Name: ....Marking Guide........... Class: .... Adm.No. ....

School: .... Date: ....

Sign:..

233/1
CHEMISTRY
Paper 1
JUNE/JULY 2021
Time: 2 hours

MOKASA JOINT EXAMINATION - 2021

Kenya Certificate to Secondary Education

CHEMISTRY PAPER 1

TIME: 2 HOURS

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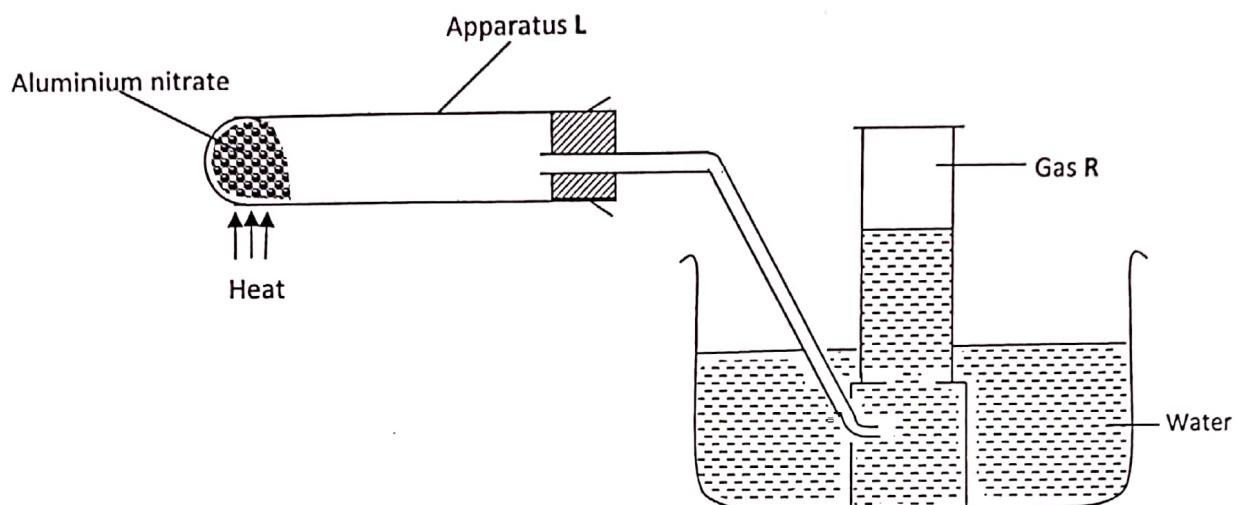
- Write your name, admission number, date and school in the spaces provided.
- Answer all the questions in the spaces provided.
- All working must be clearly shown where necessary.
- Scientific calculators may be used.

