

545/2

CHEMISTRY

Paper 2

June 2022

2 hours

MWALIMU EXAMINATIONS BUREAU

UCE RESOURCE PRE-MOCK EXAMINATIONS 2022

CHEMISTRY

Paper 2

2 hours

INSTRUCTIONS TO CANDIDATES:

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

Answer to these questions **must** be written in the spaces provided.

Section **B** consists of 4 semi-structured questions. Attempt any **two** questions from this section. Answers to the questions **must** be written in the answer sheet(s)/booklet(s) provided.

In both sections all working must be clearly shown.

Where necessary use;

(H = 1, C = 12, N = 14, O = 16, Na = 23, S = 32, Cl = 35.5, Cu = 64, Fe = 56)

1 mole of a gas occupies 24 l at room temperature.

1 mole of a gas occupies 22.4 l at s.t.p.

For Examiners' Use Only														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total

SECTION A: (50 MARKS)

Answer **all** questions in this section

1. Name **one** process by which the components of the following mixtures can be separated. (05 mks)

	Mixture	Process
(a)	Aqueous salt solution	
(b)	Iodine and sand	
(c)	Ink	
(d)	Crude oil	
(e)	Potassium nitrate and potassium chloride	

2. Elements X and Y with atomic numbers 12 and 8 react to form a compound W.

(a) Draw a diagram to show the electronic structure of

(i) X. (01 mk)

(ii) Y. (01 mk)

(b) Write the formula of compound W.

.....(01 mk)

(c) State whether W is

(i) a gas, liquid or solid at room temperature. (0½ mk)

.....

(ii) covalent or ionic. (0½ mk)

.....

3. (a) (i) Write equation to show how oxygen is prepared from sodium peroxide. (1½ mks)

.....

.....

- (ii) State how oxygen can be identified. (01 mk)

- (b) A piece of burning magnesium ribbon was lowered into a jar of dry oxygen.
 (i) State what was observed. (01 mk)

 (ii) Write equation for the reaction that took place. (1½ mks)

4. (a) Write equation for the reaction that occurs when copper(II) hydroxide is:
 (i) strongly heated. (1½ mks)

 (ii) added to dilute nitric acid. (1½ mks)

- (b) Aqueous ammonia solution was added dropwise until in excess to a sample copper(II) hydroxide.
 (i) State what was observed. (01 mk)

 (ii) Write the formula of the cation in the final mixture. (01 mk)

5. (a) A compound, R, contains 52.17% carbon, 13.04% hydrogen and 34.78% oxygen.
 (i) Calculate the empirical formula of R. (02 mks)

 (ii) Determine the molecular formula of R. (R=46) (01 mk)

- (b) When R was heated with excess concentrated sulphuric acid, a colourless gas, Z, which turned liquid bromine colourless was evolved.
 Identify:
 (i) R..... (01 mk)

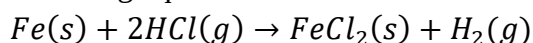
- (ii) Z..... (01 mk)
- (c) The combustion of R is highly exothermic. Suggest a possible use of R.
(0½ mk)
.....
6. (a) Differentiate between **temporarily hard water** and **permanently hard water**.
(02 mks)
.....
.....
.....
.....
- (b) (i) Name **two** substances which when present in water can cause permanent hardness of water. (01 mk)
.....
.....
- (ii) State **one** chemical method of removing permanent hardness of water.
(0½ mk)
.....
- (iii) Write equation for the reaction involved in (b)(ii) above. (1½ mks)
.....
.....
- (c) Soap was used for washing in hard water.
- (i) State what was observed. (0½ mk)
.....
- (ii) Write equation for the reaction that took place. (01 mk)
.....
.....
7. (a)(i) Name **one** substance that when reacted with concentrated sulphuric acid can produce hydrogen chloride. (0½ mk)
.....
.....
- (ii) State the condition(s) for the reaction. (0½ mk)
.....
.....
- (iii) Write equation for the reaction leading to the formation of hydrogen chloride. (1½ mks)
.....
.....

(b) State what would be observed and write equation for the reaction that would take place if hydrogen chloride was bubbled through aqueous lead(II) nitrate solution.

(i) Observation. (0½ mk)

(ii) Equation. (1½ mks)

(c) Dry hydrogen chloride reacts with strongly heated iron filings according to the following equation.



Calculate the volume of hydrogen that would be produced at room temperature if 2.8 g of iron filings was completely reacted with hydrogen chloride. (02 mks)

8. (a) Write an ionic equation for the reaction between dilute sulphuric acid and dilute potassium hydroxide solution. (01 mk)

(b) When 25 cm³ of a 0.25 M sulphuric acid was added to 25 cm³ of a 0.5 M potassium hydroxide solution, the temperature of the mixture rose from 24.0°C to 27.4°C. Calculate the molar enthalpy of neutralisation of potassium hydroxide.

