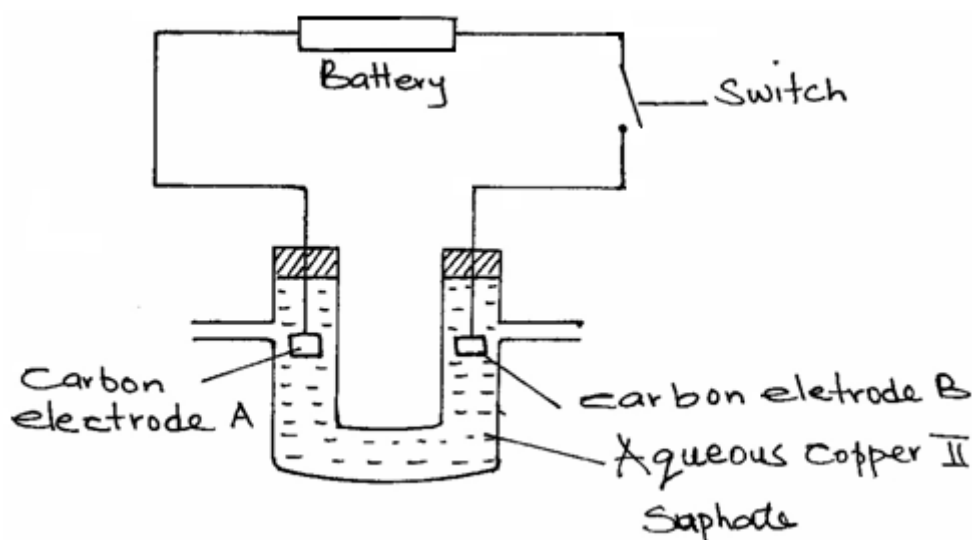


(b) Magnesium metal was connected to an underground pipe made of iron as shown below:



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:

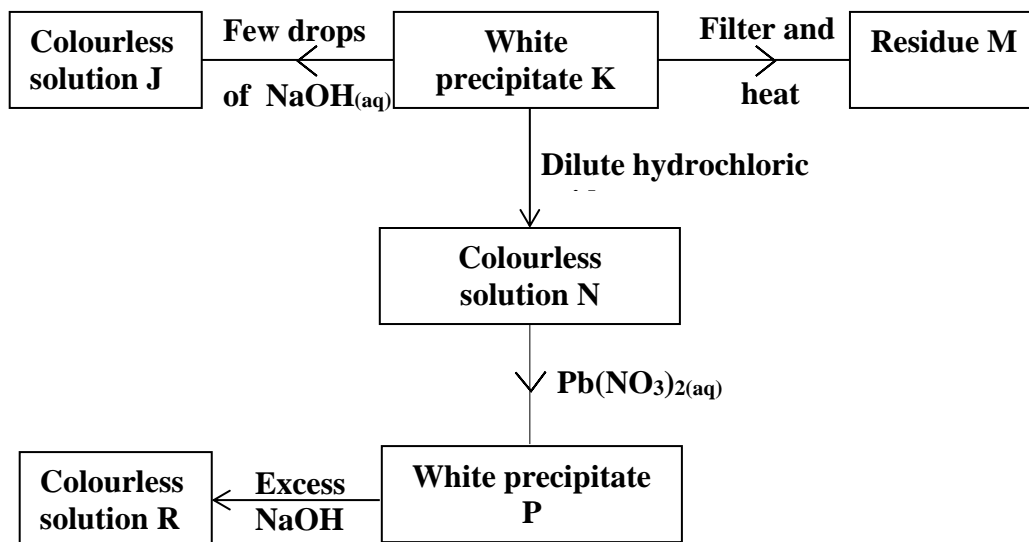
(i) Anode. (1 mark)

(ii) Cathode. (1 mark)

(v) Name **one** industrial application of the above electrolysis.

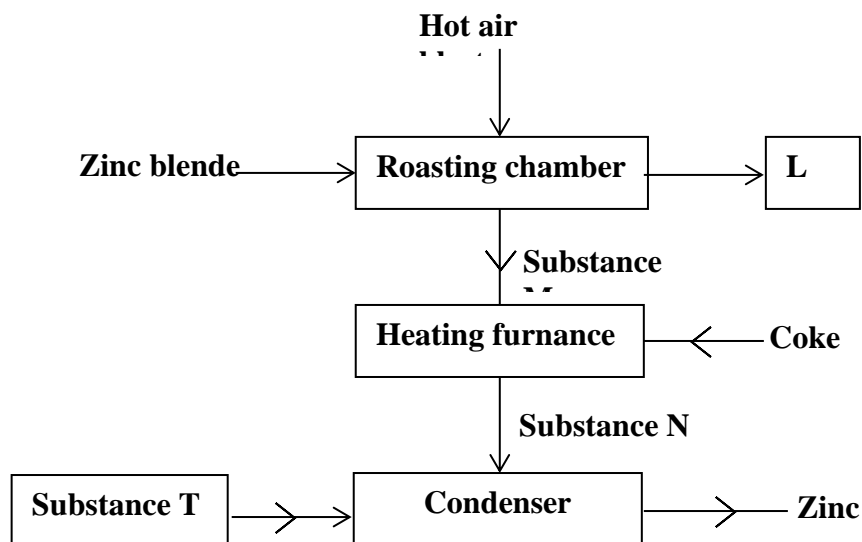
(1 mark)

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

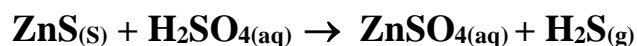


Residue **M** was yellow when hot and white when cold.

- (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)
- L-
- T-
- N-
- M-
- (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 marks)
- (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)

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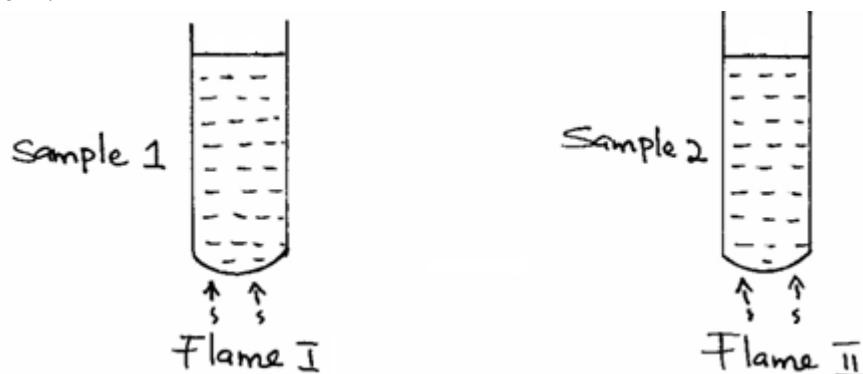
SERIES 1 TRIAL 4 PAPER 1

Kenya Certificate of Secondary Education.

TIME:2HRS

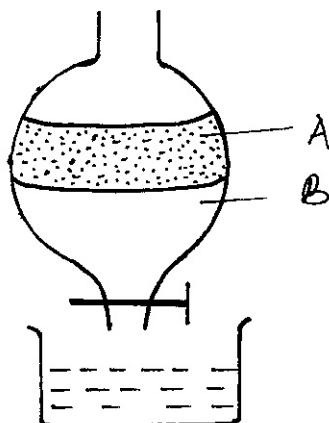
Answer all the questions

- 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)
- (b) 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.

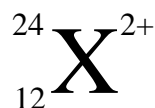


State the conditions under which flame I is produced in Bunsen burner. (1 mark)

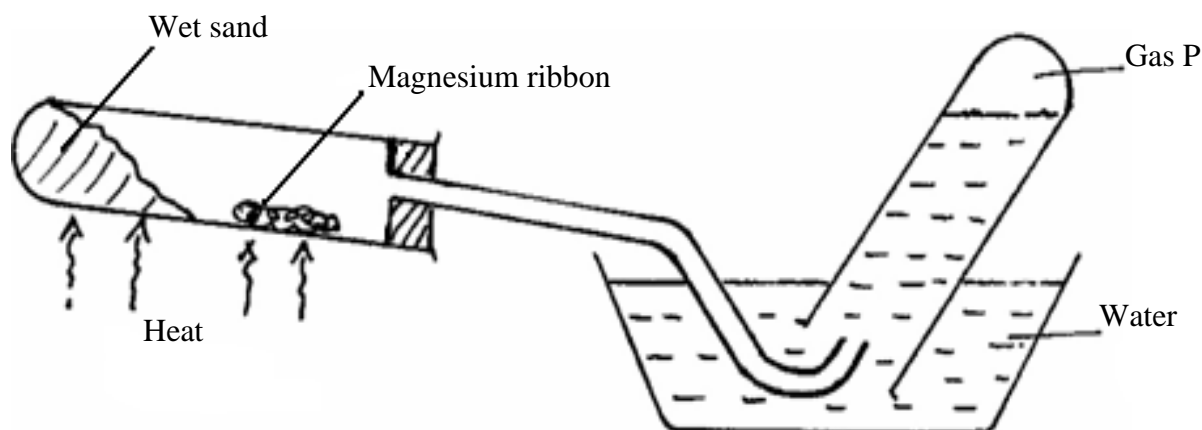
2. The apparatus below was used to separate a mixture of liquid A and B.



- (a) 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:

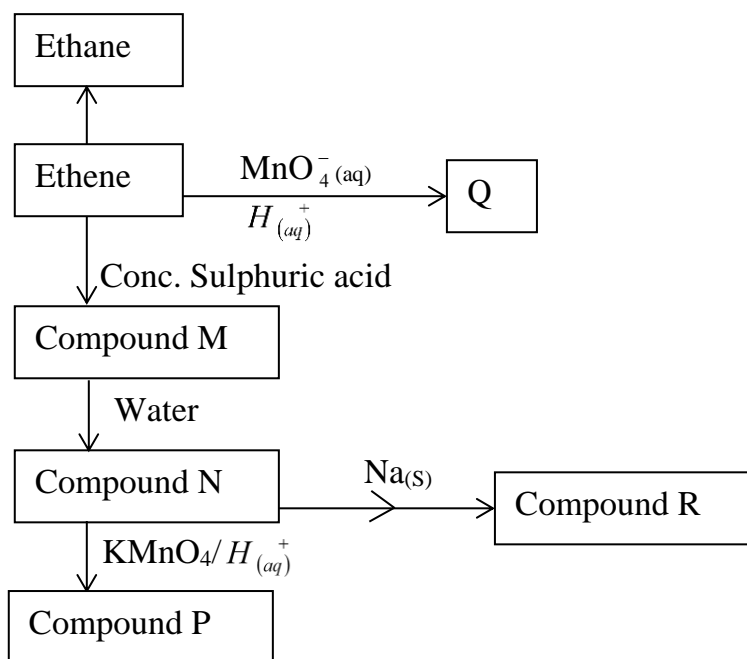


- (i) Write electronic configuration of ion of χ . **(1 mark)**
- (ii) To which group does element χ belong? **(1 mark)**
5. The set-up below can be used to study the reaction of magnesium and steam.



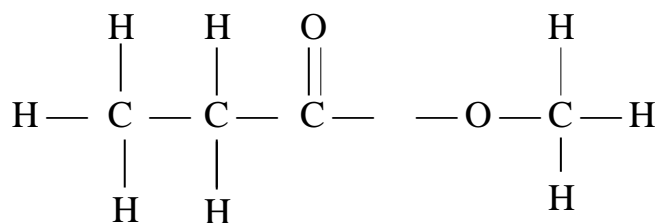
- (a) Name gas **P**. **(1 mark)**
- (b) How would you expect copper to behave compared to magnesium in the combustion tube? **(1 mark)**
- (c) Write the equation for the reaction between magnesium and steam. **(1 mark)**
6. An approximately χ molar solution of potassium manganate (VII) solution was 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:
- $$\text{MnO}_4^- + 5\text{Fe}^{2+} + 8\text{H}^+ \rightarrow \text{Mn}^{2+} + 5\text{Fe}^{3+} + 4\text{H}_2\text{O}_{(l)}$$
- What is the molarity of the potassium manganate (VII) solution? **(3 marks)**
7. During extraction of iron in the blast furnace, state the uses of the following in the furnace.
- (a) Molten slag. **(1 mark)**
- (b) Waste gases leaving the furnace. **(1 mark)**
- (c) Limestone. **(1 mark)**

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



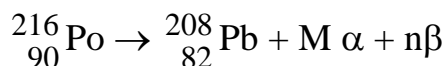
- (a) Draw the structure of compounds:
 P: (1 mark)
 Q: (1 mark)
 (b) Write the name of Compound R. (1 mark)

9. Study the organic compound below:



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

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

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:



- (a) 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)**

(b) 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.

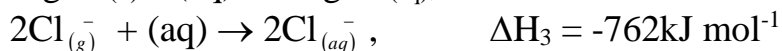
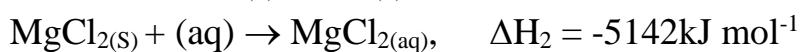
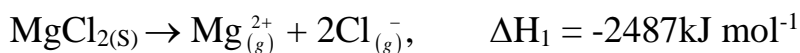
(i) C_2H_6 (C = 6, H = 1) **(1 mark)**

(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.

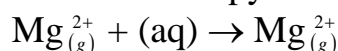


(a) Name the enthalpies **H₁** and **H₂**. (2 marks)

H₁-

H₂-

(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)

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

18 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)

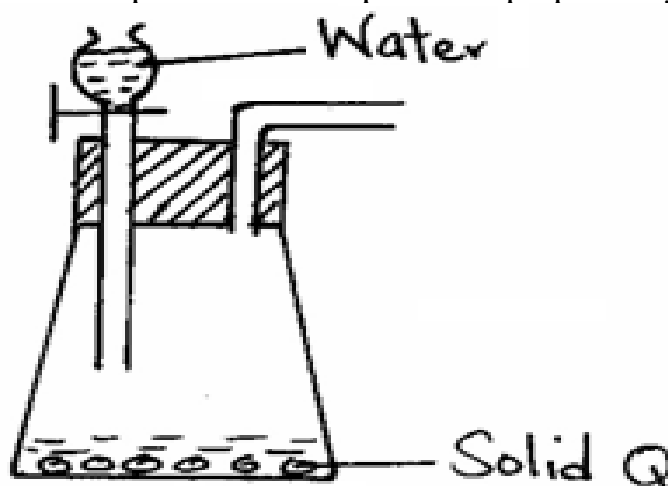
(b) Determine the value of χ if the ion of metal J is represented as $\text{J}^{\chi+}$. (1 mark)

(R.A.M of J = 44).

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.

- (a) Is strongly basic. **(1 mark)**
 (b) Reacts with sodium carbonate more vigorously. **(1 mark)**
 (c) 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)**
 (b) Give the formula of another reagent that can be used instead of potassium manganate (VII). **(1 mark)**
 (b) 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)**

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CHEMISTRY MOCKS

SERIES 1 TRIAL 4 PAPER 2

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Answer all the questions

1. The grid below shows a section of the periodic table, the letters are not the actual chemical symbol.

K	L			M		N	P	
	Q		R	S		T	V	
W								

- a) Name the family into which element P belongs to (1mk)
- b) Which two elements forms the most soluble carbonates (2mks)
- c) With a reason, identify elements in period 3 with the largest atomic radius (2mks)
- d) Write the formula of the compound formed between Q and M (1mk)
- e) State two uses of element R and for each use , state property of element R that makes its possible for the use
- (i) Use (1mk)
- Property (1mk)
- (ii) Use (1mk)
- Property (1mk)
- (e)Using dots and cross ,show bonding in the compound formed between R and oxygen (2mks)

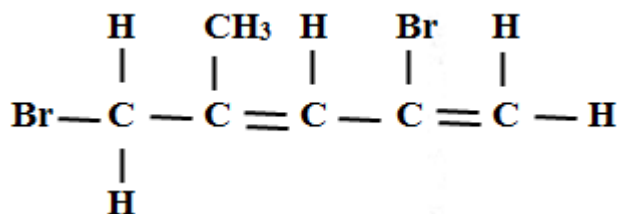
- f) In terms of structure and bonding explain why the oxides of element Thas relatively low boiling points (2mks)

2. (a) name the following compounds

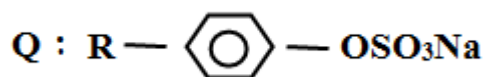
(3mks)



(ii)



b) Two types of detergents P and Q can be represented as



(i) Identify each type of the detergent (2mks)

(ii) Which of the two detergents is the best to use with hard water? Give a reason

(2mks)

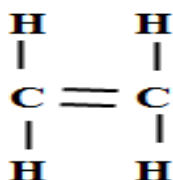
(iii) State one advantage of detergent P

(1mk)

(iv) State one disadvantage of detergent Q

(1mk)

(c) An hydrocarbon can be represented as follows



(i) Identify the hydrocarbon

(1mk)

(ii) Name two reagents that can reacted together to generate the hydrocarbon

(2mks)

3.(a) Name two apparatuses that can be used for determining mass in a laboratory

(2mks)

(b) One of the flames produced by Bunsen burner is the luminous flame

i) Explain why this flame is very bright

(1mk)

ii) State two disadvantages of the luminous flame

(2mks)

(c) Air is usually one of the substances that is considered as a mixture

(i) Identify the two most abundant component of air

(2mks)

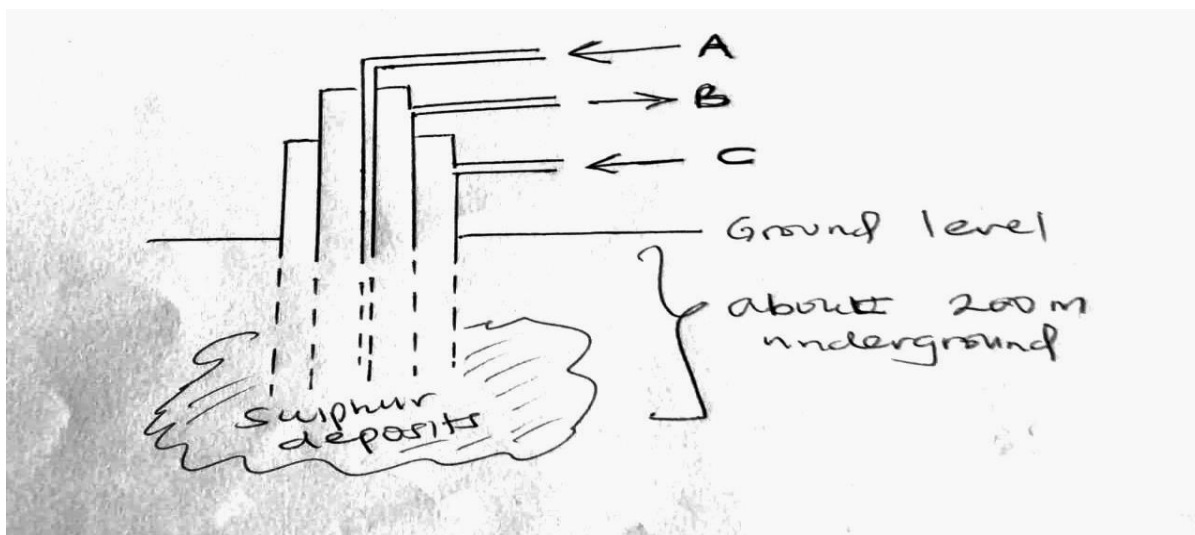
(ii) Give two reasons why the air is considered as a mixture

(2mks)

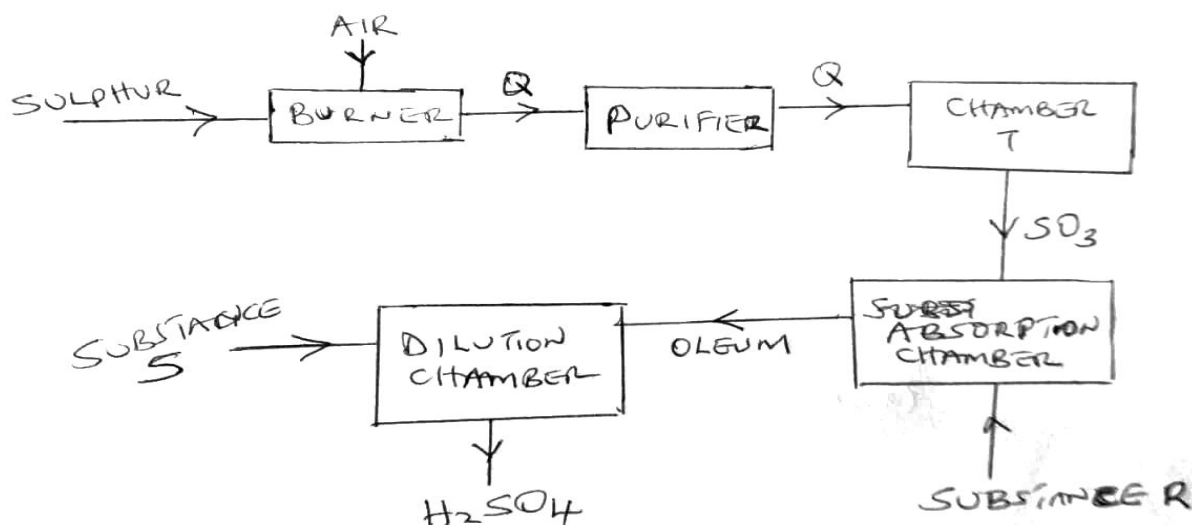
(iii) One of the components of air is carbon (iv) oxide. Describe an experiment

that can be used to prove the presence of carbon (iv) oxide in the air (2mks)

4.(a) The diagram below shows the process used to obtain Sulphur from underground deposits



- i) Name the above process used to obtain sulphur from the underground deposits (1mk)
- ii) Name the substance passed through pipe
 A - (1mk)
 B - (1mk)
- iii) State two properties of Sulphur that makes it possible to extract using the above process (2mks)
- b) The diagram below shows the contact process used in the manufacture of concentrated sulphuric(vi) acid



- i) Identify the following:
- a) Substance Q formed in the burner (1mk)
- b) Chamber T (1mk)
- c) Substance R (1mk)
- d) Substance S (1mk)
- ii) Write the chemical equation occurring in the dilution chamber (1mk)

iii) Why is it necessary to pass substance Q through a purifier (1mk)

iv) State one use of sulphuric (VI) acid (1mk)

5. (a) Calamine is one of the ores from which zinc can be extracted from

(i) Name any other ore from which zinc can be extracted from (1mk)

(ii) The calamine is usually decomposed by heating to obtain substance M as shown below



Identify substance M (1mk)

(iii) Identify two methods that can be used to obtain zinc from substance M (2mks)

(b) During the extraction of zinc, name two gases likely to be emitted into the air and that are likely to cause pollution (2mk)

(c) State one likely pollution effect of each of the gases you have mentioned in (a) above (2mks)

(d) State one possible use of zinc metal (1mk)

6.(a) Define the term electrolysis (1mk)

(b) State two functions of a salt bridge during electrolysis (2mks)

(c) The reduction potential of elements K, L, M, and P are as given below.



(i) Which letter represents the strongest reducing agent? Give a reason (2mks)

(ii) Which two letters represent elements whose half cells would form an electrochemical cell with the largest e.m.f? (1mk)

(iii) Calculate the e.m.f of the cell formed in (ii) above (2mks)

(d) During the electrolysis of a molten chloride of metal Q, a current of 0.25A was passed through the molten chloride for 2 hours and 10 minutes. Given that 0.9 grams of metal Q were deposited at the cathode.