FOR EXAMINERS' USE ONLY

Questions	Maximum Score	Candidate's Score
1 – 26	80	

This paper consists of **11** printed pages. Candidates are advised to check and to make sure all pages are as indicated and no question is missing.
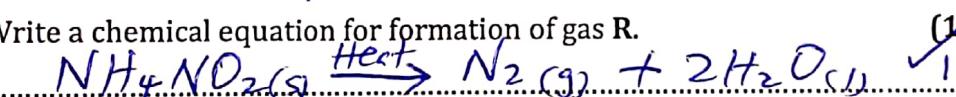
1. Ammonium nitrite was heated as shown below.
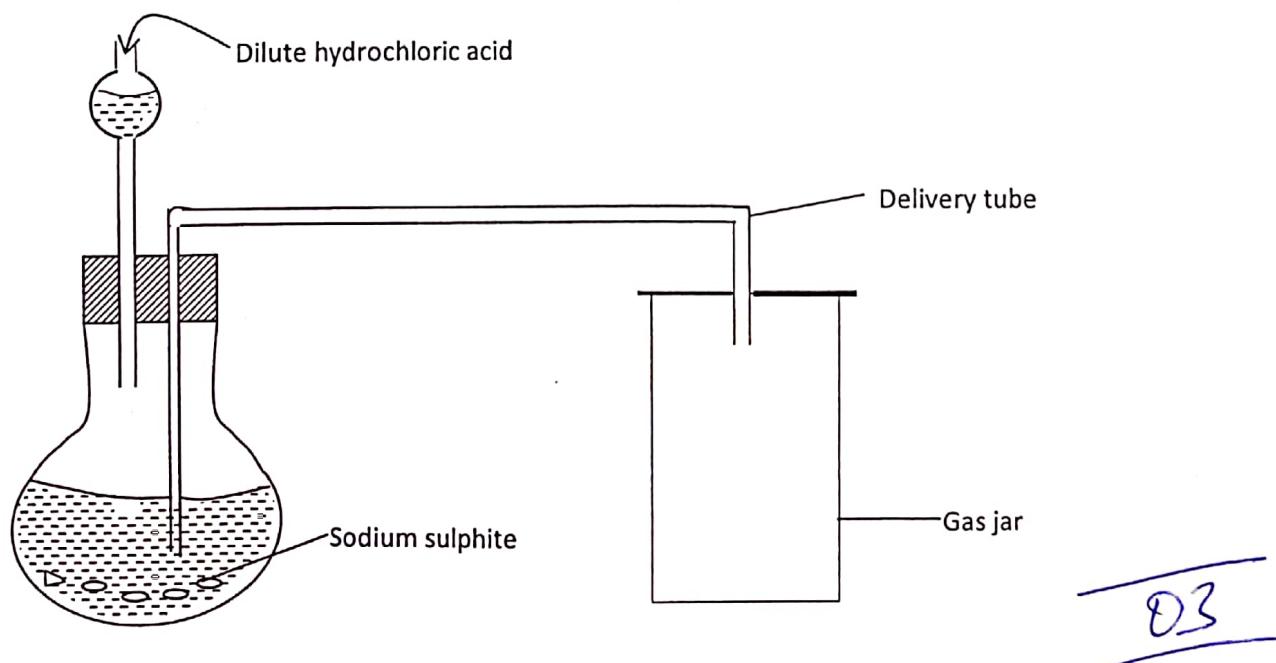
(i) Give a suitable material that can be used to make apparatus **L**, explain your answer. **(2 marks)**

Glass; Glass has high m-pt hence, can withstand strong heating.// Glass is transparent for correct observation
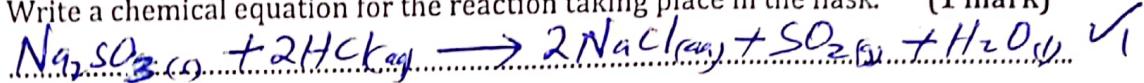
(ii) Write a chemical equation for formation of gas **R**. **(1 mark)**

$$NH_4NO_{2(s)} \xrightarrow{Heat} N_{2(g)} + 2H_2O_{(l)}$$

2. Dilute hydrochloric acid and sodium sulphite were reacted as shown below.

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(i) Write a chemical equation for the reaction taking place in the flask. (1 mark)

$$Na_2SO_{3(s)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + SO_{2(g)} + H_2O_{(l)}$$ ✓1

(ii) State one main laboratory rule that should be observed during the above experiment and give a reason for your choice. (2 marks)
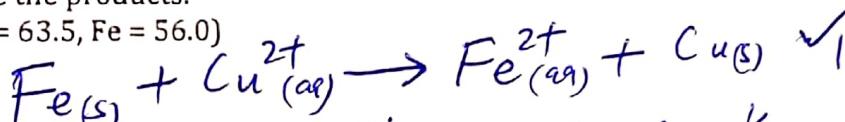
Poisonous gases should be prepared in the fume chamber; SO₂ produced is poisonous. ✓½

(iii) Give two reasons why no gas was collected in gas jar. (2 marks)

− Thistle funnel was dipped into the reaction mixture. ✓1

− Delivery tube entered the solution. ✓1

....

3. In an experiment 3.36g of iron filling were added to excess copper (II) sulphate solution. Calculate the mass of copper that was deposited given that Iron (II) sulphate and copper were the products.
(Cu = 63.5, Fe = 56.0) (3 marks)

$$Fe_{(s)} + Cu^{2+}_{(aq)} \longrightarrow Fe^{2+}_{(aq)} + Cu_{(s)}$$ ✓1
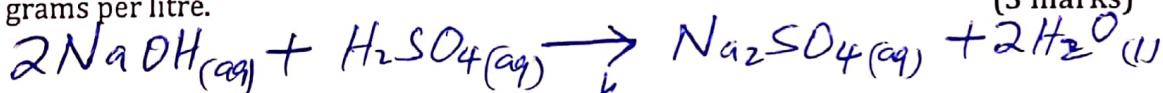
Moles of Fe = $\dfrac{3.36}{56}$ = 0.06 moles ✓½

