

Name:

Class:

Adm.No.

233/1
CHEMISTRY
Paper 1
AUGUST 2022
Time: 2 hours

M/S

MOKASA EXAMINATION TERM II 2022

INSTRUCTIONS TO CANDIDATES

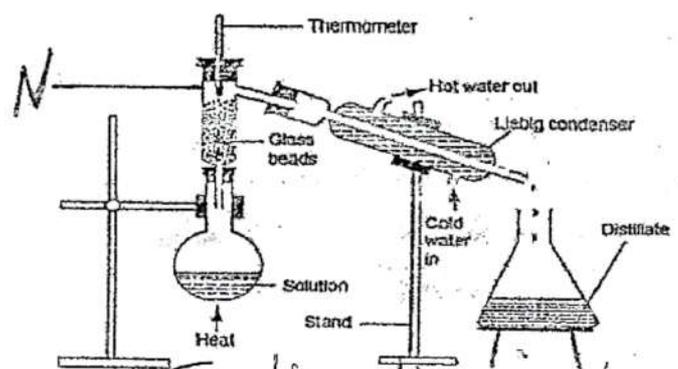
- Write your name, admission number, date and school in the spaces provided.
- Answer all the questions in the spaces provided.
- All working must be clearly shown where necessary.
- Scientific calculators may be used.

FOR EXAMINERS' USE ONLY

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	TOTAL		
							80		

This paper consists of 13 printed pages. Candidates are advised to check and to make sure all pages are as indicated and no question is missing.

- 1 a) Explain the term 'strike back' as applied to a Bunsen burner (1mk)
 - Phenomenon where the flame goes down the chimney and goes off. It happens when the gas is being burnt faster than can be supplied ✓
- b) Give the name and state the function of the apparatus labeled N in the diagram shown below (2mks)



Name Fractionating column ✓

Function Condenses vapour of a liquid with higher boiling point back to flask before attaining its boiling point ✓

2. 1.6g of Ammonium nitrate were dissolved in 100cm³ of water at room temperature of 21°C and The mixture was stirred with a thermometer. The molar heat of solution obtained in the experiment was +126kJ/mol, Calculate the final temperature of solution. (3mks)

C=4.2kJ/Kg/K, Density of solution 1g/cm³, N=14, H=1, O=16

Moles of NH_4NO_3 used $\frac{1.6}{140} = 0.02$ moles ✓
 $\Delta H = \frac{1 \text{ mole} \rightarrow 126}{0.02 \text{ moles}} = 2.52 \text{ kJ} \checkmark$
 $2.52 = \frac{100}{1000} \times 4.2 \times \Delta T \checkmark$
 $\Delta T = 6.0 \text{ }^\circ\text{C} \checkmark$
 final Temp = 21 - 6 = 15°C ✓

3. Describe how constant mass of copper can be determined in copper II carbonate (3mks)
 - Weigh the mass of the crucible and CuCO_3 ✓
 - Heat CuCO_3 in a crucible strongly to form CuO as residue ✓
 - Pass dry hydrogen over heated CuO to form Cu metal ✓
 - Determine (weigh) the mass of the residue ✓
 - Subtract the mass of crucible from the mass of residue and crucible ✓

4. a) Define the term Homologous series (1mk)
 ... Sequence of compounds with the same chemical properties, chemical formula and functional group and they exhibit gradual change in physical properties. ✓

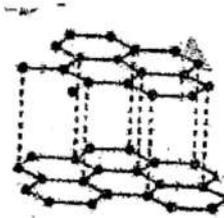
b) Hydrocarbon A with 3 carbon atoms decolorizes bromine water in the presence of light but does not decolorize acidified Potassium Manganate VII

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

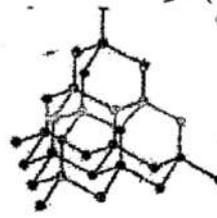
..... Alkane ✓ 1

ii) Write the chemical equation to show how the Hydrocarbon A is prepared in the laboratory (1mk)..... $C_3H_7COONa_{(s)} + NaOH_{(s)} \rightarrow C_3H_8_{(g)} + Na_2CO_3_{(s)}$ ✓ 1

5. a) The diagram below shows two allotropes of Carbon. Study them and answer questions that follows



Allotrope X



Allotrope Y

Ignore state symbols
if omitted otherwise
penalize wrong states

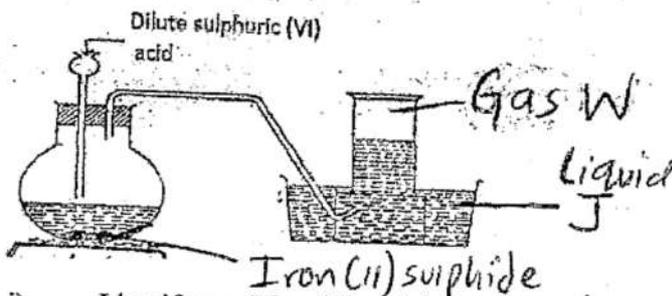
State:

(2mks)

i) One use of allotrope X
..... Dry lubricant, positive terminal in dry cell, pencils ✓ 1

ii) Why allotrope Y is very hard
- Strong covalent bonds between carbon atoms that are uniformly distributed ✓ 1
- Close packaging of the carbon atoms ✓ 1

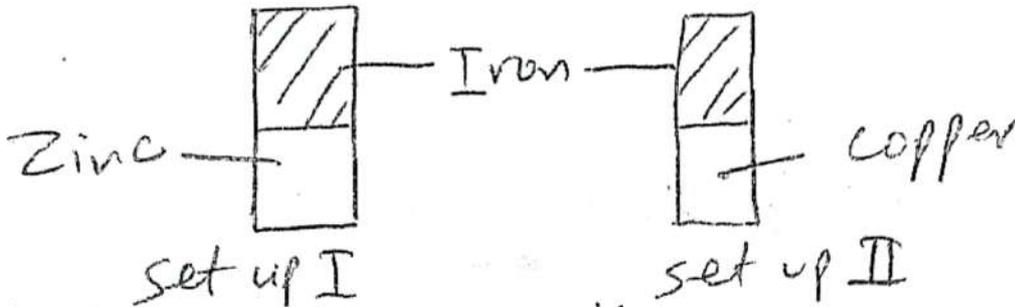
b) Set up below was used to prepare gas W



i) Identify gas W and liquid J
Gas W..... hydrogen sulphide / H_2S ✓ 1 (1mk)
Liquid J..... warm water ✓ 1

ii) State the observation made when gas W is bubbled in lead (II) nitrate solution (1mk)
Black precipitate ✓ 1

6. A form two student in an attempt to stop rusting placed copper and zinc metals in contact with iron separately as shown below:



- a) State the observation made set up I and II (1mk)
 Set I..... Iron remains grey ✓₂
 Set II..... A brown coating is formed on iron ✓₂
- b) Explain your answer in (a) above (1mk)
 In set up I, iron did not rust since zinc offers sacrificial protection.
 In set up II, iron rusted since copper is less reactive and offered no protection.
- c) Name the method of preventing rusting illustrated above (1mk) ✓₂
 Sacrificial protection ✓₁

7. a) State Graham's law of diffusion. (1mk)
 Under similar conditions of temperature and pressure, the rate of diffusion of a gas is inversely proportional to the square root of its density. ✓₁

b) 100cm³ of Carbon (IV) oxide gas diffused through a porous partition in 30 seconds, How long would it take 150cm³ of Nitrogen IV oxide to diffuse through the same partition under similar conditions C=12, N=14, O=16 (2mks)

$$100 \text{ cm}^3 \text{ of } \text{CO}_2 \rightarrow 30$$

$$150 \rightarrow ?$$

$$\frac{150 \times 30}{100} = 45 \text{ ✓}_2$$

$$T_{\text{CO}_2} = \sqrt{M_{\text{CO}_2}}$$

$$T_{\text{NO}_2} = \sqrt{M_{\text{NO}_2}}$$

$$\frac{45}{T_{\text{NO}_2}} = \frac{\sqrt{44}}{\sqrt{46}} \text{ ✓}_1$$

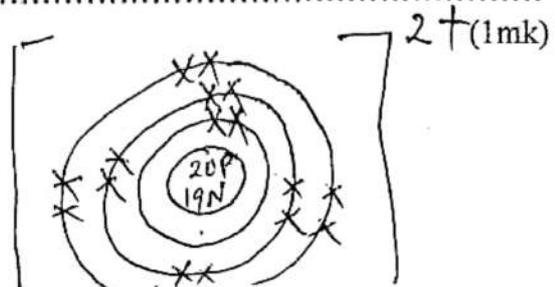
$$T_{\text{NO}_2} = \frac{46 \cdot 011}{2} \text{ seconds ✓}_2$$