(i) Calculate the quantity of electricity passed (1mk)

(ii) Charge carried by the ions of metal Q given that R.A.M of metal Q is 84 (3mks)

7 (a) starting with magnesium oxide, describe how you can obtain a dry sample of magnesium Carbonate (3mks)

(b) (i) Give one example of an acid salt (1mk)

(ii) When sodium nitrate was heated a solid A and gas B were produced identify solid A and gas B (2mks)

(iii) State two uses of gas B produced in (ii) above (2mks)

(c) State two factors that should be considered when choosing a fuel (2mks)

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CHEMISTRY MOCKS

SERIES 1 TRIAL 5 PAPER 1

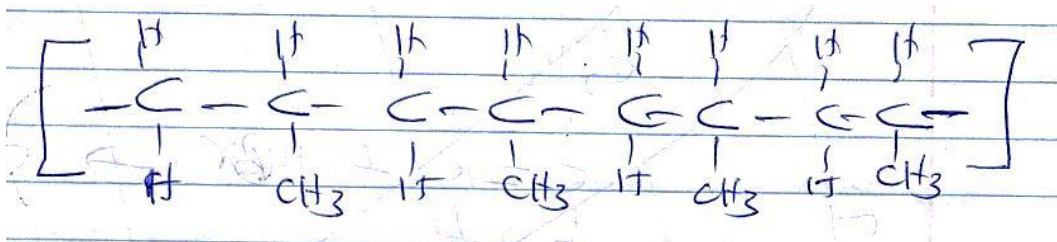
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TIME:2HRS

Answer all the questions

- 1[a] State Boyle's law [1mk]
[b] At 400°C , 850cm^3 of a gas exert a pressure of 560mmHg. What volume of the same gas would exert a pressure of 640mmHg at the same temperature [3mks]
2. When burning magnesium is lowered into a gas jar containing nitrogen (I) oxide, it continues to burn forming a white solid
[a] Name the white [1mk]
[b] Write a chemical equation of the reaction that occurred [1mk]
3. Carbon {IV} oxide is **one** of the gases used in fire extinguishers
[a] State any other possible use of carbon {IV} oxide [1mk]
[b] Name any two reagents that can be reacted together to generate carbon {IV} oxide [2mks]
4. Rusting is a process that causes massive destruction of iron structures
[a] State one condition that accelerates rusting [1mk]
[b] State one advantage of rusting [1mk]
5. At 60°C , 38 grams of lead{II} nitrate saturate 56cm^3 of water. Determine the solubility of lead {II} nitrate at this temperature [2mks]
6. Explain why molten sodium chloride conducts electricity, but solid sodium chloride does not [2mks]

7. A polymer can be represented as



[a] Name and draw the structure of the monomer [2mks]

[b] What type of polymerization occurs in the above case? [1mk]

[c] Given that the molecular mass of the polymer is 25620, how many units of the monomer make the polymer [2mks]

8. A reaction can be represented as;

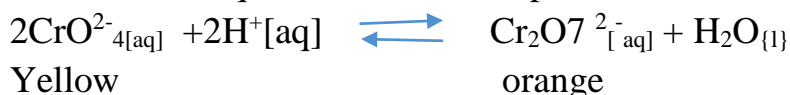


Given the bond energies of C-H, C=C, C-C, C-Br, and H-Br as 20kJ/mol, 580Kj/mole, 446Kj/mole, 438KJ/mole and 396kJ/mole respectively.

Determine the heat of formation of $\text{C}_2\text{H}_5\text{Br}$ [3mks]

9 [a] Define the term, dynamic equilibrium [1mks]

[b] A reaction at equilibrium can be represented as



Yellow

orange

State and explain the observation made when;

[i] NaOH is added to the equilibrium mixture [2mks]

[ii] HCl is added to the equilibrium mixture [2mks]

10. During the electrolysis of dilute copper {II} chloride using carbon electrodes, a current of 1.5A was passed through the solution for 2 hours and 30 minutes

[a] Write the ionic equation of the reaction that occurred at the cathode [1mk]

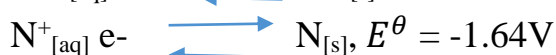
[b] Given R.A.M of copper = 64 and $1F = 96500C$, calculate the change in mass of the cathode [3mks]

11.[a] Define the term half-life [1mk]

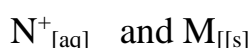
[b] Name two particles likely to be emitted when a radioactive nuclide undergoes radioactivity [2mks]

[c] The half-life of a radioactive nuclide is 3 hours. Given that its initial mass is 288g, determine the remaining mass after 12 hours. [2mks]

12. The reduction potentials of elements M and N are;



Using the above reduction potentials, predict whether a reaction would occur between [3mks]



13. An hydrocarbon can be represented as: C_2H_2

[a] Name the hydrocarbon (1mk)

[b] State **two** reagents that can be reacted together to generate the hydrocarbon [2mks]

[c] Identify the group of hydrocarbons into which C_2H_2 belongs to [1mk]

14. [a] Name two allotropes of sulphur [2mks]

[b] In an experiment to investigate a certain property of sulphur, Maina added few drops of conc HNO_3 to sulphur in a test tube and warmed the mixture

[i] State one observation made [1mk]

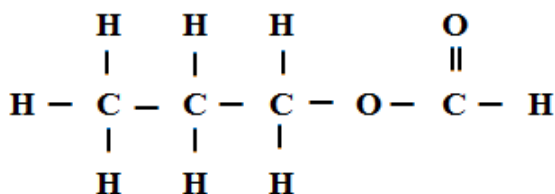
[ii] Write a chemical equation of the reaction that occurred [1mk]

15. Chlorine is commonly used in the manufacture of $Ca(OCl)_2$

[i] State one use of the above compound of chlorine [1mk]

[ii] Write a chemical equation leading to the production of $Ca(OCl)_2$ [1mk]

16. A compound can be represented as



[a] What name is given to the above class of compounds [1mk]

[b] Name two reagents that can be reacted together to generate the above compound [2mks]

[c] State two conditions necessary for the reaction leading to formation of the above compound to occur [2mks]

17. Using dots and crosses, show bonding in carbon{II} oxide [2mks]

18. When 20g of a compound containing carbon, hydrogen and oxygen was burnt in the air, 29.3g of carbon{IV} oxide and 11.7g of water were produced.

Determine its empirical formulae. [3mks]

{C=12, H=1, O=16}

19. Few drops of hydrochloric acid were added into a test tube containing lead {II} Nitrate solution

{a} State one observation made [1mk]

{b} Write an ionic equation of the reaction that occurred in the test tube [1mk]

20. In the industrial manufacture of Ammonia one of the raw materials is nitrogen gas

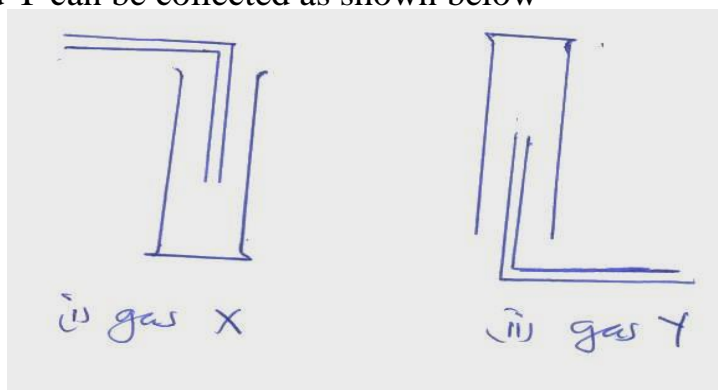
{a} Name one other raw material [1mk]

{b} Name two possible sources of the raw material you have named in {a} above [2mks]

{c} Name two substances that can be used as catalyst in this process [2mks]

{d} State one use of ammonia [1mk]

21. Gas X and Y can be collected as shown below



- [a] Name the method used to collect gas **Y** [1mk]
 [b] How do densities of gas **X** and gas **Y** compare? [1mk]
 [c] Give an example of a gas that can be collected using the same method as gas **Y** [1mk]
22. Element **W** has two isotopes **W** – 36 and **W**-40 which occur in the ratio $x:4$.
 Given that R.A.M of **W** is 37.25, find the value of **x** [2mks]
23. Describe an experiment that can be used to determine whether a given sample of a liquid is pure [2mks]
24. A given mass of gas **T** diffuses through a porous plug in 48 seconds while a similar mass of gas **R** diffuse in 70 seconds. Given that the density of gas **T** is 0.6g/cm^3 , find the density of gas **R** [2mks]
25. The electron configuration of elements **A**, **B**, **C**, **D** and **E** are as given below

Element	Electron configuration
A	2, 8, 1
B	2, 8
C	2, 7
D	2, 8, 6
E	2, 8, 3

- {a} Which element has the highest electrical conductivity [1mk]
 {b} Which letter represents the most reactive metal [1mk]
 {c} Which letter represents the most reactive non-metal [1mk]

NAME.....ADM NO.....

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CHEMISTRY MOCKS

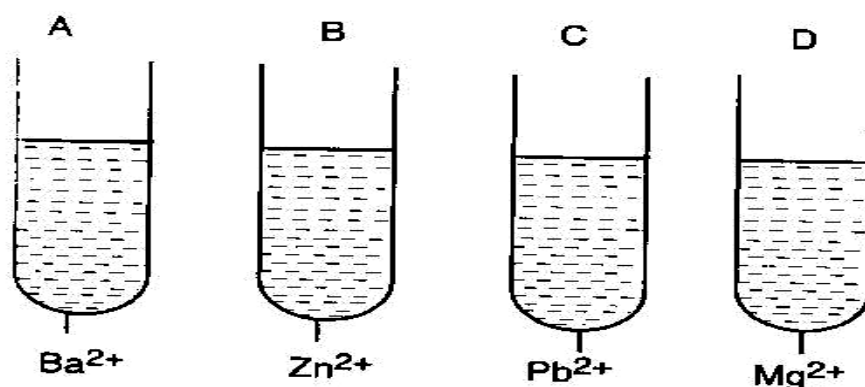
SERIES 1 TRIAL 5 PAPER 2

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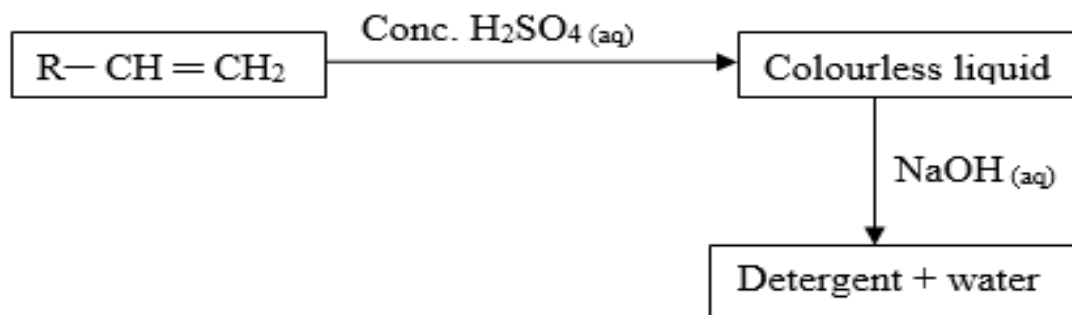
TIME:2HRS

Answer all the questions

1. A few drops of sulphuric acid were added to four test-tubes containing cations as shown below.



- (a) (i) In which test-tubes were white precipitate formed? (1 mark)
(ii) Write the chemical formula of the precipitate formed. (1 mark)
(iii) State and explain the observations that would be made in test-tube B when Aqueous ammonia is added drop-wise until in excess. (2 marks)
(iv) State and explain the observation that would be made when little amount of sodiumstearate solution are added in test-tube D. (2 marks)
- (b) Study the flow chart below and answer the questions that follow.



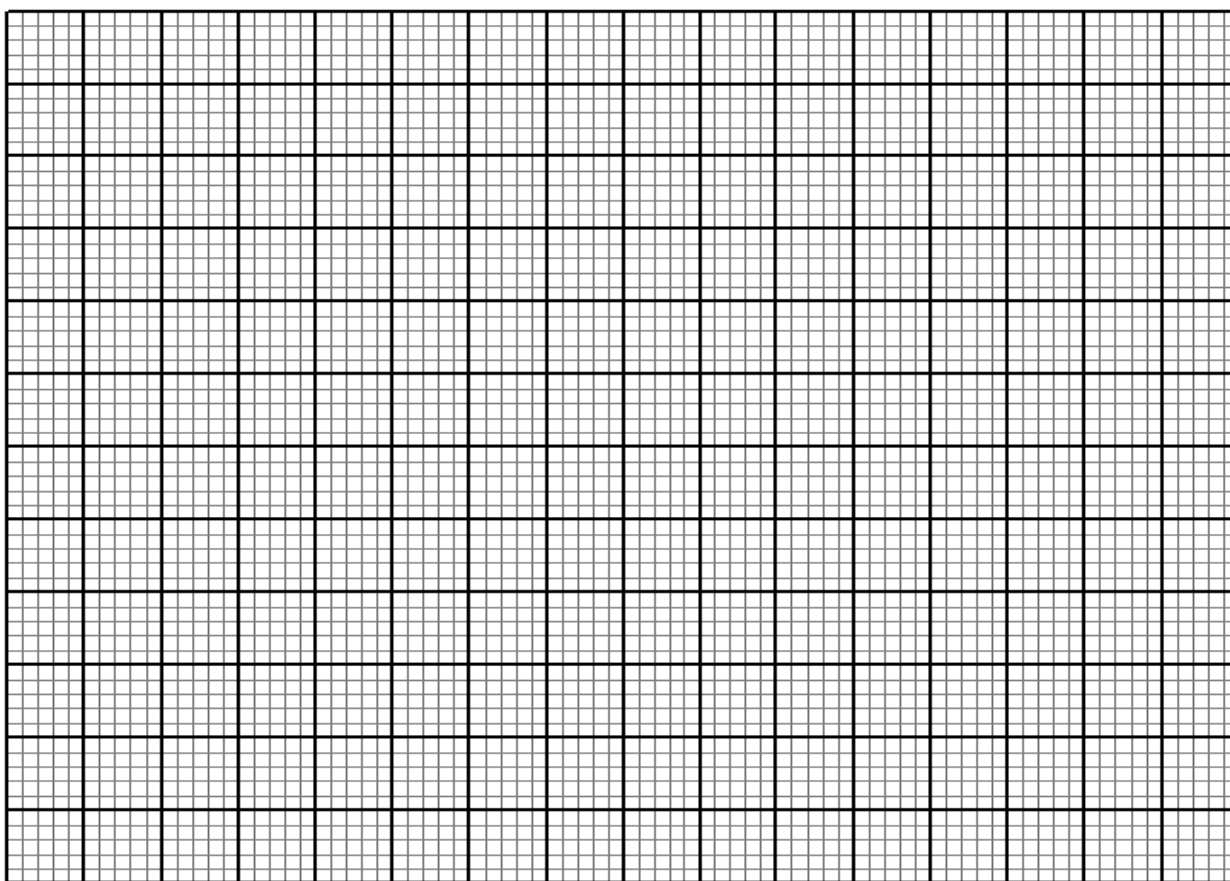
- (i) What is the type of detergent prepared in this process? **(1 mark)**
- (ii) Explain the cleaning of action of the detergent. **(2 marks)**
- (c) Using an ion equation show how sodium carbonate removes water hardness. **(1 mark)**

2. The table below gives formulae and volumes occupied by 1 g of some gases at s.t.p. Study it carefully to answer the questions that follow.

Formula of gas	Ne	C ₂ H ₂	O ₂	Ar	NO ₂	SO ₂	SO ₃
Relative Molecular Mass	20	26	32	40	46	64	80
Volume (cm ³)	1120	862	700	560	487	350	280

- (a) Plot a graph of volume of gas (y-axis) against the relative molecular mass

(3 marks)



- (b) Use the graph to predict the volume occupied at s.t.p by

(i) 1g of hydrogen chloride gas (Cl=35.5, H=1) **(1 mark)**

(ii) 1g of carbon (II) oxide. (C=12, O=16) **(1 mark)**

(ii) Relative molecular mass of a gas which occupies 508 cm³ per gram at s.t.p.

(1 mark)

(c) (i) State the Graham's law of diffusion.

(1 mark)

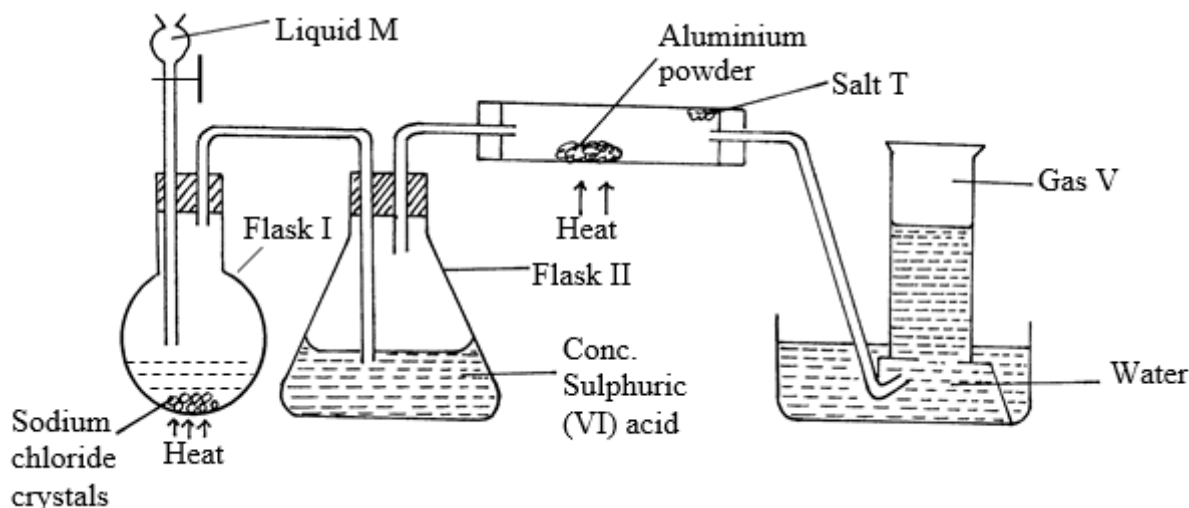
(ii) A gas X diffuses through a porous plug in 60 seconds. Gas Y which is a quarter the volume of gas X diffuses through the same plug in 22.5 seconds.

Calculate the relative molecular mass of gas Y. (Relative Molecular Mass of X = 34)

(3 marks)

(d) A gas occupies 100 cm^3 at 0°C and 1 atmosphere pressure. Calculate the temperature at which the volume is double and the pressure is halved. (2 marks)

3. The set up below was used to prepare hydrogen chloride gas and salt T.



(a) Identify the following

(i) Liquid M-

(1 mark)

(ii) Gas V-

(1 mark)

(iii) Salt T-

(1 mark)

(b) Write balanced chemical equations for reactions that occur at:

(i) Flask I

(1 mark)

(ii) Combustion tube.

(1 mark)

(c) Name the process that formed salt T as shown in the diagram. (1 mark)

(d) Sulphuric (VI) acid is used as a drying agent in this experiment. Explain why calciumoxide is unsuitable for the same purpose in this reaction. (1 mark)

(e) The water in the beaker was found to have a pH of 2.0 at the end of the experiment. Explain. (1 mark)

(f) Calculate the mass of salt T formed if 480 cm^3 of hydrogen chloride gas measured at r.t.p was reacted with aluminium powder. ($\text{Al} = 27$, $\text{Cl} = 35.5$, $\text{MGV} = 24 \text{ dm}^3$) (2 marks)

(g) In the space provided below, draw a well labelled diagram showing how you would dissolve hydrogen chloride gas in water. (1 mark)

(h) Explain why hydrogen chloride gas dissolved in methylbenzene does not react with calcium carbonate. (1 mark)

(i) Using equation, state the observation made when a gas jar containing

hydrogen chloride gas is opened near an open bottle of liquid ammonia.

(1 mark)

4. (a) The grid given represents part of the periodic table. Study it and answer the questions that follow. (The letters do not represent the actual symbol of the elements)

								A
				B				
	C		D			E		
	F							

(i) What name is given to the group of elements to which C and F belong?

(1 mark)

(ii) Which letter represents the element that is least reactive? (1 mark)

(iii) What type of bond is formed when B and E react? Explain. (2 marks)

(iv) Write the formula of the compound formed when element D and oxygen gas react. (1 mark)

(v) On the grid, indicate with a tick (✓) the position of element G which is in the third period of the periodic table and forms G^{3-} ions. (1 mark)

(vi) Compare the atomic sizes of elements C and D. Explain. (2 marks)

(b) Study the information in the table below and answer the questions that follow. (The letters do not represent the actual symbols of the substances).

Substance	Melting point (°C)	Boiling point (°C)	Solubility in water	Density at room temperature g/cm ³
H	-117	78.5	Very soluble	0.8
J	-78	-33	Very soluble	0.77×10^{-3}
K	-23	77	Insoluble	1.6
L	-219	-183	Slightly soluble	1.33×10^{-3}

(i) Which substance is a liquid at room temperature and when mixed with water two layers would be formed? **(1 mark)**

(ii) Determine the melting point of H in Kelvin? **(1 mark)**

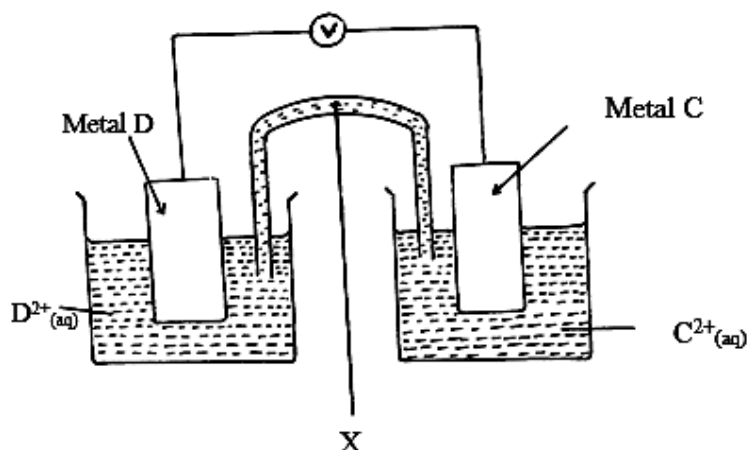
(iii) Which letter represents a substance that is a gas at room temperature and which can be Collected by downward displacement of air? (Density of air is $1.29 \times 10^{-3} \text{ g/cm}^3$ at room temperature). Explain. **(2 marks)**

5. (a) The table below gives standard electrode potentials for the metals represented by the letters A, B, C and D. Study it and answer the questions that follow.

Metal	Standard electrode potential, E^0 (Volts)
A	-0.13
B	+0.85
C	+0.34
D	-0.76

(i) Arrange the metals in a decreasing order of reactivity. **(1 mark)**

Metals C and D were connected to form a cell as shown in the diagram below.



(ii) Write the equations for the reactions that occur at electrodes.

C **(1 mark)**

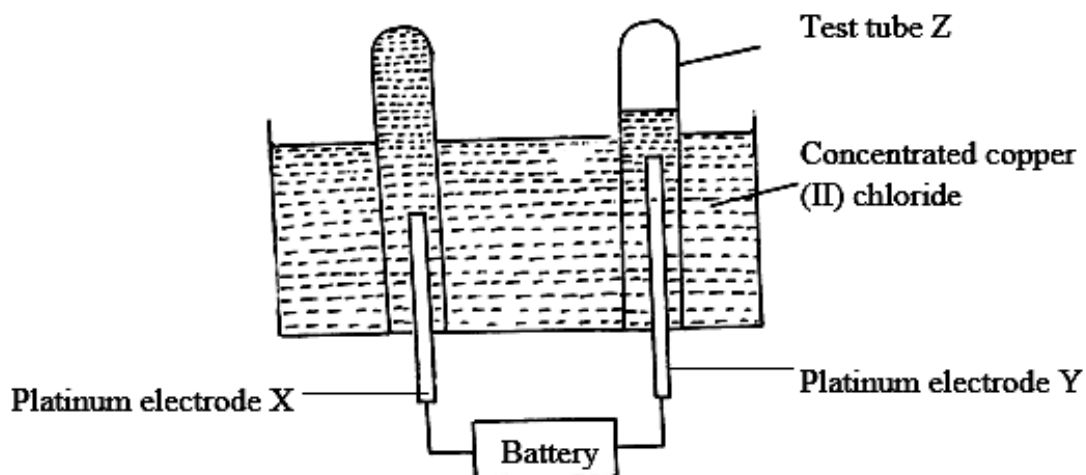
D **(1 mark)**

(iii) On the diagram, indicate with an arrow the direction in which electrons would flow. **(1 mark)**

(iv) What is the function of the part labelled X. **(1 mark)**

(v) Calculate the e.m.f of the cell formed in the diagram. **(1 mark)**

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



- (i) Write the chemical equation of reaction at cathode? **(1 mark)**
- (ii) After sometime test-tube Z was found to contain a mixture of two gases. Explain this observation. **(2 marks)**
- (iii) State the observations that would be made at the anode if the platinum electrodes are replaced with copper electrodes. **(2 marks)**
6. The list below shows the formula of some organic compounds. Use it to answer the questions

that follow. Use the letters T₁ to T₆.