Moles of Cu formed = 0.06 ✓½

Mass of Cu formed = 63.5 × 0.06 ✓½
= 3.81 g ✓½

4. In a titration experiment 30cm³ of 2M sodium hydroxide required 30cm³ of sulphuric (VI) acid for complete neutralization. Determine the concentration of sulphuric (VI) acid in grams per litre. (3 marks)

$$2NaOH_{(aq)} + H_2SO_{4(aq)} \longrightarrow Na_2SO_{4(aq)} + 2H_2O_{(l)}$$
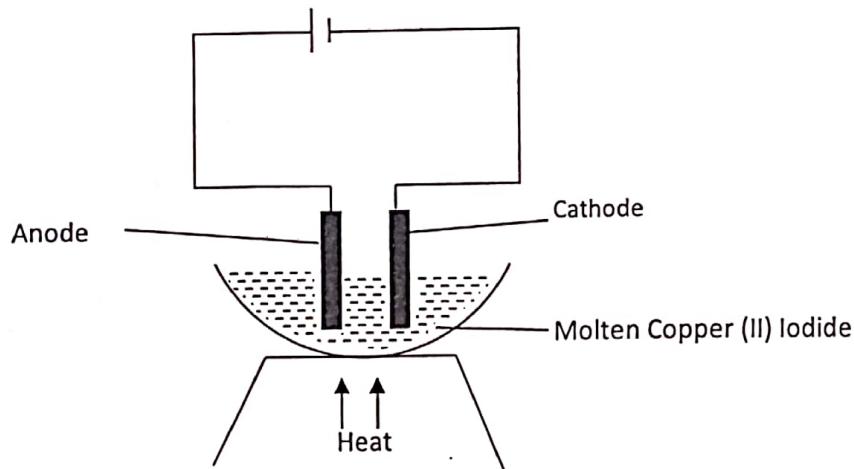
Moles of NaOH = $\dfrac{30 \times 2}{1000}$ ✓½ = 0.06 ✓½

Moles of H₂SO₄ = $\dfrac{0.06}{2}$ ✓½ = 0.03 ✓½

Molarity of H₂SO₄ = $\dfrac{0.03 \times 1000}{30}$ ✓½ = 1M.

Concentration in g/L = 1 × 98 = 98 g/L. ✓½
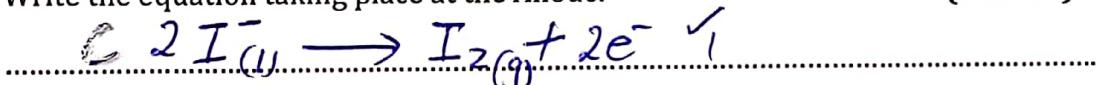
5. Study the diagram below and answer the questions that follow.

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

Brown beads / Brown solid ✓

(ii) Write the equation taking place at the Anode. (1 mark)

$2I^-_{(l)} \longrightarrow I_{2(g)} + 2e^-$ ✓

(iii) What material should be used to make the cathode? (1 mark)

Graphite ✓ / Platinum

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

Decomposition of molten / aqueous substance when electric current is passed through it ✓

(b) State two applications of electrolysis. (2 marks)

- Extraction of metals eg K, Na, Mg
- Purification of metals
- Electroplating   Any 2 x 1

7. (a) Write the electron arrangement of element P which has atomic number 16. (1 mark)
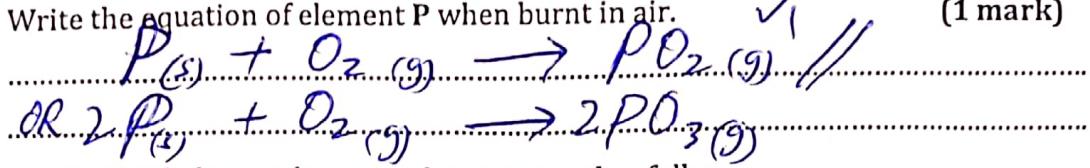
2·8·6 ✓