8. An element M has 19 neutrons and a mass number of 39

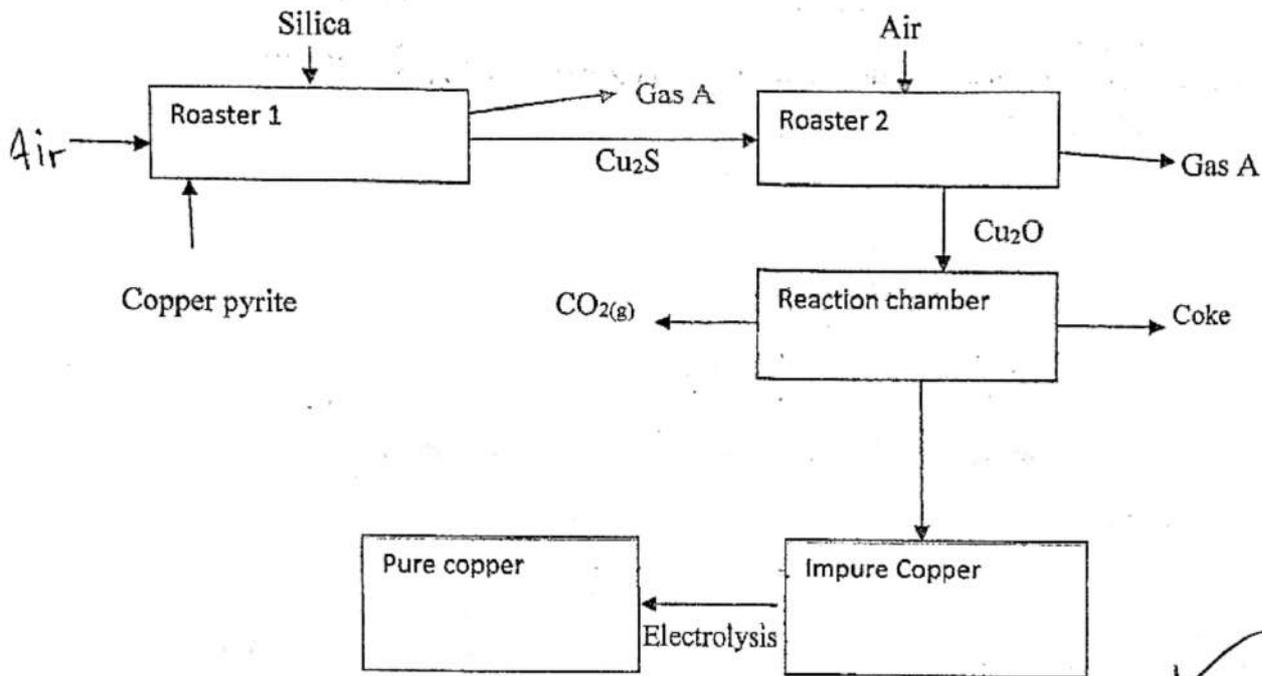
- i) Write the electron arrangement of its stable ion (1mk)
 2.8.8 ✓₁
- ii) Which period does M belong to (1mk)
 Period 4 ✓₁
- iii) Draw the structure of its ion (1mk)

- composition of nucleus ✓₂

- Distribution of electrons ✓₂

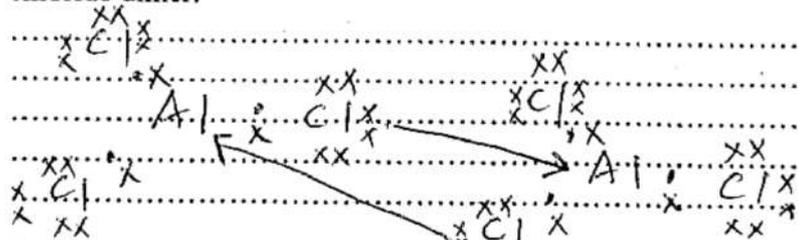


9. The flow chart below shows stages in extraction of copper, use it to answer questions that follow.



- a) Write the equation for the reaction that occurs in the roaster 1 (1mk)
 $2\text{CuFeS}_2 + 4\text{O}_2 \rightarrow \text{Cu}_2\text{S} + 2\text{FeO} + 3\text{SO}_2$
- b) Name Gas A (1mk)
 Sulphur(IV) oxide
- c) What is the importance of adding silica in roaster 1 (1mk)
 Reacts with iron(III) oxide to form iron(III) silicate (slag)

10. a) Using Dots(.) and Crosses (x) to represent electrons draw the structure of aluminum chloride dimer. (1mk)



Accept correct drawings. (1mk)

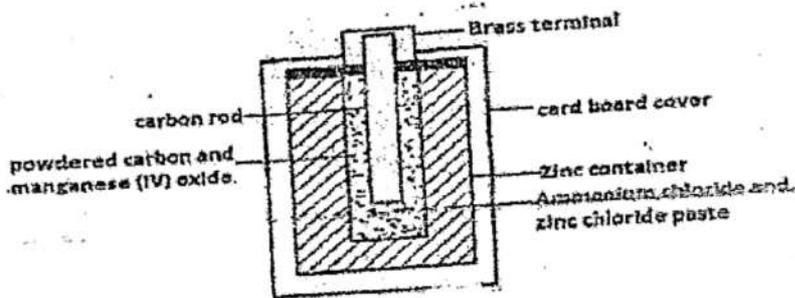
b) Explain why aluminum carbonate does not exist

Aluminium salts hydrolyze in water to form hydrogen ions which reacts with carbonate to form CO_2 gas.

c.) Melting point of Lithium chloride is higher than Sodium chloride. Give reason. (1mk)

LiCl has a stronger ionic bond than NaCl since Li forms smaller ionic radius than Na.