- (a) Select a compound which.
- (i) Will produce bubbles of a gas when reacted with sodium carbonate. **(1 mark)**
- (iii) Will decolourise both bromine water and acidified potassium permanganate. **(1 mark)**
- (iii) Will produce hydrogen gas when reacted with sodium metal. **(1 mark)**
- (iv) Represents a saturated hydrocarbon. **(1 mark)**
- (v) Is likely to undergo polymerization. **(1 mark)**
- (b) Using two molecules show how polymerization in T₅ occurs. **(1 mark)**
- (c) Name the process by which compound T₂ is formed and identify the compounds that were used to form it.

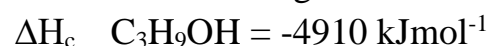
Process **(1 mark)**

Compounds **(1 mark)**

- (d) Compound T₃ can be converted to T₄ as shown by the equation below.



Given the following information

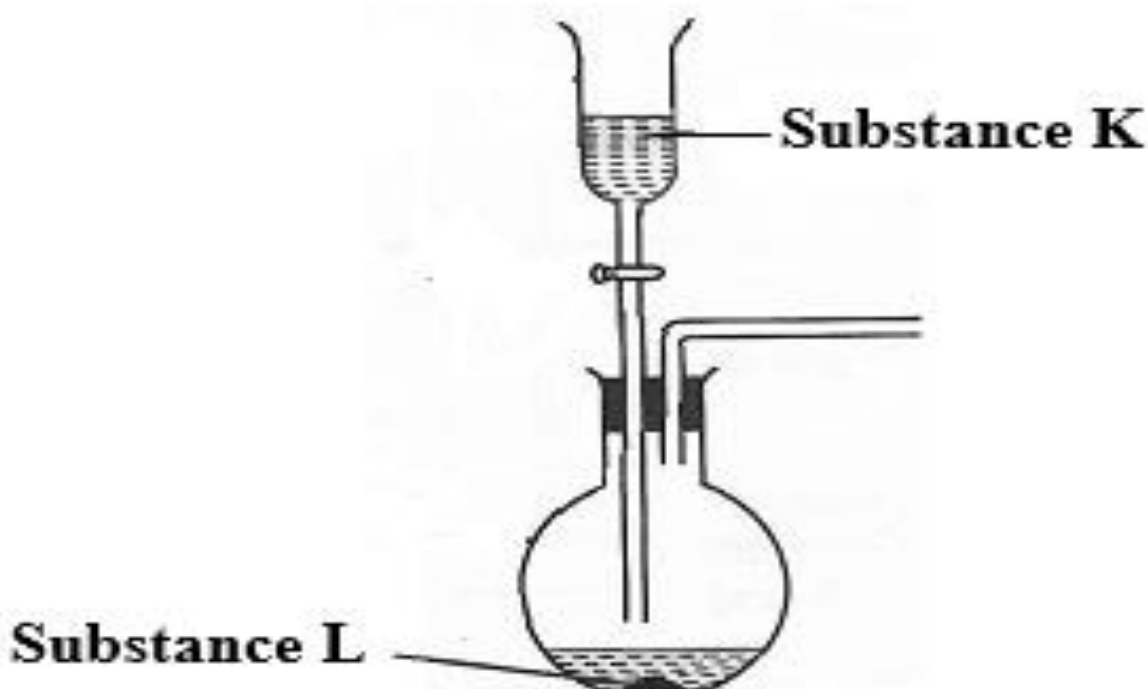


$$\Delta H_c \text{ C}_3\text{H}_7\text{COOH} = -4090 \text{ kJmol}^{-1}$$

Determine the heat change for the reaction above.

(3 marks)

7. The set-up below can be used to generate a gas.



(a) (i) Complete the table below giving the names of substance **K** and **L** if the gases generated are carbon (IV) oxide and carbon (II) oxide.

(2marks)

Substance	Carbon (IV) oxide	Carbon (II) oxide
K		
L		

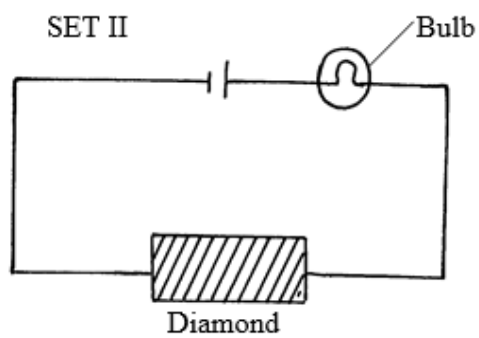
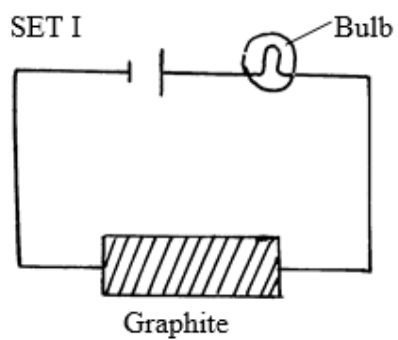
(ii) Complete the diagram to show how a sample of carbon (II) oxide can be collected. **(2marks)**

(iii) State two ways that can be used to distinguish carbon (IV) oxide from carbon (II) oxide? **(2 marks)**

(b) (i) In an experiment, carbon (IV) oxide gas was passed over heated charcoal held in a combustion tube. Write a chemical equation for the reaction that took place in the combustion tube. **(1 mark)**

(ii) State **one** use of carbon (II) oxide. **(1 mark)**

(c) The following set ups were used by Form Two students. Study and use them to answer the questions that follow.



State and explain the difference in observation made in set up I and II above.

(3 marks)

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SERIES 1 TRIAL 6 PAPER 1

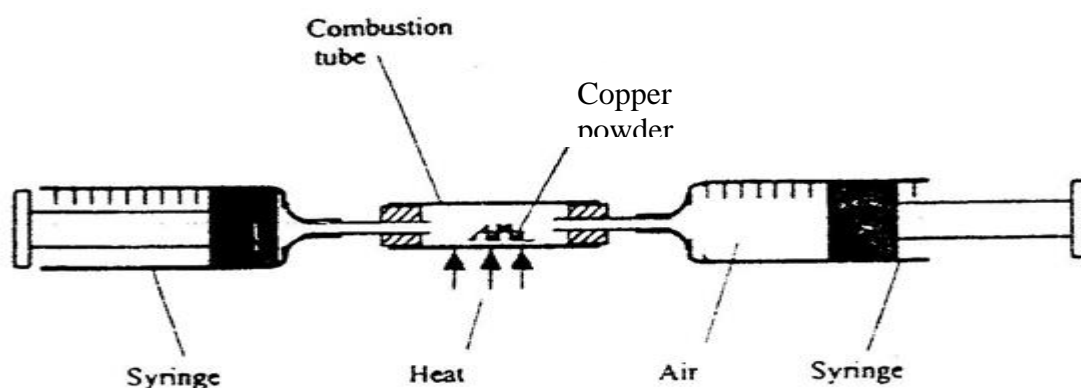
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TIME:2HRS

Answer all the questions

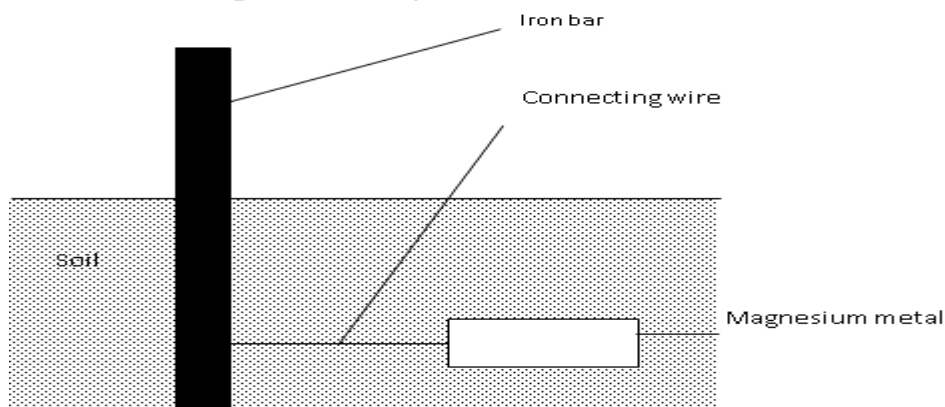
- (a) Explain why there is effervescence when lemon juice is added to sodium hydrogen carbonate (1mk)

(b) Write ionic equation for the observation made above. (1mk)
- In an experiment a certain volume of air was passed repeatedly from syringe over heated excess copper powder as shown in the diagram below.



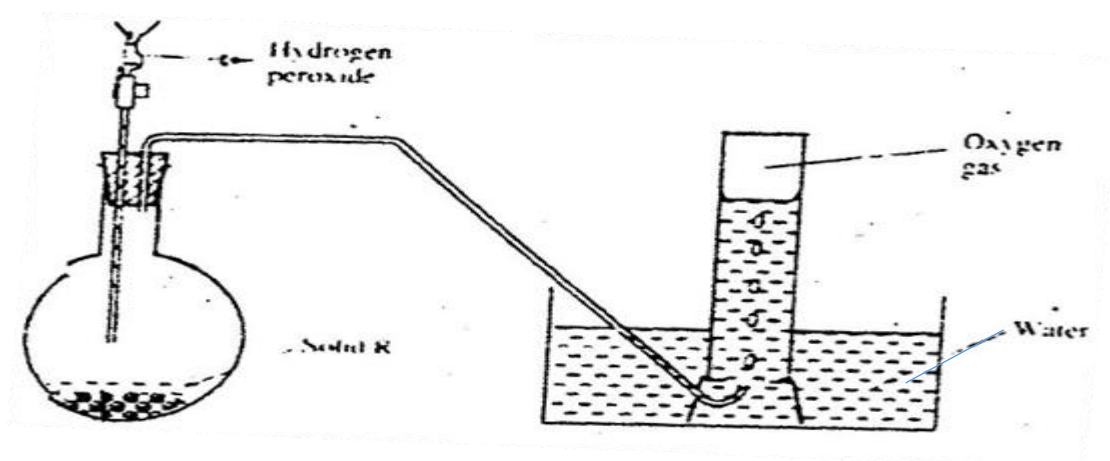
The experiment was repeated using excess magnesium powder. In which of the experiments was the change in volume of air greatest? Give reasons. (3mks)

3. The diagram below shows an iron bar, which supports a bridge. The iron is connected to a piece of magnesium metal.

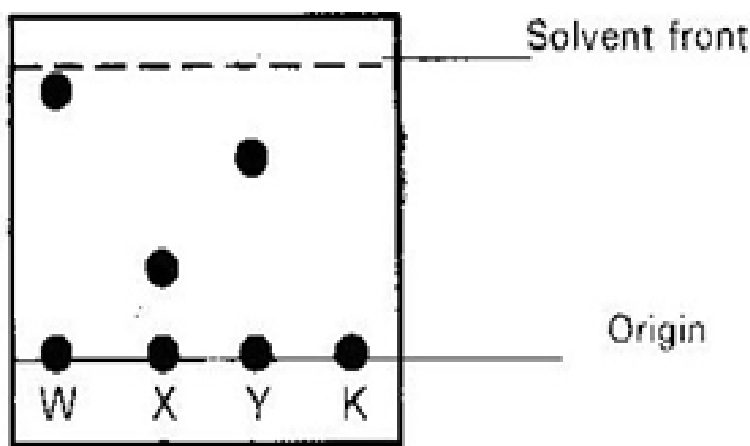


Explain why it is necessary to connect the piece of magnesium metal to the iron bar. (2mks)

4. The diagram below is a set up for the laboratory preparation of oxygen gas.



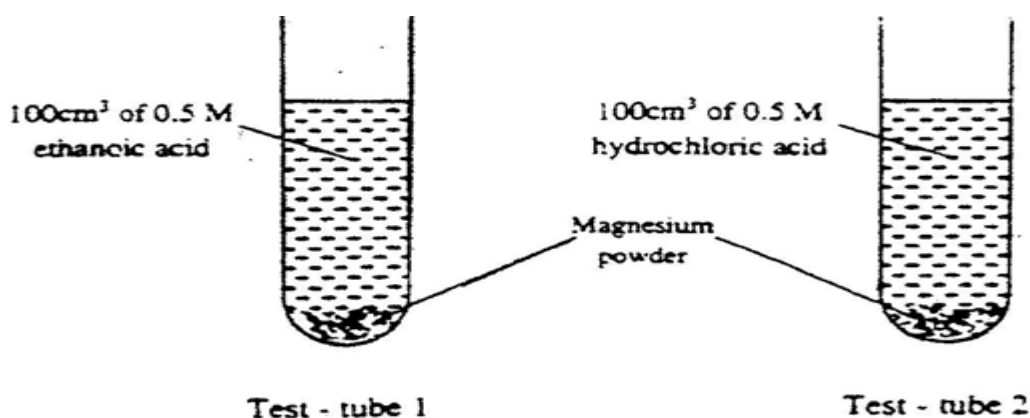
- a) Name solid R. (1mk)
b) Write an equation for the reaction that takes place in the flask. (1mk)
c) Give one commercial use of oxygen. (1mk)
5. The diagram below represents a paper chromatogram of pure **w**, **X**, and **Y**. A mixture **K** contains **W** and **Y** only. Indicate on the diagram the chromatogram of **K** (2mk)



6. (a) Solutions may be classified as strong basic, weakly acidic, strong acidic. The information below gives solutions and their PH values. Study it and answer the questions that follow.

solutions	B	C	D
PH-value	4	10	7
Classification			

- (i) Classify the solutions in the table above using terms above (1Mk)
(ii) Which ions are pre-dominantly in solution C? (1/2Mk)
(b) In an experiment, equal amounts of magnesium powder were added into test tubes 1 and 2 as Shown below



Explain the observable difference in the two test tubes (1¹/2Mks)

7. Zinc (II) Oxide reacts with acid and alkalis.

(a) Write the equation for the reaction between Zinc (II) Oxide and

- (i) Dilute Sulphuric acid (1 mk)
(ii). Sodium hydroxide solution. (1 mk)

(b) What property of Zinc oxide is shown above by the reaction (a) above? (1mk)

8. An indicator established the following equilibrium when dissolved in water.



State and explain the observation made when Lime water is added? (2mks)

9. Study the information in the table below and answer the question the table below the table.

Bond	Energy (kJ/mol)
C-H	414
Cl-Cl	244
C-Cl	326
H-Cl	431

The enthalpy change for the reaction below is -99kJ/mol.



- (i) What does the negative sign on 99kJ/mol mean? (1mk)
(ii) Which bond is the strongest to break? Explain. (2mks)
10. Give two reasons why spoons are electroplated. (1mk)
11.a) What is an isotope? (1mk)

b) Determine the relative atomic mass of argon whose isotope mixture is

36. Ar (0.34%)	38Ar (0.06%)	40 Ar (99.6)	(2mks)
18	18	18	

12. The table below gives some information about four elements. The letters are not their actual symbols.

Elements	valences	Atomic radii(nm)	Ionic radii(nm)
K	2	0.136	0.065
L	7	0.099	0.181
M	1	0.099	0.181
N	2	0.174	0.099

- i. Write the electron arrangement of any element in same chemical family as element L. (1mk)
ii. Compare the reactivity of elements K and N. (1mk)
iii. Account for the difference in ionic and atomic radii of element M. (1mk)

13. Give the main reasons why:-

- (i) Cryolite is added to the pure Aluminium oxide in the process of extracting the metal. (1mk)
(ii) State two properties of Aluminium that makes it suitable to be used in making over-head electrical cables. (2mks)

14. Excess chlorine was bubbled through a solution of potassium bromide. State and explain the observation made. (2mk)

15. In an experiment, ammonium chloride was heated in test-tube. A moist red litmus paper placed at the mouth of test first changed blue then red. Explain these observations

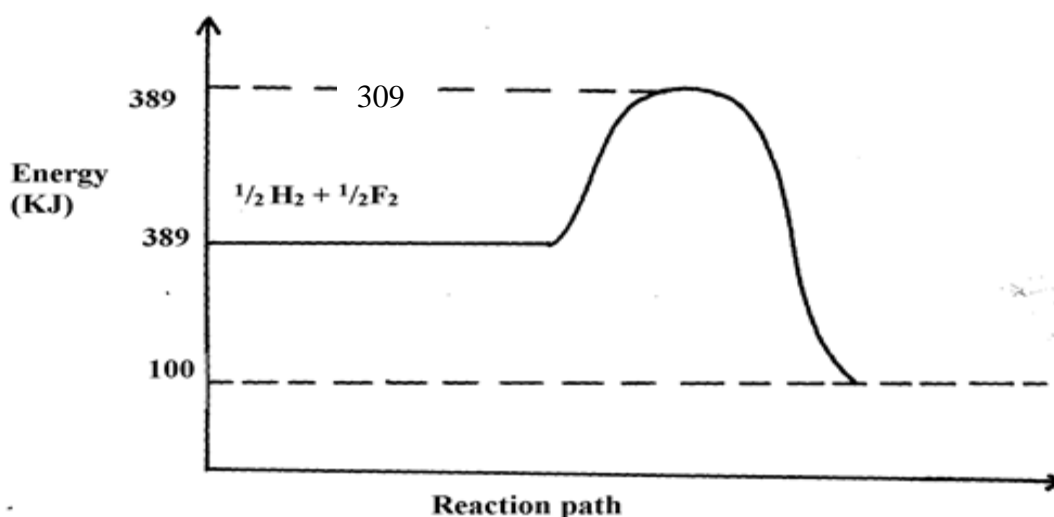
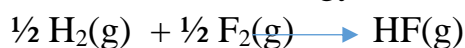
(H=1. N=14, Cl=35.5) (3mks)

16. Y grams of a radioactive isotope take 120days to decay to 3.5grams. The half-life period of the isotope is 20days

(a) Find the initial mass of the isotope (2mks)

(b) Give one application of radioactivity in agriculture (1mk)

17. The diagram below shows energy levels for the reaction



- Work out the activation energy for the reaction (1mk)
- Calculate the heat of formation of HF (1½mk)
- Is the reaction endothermic or exothermic? (½mk)

18. a) State the use of the apparatus below. (1mk)

- Conical flask
- Separating funnel

b) Highlight one precaution observed in each of the following cases:

- When evaporating Ethanol. (1mk)
- When heating to dryness a hydrated salts (1mk)

19. Dry carbon (ii) oxide gas reacts with hot lead (II) oxide as shown in the equation below.



- a) Name another gas that can be used to function as carbon (ii) oxide in this experiment. (1mk)
- b) With an appropriate reason, identify the oxidizing agent in the equation above. (2mks)

20. (a) During fractional distillation a student used glass beads. State the function of glass beads during fractional distillation in;

i) Boiling flask (1mk)

ii) Fractionating column. (1mk)

b) Give one industrial application of solvent extraction. (1mk)

21. Calculate the percentage of nitrogen in calcium nitrate. (3mks)

22. 20cm^3 of sodium hydroxide solution containing 8.0gdm^{-3} were required for complete neutralization of 0.18g of a dibasic acid H_2X . Calculate the relative molecular mass of the acid. (Na = 23, O = 16, H = 1) (3mks)

23.(a) Name one ore of Zinc metal. (1mk)

(b).A sample of a colorless solution is suspected to be Zinc (II) sulphate. Describe some tests that can be carried to prove this. (2mks)

24. A metal Y with atomic number 11 burns in chlorine to produce a white solid X.

(a) Describe the following properties of X.

i. Solubility (1mk)

ii. Electrical conductivity. (1mk)

(b) Write an equation to show the formation of compound X. (1 mark)

25. a) Define an isomer. (1mk)

b) Draw and name any two isomers of pentane. (2mks)

26 a) Name the compounds **P** and **T** below.

P - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ (1 mark)

T - $\text{CH}_3\text{CHCHCH}_3$ (1 mark)

b) Describe an experiment you would carry out to distinguish T from P.(2 marks)

27. Consider the reaction below



State and explain the effect of the following on the above equilibrium:-

(i) Removing oxygen in the reaction above. (1¹/2mk)

(ii) Injecting helium in the reaction mixture (1¹/2mk)

28. (a) Name the **TWO** products of complete combustion of a hydrocarbon with the

formula:- $\text{CH}_3(\text{CH}_2)_n\text{COOH}$. (1mk)

(b) If 15.5g of the above hydrocarbon is equivalent to 0.15moles, find the value of n in the formula above. (H=1 , C=12 , O= 16) (2mks)

29. Three elements P, Q and R form the following compounds $P(NO_3)_2$, Q_2SO_4 and R_2O_3

a. Write down the formula of :-

i. Hydroxide of Q

(1mk)

ii. Nitride of R

b. Which element is likely to form a soluble carbonate

(1mk)

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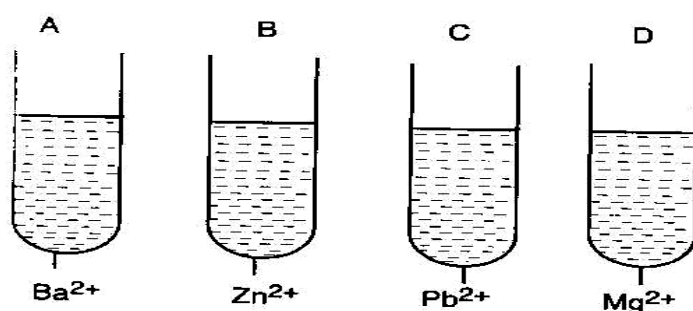
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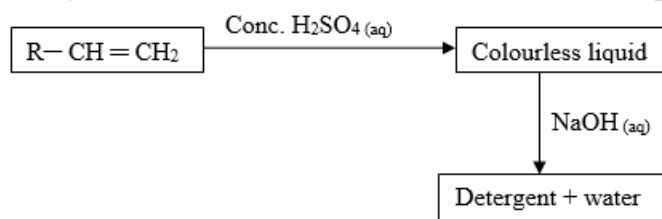
TIME:2HRS

Answer all the questions

1. A few drops of sulphuric acid were added to four test-tubes containing cations as shown below.



- (a) (i) In which test-tubes were white precipitate formed? **(1 mark)**
(ii) Write the chemical formula of the precipitate formed. **(1 mark)**
(iii) State and explain the observations that would be made in test-tube B when aqueous ammonia is added drop-wise until in excess. **(2 marks)**
(iv) State and explain the observation that would be made when little amount of sodium stearate solution are added in test-tube D. **(2 marks)**
- (b) Study the flow chart below and answer the questions that follow.



- (i) What is the type of detergent prepared in this process? **(1 mark)**
(ii) Explain the cleaning action of the detergent. **(2 marks)**
- (c) Using an ion equation show how sodium carbonate removes water hardness.

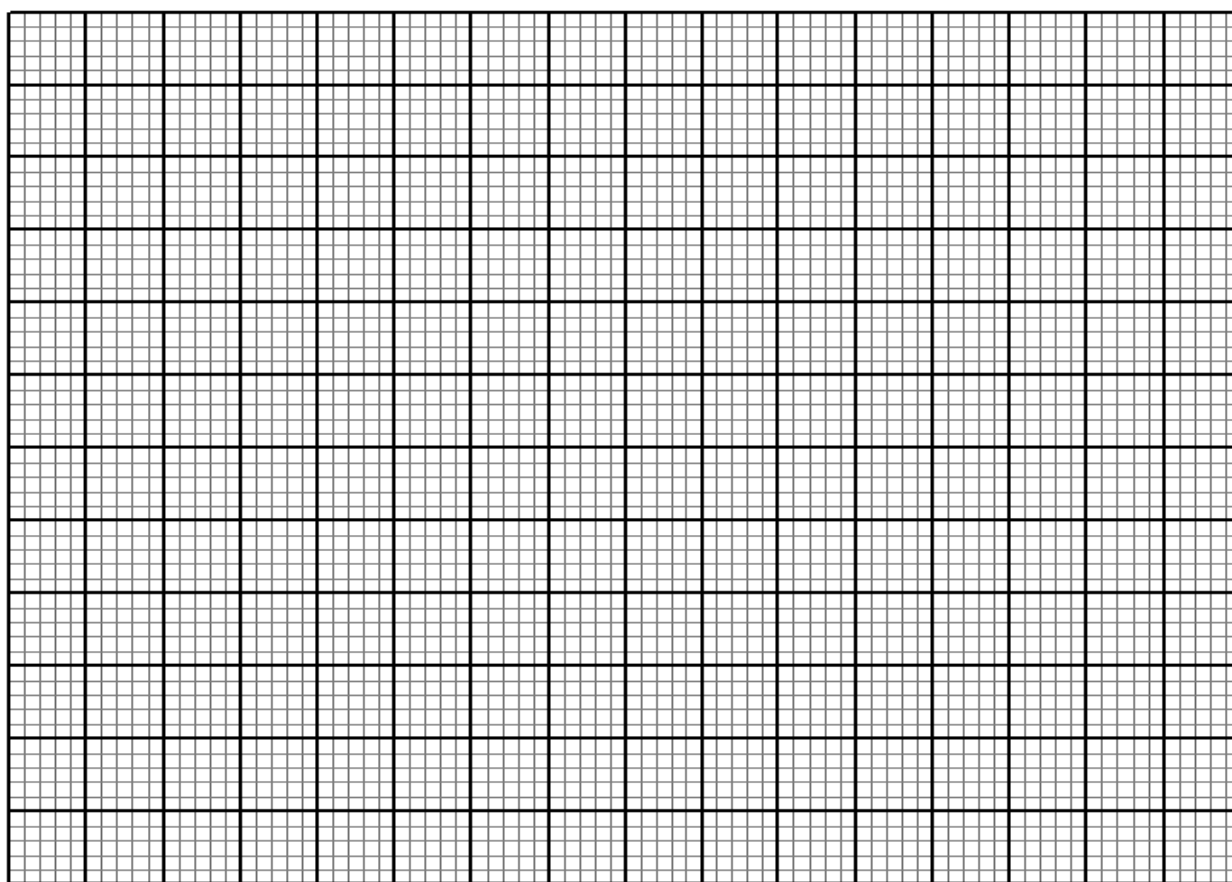
(1 mark)

2. The table below gives formulae and volumes occupied by 1 g of some gases at s.t.p. Study it carefully to answer the questions that follow.