(b) State the group and period of element P. (1 mark)
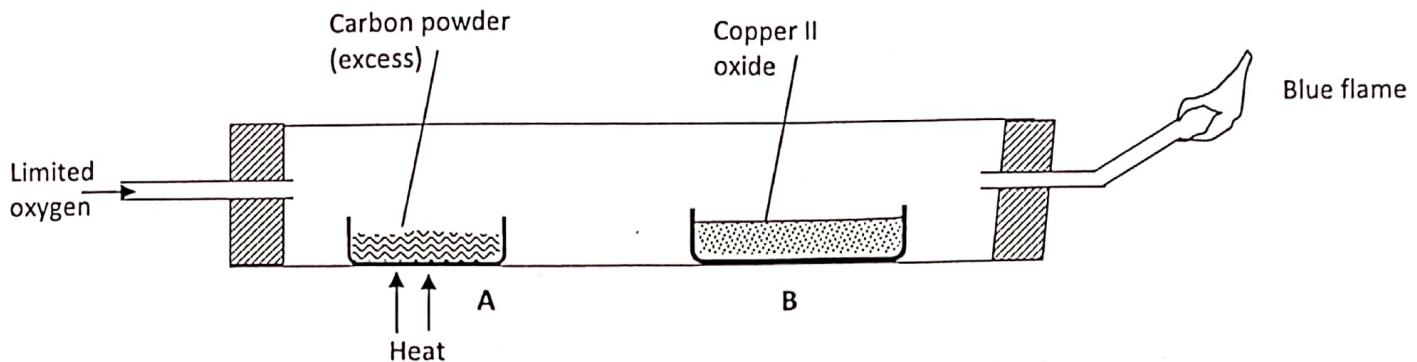
Group VI ✓
Period 3 ✓

(c) Write the equation of element P when burnt in air. ✓ (1 mark)

$$P_{(s)} + O_{2\,(g)} \rightarrow PO_{2\,(g)} \; //$$
OR $2P_{(s)} + O_{2\,(g)} \rightarrow 2PO_{3\,(g)}$

8. Study the diagram below and answer the question that follow.

Carbon powder (excess) / Copper II oxide / Blue flame / Limited oxygen / A / B / Heat

(a) State and explain observation made ~~and~~ at point A. (2 marks)

Red glow/Yellow glow ✓ – Reaction is exothermic ✓

(b) Explain the observation made out point B. (2 marks)

Black solid remains black ✓ - Absence of heat prevented reduction of CuO by CO ✓
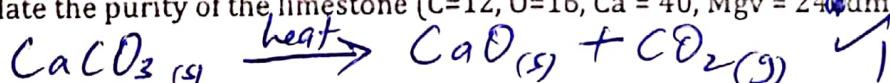
(c) Why was it necessary to burn the gas at the jet? (1 mark)

It's poisonous ✓

9. Give two reasons why carbon (IV) oxide is used at a fire extinguisher. (2 marks)

- It's denser than air ✓
- It does not support combustion ✓

10. To determine the purity of limestone Form 3 students heated 12.5g of limestone in a crucible until they obtained a constant mass. If the volume of CO_2 obtained was 2400. Calculate the purity of the limestone (C=12, O=16, Ca = 40, Mgv = 2400dm³). (3 marks)