(Specific heat capacity of water = 4.2 J g⁻¹ °C⁻¹, density of water = 1 g cm⁻³). (03 mks)

9. A circuit for the electrolysis of lead(II) bromide was set up as shown in the **Figure 1**.

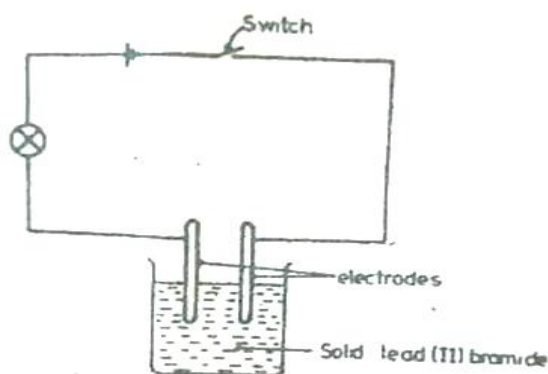


Fig. 1

- (a) State what was observed when
- (i) the switch was turned on. (01 mk)
-
-
- (ii) lead(II) bromide was melted and the switch turned on. (01 mk)
-
-
- (b) Explain your observations in (a)(i) and (a)(ii). (1½ mks)
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-
-
-
- (c) Write equation for the reaction that took place at the anode. (1½ mks)
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10. (a) A mixture of magnesium powder and copper(II) oxide was strongly heated until there was no further change.
- (i) State what was observed. (1½ mks)
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- (ii) Write equation for the reaction that took place. (1½ mks)
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-
- (b) The experiment in (a) was repeated using silver powder instead of magnesium powder.
- (i) State what was observed. (0½ mk)
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- (ii) Give a reason for your answer in (a)(i) and (b)(i). (02 mks)

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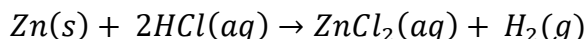
SECTION B: (30 MARKS)

Answer any **two** questions from this section

Additional questions answered will **not** be marked

11. (a) Briefly describe how a dry sample of sulphur dioxide can be prepared in the laboratory. (*Diagram is **not** required*). (05 mks)
- (b) State what would be observed if sulphur dioxide is:
- (i) bubbled through a blue litmus solution. (0½ mk)
 - (ii) bubbled through an acidified potassium dichromate(VI) solution. (01 mk)
 - (iii) mixed with moist hydrogen sulphide. (01 mk)
- (c) (i) Briefly explain your observation in (b)(ii). (01 mk)
- (ii) Write equation for the reaction that took place in (b)(iii). (1½ mks)
- (d) Sulphur dioxide can be converted into sulphur trioxide in the presence of a catalyst.
- (i) Name the catalyst used in this reaction. (0½ mk)
 - (ii) State the other condition(s) for the reaction. (01 mk)
 - (iii) Write equation for the reaction leading to the formation of sulphur trioxide. (01 mk)
- (e) Write equation(s) to show how sulphur trioxide can be converted to sulphuric acid. (02 mks)
- (f) State **one** industrial use of sulphuric acid. (0½ mk)
12. (a) (i) Draw a labelled diagram of the set-up of apparatus that can be used to prepare a dry sample of ammonia from ammonium chloride in the laboratory. (03 mks)
- (ii) Write an ionic equation for the reaction leading to the formation of ammonia. (1½ mks)
- (iii) Explain the reason for the choice of the drying agent for ammonia. (02 mks)
- (b) Name **one** reagent that would be used to confirm the presence of ammonia, and state what would be observed if the named reagent was treated with ammonia. (02 mks)
- (c) Dry ammonia was passed over strongly heated lead(II) oxide.
- (i) State what was observed and explain your answer. (03 mks)
 - (ii) Write equation for the reaction that took place in (b)(i). (1½ mks)
- (d) (i) Write equation to show how ammonia can be converted into ammonium sulphate. (1½ mks)
- (ii) State **one** large scale use of ammonium sulphate. (0½ mk)

13. Zinc reacts with dilute hydrochloric acid according to the following equation.



- (a) State what would be observed if zinc was added to dilute hydrochloric acid. (01mk)
- (b) The rate of the reaction is affected by the concentration of the acid and the presence of a catalyst.
- (i) State **two** other factors other concentration and the presence of the catalyst that can affect the rate of the reaction. (01 mk)
- (ii) Name the catalyst that can be used in the reaction. (01 mk)
- (iii) Briefly explain the effect of one of the factors you have stated in (b)(i) on the rate of the reaction. (02 mks)
- (c) The table below shows the variation in volume of hydrogen evolved with time when dilute hydrochloric acid was added to excess zinc.

Volume of hydrogen (cm ³)	0	10	20	25.5	29.5	32	32
Time(s)	0	5	10	15	20	25	30

- (i) Draw a well labeled diagram of the setup of apparatus that can be used to measure the volume of hydrogen evolved in the reaction. (03 mks)
- (ii) Plot a graph of volume of hydrogen (vertical axis) against time (horizontal axis). (03 mks)
- (iii) Determine the rate of the reaction at 12 minutes. (02 mks)
- (iv) What happens to the shape of the graph after 25 minutes? Explain your answer. (02 mks)

14. (a) Describe how a pure dry sample of lead(II) nitrate crystals can be obtained in the laboratory starting from lead(II) oxide. Your answer should include the equation for the reaction that takes place. (*No diagram(s) is/are required*). (05 mks)

- (b) Lead(II) nitrate crystals were strongly heated in a hard glass tube.
- (i) State what was observed. (1½ mks)
- (ii) Write equation for the reaction that took place. (1½ mks)
- (c) The residue in (b) was warmed with dilute nitric acid.
- (i) State what was observed. (01 mk)
- (ii) Write equation for the reaction that took place. (01 mk)
- (d) To the resultant mixture in (c) was added dilute ammonia solution drop wise until in excess.
- (i) State what was observed. (01 mk)
- (ii) Write equation for the reaction that took place. (01 mk)
- (e) Dilute sodium hydroxide solution was added drop wise until in excess to the product in (d).
- (i) State what was observed. (01 mk)
- (ii) Explain your answer in (e)(i). (*No equation(s) is/are required*). (02 mks)

END