Formula of gas	Ne	C ₂ H ₂	O ₂	Ar	NO ₂	SO ₂	SO ₃
Relative Molecular Mass	20	26	32	40	46	64	80
Volume (cm ³)	1120	862	700	560	487	350	280

(a) Plot a graph of volume of gas (y-axis) against the relative molecular mass.

(3 marks)



(b) Use the graph to predict the volume occupied at s.t.p by

(i) 1 g of hydrogen chloride gas (Cl=35.5, H=1) (1 mark)

(ii) 1 g of carbon (II) oxide. (C=12, O=16) (1 mark)

(iii) Relative molecular mass of a gas which occupies 508 cm³ per gram at s.t.p.

(1 mark)

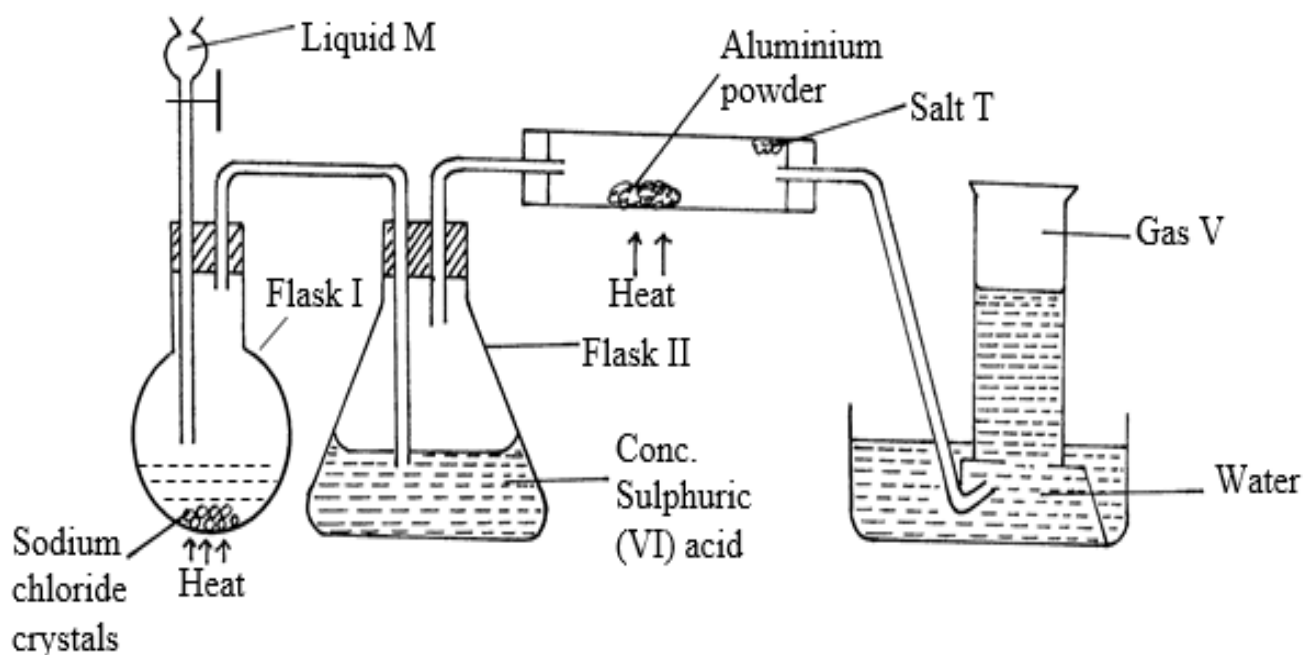
(c) (i) State the Graham's law of diffusion. (1 mark)

(ii) A gas X diffuses through a porous plug in 60 seconds. Gas Y which is a quarter the volume of gas X diffuses through the same plug in 22.5 seconds.

Calculate the relative molecular mass of gas Y. (Relative Molecular Mass of X = 34) **(3 marks)**

(d) A gas occupies 100 cm^3 at 0°C and 1 atmosphere pressure. Calculate the temperature at which the volume is double and the pressure is halved. **(2 marks)**

3. The set up below was used to prepare hydrogen chloride gas and salt T.



(a) Identify the following

- (i)** Liquid M **(1 mark)**
- (ii)** Gas V **(1 mark)**
- (iii)** Salt T **(1 mark)**

(b) Write balanced chemical equations for reactions that occur at:

- (i)** Flask I **(1 mark)**
- (ii)** Combustion tube. **(1 mark)**

(c) Name the process that formed salt T as shown in the diagram. **(1 mark)**

(d) Sulphuric (VI) acid is used as a drying agent in this experiment. Explain why calcium oxide is unsuitable for the same purpose in this reaction. **(1 mark)**

(e) The water in the beaker was found to have a pH of 2.0 at the end of the experiment. Explain. **(1 mark)**

(f) Calculate the mass of salt T formed if 480 cm^3 of hydrogen chloride gas measured at r.t.p was reacted with aluminium powder. (Al = 27, Cl = 35.5, MGV = 24 dm^3) **(2 marks)**

(g) In the space provided below, draw a well labelled diagram showing how you would dissolve hydrogen chloride gas in water. **(1 mark)**

(h) Explain why hydrogen chloride gas dissolved in methylbenzene does not react with calcium carbonate. **(1 mark)**

(i) Using equation, state the observation made when a gas jar containing hydrogen chloride gas is opened near an open bottle of liquid ammonia.

(1 mark)

4. (a) The grid given represents part of the periodic table. Study it and answer the questions that

follow. (The letters do not represent the actual symbol of the elements)

							A
				B			
	C		D			E	
	F						

(i) What name is given to the group of elements to which C and F belong?

(1 mark)

(ii) Which letter represents the element that is least reactive? (1 mark)

(iii) What type of bond is formed when B and E react? Explain. (2 marks)

(iv) Write the formula of the compound formed when element D and oxygen gas react. (1 mark)

(v) On the grid, indicate with a tick (✓) the position of element G which is in the third period of the periodic table and forms G^{3-} ions. (1 mark)

(vi) Compare the atomic sizes of elements C and D. Explain. (2 marks)

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

(The letters do not represent the actual symbols of the substances).

Substance	Melting point (°C)	Boiling point (°C)	Solubility in water	Density at room temperature g/cm^3
H	-117	78.5	Very soluble	0.8
J	-78	-33	Very soluble	0.77×10^{-3}
K	-23	77	Insoluble	1.6
L	-219	-183	Slightly soluble	1.33×10^{-3}

(i) Which substance is a liquid at room temperature and when mixed with water two layers would be formed? (1 mark)

(ii) Determine the melting point of H in Kelvin? (1 mark)

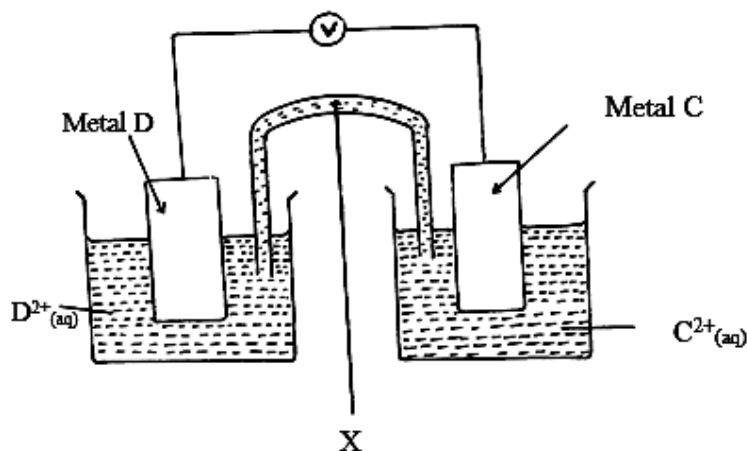
(iii) Which letter represents a substance that is a gas at room temperature and which can be collected by downward displacement of air? (Density of air is $1.29 \times 10^{-3} g/cm^3$ at room temperature). Explain. (2 marks)

5. (a) The table below gives standard electrode potentials for the metals represented by the letters A, B, C and D. Study it and answer the questions that follow.

Metal	Standard electrode potential, E^0 (Volts)
A	-0.13
B	+0.85
C	+0.34
D	-0.76

- (i) Arrange the metals in a decreasing order of reactivity. (1 mark)

Metals C and D were connected to form a cell as shown in the diagram below.



- (ii) Write the equations for the reactions that occur at electrodes.

C (1 mark)

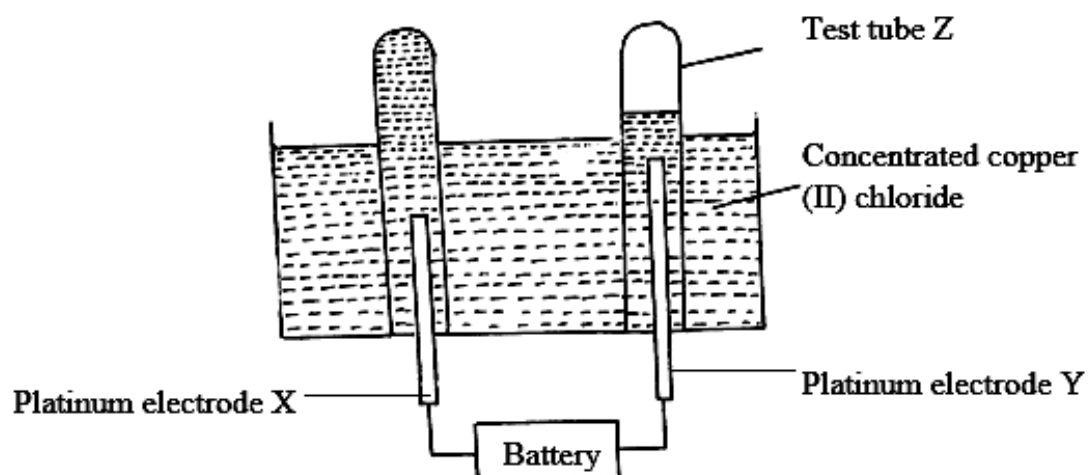
D (1 mark)

- (iii) On the diagram, indicate with an arrow the direction in which electrons would flow. (1 mark)

- (iv) What is the function of the part labelled X. (1 mark)

- (v) Calculate the e.m.f of the cell formed in the diagram. (1 mark)

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



- (i) Write the chemical equation of reaction at cathode? **(1 mark)**
- (ii) After sometime test-tube Z was found to contain a mixture of two gases. Explain this observation. **(2 marks)**
- (iii) State the observations that would be made at the anode if the platinum electrodes are replaced with copper electrodes. **(2 marks)**

6. The list below shows the formula of some organic compounds. Use it to answer the questions that follow. Use the letters T₁ to T₆.



(a) Select a compound which.

(i) Will produce bubbles of a gas when reacted with sodium carbonate. **(1 mark)**

(ii) Will decolourise both bromine water and acidified potassium permanganate. **(1 mark)**

(iii) Will produce hydrogen gas when reacted with sodium metal **(1 mark)**

(iv) Represents a saturated hydrocarbon. **(1 mark)**

(v) Is likely to undergo polymerization. **(1 mark)**

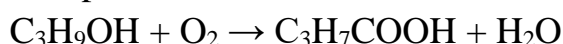
(b) Using two molecules show how polymerization in T₅ occurs. **(1 mark)**

(c) Name the process by which compound T₂ is formed and identify the compounds that were used to form it.

Process **(1 mark)**

Compounds **(1 mark)**

(d) Compound T₃ can be converted to T₄ as shown by the equation below.



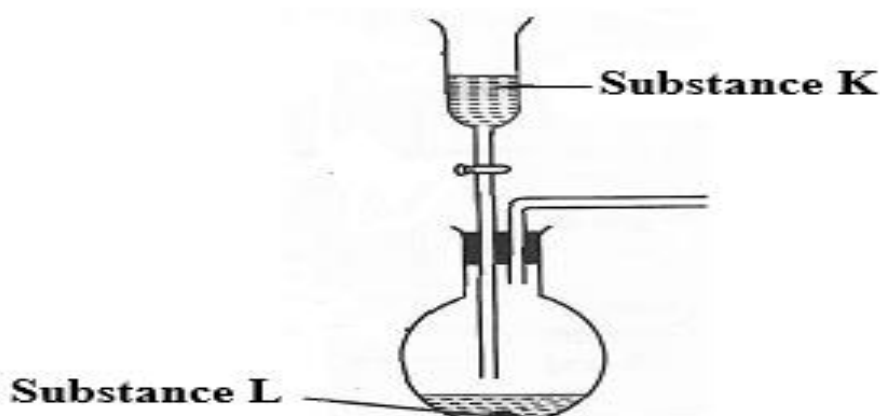
Given the following information

$$\Delta H_c \quad \text{C}_3\text{H}_9\text{OH} = -4910 \text{ kJmol}^{-1}$$

$$\Delta H_c \quad \text{C}_3\text{H}_7\text{COOH} = -4090 \text{ kJmol}^{-1}$$

Determine the heat change for the reaction above. **(3 marks)**

7. The set-up below can be used to generate a gas.



- (a) (i) Complete the table below giving the names of substance **K** and **L** if the gases generated are carbon (IV) oxide and carbon (II) oxide. **(2marks)**

Substance	Carbon (IV) oxide	Carbon (II) oxide
K		
L		

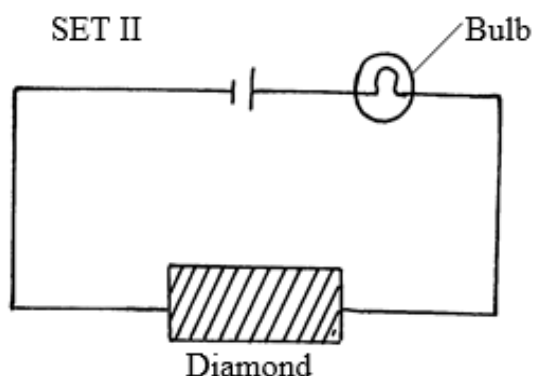
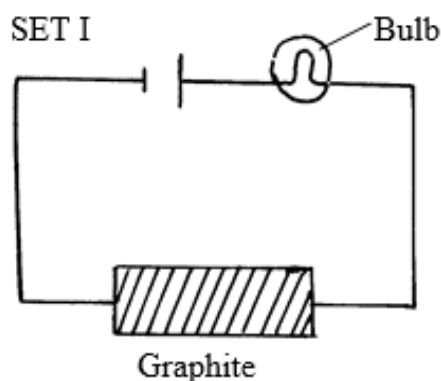
(ii) Complete the diagram to show how a sample of carbon (II) oxide can be collected. **(2marks)**

(iii) State two ways that can be used to distinguish carbon (IV) oxide from carbon (II)oxide? **(2 marks)**

(b) (i) In an experiment, carbon (IV) oxide gas was passed over heated charcoal held in a combustion tube. Write a chemical equation for the reaction that took place in the combustion tube. **(1 mark)**

(ii) State **one** use of carbon (II) oxide. **(1 mark)**

(c) The following set ups were used by Form Two students. Study and use them to answer the questions that follow.



State and explain the difference in observation made in set up I and II above.

(3 marks)

NAME.....ADM NO.....

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CHEMISTRY MOCKS

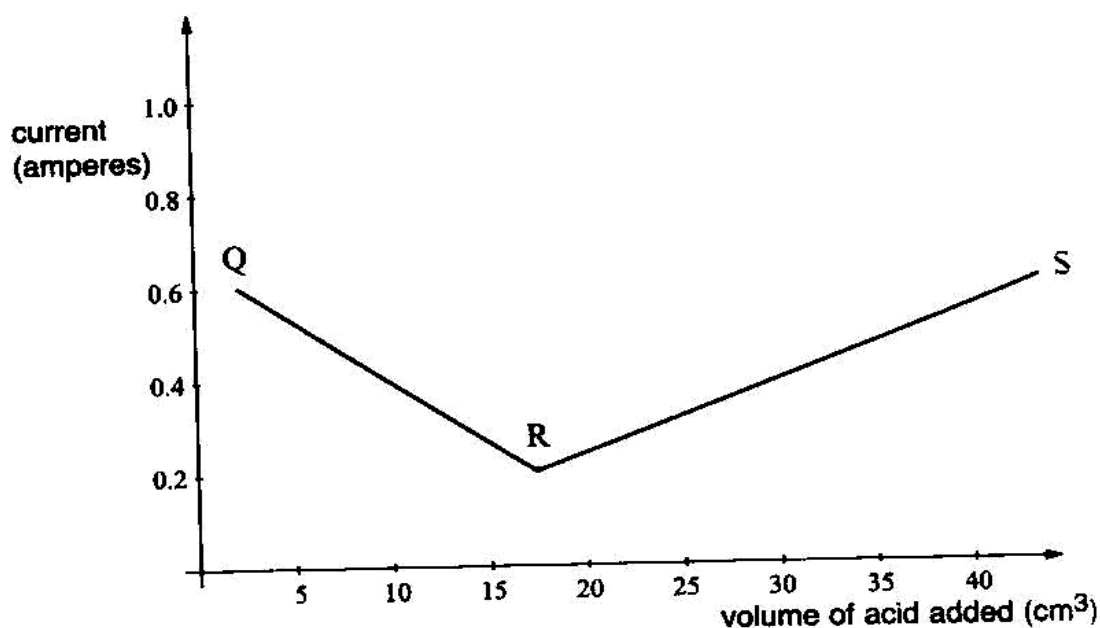
SERIES 1 TRIAL 7 PAPER 1

Kenya Certificate of Secondary Education.

TIME:2HRS

Answer all the questions

1. The electrical conductivity of barium hydroxide solution was measured after each addition of 1.0 cm^3 of dilute sulphuric (VI) acid from a burette. The graph below was obtained.



(a) Write the chemical equation of the reaction that took place. (1 mark)

(b) Explain the graph between,

(i) Q and R (1 mark)

(ii) R and S (1 mark)

2. A mass of 14.2 g sodium nitrate saturated 32.1 cm^3 of water at 32°C . Determine the solubility

of sodium nitrate at 32°C . (Density of water = 1g/cm^3). (2 marks)

3. Explain why sulphur is a solid while oxygen is a gas at room temperature.

(2 marks)

4. Study the electrode potential in the table below and answer the questions that follow.

	<u>E volts</u>
$\text{Cu}^{2+}_{(\text{aq})} + 2\text{e}^- \rightarrow \text{Cu}_{(\text{s})}$	+0.34
$\text{Mg}^{2+}_{(\text{aq})} + 2\text{e}^- \rightarrow \text{Mg}_{(\text{s})}$	-2.38
$\text{Ag}^{+}_{(\text{aq})} + \text{e}^- \rightarrow \text{Ag}_{(\text{s})}$	+0.80
$\text{Ca}^{2+}_{(\text{aq})} + 2\text{e}^- \rightarrow \text{Ca}_{(\text{s})}$	-2.87

(a) Identify the strongest reducing agent. (1 mark)

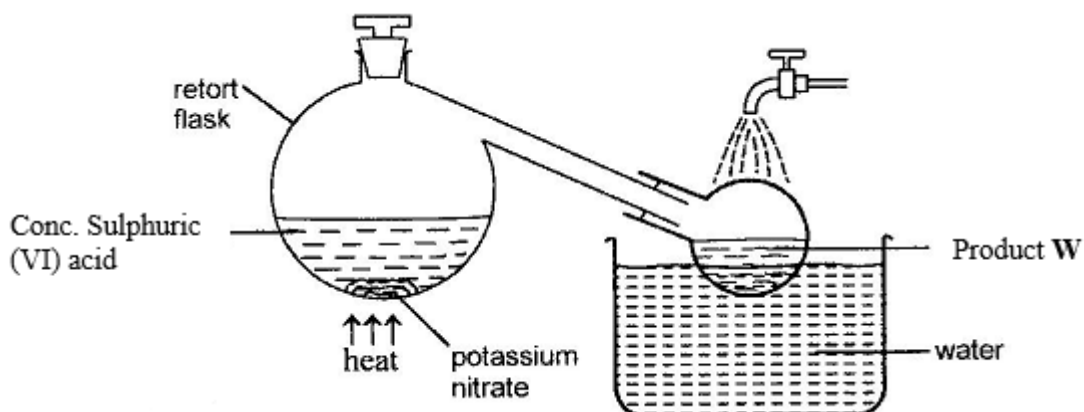
(b) What would be observed when magnesium ribbon is dipped in solution of copper(II)sulphate. Explain. (2 marks)

5. In a reaction, 0.65 g of impure zinc oxide reacted with 100 cm³ of 0.15 M nitric (V) acid.

(a) Write equation of the reaction. (1 mark)

(b) Calculate percentage purity of the zinc oxide sample. (2 marks)
(Zn = 65, O = 16)

6. The set up below can be used for the laboratory preparation of product W.



(a) Write chemical equation for the reaction that takes place in the retort flask. (1 mark)

(b) Explain why product W appears yellow in colour. How is the colour removed? (2 marks)

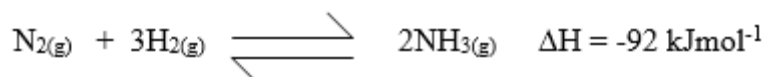
7. The table below shows information of four elements A, B, C and D. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Electronic arrangement	Atomic radius	Ionic radius
A	2.8.2	0.136	0.065
B	2.8.7	0.99	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 similar properties? (1 mark)

(b) Explain why **B** ionic radius is larger than its atomic radius. (2 marks)

8. The production of ammonia gas involves a reversible reaction as shown.



(a) What condition is necessary for the chemical equilibrium to be established?

(1 mark)

(b) Suggest **two** conditions that are likely to shift the equilibrium from right to left.

(2 marks)

9. Describe how chloride ions are tested in a solution.

(2 marks)

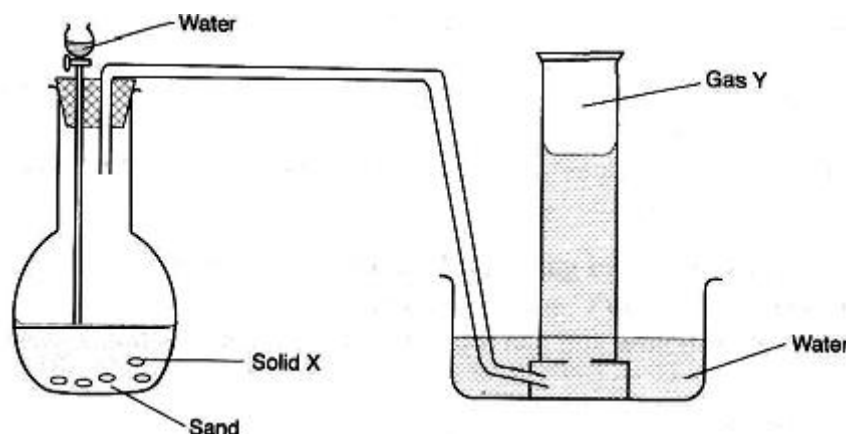
10. The empirical formula of X is CH_2Br . Given that 0.235 g of X occupies a volume of 56 cm^3 at 546 K and 1 atmosphere pressure, determine its molecular formula.