$$CaCO_{3\,(s)} \xrightarrow{heat} CaO_{(s)} + CO_{2\,(g)} \; ✓$$

Moles of $CO_2 = \dfrac{2400}{24000} = 0.1$ ✓

Moles of $CaCO_3 = 0.1$
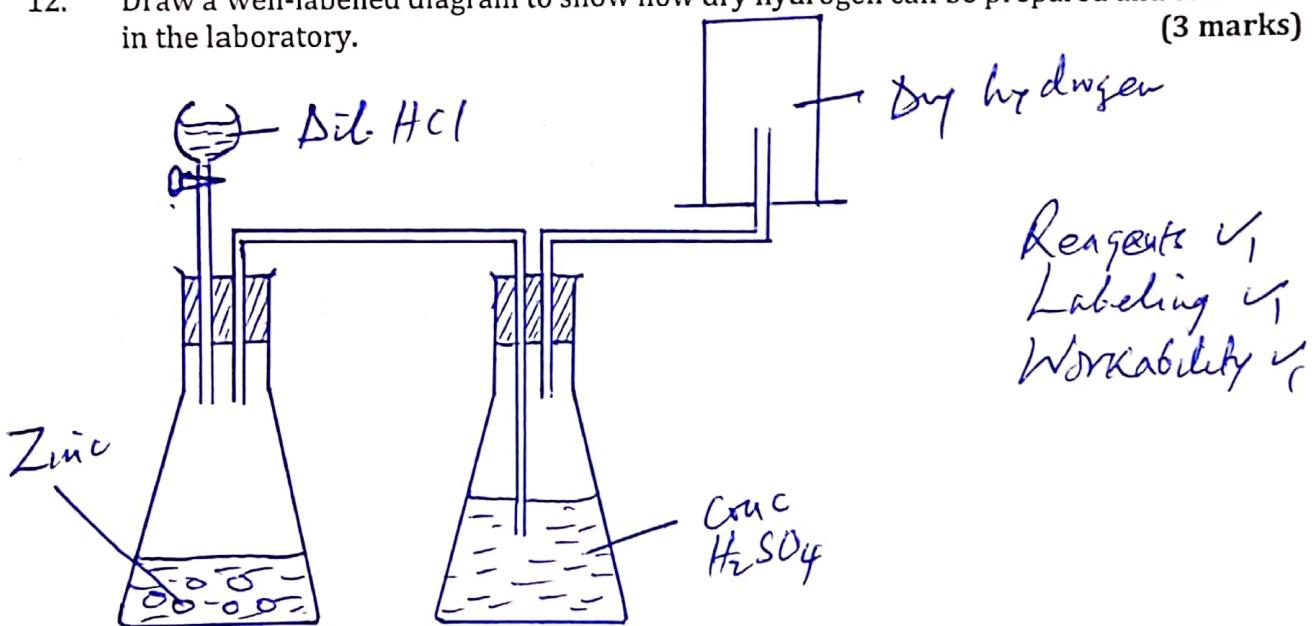
Mass of $CaCO_3 = 0.1 \times 100$
$= 10g$ ✓

% purity $= \dfrac{10}{12.5} \times 100 = 80\%$ ✓

11

11. Determine the relative atomic mass of Neon whose isotopic composition is as follows.

$^{20}_{10}Ne$ 90.92 (90.92%) $^{21}_{10}Ne$ (0.26%) $^{22}_{10}Ne$ (8.82%)   **(3 marks)**

$$RAM = \frac{(20 \times 90.92) + (21 \times 0.26) + (22 \times 8.82)}{100}$$

$$= \frac{1818.4 + 5.46 + 194.04}{100}$$

$$= 20.179$$

12. Draw a well-labelled diagram to show how dry hydrogen can be prepared and collected in the laboratory.   **(3 marks)**

Dil. HCl

Dry hydrogen

Zinc

Conc H₂SO₄

Reagents ✓
Labeling ✓
Workability ✓

13. Give **two** characteristics of a temporary chemical change. State one example of such reaction.   **(2 marks)**

- Reversible
- New substance formed
- Change in mass
- Net heat change
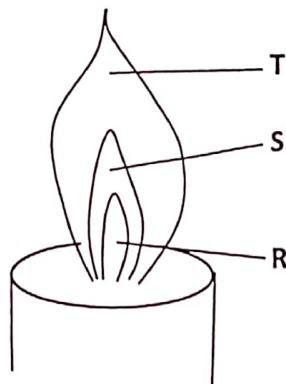
Example; Heating of CuSO₄·5H₂O
Heating of CoCl₂·6H₂O.

14. (a) What is drug abuse?   **(1 mark)**

Use of a drug for a purpose other than the one it's intended for // Overdose or underdose of a drug.

(b) Name one commonly abused non-medicinal drug.   **(1 mark)**

Cocaine // Miraa // Alcohol

10

(c) A doctor prescribed drugs to a patient Amoxil 2x3. How should the patient take the drug? **(1 mark)**

