

Name..... MuGISA ROBERT ADYEERI Signature..... 0704658701;
School..... Index No..... 0786500753;

Kasah
Mugisa

545/2
CHEMISTRY
Paper 2
July/August
2 hours



WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

CHEMISTRY

Paper 2

2 hours

INSTRUCTIONS TO CANDIDATES;

- Section A consists of 10 structured questions. Answer all questions in this section.

Answers to these questions must be written in the spaces provided.

- Section B consists of 4 semi - structured questions. Answer any two questions from this section.
- Answers to section B must be written in the answer booklet/sheets provided and stapled at the back of the question paper.
- Show all your working clearly in both sections.
Where necessary use;
 $[Ca = 40, K=39, C = 12, O = 16, H = 1, \text{Molar gas volume at s.t.p} = 22.4\text{dm}^3]$

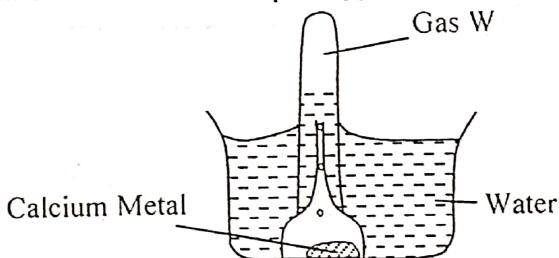
| For examiner's use only | | | | | | | | | | | | | | |
|-------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|-------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | Total |
| | | | | | | | | | | | | | | |

SECTION A

Answer all questions in this section.

1. Impure Aluminium is light and soft but can be strengthened by alloying. (1 mark)
- (a) What is meant by the term alloy? ✓
- It is a uniform mixture of one metal with one or more other substances usually Metals or Carbon. Reject: Mixture of two or more metals
- (b) State the elements that make up the following alloys. (1½ marks)
- (i) Duralumin. Aluminium ✓, Copper ✓, Magnesium ✓, Manganese ✓
- (any 3) (1 mark)
- (ii) Brass. Copper ✓, Zinc ✓
- (c) (i) Identify the element that is common in both brass and duralumin. (1 mark)
- Copper ✓ Allow formula: (½ mark)
- (ii) State one use of duralumin. Making Air craft ✓, Making Space satellites
Making Bicycle parts ✓, Engine parts like Piston & cylinders. (any one)

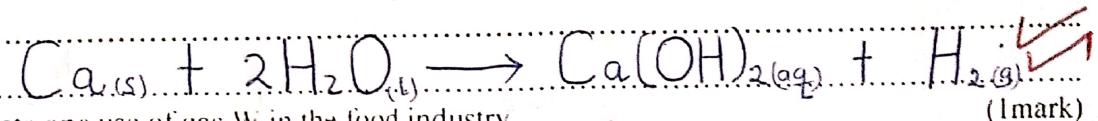
2. The diagram below shows a setup of apparatus used to prepare gas W. 05



- (a) State how gas W can be identified in the laboratory. (1½ marks)

Accept: Put Insert, Placing Explode
A burning splint is lowered into a gas jar containing gas W. It burns with a pop sound.

- (b) Write equation of reaction leading to the formation of gas W (1½ marks)

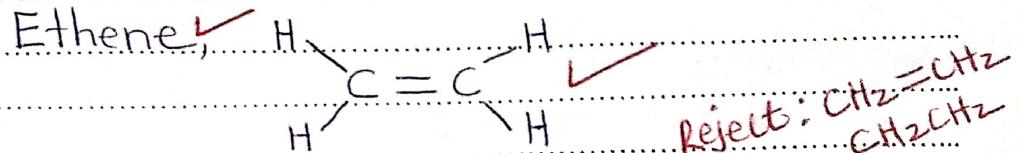


- (c) State one use of gas W in the food industry. (1 mark)

Manufacture of Margarine ✓

3. (a) An organic compound X has a molecular formula C_2H_4 . Accept: Hydrogenation of oils (Hardening of oils). Reject only Hydrogenation

- (i) Write the name and structure formula of X. (2 marks)