(H = 1.0, C = 12.0, Br = 80.0, molar gas volume at STP = 22.4 dm^3) (3marks)

11. When a piece of sodium metal is placed in cold water in a beaker it melts producing a hissing sound, as it moves on the surface of the water. Explain these observations.

(3 marks)

12. The set-up below was used to prepare a hydrocarbon. Study it and answer the questions that follow.



(a) Identify solid X and gas Y.

Solid X

(1 mark)

Gas Y

(1 mark)

(b) Write a chemical equation for the complete reaction between gas Y and bromine vapour.

(1 mark)

13. (a) When excess chlorine gas is bubbled through cold, dilute sodium hydroxide solution, the resulting solution acts as a bleaching agent. Using an equation, explain how the resulting solution acts as a bleaching agent.

(1 mark)

(b). What is observed when chlorine gas is bubbled through a solution of potassium bromide? Explain.

(2 marks)

14. (a) Explain why the pH of 1.0 M hydrochloric acid is 1 while that of 1.0 M ethanoic acid is 5.0.

(1 mark)

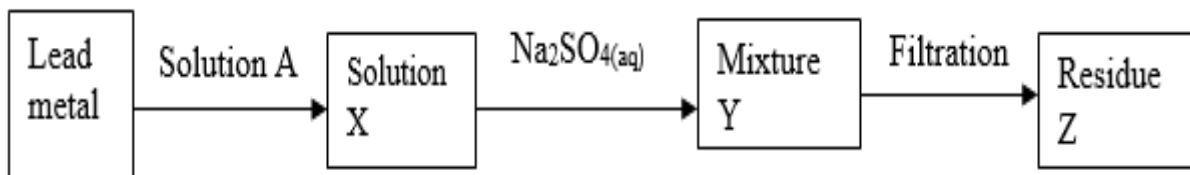
(b) How can a precipitate of barium sulphate be distinguished from that of

barium sulphite?

(2 marks)

15. **A, B, C and D** are dyes present in a mixture. In a given solvent, **C** is more soluble than **B** and **A** is more soluble than **C**. **D** is the least soluble. Draw an ascending paper chromatogram showing how they would appear when separated using the solvent. (2 marks)

16. The reaction below refers to the preparation of lead (II) sulphate starting with lead metal.



(a) Name solution A

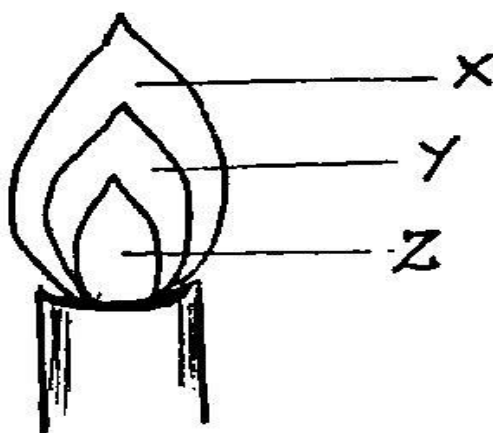
(1 mark)

(b) Write an ionic equation for the reaction in (a) above.

(1 mark)

(c) Explain why it is not possible to prepare residue Z using lead metal and dilute sulphuric acid. (1 mark)

17. The diagram below represents a Bunsen burner flame. Study it and answer the questions that follow.



(a) Under what condition is the represented flame produced?

(1 mark)

(b) Which of the regions shown represents the hottest part of the flame?

(1 mark)

(c) Name region Y

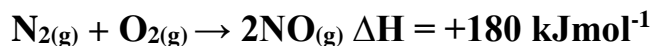
(1 mark)

18. A typical electrolysis cell uses a current of 40,000 amperes. Calculate the mass in kilograms of aluminium produced in one hour. (Al = 27, 1 Faraday = 96,500 coulombs) (3 marks)

19. (a) Distinguish between endothermic and exothermic reaction.

(1 mark)

(b) Nitrogen reacts with oxygen to form nitrogen (II) oxide according to the following reaction



Draw an energy level diagram for this reaction including the activation energy.

(2 marks)



20. (a) When a compound T was heated, a brown gas and a residue which was yellow when hot and white when cold were formed. Identify the:

(i) Brown gas (1 mark)

(ii) Residue (1 mark)

(b) Name a suitable drying agent for ammonia gas. (1 mark)

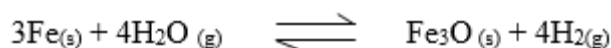
21. Give the structural formula of the following organic compounds.

(a) 2-Methylbutane

(b) Pent-2-ene

(c) Ethylpropanoate

22. When iron and steam are heated in a closed container, a dynamic equilibrium is reached.



(a) Define the dynamic equilibrium. (1 mark)

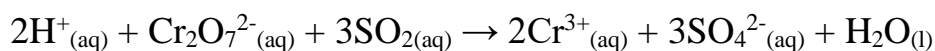
(b) What is the effect on equilibrium if magnesium is added? Explain. (2 marks)

23. State and explain the observations that would be made when burning magnesium is lowered

into a gas jar of sulphur (IV) oxide. (3 marks)

24. A mixture contains barium sulphate, calcium chloride and dry ice. Describe how the components can be separated. (3 marks)

25. In the redox reaction below:



Identify the reducing agent. Explain.

(2 marks)

26 (a) Explain why aluminium utensils do not corrode as easily as iron utensils although aluminium is higher than iron in the reactivity series.

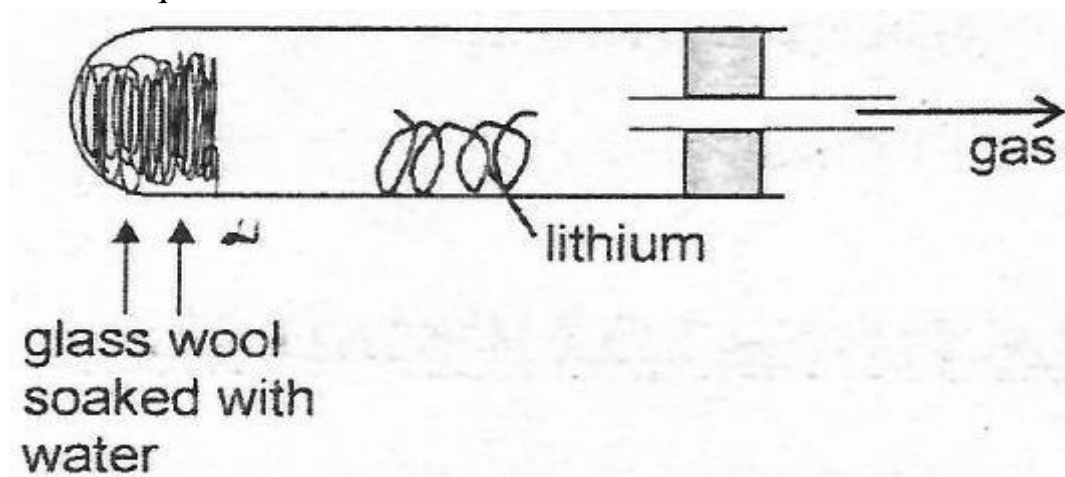
(1 mark)

(b) State **two** uses of aluminium other than utensils making.

(2 marks)

27. The diagram below represents a set up that was used to react lithium with steam. Study and

answer the question that follows.



a) Write an equation for the reaction that takes place.

(1 mark)

b) Why is it not advisable to use potassium metal in place of lithium in the above set-up?

(1 mark)

c) The gas produced above is used for welding. Which other gas is combined with it?

(1 mark)

28. Using dots (.) and crosses (×) to represent valence electrons, show bonding in:

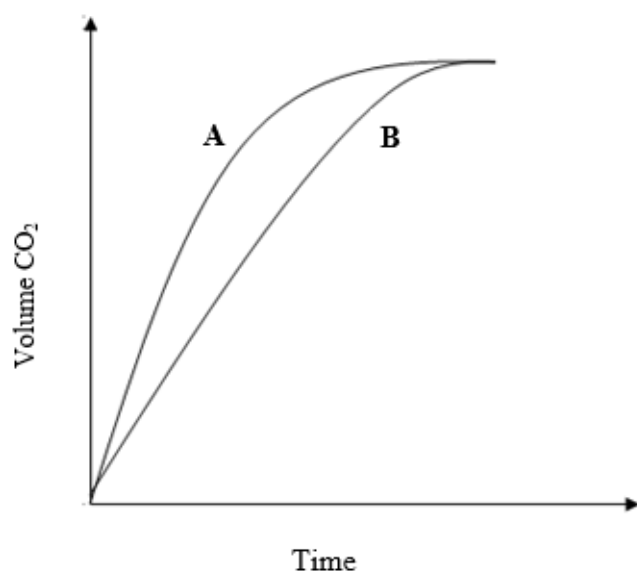
(a) Nitrogen trifluoride (N = 7, F = 9)

(1 mark)

(b) Sodium oxide (Na = 11, O = 8)

(1 mark)

29. The graphs below were drawn by measuring the volume of hydrogen produced with time when excess zinc metal in different physical states were reacted with 50 cm³ of 2 M hydrochloric acid.



(a) Which curve corresponds to the reactions involving powdered zinc?

(1 mark)

(b) Both curves eventually flatten out at the same level of hydrogen. Explain.

(1 mark)

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

CHEMISTRY MOCKS

SERIES 1 TRIAL 7 PAPER 2

Kenya Certificate of Secondary Education.

TIME:2HRS

Answer all the questions

1. (a) Study part of the periodic table below. The letters do not represent the actual symbols. Use the letters to answer the questions that follow.

F				J	J	K	L	M
O	P			R				

- (i) Which one element would form a divalent anion? **(1mark)**
- (ii) Write formula of the compound formed when P reacts with L **(1mark)**
- (iii) Monovalent cation of X electronic configuration 2.8.8. Identify its position in the periodic table above. **(1mark)**
- (iv) Identify most reactive metallic element **(1mark)**
- (b) The table shows some properties and electron arrangements of common ions of elements represented by letters Q to X. Study the information provided then answer the questions that follow.

Element	Formula of ion	Ionic electron arrangement	Atomic Radius	Ionic Radius
Q	Q^-	2.8	0.072	0.136
R	R^+	2.8.8	0.231	0.133
S	S^{3+}	2.8	0.143	0.050
T	T^{2+}	2.8.8	0.133	0.074
U	U^{2+}	2.8	0.160	0.064
V	V^+	2.8	0.186	0.095
W	W^{3-}	2.8.8	0.110	0.190
X	X^-	2.8.8	0.099	0.181

- (i) Give the atomic numbers of elements T and Q (2marks)

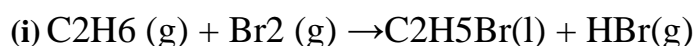
T-

Q-

- (ii) Select two non-metals that belong to the same period (1mark)
- (iii) Which two elements would react violently with water to produce hydrogen? (2marks)
- (c)(i) Why is the atomic radius of R larger than its ionic radius? (2marks)
- (ii) Element S is suitable for making cooking pans. Explain (2 marks)
- 2. (a)** Give the names of the following compounds



b) Ethane and ethene react with Bromine according to the equations given below.

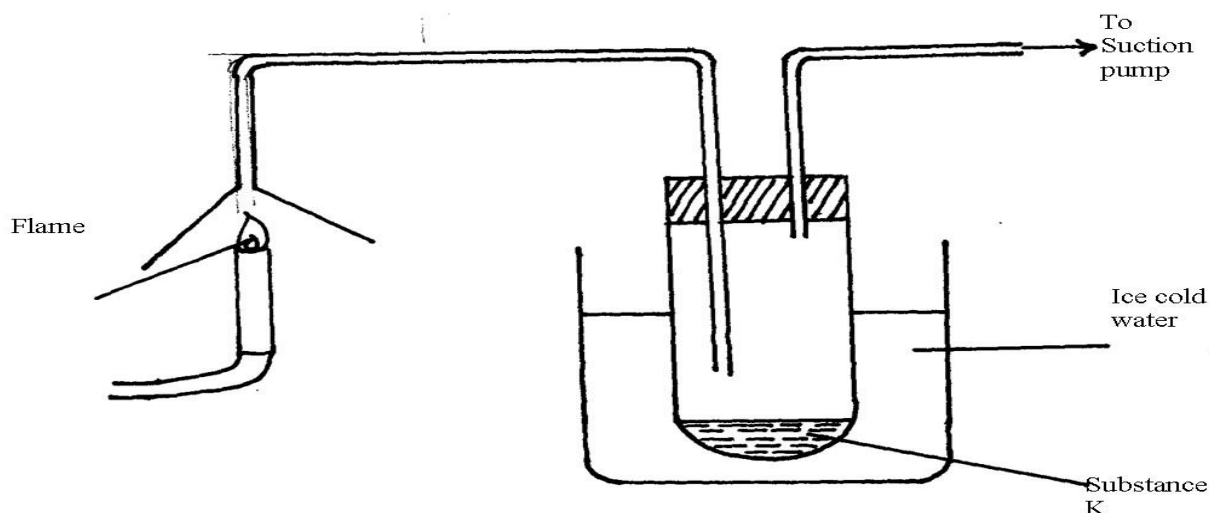


Name the type of bromination reacting taking place in (i) and (ii) above
(1mark)

(i)

(ii)

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



(i) Write the equation for the complete combustion of butane

(ii) The pH of substance **K** was found to be less than 7.

Explain the observation

(2marks)

(e) The polymerization of tetra fluorocarbon (C_2F_4) is similar to that of ethane (C_2H_4)

(i) What is meant by polymerization?

(1mark)

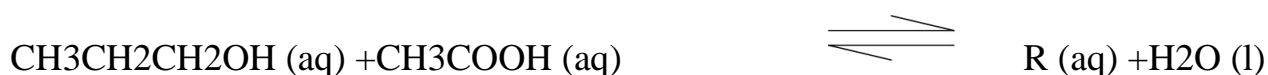
(ii) Draw the structural formula of the polymer obtained from monomer C_2H_4

(1mark)

(iii) State any two advantages of synthetic polymers over natural polymers.

(2marks)

(f) Propanol and ethanoic acid react according to the following equation



Name:

(i) Product **R**

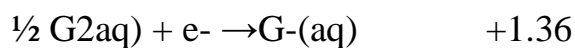
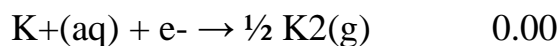
(1mark)

(ii) The type of reaction that produce **R**

(1mark)

2. Study the standard electrode potential for the half-cells given below and answer the questions that follow. The letters do not represent the actual symbols of the elements

	<i>E</i> - Volts
$N^{+}(aq) + e^{-} \rightarrow N(s)$	-2.92
$J^{+}(aq) + e^{-} \rightarrow J(s)$	+0.52



(i) Identify the strongest oxidizing agent. Give a reason for your answer

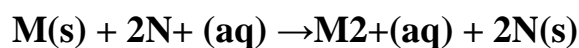
(1 ½ marks)

(ii) Which two half-cells would produce the highest potential difference when combined?

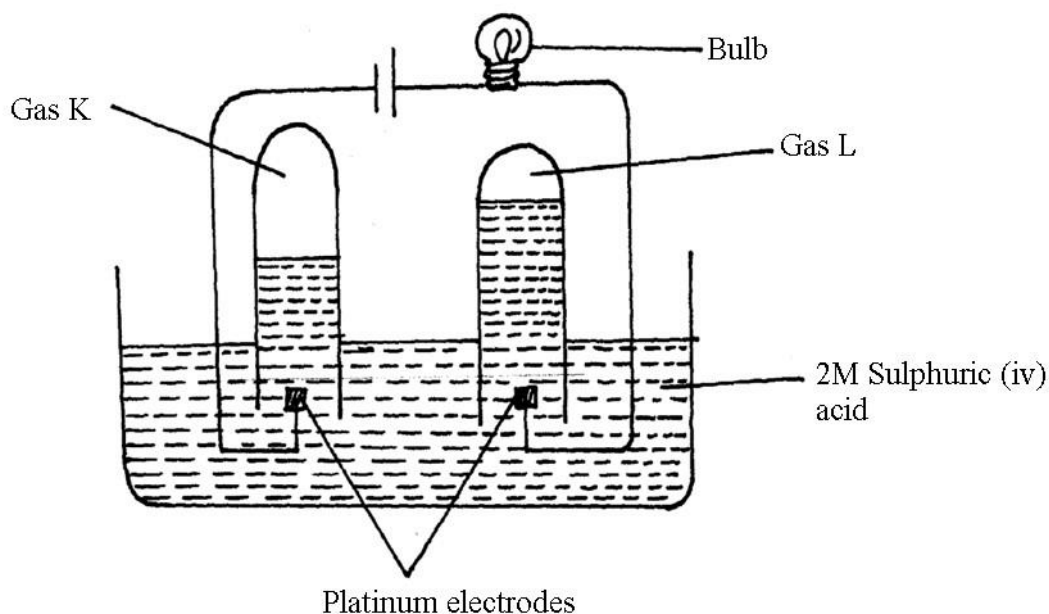
(1mark)

(iii) Explain whether the reaction represented below can take place

(2marks)



(b) 100cm³ of 2M sulphuric (iv) acid was electrolyzed using the set-up represented diagram below.



(i) Write an equation for the reaction that produces gas L

(1mark)

(ii) Describe how gas K can be identified

(1 ½ mks)

(iii) Explain the differences in;

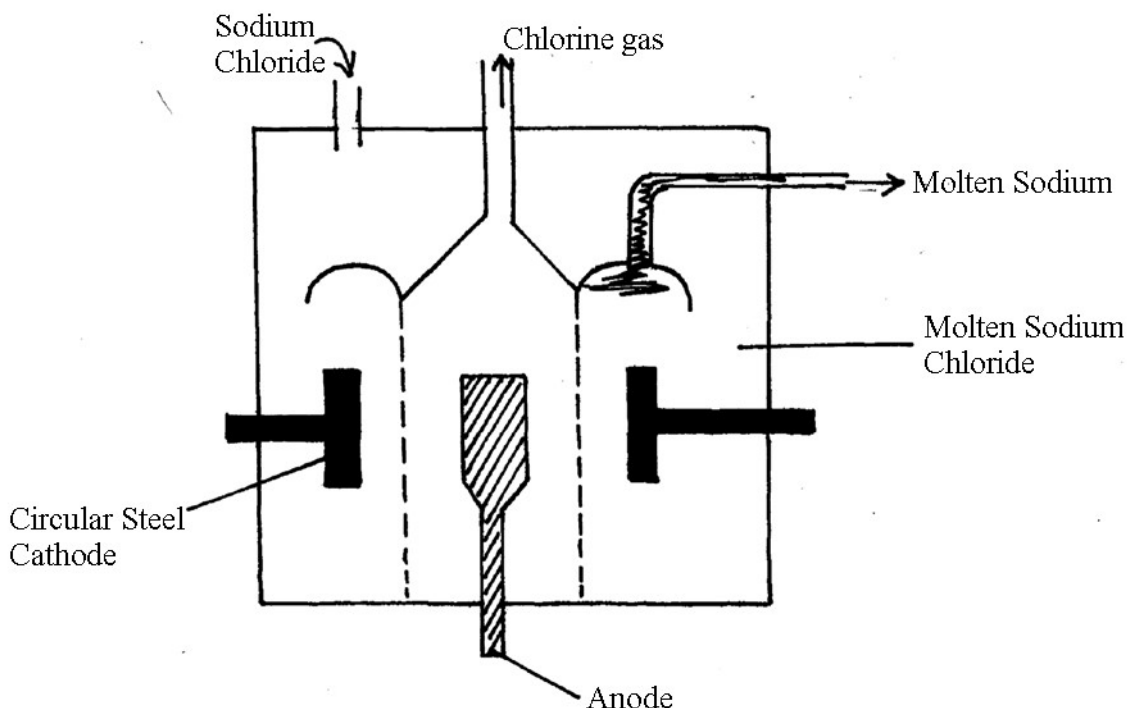
(I) volume of gases produced at electrodes

(1mark)

(II) Brightness of the bulb if 100cm^3 of 2M ethanoic acid was used in place of 2M sulphuric (iv) acid **(2marks)**

(c) A current of 0.5A was passed for 2 hours. Calculate the mass of Lead deposited (Pb=207, IF=96500⁰C) **(2marks)**

3. (a) Below is a simplified diagram of a down's cell used in manufacture of Sodium. Study it and answer the questions that follow,



(i) What material is the anode made of?. Give a reason **(2marks)**

(ii) What precaution is taken to prevent chlorine and sodium from recombining **(1mark)**

(iii) Write an ionic equation for the reaction in which chlorine gas is formed. **(1mark)**

(b) In the Down's cell, a certain salt is added to lower the melting point of Sodium chloride from 800°C to 600°C

(i) Name the salt that is added **(1mark)**

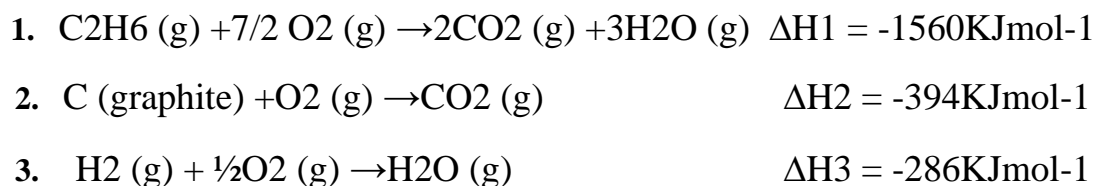
(ii) State why its necessary to lower melting point **(1mark)**

(c) Explain why its not suitable to use aqueous sodium chloride for the manufacture of sodium in the Down's process **(2marks)**

(d) Sodium metal reacts with air to form two oxides. Give the formulae of the two oxides **(2marks)**

(e) State two uses of sodium metal **(2mark)**

4. (a) Define the standard enthalpy of formation of a substance **(1mark)**
- (b) Use the thermo chemical equations below to answer the questions that follow.



- (i) Name two types of heat changes represented by ΔH_3 **(2marks)**
- (ii) Draw an energy level diagram for the reaction represented by equation 1 **(2marks)**
- (iii) Calculate the standard enthalpy of formation of ethane **(2marks)**
- (iv) When a sample of ethane was burnt, the heat produced raised the temperature of 500g of water by 21.5k (specific heat capacity of water $4.2 \text{Jg}^{-1}\text{k}^{-1}$)

Calculate

- (I) Heat change for the reaction **(2marks)**
- (II) Mass of ethane that was burnt (Relative formula mass of ethane = 30) **(1mark)**

5. (a) Define the term solubility **(2marks)**

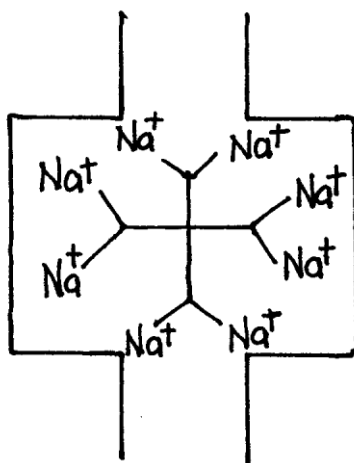
Mass of $\text{KCl}_{(\text{g})}$	20	20	20	20	20	20
Volume of water (cm^3)	40.0	45.0	50.0	55.0	60.0	65.0
Temperature at which crystals first appear ($^{\circ}\text{C}$)	77.0	56.0	40.0	26.0	15.0	8.0
Solubility in g per 100g of water						

- (i) Complete the table above by calculating the solubility of KCl in grammes per 100g of water **(3marks)**
- (ii) Plot the graph of solubility in g/100g of water (y-axis) against temperature (x-axis) **(3marks)**
- (iii) From your graph determine solubility at 50°C **(1mark)**

(iv) If a saturated solution of potassium chloride is cooled from 70°C to 10°C. What mass of the crystals would be obtained? **(2marks)**

(v) Calculate the concentration of the saturated solution of 50°C. (K=39.0, Cl = 35.5) **(2mks)**

(c) The set-up below was used to remove hardness in water.