11. The diagram below is a cross section of the dry cell. Study it and answer questions that follow.



i) Write the overall equation to represent the reaction that takes place in the cell (1mk)

$Zn(s) + 2NH_4^+(aq) \rightarrow Zn^{2+}(aq) + 2NH_3(g) + H_2(g)$

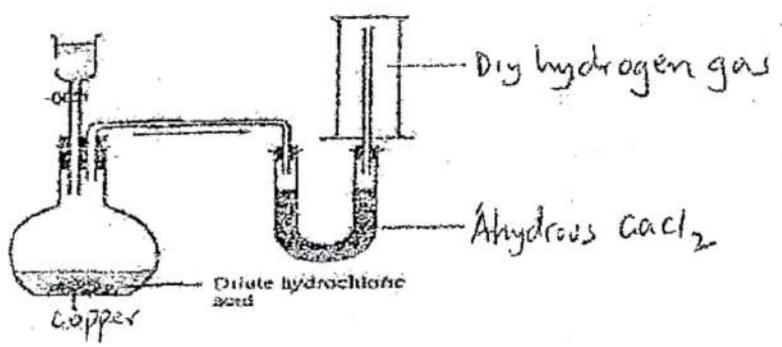
ii) The carbon rod is surrounded with a mixture of powdered carbon and manganese IV oxide. What is the function of Manganese IV oxide. (1mk)

Depolarizer / oxidizes hydrogen gas to water preventing accumulation of bubbles at the positive terminal

iii) Explain why a brass Cap is suitable over copper cap in the above cell (1mk)

Brass is resistant to corrosion than copper / it is highly conductive and perfect for electrical parts.

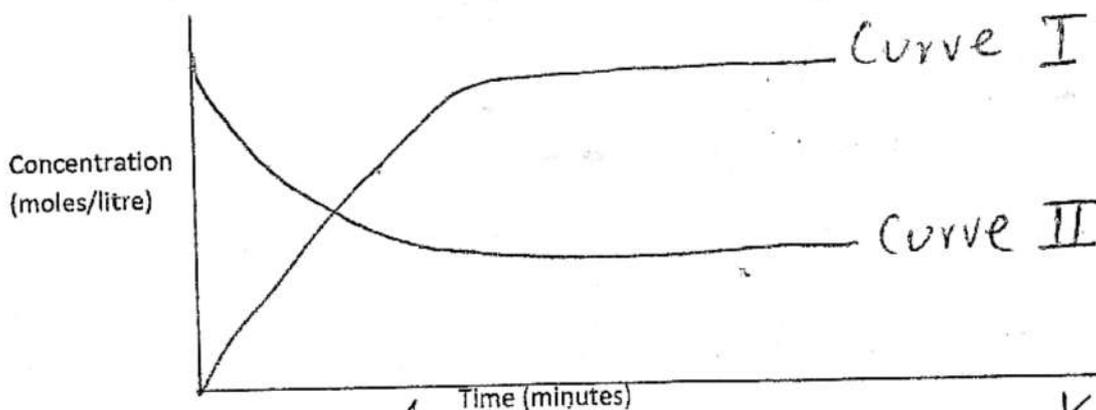
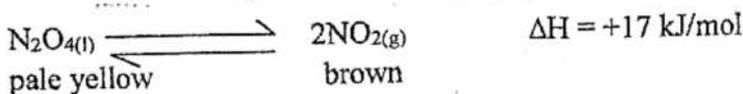
12. The diagram below shows preparation of Hydrogen gas. Study it and answer questions that follow.



i) Explain why no Hydrogen gas was produced (1mk)

Copper is lower than hydrogen in the reactivity series hence cannot displace hydrogen from the dilute acid.