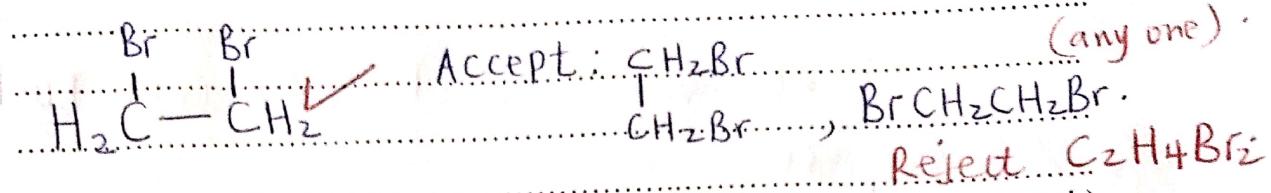
Reject: $\text{CH}_2=\text{CH}_2$, CH_2CH_2

Accept: $\text{H}_2\text{C}=\text{CH}_2$

Compound X was bubbled through bromine liquid.

(1 mark)

- (i) Write the structure of the compound formed.



- (ii) What is the role of bromine liquid in the experiment?

(1 mark)

To confirm unsaturation: ✓

Allow confirming a double bond or Ethene;

Name one other compound can be used instead of bromine liquid.

(1 mark)

Acidified Potassium Manganate(VII) solution. ✓

Accept: Potassium Permanganate solution. Reject: Bromine water.

4. When strongly heated magnesium ribbon was treated with dry nitrogen gas, solid W was formed

- (a) (i) Determine the empirical formula of solid W given that 0.72g of magnesium

produce 1.0g of solid W (Mg = 24 N=14)

(2½ marks)

Elements: Mg N

Mass composition: 0.72 1 - 0.72 = 0.28

3 : 2

Moles: 0.72 / 24 0.28 / 14

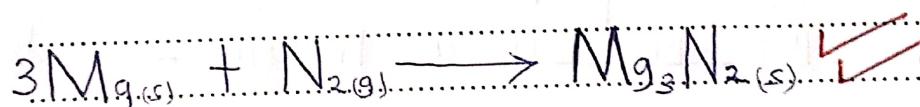
Empirical formula is

Ratio: 0.03 / 0.02 = 1.5 0.02 / 0.02 = 1

Mg₃N₂

- (ii) Write equation for reaction between magnesium and nitrogen.

(1½marks)



5. (b) Solid W when reacted with water produced gas Y and Solid X.

- (i) State how the gaseous product in (b) can be identified in the laboratory. (1½marks)

Using a wash bottle containing concentrated hydrochloric acid brought nearer to the gaseous product. Dense white fumes form.

(ii) Identify solid X.

(0½marks)

Magnesium hydroxide ✓ Accept formula.

5. A boiling tube was filled with Chlorine water and then inverted over a beaker containing a similar solution. The set up was then exposed to sunlight.

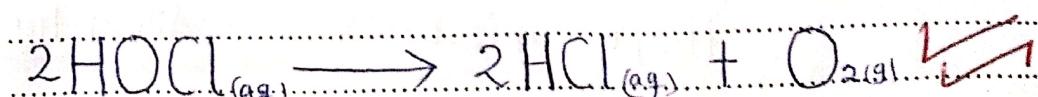
(1mark)

- (a) (i) State what was observed.

Bubbles of a colourless gas and a colourless solution.

- (ii) Write equation for the reaction that took place in the boiling tube.

(1½mark)



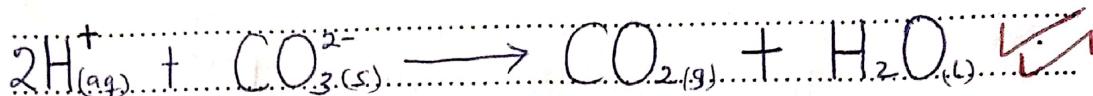
Turn Over

3

- (b) The resultant solution in (a) was added to a beaker containing Marble chips. (1 mark)
(i) State what was observed in the beaker.

Effervescence; ✓ Accept Bubbles;

- (ii) Write ionic equation for the reaction that took place. (1½marks)

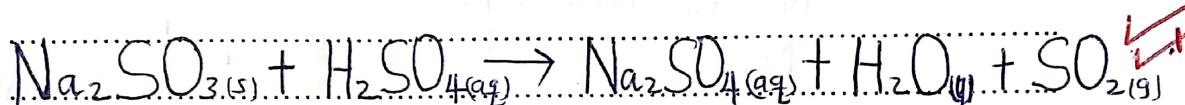


6. (a) Name two compounds that can be used to prepare sulphur dioxide in the laboratory. (2marks)

Sodium sulphite and dilute hydrochloric acid.
or dilute sulphuric acid.