2 tablets after every 8 hours ✓1

15. The figure below shows a flame obtained from a Bunsen burner.

(a) Name the type of flame. **(1 mark)**

Non- luminous flame ✓1
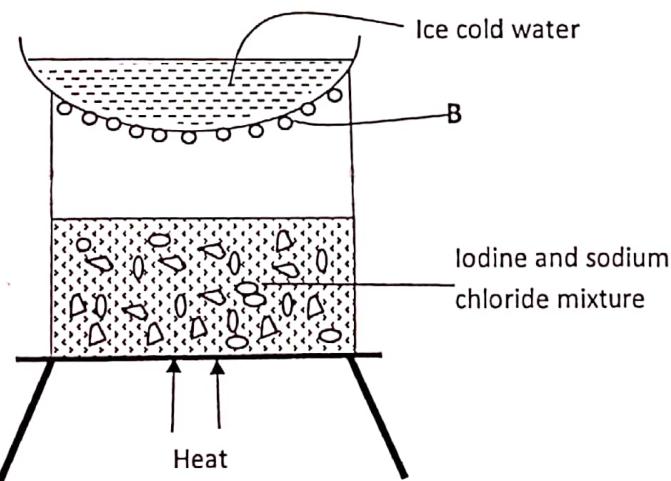
(b) A matchstick head placed at region R will not ignite. Explain. **(1 mark)**

Its a region of unburnt gases hence not very hot. ✓½

(c) Name region S. **(1 mark)**

Green- blue Zone ✓1

16. The set-up below was used to separate a certain mixture.

Ice cold water

B

Iodine and sodium chloride mixture

Heat

(a) Identify the method of separation shown. **(1 mark)**

Sublimation. ✓1

(b) Identify substance B. (1 mark)

...... Iodine ✓ ....
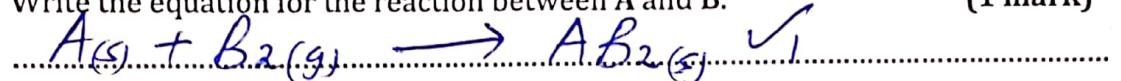
(c) Give any other substance when mixed with sodium chloride can be separated as above? (1 mark)

...... $AlCl_3$ // solid CO_2 // $FeCl_3$ // Benzoic acid ...... Any 1×1
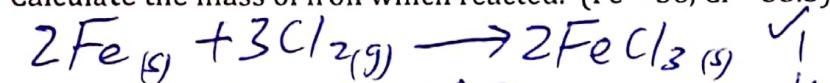
17. Element A with atomic number 12 and B with atomic number 9.

(a) To which chemical family is; (2 marks)

A   -   ...... Alkaline Earth Metals ✓ ......

B   -   ...... Halogens ✓ ......

(b) Write the equation for the reaction between A and B. (1 mark)

...... $A_{(s)} + B_{2(g)} \longrightarrow AB_{2(s)}$ ✓ ......

18. When chlorine gas is passed over heated iron metal, 26.7g of the product is formed. Calculate the mass of iron which reacted. (Fe = 56, Cl = 35.5) (3 marks)

$$2Fe_{(s)} + 3Cl_{2(g)} \longrightarrow 2FeCl_{3(s)} \checkmark$$
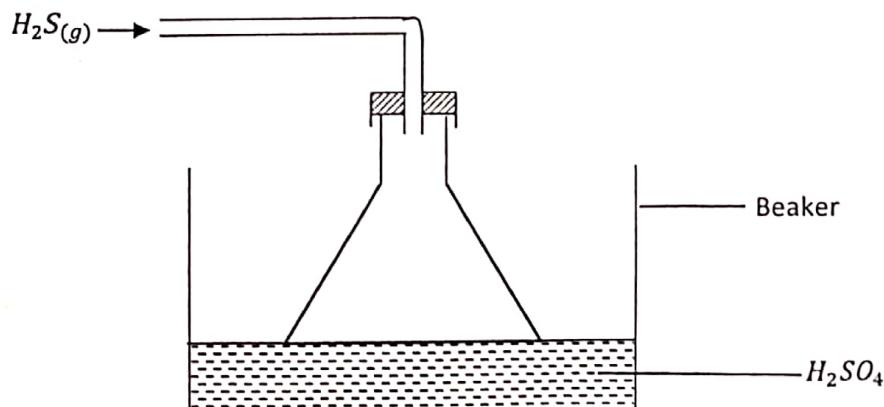
$$Moles \ of \ FeCl_3 = \frac{26.7}{162.5} = 0.1643 \ \checkmark$$

$$Moles \ of \ Fe = 0.1643 \ \checkmark$$

$$Mass \ of \ Fe = 0.1643 \times 56 \ \checkmark$$
$$= 9.2008g \ \checkmark$$

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

$H_2S_{(g)} \rightarrow$

Beaker

H_2SO_4

08

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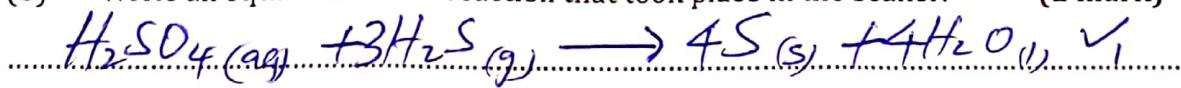
(a)   Give the observation made in the beaker.   (1 mark)