- ii) When the mistake is corrected, hydrogen gas is produced name the method used to collect the gas and give reason why it was used (1mk)
 Method..... upward delivery / downward displacement of air ✓ 2
 Reason..... hydrogen is less dense than air / lighter than air ✓ 2
- iii) Describe a test that can be done to identify Hydrogen gas in the laboratory (1mk)
Introduce a burning splint into a gas jar containing hydrogen gas. It extinguishes the burning splint with a 'pop' sound. ✓ 1
13. The equation and the curves below shows decomposition of dinitrogen tetraoxide



- i) Which curve represents change in concentration of Nitrogen (IV) oxide. Explain (1½mks)
Curve I - Increase in concentration of NO₂ ✓ 2
- ii) State and explain the observation made when the beaker containing the mixture is placed in hot water (1½mks)
Brown colour intensifies - Equilibrium shifts forward since Endothermic reaction is favoured by increase in Temp ✓ 2

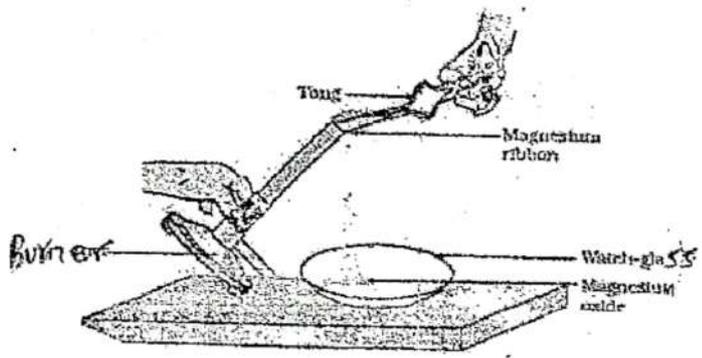
14. A student bubbled chlorine gas through a solution of Magnesium bromide in a corked conical flask

- i) State and explain the observation made (2mks)
Solution changes to brown - Cl₂ displaces Br⁻ from the solution ✓ 2
- ii) Write the ionic equation for the reaction which occurred at the conical flask (1mk)

$$2\text{Br}^-(\text{aq}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{Cl}^-(\text{aq}) + \text{Br}_2(\text{l})$$
 ✓ 1

15. a) It is not appropriate to refer to group VIII elements as 'Inert gases' Explain giving an example Some group VIII elements are chemically reactive, because of larger atomic radius, hence tendency to lose electrons (2mks) ✓
- b) Give one use of Helium Research balloons / Arch welding ✓ E.g. Xenon (1mk) ✓

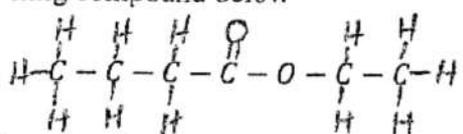
16. The diagram below shows burning of Magnesium in air and collecting the products



- a) Name the observation made during the reaction. Brilliant white flame ✓ (1mk)
- Water was added to the product formed, a colorless gas with a pungent irritating smell was produced.
- i) State the chemical test for the colorless gas. Introduce glass rod dipped in concentrated HCl, white fumes are formed. ✓ (1mk)
- ii) Write the equation leading to formation of colorless gas (1mk)
- $$\text{Mg}_3\text{N}_2(s) + 6\text{H}_2\text{O}(l) \rightarrow 3\text{Mg}(\text{OH})_2(aq) + 2\text{NH}_3(g) \quad \checkmark$$

17. a) Name the compound below
- $$\begin{array}{ccccccc} & \text{H} & & \text{H} & & \text{CH}_3 & & \text{H} \\ & | & & | & & | & & | \\ \text{H} & - \text{C} & - & \text{OH} \\ & | & & | & & | & & | \\ & \text{CH}_3 & & \text{H} & & \text{H} & & \text{H} \end{array}$$
- 2-methylhexan-1-ol ✓ (1mk)

b.) Compound M reacts with ethanol in the presence of few drops concentrated of Sulphuric (VI) acid to form a fruity smelling compound below