Reject: copper Accept: sodium hydrogen sulphite

- (b) (i) Write equation of reaction that takes place when a mixture of the two compounds named in (a) above is heated. (1½marks)



- (ii) State how the gas can be dried in the laboratory. (1 mark)

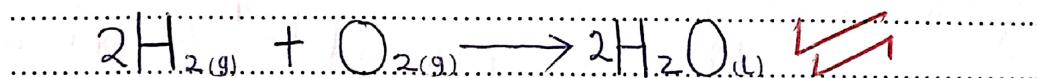
By bubbling the gas through concentrated sulphuric acid.

7. Water can be transformed from one state to another through the water cycle.

- (a) (i) Name two processes involved in the water cycle. (2 marks)

Evaporation; ✓ Reject: Precipitation,
Condensation; ✓ Wrong spellings;

- (ii) Write equation to show how hydrogen reacts with oxygen to form water. (1½marks)



- (b) Drops of water were added to anhydrous copper (II) Sulphate in a test tube. State what was observed after adding 3-4 drops of water. (1 mark)

White solid turned to blue crystals.

- (c) When Sodium Chloride Crystals were placed on a petri dish and exposed for two days, they appeared wet.

- (i) Which word describes the behavior of the Sodium Chloride Crystals? (1 mark)

Hygroscopic. ✓ Allow: Hygroscopy.

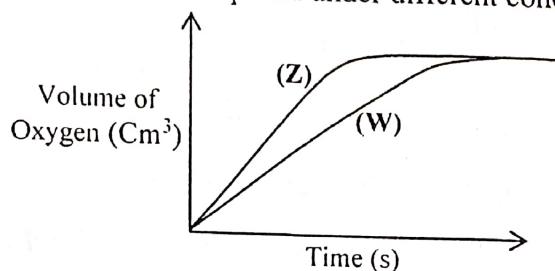
- (ii) Name one other substance that can behave like sodium chloride when exposed.

- Copper(II) Oxide - Calcium Chloride - Ethanol - Calcium oxide
- sodium Nitrate, - Potassium hydroxide - sodium hydroxide - Iron(III) chloride
- Phosphorous Pentaoxide.

Reject formula.

(any one)

- (a) What is meant by the term rate of chemical reaction?
 OR: Is the amount of product formed per unit time.
- (b) State two factors that can affect the rate of chemical reaction.
- Temperature ✓ - catalyst ✓ - Surface area of reactants
 - Concentration of Particles / Ions / Molecules in solution;
- (c) Hydrogen peroxide was decomposed under different conditions as shown in the figure below.



- (i) Which curve represents a reaction to which Manganese (IV) oxide was added?
 Curve Z ✓ (1 mark)
- (ii) State the role manganese (IV) oxide in above reaction.
 To speed up the process of decomposition.

~~05~~ 9. Rusting is an exothermic reaction that weakens garden tools when stored in places that are moist.

- (a) (i) State what is meant by the term exothermic reaction.
 Is a reaction that proceeds with evolution of heat ✓ (1 mark)
- (ii) State one domestic application of exothermic reactions.
 Cooking ✓ (any one)

- (b) (i) State one other factor apart from moisture that supports rusting.
 Oxygen ✓ (1 mark)

- (c) Galvanizing is one of the methods used to prevent rusting.
 Allow air.

- (i) Name the metal used to galvanize iron.
 Zinc ✓ (1 mark)

- (ii) State the principle behind the use you have named in c(i) above.
 Zinc is more electropositive than Iron. ✓

~~05~~ Allow: Zinc is more reactive than Iron hence prevents oxygen from reacting with iron. (1 mark)

10. During the electrolysis of molten sodium chloride in the Down's cell, a calcium salt X is added to the electrolyte.

- (a) State the role of salt X in the process.
 To lower the melting point of electrolyte. ✓ (1 mark)

- (b) Name the substances used as the anode and give a reason for your answer.