A yellow solid deposited ✓₁

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

$H_2SO_{4\,(aq)} + 3H_2S_{(g)} \longrightarrow 4S_{(s)} + 4H_2O_{(l)}$ ✓₁

(c)   Give one reason why the gas is directed into the beaker using the inverted funnel
       as above?   (1 mark)

- To avoid sucking back of the acid ✓₁
- To increase S.A for the reaction

20.   (a)   State Graham's law of diffusion.   (1 mark)

Under constant temp and pressure, the rate of
diffusion of a gas is inversely proportional to square root
of density. ✓₁

(b)   It takes 50 seconds for 200cm³ of carbon (IV) oxide to diffuse through a plug.
       How long will it take 300cm³ of nitrogen (IV) oxide to diffuse through the same
       plug under the same conditions of temperature and pressure.
       (C = 12, N = 14, O = 16)   (2 marks)

300 cm³ of CO_2 diffuses
in $\dfrac{300 \times 50}{200}$ = 75 sec

$t_{NO_2} = t_{CO_2} \times \sqrt{\dfrac{MM_{NO_2}}{MM_{CO_2}}}$

$t_{NO_2} = 75 \times \sqrt{\dfrac{46}{44}}$ ✓₁
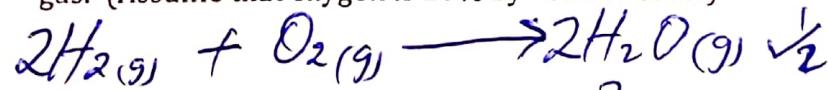
$= 76.69$ seconds ✓₁

Accept any other method.

21.   (a)   State Gay Lussac's law.   (1 mark)

When gases react they do so in volumes that bear a
simple ratio to one another and to the volumes of the ✓₁
products if gaseous, Temp and pressure remaining Constant.

(b)   Calculate the volume of air required to completely react with 100cm³ of hydrogen
   gas. (Assume that oxygen is 20% by volume of air).   (3 marks)

$2H_{2\,(g)} + O_{2\,(g)} \longrightarrow 2H_2O_{(g)}$ ½

2   1   2
100cm³   50 cm³ ½   100 cm³
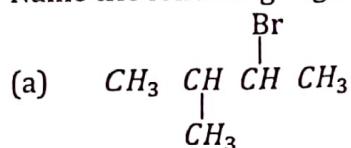
20% → 50 cm³ $\dfrac{100 \times 50}{20}$ ✓₁
100% → ?

$= 250 cm^3$ ✓₁

$\overline{10}$
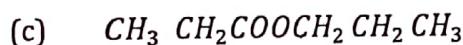
22. Name the following organic substances. (3 marks)

(a)   Br
    |
CH₃ CH CH CH₃
        |
       CH₃

2-Bromo-3-Methylbutane ✓ or 3-Bromo-2-methylbutane

(b) CH_3 CH CH CH_2 CH_3

Pent-2-ene ✓

(c) CH_3 $CH_2 COOCH_2$ CH_2 CH_3
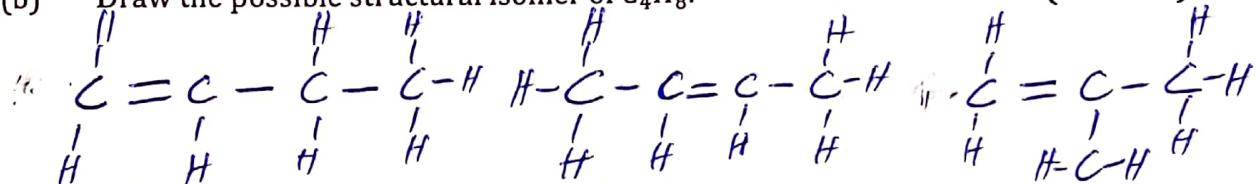
Propyl propanoate ✓