- i) Write the molecular formula of compound M (1mk)
- C₃H₇COOH / C₄H₈O₂ ✓

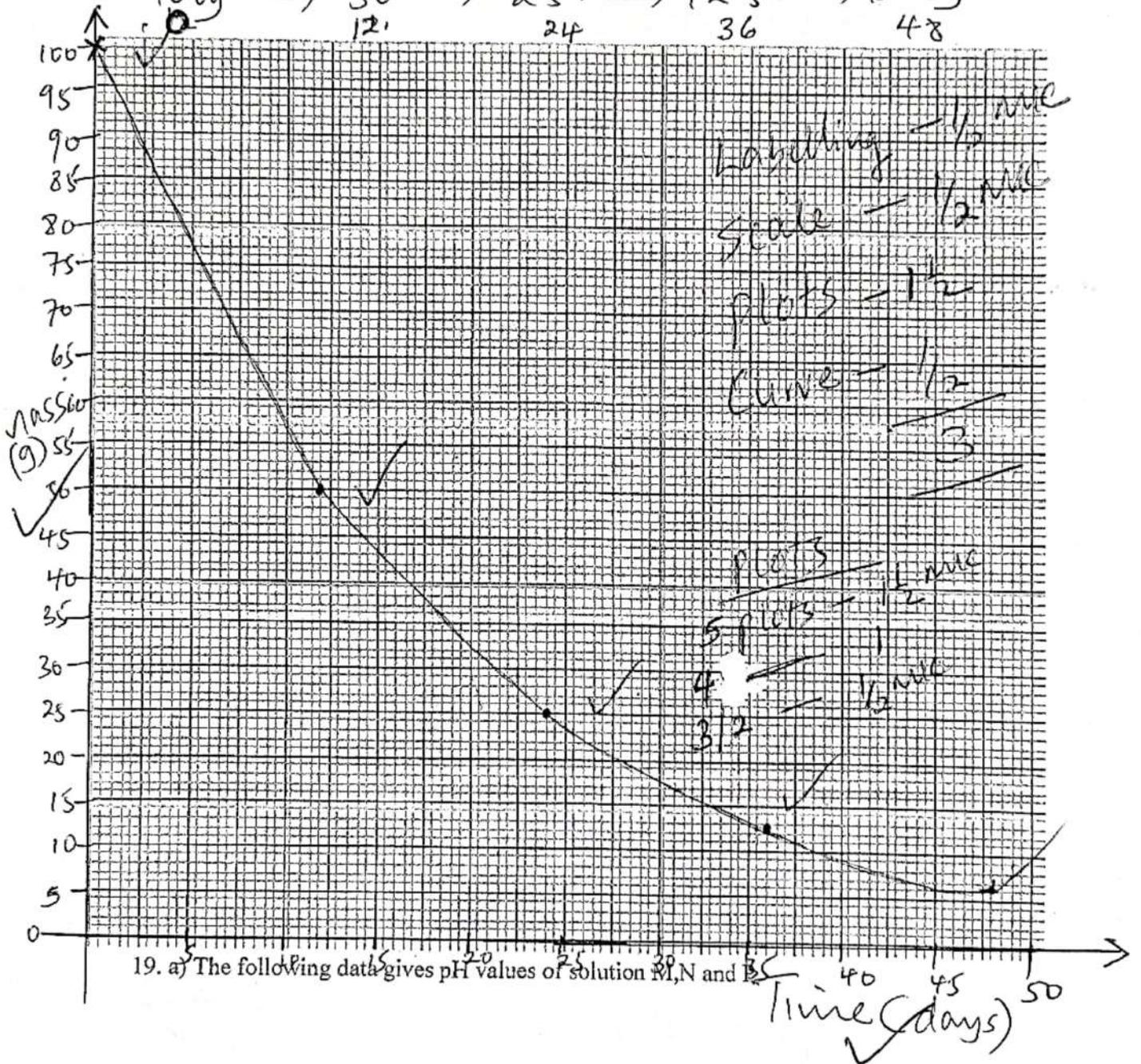
ii) Give one use of the fruity smelling compound (1mk)

- fresheners - cosmetics

- perfumes

18. 100g of ${}_{91}^{231}\text{Th}$ with half life of 12 days decayed to a mass of 6.25g on the grid provided below, plot a graph of mass of ${}_{91}^{231}\text{Th}$ against time (3mks)

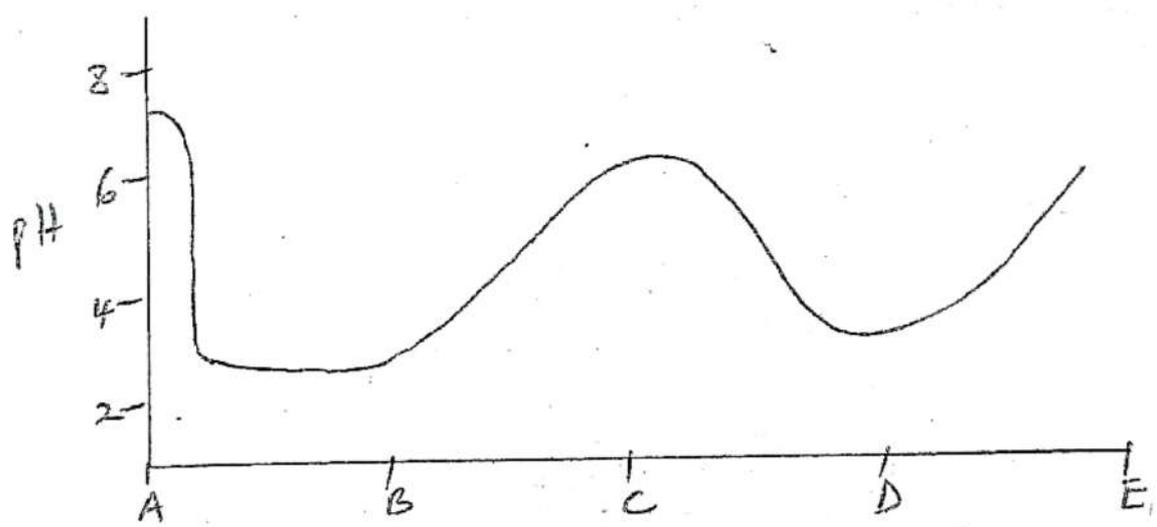
100g → 50 → 25 → 12.5 → 6.25g
 12 24 36 48



