

Name: ..... Index No. .... Signature: .....

545/2

**CHEMISTRY**

Paper 2

July/Aug. 2023

2 hours



**UGANDA TEACHERS' EXAMINATIONS SCHEME**

**Uganda Certificate of Education**

**JOINT MOCK EXAMINATIONS**

**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 spaced provided.*

*Section B consists of 4 semi-structured questions. Answer any **two** questions from the question. Answers to the questions **must** be written in the answer booklet(s) provided.*

*In both sections, **all** working **must** be clearly shown.*

*Where necessary use;*

*$H = 1, O = 16, Na = 23, Al = 27, Cl = 35.5, S = 32, C = 12$ .*

*1 mole of gas occupies 24l at room temperature,*

*1 mole of gas occupies 22.4l at stp or 22400cm<sup>3</sup>.*

For Examiners' use only														
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	Total

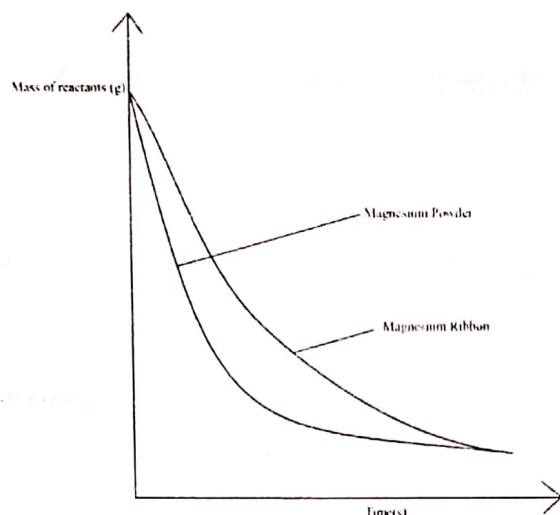
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**Turn Over**

## SECTION A (50 MARKS)

Answer **all** questions in this section.

1. Steel is one of the widely used alloys,
- (a) What is meant by the term alloy? (01 mark)
- .....
- .....
- (b) State **two** elements in the alloy steel (01 mark)
- .....
- .....
- .....
- (c) Give two reasons why steel is widely preferred (02 marks)
- .....
- .....
- (d) State **two** other alloys other than steel. (01 mark)
- .....
- .....
2. (a) Define the term rate of reaction. (01 mark)
- .....
- .....
- (b) The graph below was drawn from experimental results for a reaction between dilute hydrochloric acid and equal amounts of magnesium powder and magnesium ribbon separately and respectively. Study the graph and answer questions that follow.



- (i) Compare the shapes of the graphs. (2½ marks)

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- (ii) Explain the shapes of the graphs. (02 marks)

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3. An ion  $X^+$  has electronic configuration 2:8.

- (a) State the group and period in periodic table to which a neutral element X belongs (01 mark)

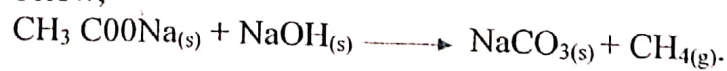
(i) Group.....

(ii) Period .....

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- (b) (i) Write the formula of the oxide of X (0½mark)  
 .....  
 .....
- (ii) State the type of bond in the oxide of X in b (i) above.  
(0½mark)  
 .....  
 .....
- (iii) Give a reason for the type of bond in b (ii) above  
(0½mark)  
 .....  
 .....
- (c) Write an equation for the reaction between the oxide of X above and dilute hydrochloric acid.  
(1½marks)  
 .....  
 .....  
 .....
- (d) To the resultant solution in C above, was added dilute Sodium hydroxide dropwise until excess, state what was observed.  
(01 mark)  
 .....  
 .....  
 .....  
 .....

4. Methane can be prepared in the laboratory according to the equation below;



(a) Write the structure of methane (01 mark)

.....

.....

.....

.....

(b) Draw the diagram of a set up that can be used in the experiment (a) above. (02 marks)

(c) Calculate the amount of sodium ethanoate in grams required to produce  $33600\text{cm}^3$  of methane at s.t.p. (1½marks)

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5. (a) What is meant by the term oxide? (01 mark)

.....