- (i) Substance used as a node.
 Carbon ✓ (1 mark)

Turn Over

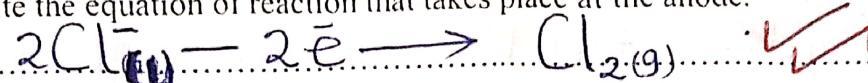
- (ii) Reason for your answer in b (i) above.

(1 mark)

Cannot react with chlorine; ✓

- (c) Write the equation of reaction that takes place at the anode.

(1½ marks)



SECTION B

Answer any two questions from this section.

11. When hard water is treated with soap, scum is formed.

- (a) State the chemical names for;

(1 mark)

(i) Soap.

(1 mark)

(ii) Scum.

- (b) (i) Identify **two** ions that lead to the formation of scum when soap is used to clean fabric. (2 marks)

- (ii) Write equation of reaction leading to the formation of scum. (1½marks)

- (c) (i) Identify **one** compound that can be used to break the hardness in water. (1 mark)

- (ii) Write equation to show how the compound named in (c) (i) breaks down the hardness in water. (1½marks)

- (d) Describe the cleaning action of soap on fabric stained with grease. (5 marks)

- (c) State one;

(1 mark)

(i) Advantage.

(ii) Disadvantage

of using hard water.

(1 mark)

12. (a) Describe the industrial manufacture of ammonia gas. (5½marks)

- (b) Ammonia burns in a plentiful supply of oxygen,

(3 marks)

- (i) Draw a setup of apparatus that can be used to burn ammonia.

(1½ marks)

- (ii) Write equation for the combustion of ammonia.

- (c) You are provided with copper (II) sulphate Crystals, briefly describe how you can test for the presence of copper (II) and sulphate ions. (5 marks)

(1 mark)

13. (a) Define the term **heat of neutralization**. (1 mark)

- (b) The table below shows results of an experiment in which seven portions of 25cm³ of 2M sodium hydroxide were reacted with various quantities of hydrochloric acid. The heat change in each case was calculated and results recorded.

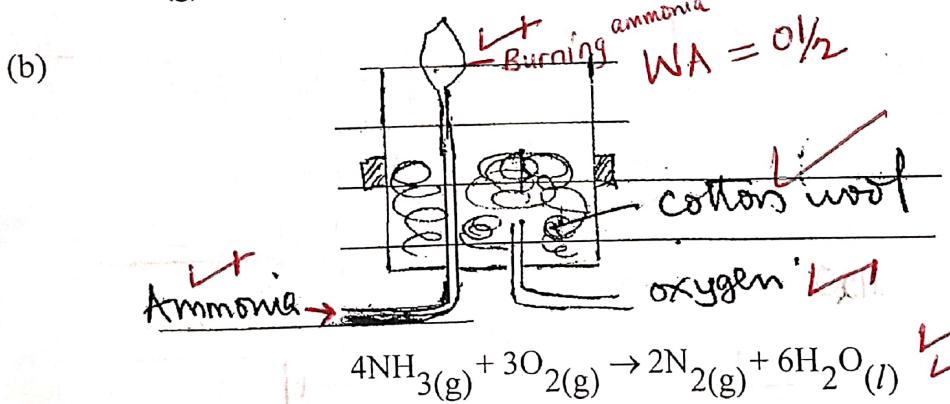
| Experiment No | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------------------------------|-----|-----|-----|-----|-----|-----|-----|
| Volume of NaOH(cm ³) | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Volume of HCl(cm ³) | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
| Heat evolved (KJ) | 1.1 | 2.2 | 3.4 | 4.5 | 5.6 | 5.6 | 5.6 |

SECTION B

11. (a) (i) Sodium stearate. ✓ allow Potassium stearate
 (ii) Calcium stearate / Magnesium stearate.
- (b) (i) $\checkmark \text{Ca}^{2+}$ and $\checkmark \text{Mg}^{2+}$ ions allow Names;
 (ii) $\text{Ca}_{(\text{aq})}^{2+} + 2\text{Na}_{(\text{aq})}\text{Y}_{(\text{aq})} \rightarrow \text{CaY}_{(\text{s})} + 2\text{Na}_{(\text{aq})}^+$ ✓
 Soap scum allow aqueous ammonia
- (c) (i) Sodium Carbonate ✓ allow Permutit, calcium hydroxide.
 (ii) $\text{Na}_2\text{CO}_3(\text{aq}) + \text{Ca}_{(\text{aq})}^{2+} \rightarrow 2\text{Na}_{(\text{aq})}^+ + \text{CaCO}_3(\text{s})$ ✓
- (d) Soap contains two parts, the polar end and non-polar end, when soap is added to water, the polar part dissolves in water while the non-polar floats on the water surface. When the greasy fabric is put into a soap solution, the non-polar of soap enters the grease. In the process, the grease is broken into small particles and carried off into the solution.