Solution	pH value
M	13.6
N	7.0
P	1.3

- i) Which solution will produce carbon iv oxide when reacted with copper (ii) carbonate (1mk)
 P ✓ 1
- ii) What would be the colour of solution M after adding a few drops of phenolphthalein (1mk)
 pink ✓ 1

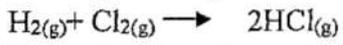
b.) The graph below shows how the pH value of soil in a farm over a period of time



State one factor that may have been responsible for the change in soil pH in the interval AB (1mk)

..... Acidic rain / Leaching / water logging ✓ 1

20. When 80cm³ of Hydrogen gas were mixed with 60cm³ of chlorine and the mixture exploded in a bright sunlight. Reaction took place according to the equation below:



a) Determine the volume of the resulting gas mixture

H ₂	Cl ₂	2HCl
60	60	120

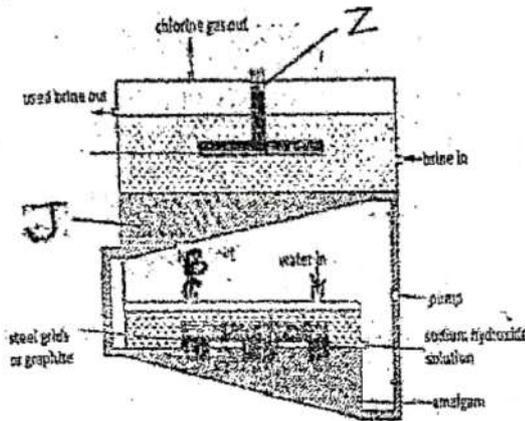
Volume of H₂ used 80 - 60 = 20cm³ ✓ 2 3
 Total volume = 20cm³ + 120
 = 140cm³ ✓ 1/2

b) When the resulting gas mixture was shaken well with water, the volume of the gas was found to be less than the original mixture

i) Why was the volume reduced
 $HCl(g)$ dissolved in H_2O ✓ 1 (1mk)

ii) Determine the volume of the residue gas after the reduction
 $140cm^3 - 120cm^3 = 20cm^3$ of $H_2(g)$ ✓ 2 (1mk)

21. The diagram below represents the mercury cell used in the industrial manufacture of sodium hydroxide. Study it and answer questions that follow.

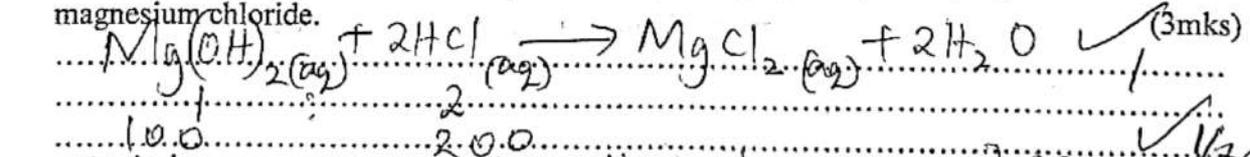


a) Name the substance B
 Hydrogen gas ✓ 1 (1mk)

b) Write the equation for the reaction that takes place at electrode Z
 $2Cl(aq) \rightarrow Cl_2(g) + 2e^-$ ✓ 1 (1mk)

c) Give one reason why electrode J is made up of mercury
 Hg prevents/block discharge of $H^+(aq)$ at cathode ✓ 1 (1mk)

22. Student was required to prepare crystals of Magnesium chloride, starting with 100cm³ of 2M Magnesium Hydroxide. Describe how the student prepared pure dry crystals of magnesium chloride.



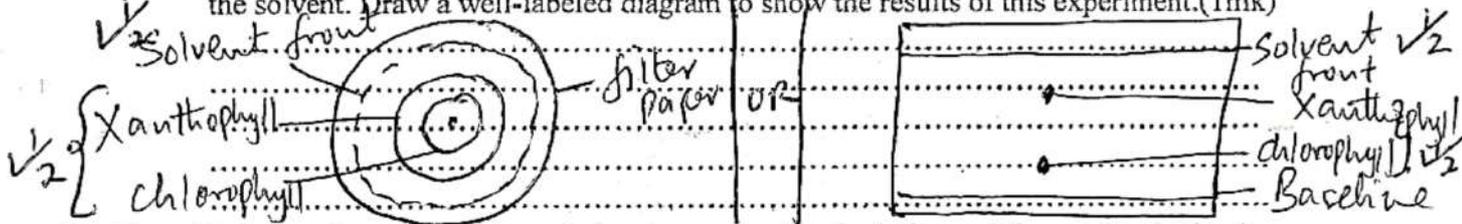
- Add 200cm³ of 2M HCl to 100cm³ of 2M Mg(OH)₂
- evaporate the resulting solution to saturation
- cool the solution to dry crystals between filter paper ✓ 2

23. In an experiment to separate a mixture Xanthophyll and Chlorophyll in plant leaf

i) Describe a procedure that was carried out first before separating the two pigments.