(i) Identify the above method of removing water hardness

(1mark)

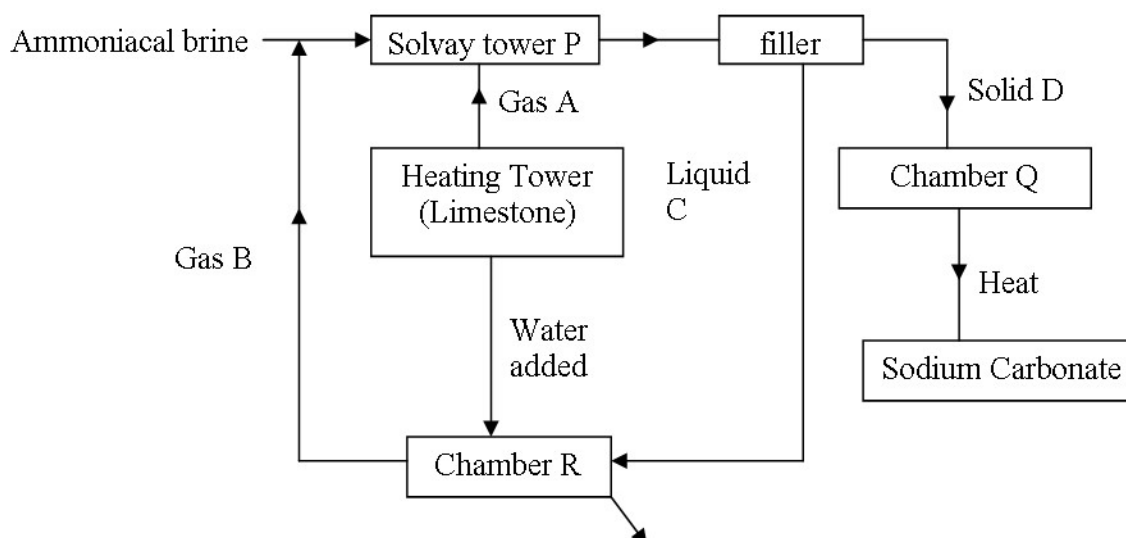
(ii) The above system eventually lack the ability to soften hard water. Explain how it can be reactivated.

(1mark)

(iii) State any advantage of hard water

(1mark)

6. The scheme below shows the manufacture of sodium carbonate by the Solvay process. Study it and use it to answer the questions that follow.



(a) Name (i) gases A and B

(1mark)

(b) Name liquid C and Solid D

(1mark)

- (c) Write equations for the reactions taking place in tower P and chamber R
(2marks)
- (d) Name the product formed in chamber at chamber R and give one of its uses
2marks)
- (c) State two uses of sodium carbonate (1mark)

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

CHEMISTRY MOCKS

SERIES 1 TRIAL 8 PAPER 1

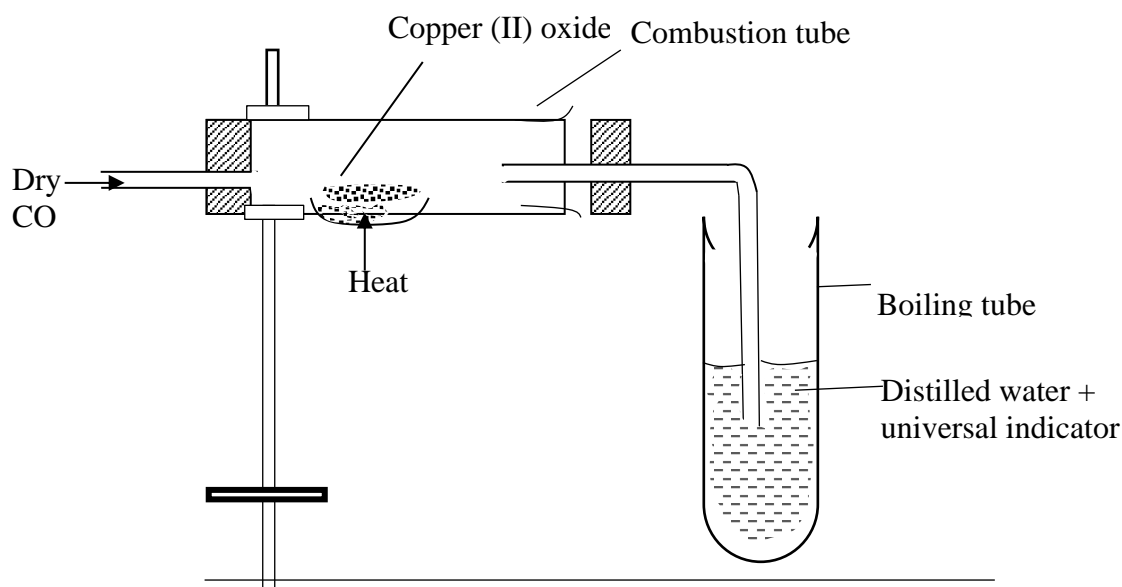
Kenya Certificate of Secondary Education.

TIME:2HRS

Answer all the questions

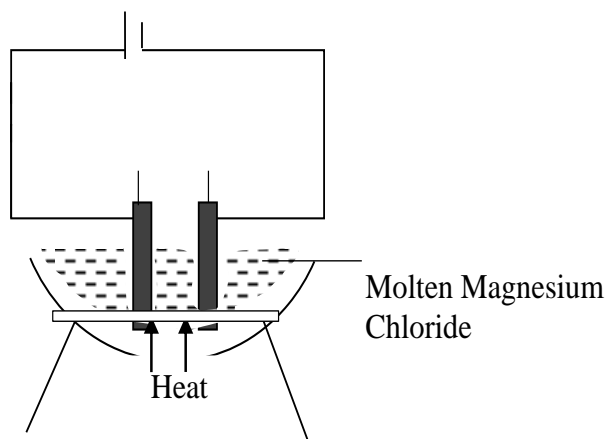
1. State **two** laboratory rules that should be followed to avoid contamination and wastage of chemicals. **(2 marks)**
2. (a) Give **one** reason some of the laboratory apparatus are made of ceramics. **(1 mark)**
(b) Name **two** apparatus that can be used to measure approximately 75 cm³ of dilute sulphuric (VI) acid. **(2 marks)**
3. Draw the procedural set-ups that can be used to separate a mixture of sand and calcium chloride to obtain crystals of calcium chloride. **(3 marks)**
4. State **two** applications of chromatography. **(2 marks)**

5.

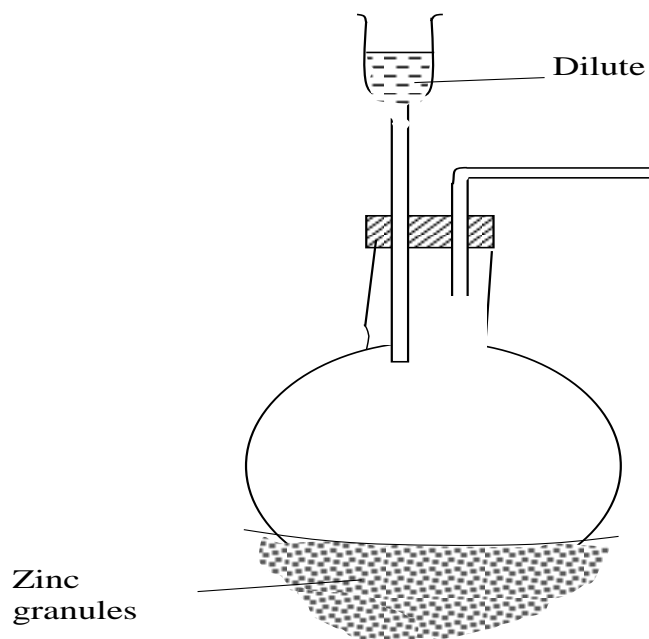


The above set-up was used to determine the chemical properties of carbon (II) oxide.

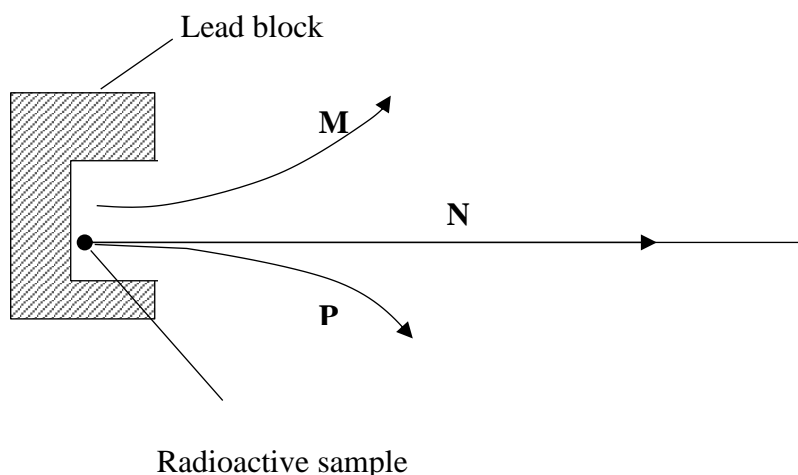
- (a) Write the chemical equation for the reaction taking place in the combustion tube. (1 mark)
- (b) State and explain the observation made in the boiling tube. (2 marks)
6. A student placed some hydrogen peroxide in a test tube then added a small amount of manganese (IV) oxide. A glowing splint was then brought near the mouth of the tube.
- (a) State the observation made on the glowing splint. (1 mark)
- (b) What is the role of the manganese (IV) oxide? (1 mark)
- (c) Give **one** use of the gas produced. (1 mark)
7. An organic compound with formula C_4H_8 , has isomers. Draw and name two possible structural isomers of the compound. (3 marks)
8. Explain how the compound C_4H_8 and C_4H_{10} can be distinguished using bromine water. (2 marks)
9. (a) Chlorine can be prepared in the laboratory by using the following reagents and chemicals. Concentrated sulphuric (VI) acid, water, manganese (IV) oxide, concentrated hydrochloric acid.
- (i) State the role of concentrated sulphuric (VI) acid. (1 mark)
- (ii) Write the equation for formation of chlorine. (1 mark)
- (iii) What is the role of manganese (IV) oxide? (1 mark)
10. (a) State Boyle's law. (1 mark)
- (b) A gas occupies 270cm^3 at a pressure of 660mmHg at 37°C . What is the new volume if pressure is changed to 810mmHg at 63°C ? (2 marks)
10. An organic compound contains 24.24% carbon, 4.04% hydrogen and the rest chlorine. If its relative molecular mass is 99, what is its molecular formula? (3 marks)
- (C = 12, H = 1, Cl = 35.5)
12. A given mass of sodium nitrate was heated completely and 320cm^3 of the gas was produced at s.t.p. Determine the mass of the sodium nitrate heated. (Na = 23, N = 14, O = 16, molar gas volume = 22.4L) (3 marks)
13. (a) Give **one** advantage of using methyl orange over phenolphthalein as an indicator. (1 mark)
- (b) Three drops of litmus solution was added to 20cm^3 of 2M hydrochloric acid in a beaker followed by 20cm^3 of 2M ammonium hydroxide. State and explain the observation made. (2 marks)
14. A tea farmer suspects that her farm had turned acidic. She obtained a soil sample to analyze for pH. Give her the procedure to follow in order to verify this. (2 marks)
15. Study the diagram below and answer the questions that follow.



- (a) Define electrolysis. **(1 mark)**
 - (b) On the diagram, label the Anode and Cathode. **(2 marks)**
 - (c) Write the equation at the anode. **(1 mark)**
16. In order to find the proportion by volume of gases in air, a sample of air was passed through two wash bottles, the first containing sodium hydroxide solution and the second containing concentrated sulphuric (VI) acid. The remaining gas was then collected in a syringe.
- (a) Why was the air passed through;
 - (i) sodium hydroxide solution? **(1 mark)**
 - (ii) concentrated sulphuric (VI) acid? **(1 mark)**
 - (b) Name the major gas collected in the syringe. **(1 mark)**
17. During the manufacture of sodium carbonate in the industry.
- (a) Give the name of the process to manufacture sodium carbonate. **(1 mark)**
 - (b) Write the final equation for the formation of sodium carbonate during the process. **(1 mark)**
 - (c) Give **one** use of sodium carbonate. **(1 mark)**
18. Describe how to prepare crystal of magnesium sulphate starting with magnesium powder. **(3 marks)**
19. (a) Complete the diagram below to show how dry sample of hydrogen gas is prepared in the laboratory. **(2 marks)**



- (b) Name the catalyst which could be used to increase the reaction rate of production of hydrogen gas in the set up drawn above. **(1 mark)**
20. An element consists of two isotopes with atomic masses 59 and 61 in the ratio of 3 : 2 respectively.
- (a) What are isotopes? **(1 mark)**
- (b) Calculate the relative atomic mass of the element. **(2 marks)**
21. An element: ${}^{24}_{12}\text{R}$
- (a) To which chemical family does it belong? **(1 mark)**
- (b) Write the electron arrangement of the atom. **(1 mark)**
- (c) Draw the structure of its ion. **(1 mark)**
22. Given the bond energies.
- | | |
|---------|------------|
| H – Cl | 431kJ/mole |
| H – H | 435kJ/mole |
| Cl – Cl | 243kJ/mole |
- (a) Calculate the enthalpy change for the formation of hydrogen chloride gas when chlorine and hydrogen react. **(2 marks)**
- (b) Sketch the energy level diagram for the reaction. **(1 mark)**
23. The diagram below shows the radiations emitted by a radioactive sample.



Name the radiations;

(3 marks)

P -

M -

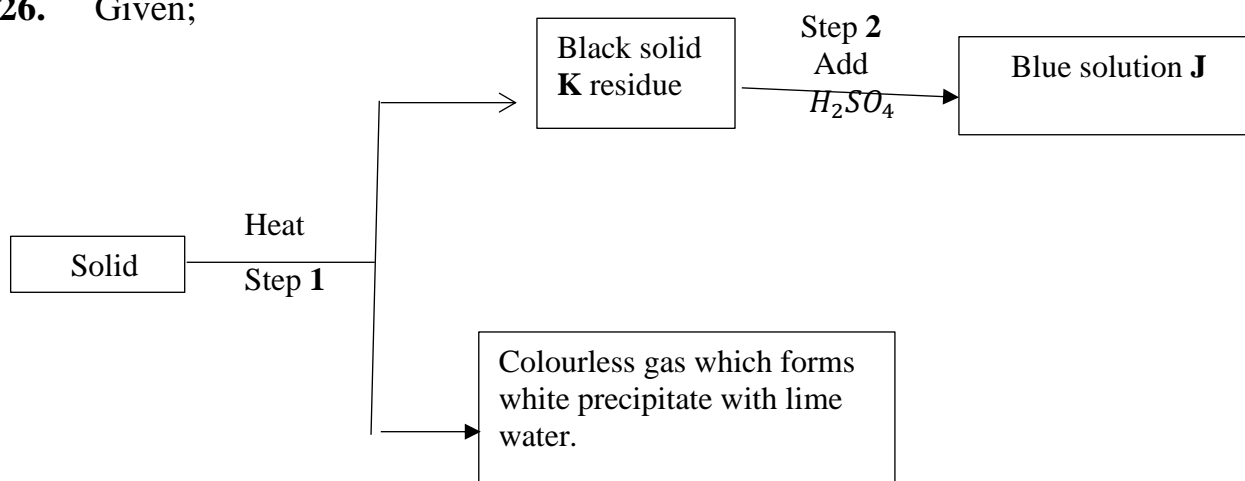
N -

24. Calculate the enthalpy of formation of ethanol given the enthalpies of;
 combustion of ethanol = -1369 kJ/mole
 combustion of carbon = -394kJ/mole
 combustion of hydrogen = -286kJ/mole

(3 marks)

25. (a) State what is observed when sodium hydroxide pellets are left in air overnight. (1 mark)
 (b) What name is given the process shown by the salt in (a) above? (1 mark)

26. Given;



- (a) Identify;
 Solid **F**- (1 mark)
 Solid **J** (1 mark)
 (b) Write equation for step 1. (1 mark)

- 27.** A saturated solution of sodium nitrate in water was made at 30°C. Use the information below to answer the questions that follow.

Mass of evaporating dish = 52.5g

Mass of evaporating dish + salt solution = 119.6g

Mass of evaporating dish + dry salt = 59.3g

- (a) What is solubility? (1 mark)
(b) Determine the solubility of sodium nitrate at 30°C. (2 marks)

(c) Use dot (•) and cross (X) to show the bonding in Lithium oxide. (1 mark)

- 28.** Excess magnesium ribbon was burnt in air to form a white solid mixture.

Write two equations to show the formation of the white solid mixture.

(2 marks)

NAME.....ADM NO.....

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CHEMISTRY MOCKS

SERIES 1 TRIAL 8 PAPER 2

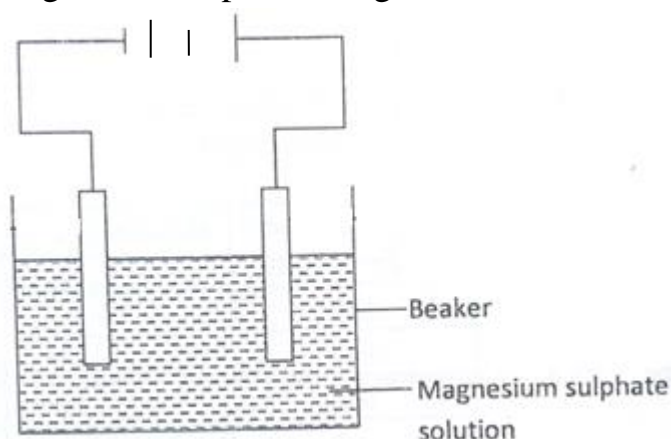
Kenya Certificate of Secondary Education.

TIME:2HRS

Answer all the questions

1. (a) Define an electrolyte. (1mark)

(b) The set-up below was used to carry out electrolysis of an aqueous solution of magnesium sulphate using carbon electrodes.



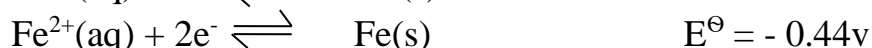
i) State and explain the observation made at the cathode. (1 mark)

(ii) Write down an equation for the reaction that occurs at the anode. (1mark)

(iii) What change occurred to the concentration of magnesium sulphate solution during the experiment? Explain. (3 marks)

(c) During the electrolysis of dilute copper (II) chloride, the mass of the platinum cathode increased by 3.2g. If a current of 2.5 amperes was passed through the solution for some time, calculate the time taken. (Cu= 64.0; 1 faraday = 96,500 Coulombs) (3 marks)

(d) Use the information below to answer the question that follows.



Why is it not advisable to keep a solution of iron (II) nitrate in a container made of aluminium? **(2 marks)**

(e) Other than electroplating, give one application of electrolysis. **(1 mark)**

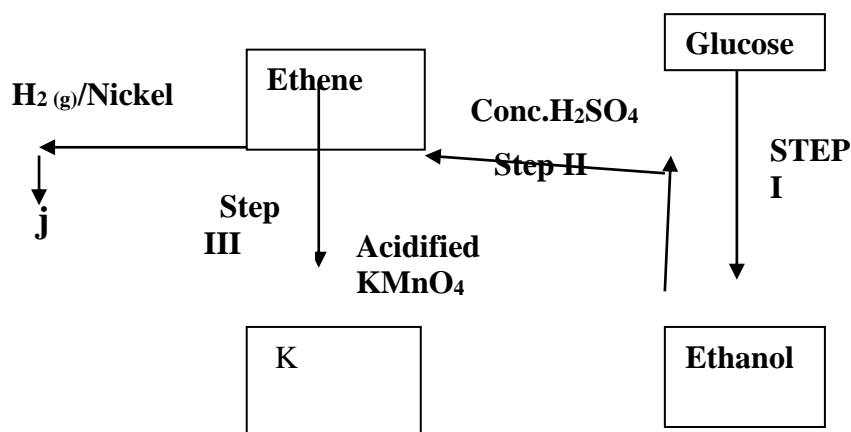
2. a) Draw the structural formula of **(3 marks)**

(i) Propan-1-ol

(ii) Pent-2-yne

(iii) 2,3-dimethylbutane

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



(i) Name the process in step I **(1 mark)**

(ii) Give the two conditions necessary in step II **(2 marks)**

(iii) State the observation made in step III. **(1 mark)**

(iv) Name compound J. **(1 mark)**

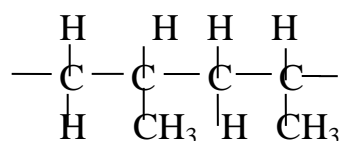
(v) Draw the structural formula of compound K. **(1 mark)**

(c) Water is added dropwise to calcium carbide in a conical flask.

(i) Identify the gas produced. **(1 mark)**

(ii) Write a chemical equation for the reaction that occurs. **(1 mark)**

(d) Part of a polymer is required below.



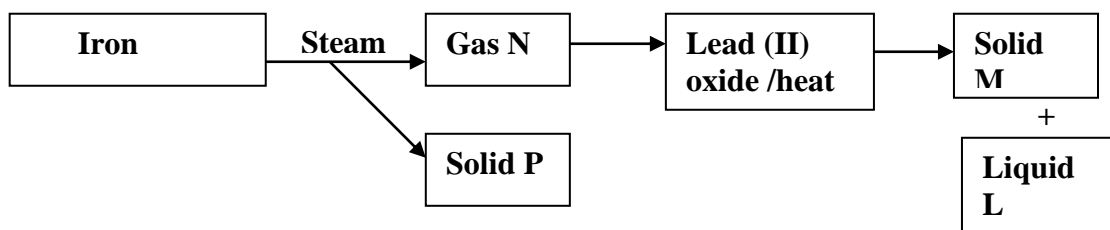
(i) Draw the structural formula of the monomer of this polymer. **(1 mark)**

(ii) State one use of this polymer. **(1 mark)**

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

Y	R					Q	X	
	V		W					U

- (a) Select an element whose oxide is amphoteric. (1 mark)
- (b) On the grid indicate with letter J the position of element J which is in period 3 and forms a stable ion J^{2-} . (1 mark)
- (c) Draw a dot-cross diagram to show bonding in the compound consisting of elements V and X only. (2 marks)
- (d) Write an equation to show the formation of an ion of R. (1 mark)
- (e) Which is the least reactive element? Give a reason for your answer. (2 marks)
- (f) Write an equation for the reaction that occurs when element Y is placed in water. (1 mark)
- (g) How does the atomic radius of W compare with that of V? Explain. (2 marks)
- (h) Name the chemical family to which elements R and V belong. (1 mark)
4. a) Use the chart below to answer the questions that follow.