- (e) (i) Contains Calcium for teeth and bone development. ✓ prevent Lead Poisoning
 (ii) It waste soap. ✓ or Formation of fur
 Formation of scum

12. (a) Ammonia is manufactured through direct combination of nitrogen and hydrogen in the ratio of 1:3 respectively. The two gases are made to react at a temperature of 450°C to 500°C and a pressure of 250 atmosphere in the presence of iron as a catalyst.
- $$3\text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$$



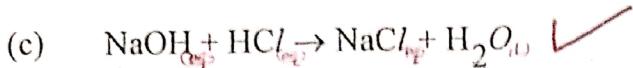
- (c) Dissolve the copper (II) sulphate in water and divide the resultant solution into 2. To the first portion add aqueous ammonia drop wise until in excess, a blue precipitate which dissolves to form a deep blue solution confirms the presence of copper (II) ions. To the second portion add nitric acid followed by barium nitrate, a white precipitate confirms the presence of the sulphate ions.

13. (a) The heat change when one mole of H^+ ions react with 1 mole of OH^- ions to form 1 mole of water.

- (b) (i) On Graph paper

(ii) 1000cm³ of solution contains 2 moles of NaOH *solution*. ✓
∴ 50cm³ of solution contained $\frac{50 \times 2}{1000} = 0.1$ moles. ✓ 02½

(iii) 50cm³ ✓



The mole ratio as per the equation is

1HCl : 1NaOH. ✓

Therefore moles of HCl that reacted = 0.1 moles ✓

But 50 cm³ of the solution had 0.1 moles of HCl ✓

∴ 1000cm³ of the solution will contain.

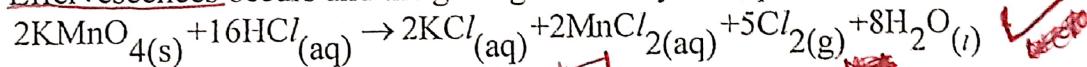
$$\frac{1000 \times 0.1}{50} = 2\text{M}$$
 ✓

∴ The molarity of HCl is 2 moles/dm³ ✓

From the graph, 0.1 moles are neutralized with the production of 5.6kJ of heat. ✓

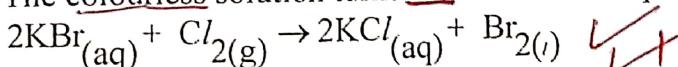
∴ If 1 mole is neutralized then $\left(\frac{5.6 \times 1}{0.1}\right)$ kJ moles. ✓
will be produced = 56kJ/ mole. ✓

- 15
14. (a) Place Potassium manganate (VII) crystals in a flat bottomed flask fitted with a delivery tube. Add concentrated hydrochloric acid by means of a funnel. ✓ Effervescence occurs and the gas is given off by the equation.



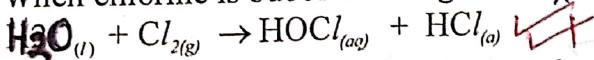
Pass the gas through concentrated sulphuric acid to dry collect the gas by downward delivery. ✓ or Gas is passed through wash bottle containing water to remove acid fumes.

- (b) (i) The colourless solution turns red due to the displacement of Bromine. ✓

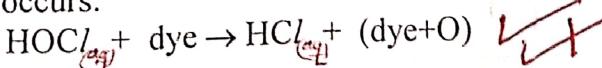


The greenish yellow gas forms Pale yellow solution

- (ii) When chlorine is bubbled through water it forms two acids



The hypochlorous acid is unstable therefore it bleaches the flower, hence the blue colour of the flower turns white/ bleaching of the flower occurs.



- 15
(iii) Iron wire glows red with chlorine forming black crystals; Iron reacts with chlorine forming Iron (III) Chloride forming chloride which appears as black crystals. ✓



END

MUGISA ROBERT ADYEERI

(b)(ii) A graph of heat change against the volume of hydrochloric acid