.....

**Turn Over**

(b) State what is observed and give the class of the resultant oxide when each of the following is burnt in excess oxygen.

(i) Carbon

Observation

.....  
.....

Class.....

(ii) Calcium

Observation

.....  
.....

Class .....

(c) A part from the oxides you have named in (b), name one other oxide and write the formula of one example of the oxide

Oxide ..... ( $\frac{1}{2}$ mark)

Formula..... ( $\frac{1}{2}$ mark)

6. When 1.8g of compound Y of an oxide of W was reduced by hydrogen, 1.44g of solid W remained, the molecular mass of Y is 81.

(W = 65, O = 16)

(a) Define the term reduction (01 mark)

.....  
.....

(b) Calculate the empirical formula of Y (03 marks)

.....  
.....  
.....  
.....  
.....  
.....

(c) Determine the molecular formula of Y (01 mark)



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.....  
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7. (a) Explain the term basicity of an acid. (1½ mark)

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.....  
.....  
.....

- (b) 12.50cm<sup>3</sup> of 0.1M dibasic acid reacted exactly with 25.0cm<sup>3</sup> of sodium hydroxide solution.

- (i) Calculate the concentration of sodium hydroxide solution in moles per litre. (2½ marks)

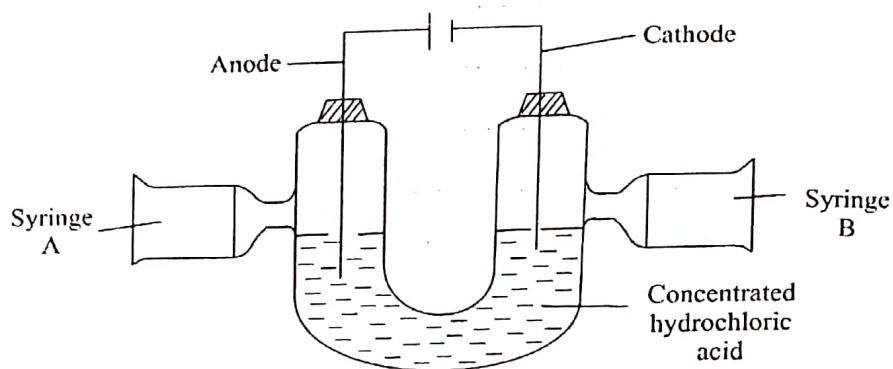
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- (ii) the concentration of sodium hydroxide solution in grams per litre. (1 mark)

.....  
.....

8. Figure below shows an electrochemical cell used during electrolysis of concentrated hydrochloric acid.

**Turn Over**



(a) Name the possible electrodes that can be used as

(i) Anode ( $\frac{1}{2}$  mark)

.....

(ii) Cathode ( $\frac{1}{2}$  mark)

.....

(b) Name the product in the syringe

A ..... ( $\frac{1}{2}$  mark)

B ..... ( $\frac{1}{2}$  mark)

(c) Write the equation of reaction at

(i) Cathode (01 mark)

.....

(ii) Anode (01 mark)

.....

(d) Gases in syringe A and B were tested separately with a wet red litmus paper, state what was observed with

(i) Gas A ..... ( $\frac{1}{2}$  mark)

(ii) Gas B ..... ( $\frac{1}{2}$  mark)



9. A mixture of copper(II) sulphate and zinc sulphate were dissolve in  $4\text{cm}^3$  of distilled water. Dilute sodium hydroxide solution was the added to the resultant solution dropwise until in excess. The mixture was filtered.

(a) Identify the cation in the;

(i) Filtrate ( $\frac{1}{2}$  marks)

.....  
.....

(ii) Residue ( $\frac{1}{2}$ marks)

.....  
.....

(b) Write the equation(s) of reaction(s) between excess sodium hydroxide and the cation in the;

(i) Filtrate ( $2\frac{1}{2}$  marks)

.....  
.....  
.....  
.....