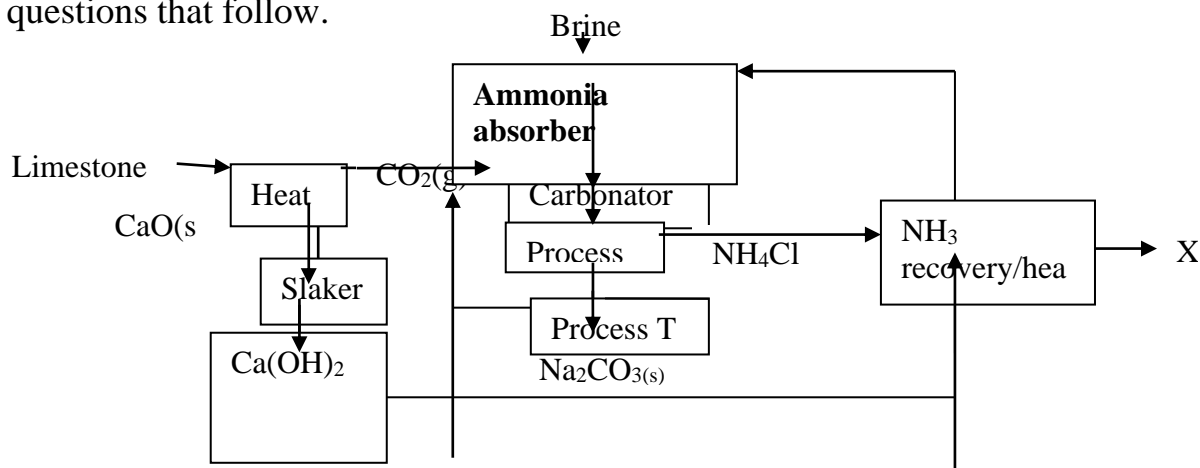
Identify:

- Gas N (1/2 mark)
- Solid P (1/2 mark)
- Solid M (1/2 mark)
- Liquid L (1/2 mark)

- b) Name the method that can be used to extract oil from castor oil seeds. (1 mark)
- c) i) In the method named above, state the property of oil that enables the extraction to take place. (1 mark)
- ii) Describe an experimental procedure that can be used to extract oil from the seeds. (3 marks)
- d) How is phosphorus stored in the laboratory? Explain your answer. (1 mark)
- e) i) In the fractional distillation of liquid air water is removed, name two other substances that are removed. (1 mark)
- ii) Why must water be removed (1 mark)

iii) State the processes involved in fractional distillation of liquid air. (2 marks)

5. Study the flow chart below showing the Solvay process and use it to answer the questions that follow.



a) Write the equation for the reaction producing substance X. (1 mark)

b) Name processes Y and T. (1 mark)

Y-

T-

c) In the carbonator, two reactions take place. Write the two equations for the reactions. (2 marks)

d) Explain why the Solvay process is said to be one of the most efficient industrial process. (1 marks)

e) 16.8g of sodium hydrogen carbonate are completely decomposed by heating. Calculate;

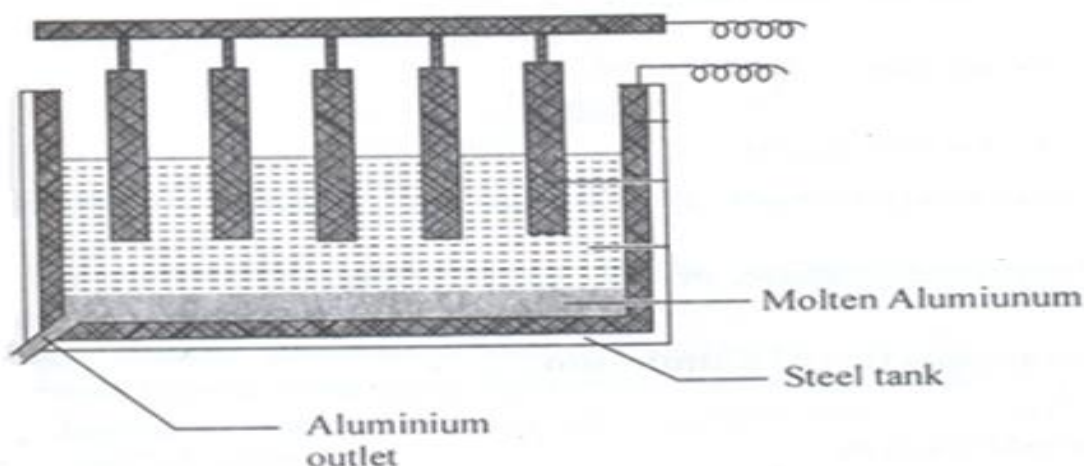
i) the mass of the resulting solid produced. (3 marks)

ii) the volume in litres of the gas produced at s.t.p (2 marks)

(Molar Gas Volume at s.t.p = 22400 cm³, Na=23.0, C=12.0, H= 1.0, O=16.0)

f) Give two industrial uses of sodium carbonate. (1 mark)

6. The diagram below shows the electrolysis process in the extraction of aluminium. Study it and answer the questions that follow.



a) i) Name the main ore from which aluminium is extracted from. (1 mark)

ii) Explain how the impurities present in the ore are removed. (3 marks)

b) Label on the diagram the anode and the cathode. (1 mark)

c) The melting point of aluminium oxide is 2015°C but the electrolysis is carried out at temperature of around 800°C .

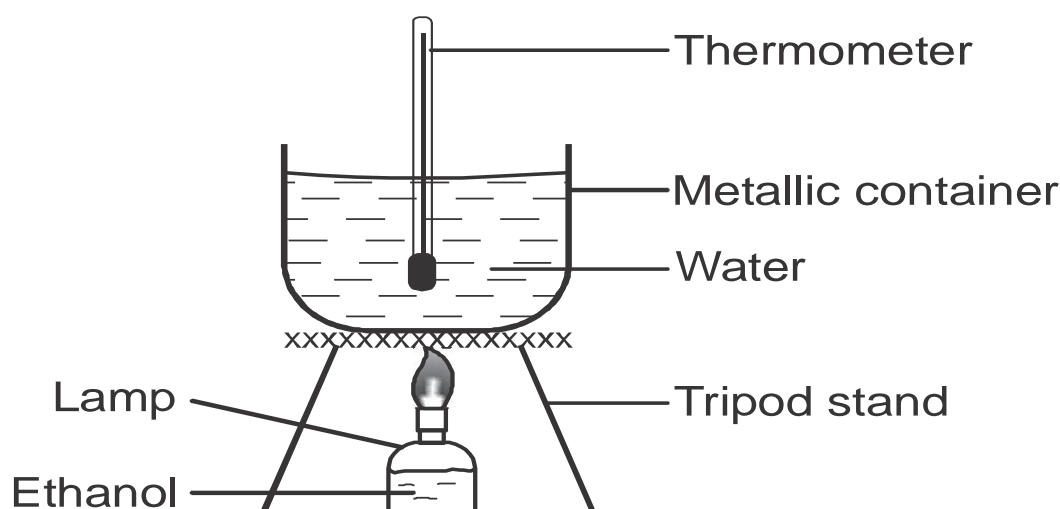
i) Why is the electrolysis not carried out at 2015°C (1 mark)

ii) How is the temperature lowered to about 800°C (1 mark)

d) Duralumin (an alloy of aluminium) is preferred to pure aluminium in the construction of aeroplane bodies. Give **two** properties that make it suitable for making the aeroplane bodies (2 marks)

7.a) State two reasons why wood charcoal is not a suitable fuel for cooking. (1 mark)

b) The diagram below represents a set up that was used to determine the molar heat of combustion of ethanol.



During the experiment the data given below was recorded :

Volume of water = 450cm^3

Initial temperature of water = 24.0°C

Final temperature of water = 45.5°C

Mass of ethanol + lamp before burning = 113.5g

Mass of ethanol + lamp after burning = 112.0g

I. Calculate the :

i) Heat evolved during the experiment (density of water = 1g/cm^3 , specific heat capacity of water = $4.2\text{Jg}^{-1}\text{K}^{-1}$) (2 marks)

ii) Molar heat of combustion of ethanol. (C = 12.0, O = 16.0, H = 1.0) (1½ marks)

III. Write the thermochemical equation for the complete combustion of ethanol. (1 mark)

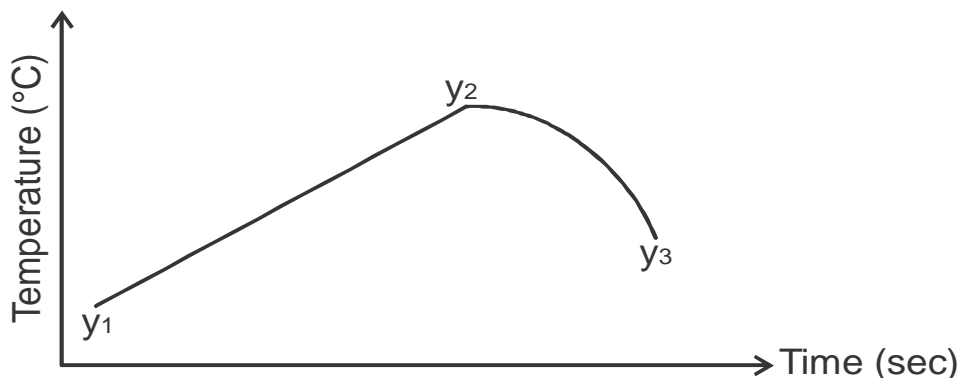
III. The value of the molar heat of combustion of ethanol obtained in b(ii) above is lower than the theoretical value. State two reasons which lead to this. (2 marks)

IV. On the axis below, draw an energy level diagram for combustion of ethanol. (1½ marks)



c) In order to determine the molar enthalpy of neutralization of sodium hydroxide, 50cm^3 of 2M sodium hydroxide and 50cm^3 of 2M hydrochloric acid both at the same initial temperature were mixed and stirred continuously with a thermometer. The temperature of the resulting solution was recorded after every 15 seconds until the highest temperature of the solution was attained. Thereafter the temperature of the solution was recorded for a further two minutes.

The sketch below was obtained when the temperature of the mixture were plotted against time. Study and answer the questions that follow.



- i) What is the significance of point y_2 (1 mark)
- ii) Explain why there is a temperature change between points y_1 and y_2 (1 mark)
- iii) Explain how the value of temperature rise obtained in this experiment would compare with the one that would be obtained if the experiment was repeated using 50cm^3 of 2M methanoic acid instead of hydrochloric acid. (2 marks)

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CHEMISTRY MOCKS

TRIAL 9 PAPER 1

Kenya Certificate of Secondary Education.

TIME:2HRS

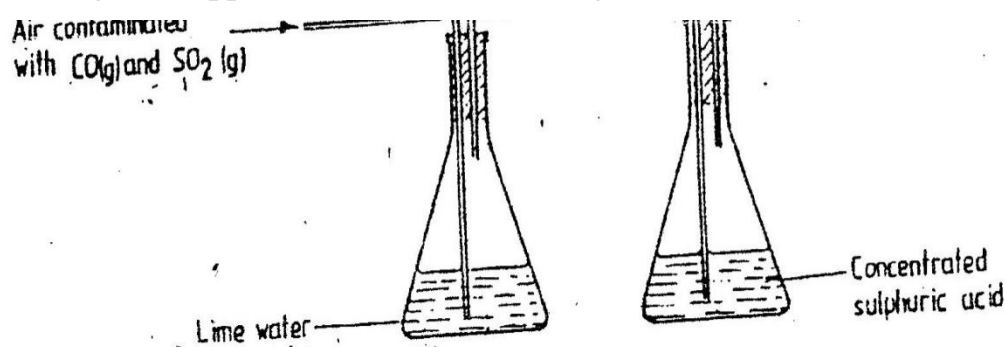
Answer all the questions

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)

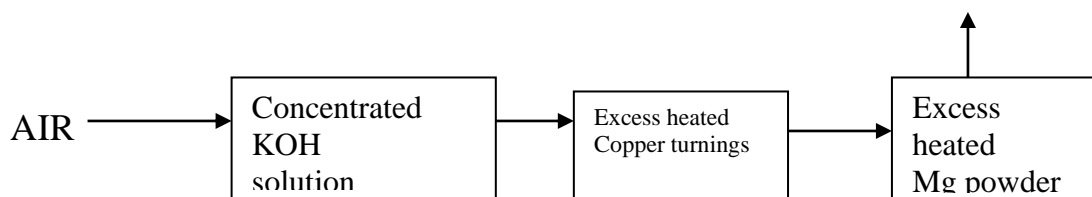
4. (a) Write an equation for the reaction that takes place when carbon (II) oxide gas is passed over heated lead(II)oxide. (1mk)
- (b) State **one** other use of carbon (II) oxide gas. (1mk)
5. Describe how the following reagents can be used to prepare copper (II) hydroxide, solid copper (II) sulphate, 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

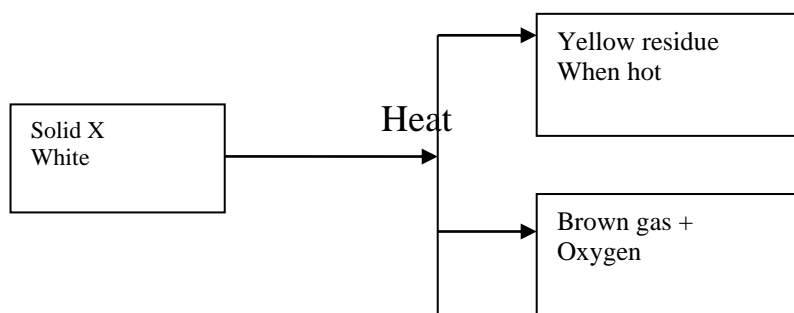
	Relative molecular mass	Boiling point(°C)
Methane	16	-161
Water	18	100

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
Escaping gases

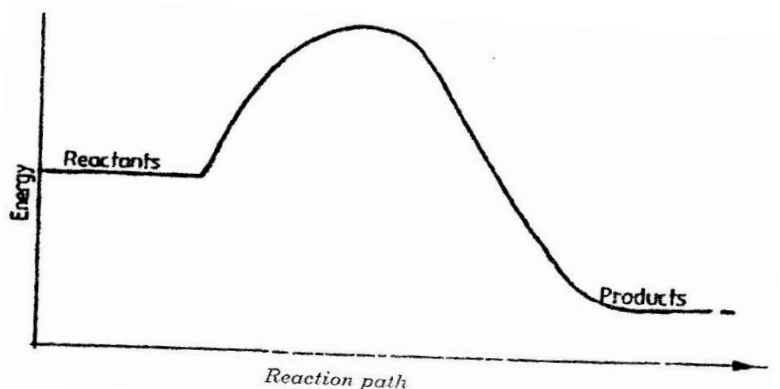


- (a) Write an equation for the reaction, which takes place in chamber with magnesium powder (1mk)
- (b) Name one gas, which escapes from the chamber containing magnesium powder. Give a reason for your answer. (2mks)
11. (a) Other than the enthalpy of combustion, state **one** factor which should be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

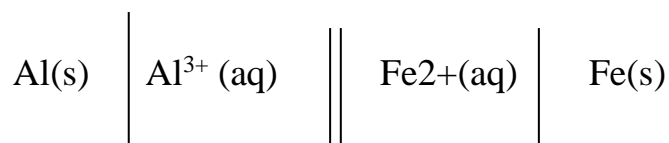


- (a) Explain how an increase in temperature would affect the yield of nitrogen(II)oxide (2mks)
- (b) On the energy level diagram above sketch, the energy level diagram that would be obtained if the reaction is carried out in the presence of platinum catalyst. (1 mk)

14. Use the information below to answer the questions that follow:



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



(1mk)

15. The grid below shows part of a periodic table. The letters do not represent the actual symbols of the elements

[illegible]

a) Select the:

(1mk)

(1mk)

(1mk)

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

(1mk)

(1mk)

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

(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-

(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 C₂ H₅Cl. 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, C₃H₆ O 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)**

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

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

NAME.....ADM NO.....

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DATE.....

CHEMISTRY MOCKS

SERIES 1 TRIAL 9 PAPER 2

Kenya Certificate of Secondary Education.

TIME:2HRS

Answer all the questions

1. a) Sodium -20 is a radio isotope and decays by beta emission as shown in the equation below.

- i. Define the term radio isotope. (1mk)
- ii. Find the value of a and b. (1mk)
- iii. Identify the actual symbol of x. (1mk)

b) The half life of sodium -20 is 0.3 seconds. P grams of sodium -20 decays to 6 grams in 0.9 seconds.

- i. Calculate the initial mass P, of the isotope. (2mks)
- ii. With reference to sodium -20, give one use of radio isotopes in medicine. (1mk)

c) In the Down's process, (used to manufacture sodium) a certain salt is added to lower the melting point of sodium chloride from 800°C to 600°C .

- i. Name the salt that is added. (1mk)
- ii. State why it is necessary to lower the temperatures. (1mk)

d) Explain why aqueous sodium chloride is not suitable as an electrolyte for the manufacture of sodium in Down's process. (2mks)

e) Sodium metal reacts with air to form two oxides; give the formulae of the two oxides. (1mk)

f) Why is sodium used in nuclear reactors? (1mk)

2. The grid below shows part of the periodic table. Use it to answer the question that follows. (*Letters are not actual symbols of elements.*)

						E	F	
G			H	I			J	K
	L							

- a) Write the electronics configuration of the following element. (1mk)
- E
 - L
- b) Give the formula of one stable ion with an electron arrangement of 2:8 which is; (1mk)
- Negatively charged.
 - Positively charged
- c) The oxide of H reacts with both hydrochloric acid and sodium hydroxide to form a salt. What is the nature of the oxide? (1mk)
- d) Identify the most reactive non-metal, give a reason. (1mk)
- e) Explain the following observations.
- Atomic radius decreases from H to J. (1mk)
 - Melting point of J is higher than that of F. (1mk)
- f) When a piece of element G is placed on water, it melts and a hissing sound is produced as it moves on water.
- Explain these observations. (2mks)
 - Write a chemical equation between element G and water. (1mk)
- g) 60cm³ of gas E diffused through a porous partition in 50 seconds. How long would it take 60cm³ of sulphur IV oxide gas to diffuse through the same partition, under the same conditions? (3mks)
- (O=16, S=32)

3. a) Complete the table below to show the differences between the two types of detergents.

(2mks)

Detergent	Type of detergent	Effect on hard water
$C_{17}H_{35}COONa$		
R		

- b) Study the flow chart below and answer the questions that follow.

- i. Names the processes in steps (1mk)
 - I -
 - IV -
- ii. State the reagent and condition necessary for steps II (1mk)
 - Reagent -
 - Condition -
- iii. Identify substances (1mk)
 - A-
 - B -
- iv. State the observation in step III. (1mk)
- v. Write the equation for the reaction in step IV. (1mk)

- c) A polymer has the following structure.

A sample of this polymer is found to have a molecular mass of 750. Determine the number of monomers in the polymer. (2mks)

(Cl=35.5, C=12, H=1)

- ii) State why the polymer above should not be thrown away. (1mk)

4. The flow chart below represents preparation and properties of oxygen gas. Study it and answer the questions that follow.

- a) Name the following (2mks)

- i. Solid **K**
- ii. Gas **P**
- iii. Solid **Q**
- iv. Solution **R**

- b) Write equation leading to the formation of;

- i. Solid Q and solution R (1mk)
- ii. Gas P. (1mk)

- c) i) What observation is made when excess ammonia solution is added to solution **M**. (1mk)

- ii) Write an ionic equation for the reaction in C (i) above. (1mk)

- d) 1.68g of hot copper metal completely reacted with oxygen gas. Calculate the volume of oxygen gas used (molar gas volume= 24dm³ Cu=63.5) (3mks)
- e) State two uses of oxygen gas. (2mks)
5. a) In an experiment to determine the molar heat of reaction when magnesium displaces copper, 0.15g of magnesium powder were added to 25.0cm³ of 2M copper II chloride solution. The temperature of copper II chloride solution was 25⁰c while that of the mixture was 43⁰c.
- Other than increase in temperature, state and explain the observation made during the reaction. (3mks)
 - Calculate the heat change during the reaction
(S.H.C of solution=4.2j/g/k, density of solution=1g/cm³) (2mks)
 - Determine the molar heat of displacement of copper by magnesium. (2mks)
 - Write the ionic equation for the reaction. (1mk)
 - Sketch an energy level diagram for the reaction. (2mks)
- b) i) Use the reduction potentials below to draw a labeled diagram of an electrochemical cell that can be constructed to measure the electromotive force between magnesium and copper. (2mks)
- $$\begin{array}{ll} \text{Mg}^{2+} + 2e^{-} \rightarrow \text{Mg}_{(s)} & E^{\ominus} = -2.38\text{V} \\ \text{Cu}^{2+} + 2e^{-} \rightarrow \text{Cu}_{(s)} & E^{\ominus} = +0.34\text{V} \end{array}$$
- ii) Calculate the E⁰ value for the cell above. (1mk)
6. a) Chlorine can be prepared using the following reagents; concentrated hydrochloric acid, potassium manganate VII and concentrated sulphuric VI acid.
- What is the role of each of the following?
Potassium manganate VII. (1mk)
Concentrated sulphuric VI acid. (1mk)
 - Name the bleaching agent formed when chlorine gas is passed through cold, dilute sodium hydroxide solution. (1mk)
 - Name one other use of the compound formed in (ii) above other than bleaching. (1mk)
- b) State and explain observations that would be made if a moist blue litmus paper was placed in a gas jar full of chlorine gas. (2mks)

c) 1.9g of magnesium chloride was dissolved in distilled water. Silver nitrate solution was added until in excess. Calculate the mass of silver nitrate that was used for complete reaction. (3mks)

(RMM $\text{MgCl}_2=95$, $\text{N}=14$, $\text{O}=16$, $\text{Ag}=108$)

d) Other than bleaching, state two other uses of chlorine gas. (2mks)

7. The table below gives the solubility of ammonium phosphate at the stated temperatures.

Temp $^{\circ}\text{C}$	10	18	26	34	42	50
Solubility g/100g H_2O	21	28	38.5	51	68.5	98

a) Plot a graph of solubility of ammonium phosphate against temperature. (3mks)

b. Use the graph to;

i. Determine the solubility of ammonium phosphate at 17°C . (1mk)

ii. Determine the molar concentration of ammonium phosphate at 17°C . (2mks)

($\text{N}=14$, $\text{H}=1$, $\text{P}=31$, $\text{O}=16$)

iii. State two uses of solubility curves. (2mks)

iv. Use an equation to explain how temporary water hardness is removed. (1mk)

c. Study the information in the table below and answer the question that follows.

Salt	Solubility (g/100g H_2O) at	
	45°C	60°C
i. Na_2CO_3	35	80
ii. $\text{Pb}(\text{NO}_3)_2$	77	101

A mixture containing 90g of sodium carbonate and 72g of lead II nitrate in 100g of water at 60°C was cooled to 45°C .

i. Identify the salt that crystallized out. (1mk)

ii. Calculate the mass of the salt that crystallized out. (1mk)

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CHEMISTRY MOCKS

SERIES 1 TRIAL 10 PAPER 1

Kenya Certificate of Secondary Education.

TIME:2HRS

Answer all the questions

1. a) Distinguish between a covalent bond a dative bond. (1mk)
b) Element D has atomic number 6 and element C has atomic number 8. Using dot (.) and cross (x) diagrams, show bonding between D and C to produce a compound of the formula DC. (2mks)
2. The table below shows pH values of substances P, Q, R and S.

Substance	pH value
P	8
Q	7
R	4
S	13

- a) What is pH? (1mk)
b) Comment the nature of substance P in terms of its pH value. (1mk)
c) Give an example of a chloride salt solution that has same pH value as substance R. (1mk)
3. You are provided with boiling tube, thermometer, distilled water, beaker, source of heat and substance N. Draw a diagram of a setup of apparatus that can be used to determine the solubility of substance N. (3mks)
4. a) State Gay Lussac's law. (1mk)
b) 50cm³ of Sulphur (IV) oxide gas was passed over a heated catalyst with 25cm³ of oxygen gas. At the end of the reaction, it was found out that 50cm³ of a new oxide of sulphur had been formed, and none of the original gases remained. Work out the formula of the new oxide. (3mk)

5. A mixture contains iron (III) oxide, iron (II) sulphate and iron (III) chloride. Describe the procedure that can be used to obtain a solid sample of iron (II) sulphate from the mixture. **(3mks)**
6. The table below shows the results obtained during an experiment in which solid Q was added to a solution of 50cm³ of 0.5M copper (II) sulphate solution.

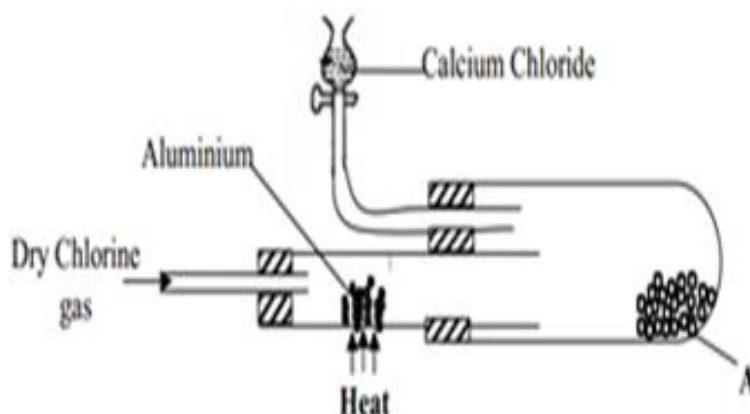
Time (minutes)	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4
Temperature (°C)	21	21	21	21	xxx	33	31	29	28

- a) On the grid provided, draw a graph of temperature against time. **(2mks)**
- (Provide a graph paper)**
- b) Use your graph to determine the highest temperature change during the reaction. **(1mk)**
7. a) Illustrate the giant atomic structure using diamond. **(2mks)**
b) Explain one use of diamond. **(1mk)**
8. The Grid below shows part of a periodic table. Study it and answer the questions that follow: (The letters are not actual symbols of the elements)

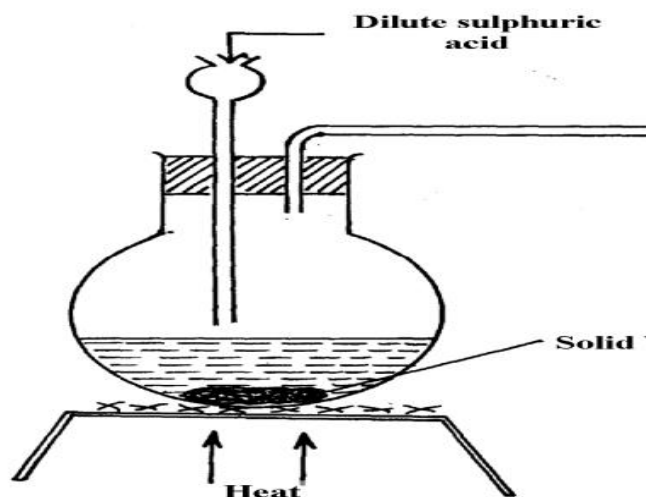
					Z		X	
W					Y			

- a) Select an element that is stored under water in the laboratory. **(1mk)**
b) Explain why element Y is a solid at room temperature. **(1mks)**
c) Give one use of element W. **(1mk)**
9. a) Define sublimation. **(1mk)**

b) In an experiment, dry chlorine gas was reacted with aluminium as shown in the diagram below:



- i) Name substance A. (1mk)
 - ii) State another substance that can be used instead of Calcium chloride. (1mk)
 - iii) Write an equation for the reaction taking place between dry chlorine gas and aluminium metal. (1mk)
10. The diagram below shows the setup of apparatus that can be used to prepare a sample of hydrogen sulphide gas. Study it and answer the questions that follow.