23. (a) Define isomers. (1 mark)

Compounds with same molecular formula but different structural formula. ✓

(b) Draw the possible structural isomer of C_4H_8. (2 marks)

But-1-ene   But-2-ene   2-Methylprop-1-ene

Any 2×1

24. (a) Give the chemical name for rust. (1 mark)

Hydrated iron(III) oxide ✓

(b) Name one condition which speeds up rusting. (1 mark)

Acidic condition // High temp // Salt condition ✓ Any 1×1

(c) Many iron products are coated with a layer of zinc to protect it from rusting. State two ways in which zinc prevents rusting of iron. (1 mark)
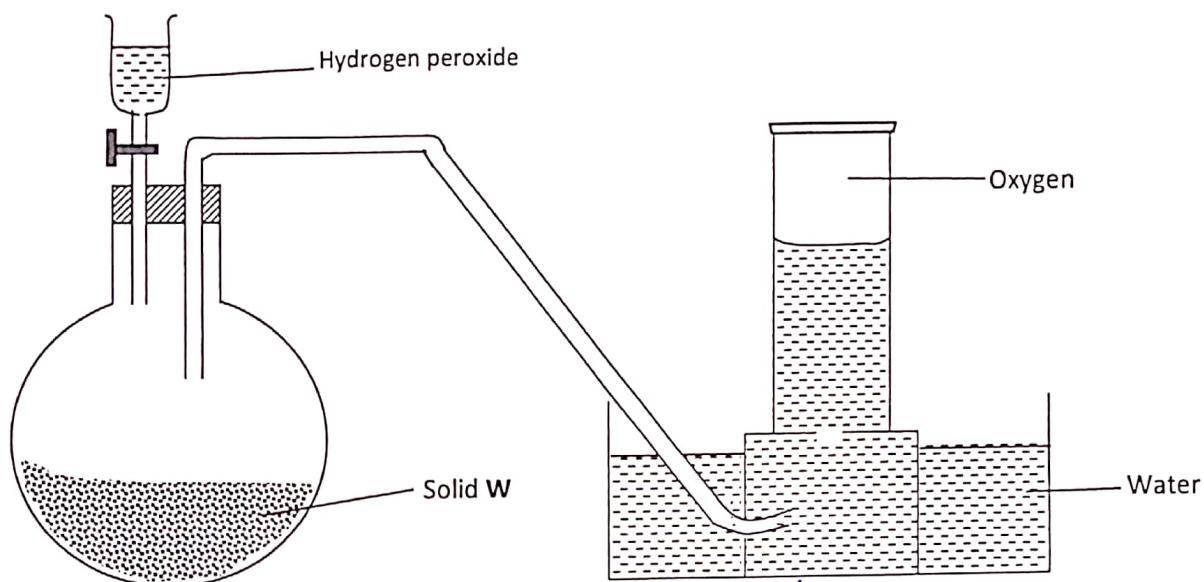
- Cathodic protection ✓
- Galvanisation ✓
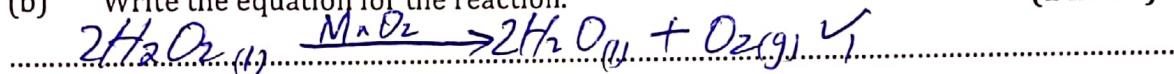
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25. Study the diagram below for the preparation of oxygen in the laboratory.

- Hydrogen peroxide
- Oxygen
- Solid **W**
- Water

(a) Name solid **W**. ......*Manganese(IV) oxide ; Rej: formula*...... (1 mark)

(b) Write the equation for the reaction. (1 mark)

$$2H_2O_{2(l)} \xrightarrow{MnO_2} 2H_2O_{(l)} + O_{2(g)}$$

(c) What property of oxygen makes it to be collected as above? (1 mark)

Slightly soluble in water // Does not react with water

26. Starting with Barium Oxide describe how Barium chloride can be prepared in the Lab. (2 marks)

- Add excess BaO into $HCl_{(aq)}$ and stir ½
- Filter to remove excess BaO as residue
- Heat the filtrate to saturation ½
- Allow it to cool.
- Pour out the mother liquor ½
- Dry the crystals between filter papers.

5

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