(ii) Residue ( $1\frac{1}{2}$  marks)

.....  
.....  
.....

10. Explain the following observations and in each case write an ionic equation for the reaction.

(a) When chlorine gas is bubbled through a solution of iron(II) sulphate, the solution turns from pale green to yellow. ( $2\frac{1}{2}$ marks)

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- (b) When hydrogen sulphide gas is bubbled through a solution of Iron(III) chloride, the solution turns from yellow to green.

### SECTION B: (30 MARKS)

Answer **two** questions from this section.

Additional questions answered will not be marked.

11. (a) Define the term enthalpy of neutralization. (01 mark)
- (b) In an experiment to determine the enthalpy of neutralization of an acid  $H_nX$ , 30.0cm<sup>3</sup> of 1M sodium hydroxide solution were poured in a plastic beaker, volumes of 1M acid  $H_nX$  were added as shown in the table below; The initial temperature  $t_1$  of sodium hydroxide and  $t_2$  of acid  $H_nX$  were 19°C and 21°C respectively. The mixtures were stirred and temperature  $t_3$  attained every after additional volume was recorded. The results were recorded in the table below.

Volume of $H_nX$ added (cm <sup>3</sup> )	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0
Temp $t_3$ (°C)	21.5	22.8	24.2	25.5	26.8	28.0	28.1	27.7
Temp change $t = \left( t_3 - \frac{t_1 + t_2}{2} \right)$								

Complete the table above

(03 marks)

- (b) (i) Plot a graph of temperature change against volume of acid added (05 marks)
- (ii) Using the graph, determine the volume of acid required to neutralize 30.0cm<sup>3</sup> of sodium hydroxide. (01 mark)
- (c) Determine the number of moles of sodium hydroxide used. (02 marks)
- (d) Calculate the enthalpy of neutralization of the acid H<sub>n</sub>X.  
(density of solution = 1gcm<sup>-3</sup>, S.H.C of solution = 4.2Jg<sup>-1</sup>°C<sup>-1</sup>)
12. (a) (i) Name two general methods used in extraction of metals. (01 mark)
- (ii) For each of the methods you have name in a (i) above, identify two metals that can be extracted by the method. (02 marks)
- (b) Describe how sodium can be extracted from its ore of brine  
(diagram not required) (9½ marks)
- (c) Sodium was burnt in limited oxygen
- (i) State what was observed. (01 mark)
- (ii) Write the equation for the reaction. (1½marks)
13. (a) Dilute nitric acid was added to a mixture of Lead(II) Carbonate and Zinc carbonate. State what was observed. (02 marks)
- (b) Dilute ammonia solution was added dropwise until excess to the resultant solution in (a), state what was observed. (01 mark)

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- (c) the resultant mixture in (b) was filtered and both filtrate and residue were kept
- (i) State what was observed. (01 mark)
  - (ii) Write the formula of the substance responsible for the filtrate formed. (01 mark)
- (d) Dilute nitric acid was added to the filtrate in (c) dropwise until the solution was just acidic
- (i) State what was observed. (01 mark)
  - (ii) To  $1\text{ cm}^3$  of the acidified solution, was added dilute sodium hydroxide solution dropwise until excess. State what was observed, explain your observation. (07 marks)
  - (iii) Describe a test that can be used to identify the cation present in the residue (02 marks)
14. (a) With the aid of a labelled diagram, describe a setup of experiment that can be used to prepare dry ammonia gas in the laboratory starting with ammonium chloride. (06 marks)
- (b)  $56\text{ dm}^3$  of ammonia gas were passed over excess strongly heated copper(II) oxide in a U-tube.
- (i) State what was observed. (01 mark)
  - (ii) Write the equation for the reaction in the U-tube. (1½ marks)
  - (iii) Calculate the mass of the solid product formed. (2½ marks)
- (c) (i) Describe a chemical test, that can be used to identify a cation of ammonium in solution. (2½ marks)
- (ii) Write a possible equation for the reaction in c (i) above.

**END**