- a) Complete and label the diagram to show how hydrogen sulphide gas is collected. (1½ mks)
- b) Write an equation for the reaction that occurs in the round bottomed flask. (1mk)

c) State the observation made when hydrogen sulphide gas is passed over a filter paper dipped in Lead (II) acetate solution. (1/2 mk)

11. The table below shows solubility values of Sodium hydroxide at different temperatures.

Temperature	Solubility of sodium hydroxide (g/100g of water)
25 ⁰ C	1.8
30 ⁰ C	2.4

a) 25cm³ of a solution of sodium hydroxide at 25⁰C was reacted with 20cm³ of XM oxalic acid. Determine the value of X. (Na= 23, O=16, H=1) (2mks)

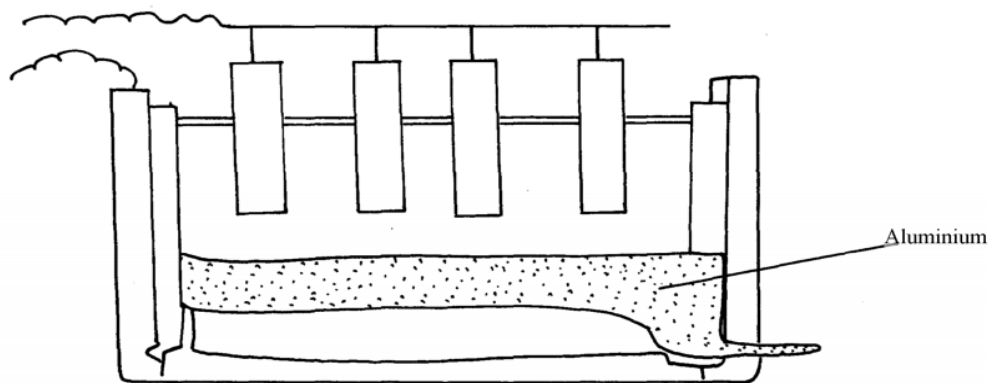
b) State one use of sodium hydroxide. (1mk)

12.a) Complete the table below to show the compounds formed when the elements given combine: (2mks)

Combining elements	Name of compound formed
Iron and sulphur	
Magnesium and nitrogen	
Calcium and phosphorus	
Calcium and carbon	

c) Give one difference between a physical change and a chemical change. (1mk)

13. The diagram below shows a cell in which molten aluminium oxide is electrolyzed to produce aluminium metal.

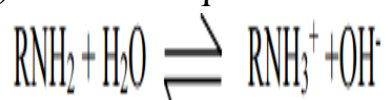


a) What is the name of the above cell. (1mk)

b) On a certain day, a steady current of **X** Amperes was passed through the molten aluminium oxide for 10 hours. Determine the mass of aluminium that was deposited at the cathode. ($Al = 27$, $1F = 96,500C$.) (2mks)

14.a) Define an acid. (1mk)

b) Given the equation below;



Identify the substance that acts as an acid in the backward reaction. (1mks)

c) What is meant by equilibrium for a reversible reaction? (1mk)

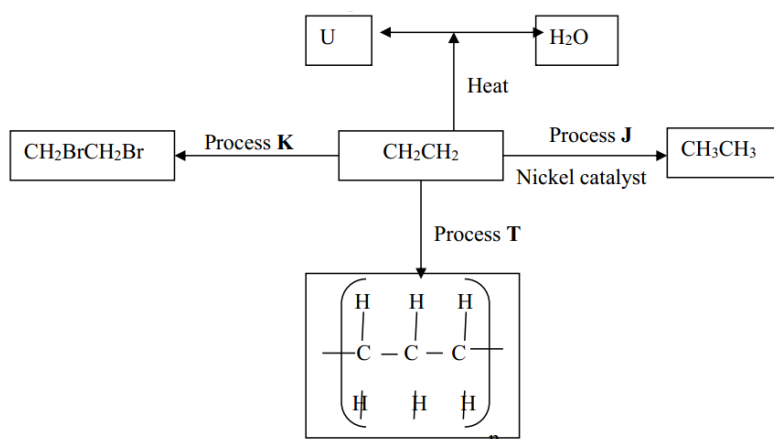
15. Aluminium oxide is said to be amphoteric in nature;

a) What is an amphoteric substance? (1mk)

b) Explain why it is not advisable to clean utensils made of aluminium using wood ash solution. (2mks)

16. Give two differences between the melting point of pure substance X and that of an impure substance X. (2mks)

17. Use the flow chart to answer the question that follow.



a) Give the name of the reaction represented by process J. (1mk)

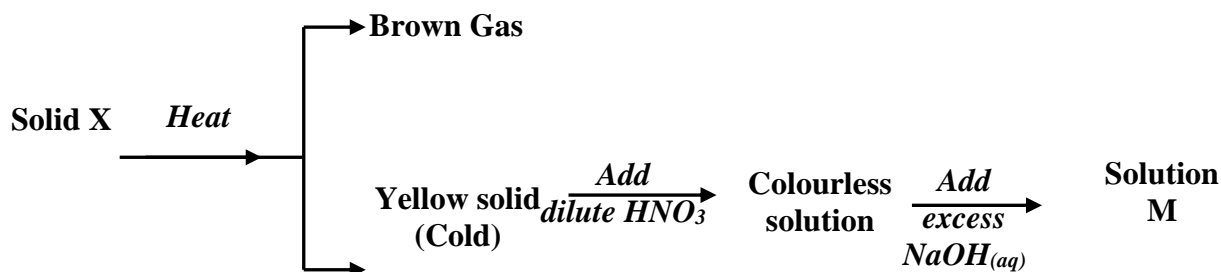
- b) Write the equation for the reaction represented by process K. (1mk)
- c) State one disadvantage for the continued use of the product of process T. (1mk)

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

Element	Atomic radii(nm)	Ionic radii(nm)
P	0.185	0.153
Q	0.184	0.211
R	0.260	0.230
S	0.260	0.305

- (a) Explain the difference in atomic radius and ionic radius for element P. (2mks)
- (b) Which one is the most reactive non-metallic element? (1mk)
19. When $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$ is heated strongly it loses 63.20% of mass. Calculate the value of X. (Na=23.0, C=12.0, O=16.0, H=1.0) (3mks)
- 20.a) Define half-life (1mk)
- b) If 1g of Caesium – 137 decays to $\frac{1}{32}$ in 100 days. What is the half-life of Caesium- 137? (2mks)
21. An element K has relative atomic mass of 36.2. Given that the element has two isotopes A of atomic mass 35.0 and B 38.0. Calculate the relative percentage abundances of each of the isotopes. (3mks)

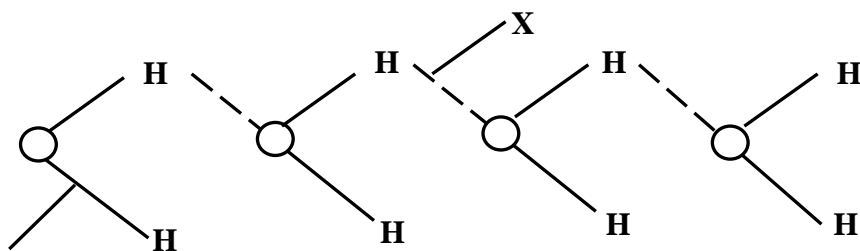
22. Study the flow chart below and answer the questions that follow.



- a) Identify the cation and anion present in solid X. (1mk)
- Cation
- Anion
- c) Write the ionic equation for the reaction that takes place during the formation of solution M (1 mk)

c) Give the name of the complex ion present in solution M (1mk)

23. The structure of water molecules can be represented as shown below.



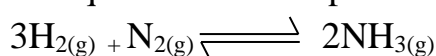
a) Name the type of bond represented by the letter X and W. (1mks)

X-

W-

b) Relative mass of methane and water are almost similar however the boiling point of water is 100°C while that of methane is -161°C. Explain. (2mks)

24. The equation below represents a major reaction in the industrial process.

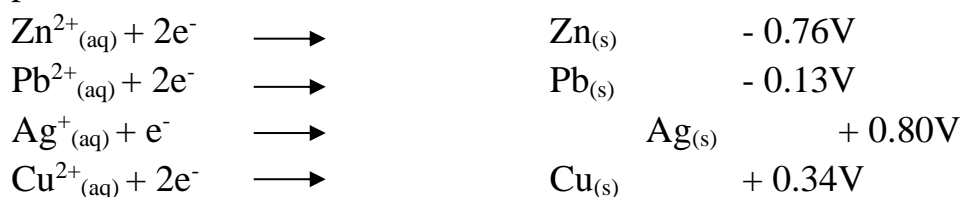


a) Name the industrial process. (1mk)

b) Name the catalyst used in the above process. (1mk)

c) Explain the following observations when ammonia gas mixed with oxygen is sparked out the catalyst in (b) above, brown fumes are evolved. (2mks)

25. The following are half-reactions for some half-cells and their respective reduction potentials.



(a) Write the overall cell equation for two half-cells which will give the highest e.m.f. (1mk)

(b) Draw the electrochemical cell diagram for the cell obtained when the two half cells in (a) above are connected. (2mks)

26. A volume of 280cm³ of nitrogen gas diffuse through a membrane in 70 seconds, how long will it take 400cm³ of carbon(iv) oxide to diffuse through the same membrane?

(N=14, C=12, O=16) (3mks)

27. Starting with copper metal, describe a procedure that can be used to prepare copper (II) carbonate. (3mks)

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CHEMISTRY MOCKS

ASERIES 1 TRIAL 10 PAPER 2

Kenya Certificate of Secondary Education.

TIME:2HRS

Answer all the questions

1.The table below shows some information about elements X,Y,W and Z. The letters are not the actual symbols of the elements.

Element	Electron arrangement	Ion	Valency	Oxidation number
X	2.3			
Y	2.8.2			
W	2.7			
Z	2.5			

i) Complete the table by filling the missing information. (6marks)

ii) Which elements belong to the same period? Explain your answer. (2marks)

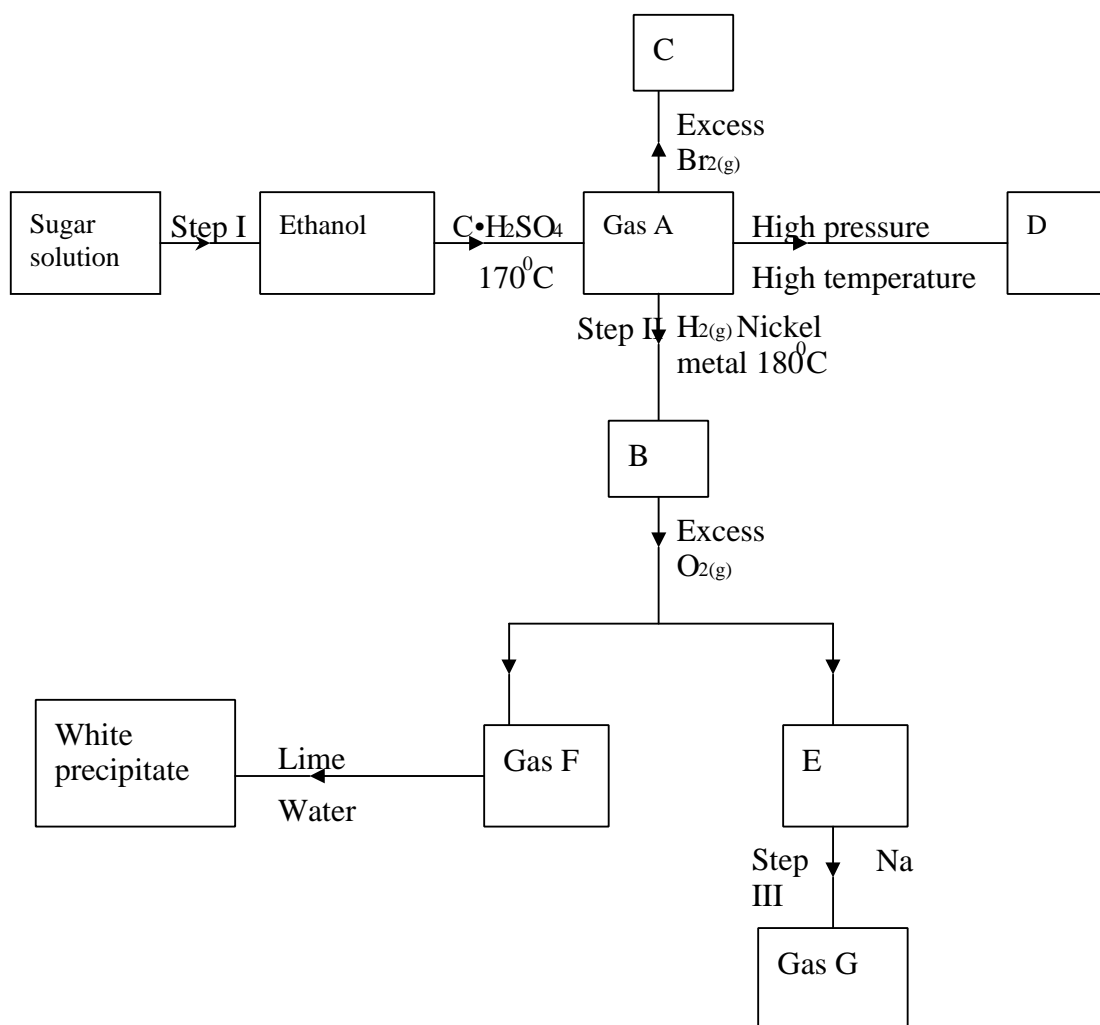
iii) Name two elements that would conduct an electronic current. Explain your answer. (2marks)

iv) Which of the elements in (iii) is a better conductor of electricity? Give a reason.

(2marks)

v) Draw a dot (•) and cross (x) diagram to show the bonding in a compound formed between W and Z. (2marks)

2.Study the flow chart below to answer the questions that follow.



i) What name is given to the process in step I? (1mark)

ii) Name the substances A, B, F and G.

I. A

(1mark)

II. B

(1mark)

III. F

(1mark)

IV. G

(1mark)

iii) Write the equation for the formation of:

I. C

(1mark)

II. E and F

(1mark)

III. Gas G

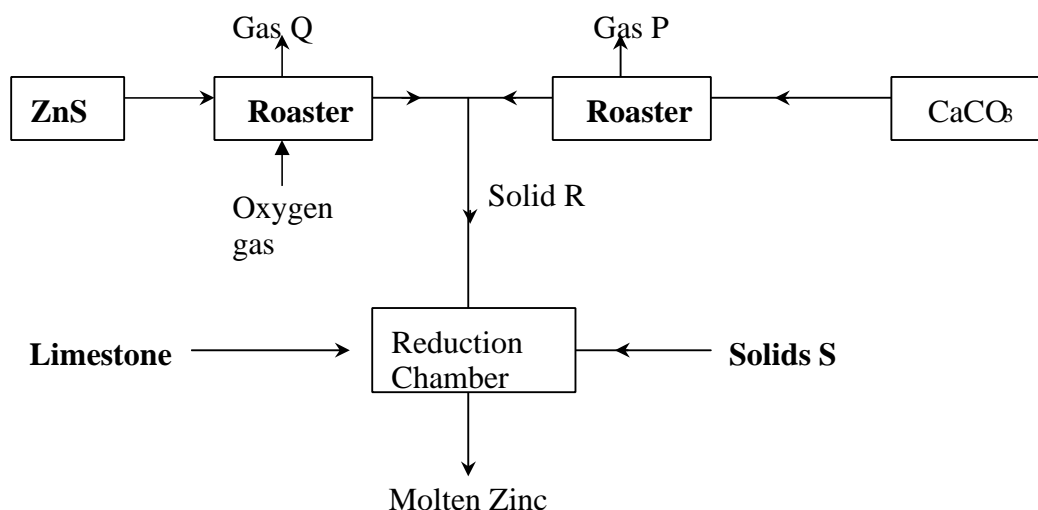
(1mark)

iv) What is the environmental effect of continued use of substance D? Explain your answer. (2marks)

v) Name the white precipitate? (1mark)

vi) What is the importance of the reaction in steps II in industry? (1mk)

3. The flow chart below shows the extraction of Zinc from two ores. Study it to answer the questions that follow.



i) Give the common names of the ores:

I. ZnS

(1mark)

II. CaCO₃

(1mark)

ii) Name the gases P and Q

I. P -

(1mark)

II. Q-

(1mark)

iii) Name the solids R and S.

I. R-

(1mark)

II. S-

(1mark)

iv) Write a chemical equation for the reaction that produces Zinc metal. (1mark)

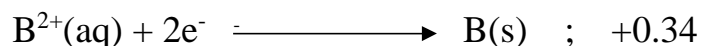
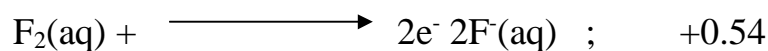
v) What is the purpose of adding limestone in the reduction chamber? (1mark)

vi) Give two uses of Zinc metal (2marks)

vii) Name two other industries that can be established alongside the zinc extraction plant. (2mks)

4.a) Study the standard reduction potentials given below to answer the questions that follow. The letters are not the actual symbols of the elements.

$E^\ominus(\text{Volts})$



i) Identify the strongest reducing agent. (1mark)

ii) Which element is likely to be hydrogen? Explain (2marks)

iii) Write an equation for the reaction which takes place when solid A is added to a solution containing

B²⁺ions

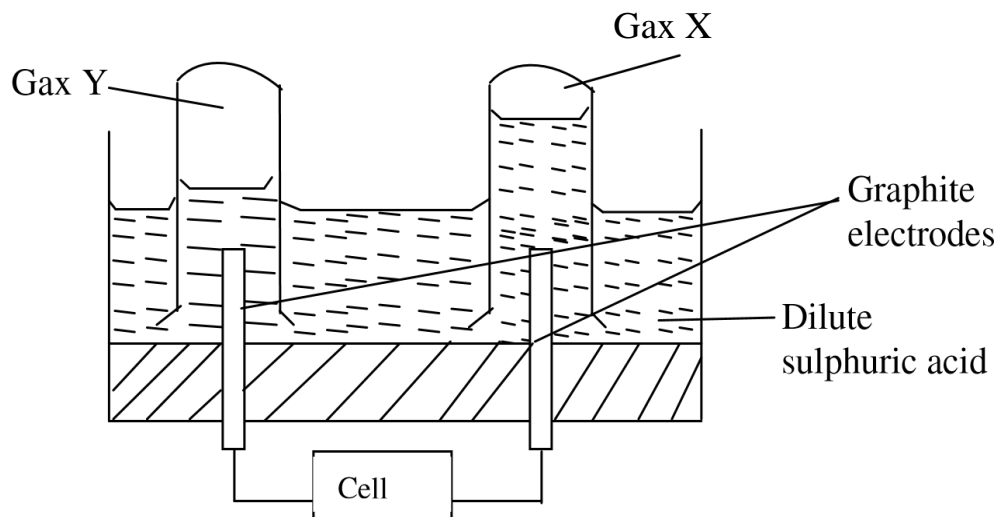
(1mark)

iv) Calculate the E^\ominus value for the reaction in (iii) above. **(2marks)**

v) Draw a labeled diagram of the electrochemical cell that would be obtained in (iv) above **(3marks)**

b (i) What is meant by an electrolyte? **(1marks)**

ii) The diagram below shows the apparatus that can be used to electrolyse dilute Sulphuric acid. Study it to answer the questions that follow.



I. Identify the gases **X** and **Y**

a)X **(1mark)**

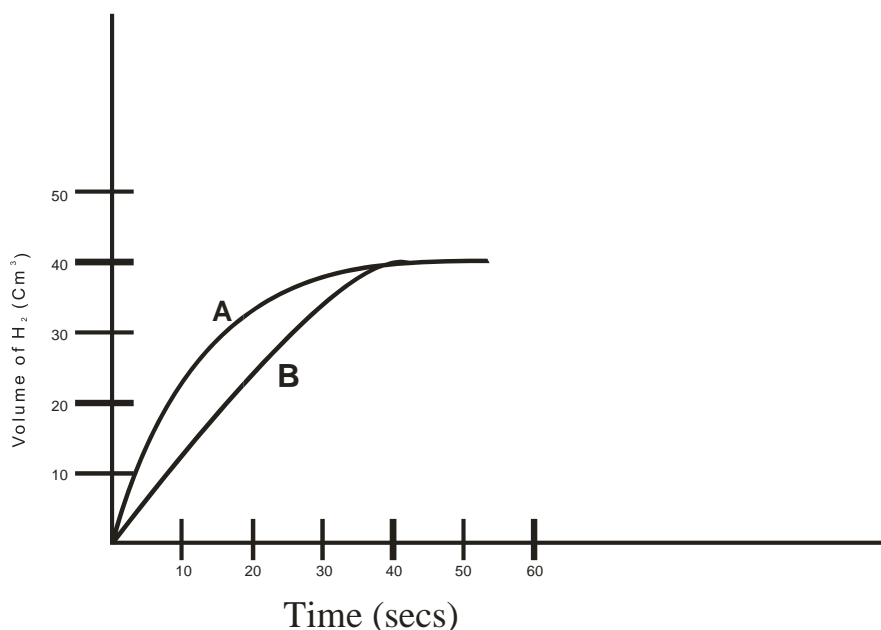
b)Y **(1mark)**

II. What happens to the concentration of the Sulphuric acid during the process with time? Explain **(2marks)**

III. During the electrolysis a current of 0.72A was passed through the electrolyte for 15 minutes. Calculate the volume of gas X produced

(1 Faraday = 96,500c, molar gas volume = 24dm³ at r.t.p). **(3marks)**

5. In an experiment to investigate the rate of reaction, 0.1g of a piece of magnesium was allowed to react with excess 1.0m hydrochloric acid. The results were used to draw a graph. The same experiment was repeated with 2.0m hydrochloric acid and a graph drawn. The results are shown in the graph below.



- i) Which curve was obtained using 2m hydrochloric acid? Explain (2marks)
- ii) Explain why the curves become horizontal where they meet. (1mark)
- iii) Determine the number of moles of hydrogen gas that would be produced in the reaction. (Mg=24, H=1, Molar gas volume is 24dm³). (3mks)
- iv) Explain how the rate of reaction would be affected if the mixture is warmed. (2marks)
- v) Explain why nitric acid is not used in preparing hydrogen gas. (2marks)
- vi) State one industrial use of hydrogen gas. (1mark)

6. An experiment was done between lead (II) nitrate solution and Potassium iodine solution. 10cm³ of 0.4M Potassium iodide solution was put in 10 test-tubes and different volumes of 0.25M lead (II) nitrate added to the different test-tubes. A yellow precipitate and a colourless solution were formed each time. The table below gives the results obtained in each case.

Height of precipitate (mm)	5	10	15	20	25	30	35	39	39	39
Volume of lead(II) nitrate (cm ³)	1	2	3	4	5	6	7	8	9	9

- i) Draw a graph of height of precipitate (y-axis) against volume of lead (ii) nitrate solution added. (1mark)
- (provide a graph paper)
- ii) Name the precipitate formed during the experiment. (1mark)
- iii) From the graph, determine the height of precipitate when 5.4cm³ of lead (II) nitrate solution is added. (1mark)

- iv)** What volume of Lead (II) nitrate solution is required for complete reaction?
Explain (2marks)
- v)** Determine the number of moles of Potassium iodide solution used. (2marks)
- vi)** Calculate the number of moles of lead (II) nitrate solution that reacted. (2marks)
- vii)** Write an ionic equation for the reaction between lead (II) nitrate solution and Potassium iodide solution. (3marks)



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