- (2mks)
- Crush the leaves in mortar using pestle ✓ 1
 - Add propanone and continue crushing ✓ 2
 - Decant the solution formed into a beaker ✓ 2

ii) After sometime it was discovered that Xanthophyll is more soluble than chlorophyll in the solvent. Draw a well-labeled diagram to show the results of this experiment. (1mk)



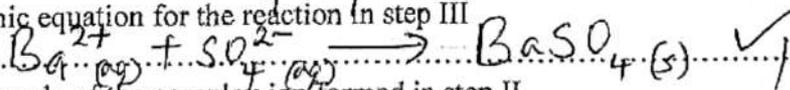
24. The table below shows the tests carried out on a sample of solution and the results obtained as shown on the table below:

	Tests	Results
I	Addition of excess Sodium Hydroxide	White precipitate soluble in excess
II	Addition of excess aqueous Ammonia solution	White precipitate soluble in excess
III	Addition of acidified Barium Nitrate	White precipitate

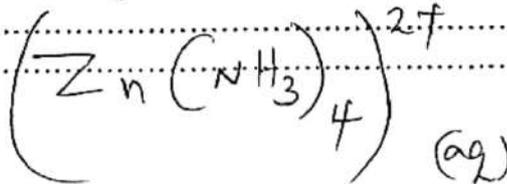
a) Identify the Anion present in the solution (1mk)

SO_4^{2-} / Sulphate ion ✓ 1

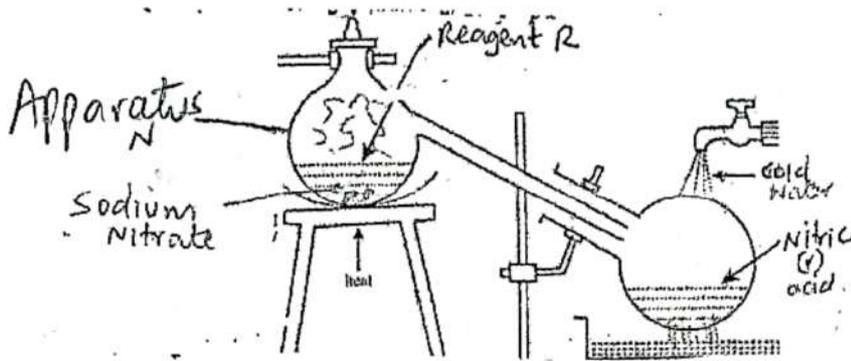
b) Write the ionic equation for the reaction in step III (1mk)



c) Write the formula of the complex ion formed in step II (1mk)



25. In the laboratory Nitric V acid can be prepared using the set up below



a) Name: (1mk)

i) Apparatus N

Retort flask ✓₂

ii) Reagent R

Concentrated Sulphuric (VI) acid ✓₂

b) Give a reason why sodium nitrate is preferred over other nitrates in the above experiment

Lacks water of crystallization ✓ (1mk)

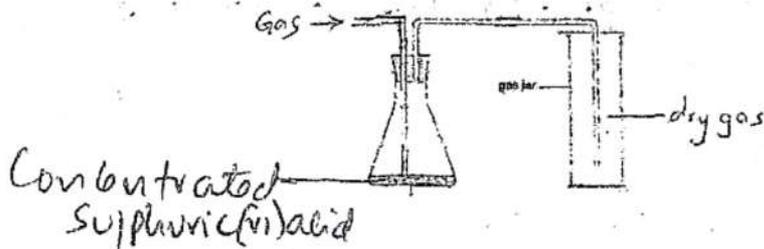
c) State one property that makes reagent R suitable for use in this experiment

Less volatile ✓ (1mk)

26. Potassium carbonate cannot be manufactured by the Solvay process. Explain (1mk)

$KHCO_3$ is more soluble than $NaHCO_3$ hence does not crystallize ✓

27. The set up below was used to collect dry sample of a gas



Give two reasons why the set up above is suitable for collecting Carbon IV oxide (2mks)

- CO_2 does not react with H_2SO_4 ✓

- CO_2 is denser than air ✓

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