545/2
Chemistry
Paper 2
July - August 2022
2 Hours

UGANDA MUSLIM TEACHERS' ASSOCIATION

UMTA JOINT MOCK EXAMINATIONS-2022

NAME.....

INDEX NO.....SIGN.....

UGANDA CERTIFICATE OF EDUCATION
Chemistry paper 2

Time 2hours

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 only.*
- *Section **B** consists of 4 semi-structured questions.*
- *Answer any **two** questions from this Section.*
- *Answers to these questions must be written in the answer sheets provided only*
- *In both sections all working must be clearly shown.*
  Where necessary use;

(H = 1; C = 12; S = 32; Cu = 64; Fe = 56; Pb= 207)

1 mole of gas occupies 24*L* at room temperature
1 mole of a gas occupies 22.4*L* at s.t.p

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

SECTION A: (50 MARKS)

1. (a) Name the method you would use to separate the following mixtures:

(i) Copper (II) carbonate and ammonium chloride.

.....

(ii) Oil and water.

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(iii) Kerosene and crude oil.

.....

(iv) Dissolved salts in sea water.

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(b) Copper (II) carbonate was heated until no further change.

(i) State what was observed. (1 mark)

.....

(ii) Write the equation for the reaction. (1 ½ marks)

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2(a) Name one allotrope of carbon that is used;

(i) in extraction of iron. (½ mark)

.....

(ii) as an electrode. (½ mark)

.....

(b) State one property of the allotrope of Carbon that you have named in (a) which is the reason for its use;

(i) in extraction of Iron. (1 mark)

.....

(ii) as an electrode. (1 mark)

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(c) Describe how you can prove that the above forms of Carbon are allotropes of carbon. (2 marks)

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3. A mixture of sodium hydroxide solution and solid ammonium chloride was heated and 180cm^3 of ammonia gas were evolved at s.t.p.

(a) Write an ionic equation for the reaction of Sodium hydroxide with ammonium chloride. (1 ½ marks)

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(b) Explain why ammonia cannot be collected by:

(i) Downward displacement of water. (1 mark)

.....

.....

(ii) Upward displacement of air. (1 mark)

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(c) Calculate the mass of ammonia gas that was produced at s.t.p.

(1 mole of gas occupies 22400cm^3 at s.t.p; H=1, N=14) (1 ½ marks)

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4. Dilute nitric acid was added to a mixture of copper (II) oxide and lead (II) oxide until no further change. To the resultant solution, dilute sodium hydroxide solution was added drop wise until in excess and the mixture was then filtered.

(a) Write the formula of cation present in the

(i) Filtrate. (½ mark)

.....

(ii) Residue. (½ mark)

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(b).The residue was heated strongly until no further change.

(i) State what was observed. (1 mark)

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(ii) Write an equation for the reaction. (1 ½ mark)

.....

(c) In another experiment students had solutions of lead (II) nitrate, magnesium sulphate and zinc chloride.

Which one of the above solution formed a precipitate with:

(i) Barium nitrate solution. (½ mark)

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(ii) Silver nitrate solution. (½ mark)

.....

(iii) Potassium iodide solution. (½ mark)

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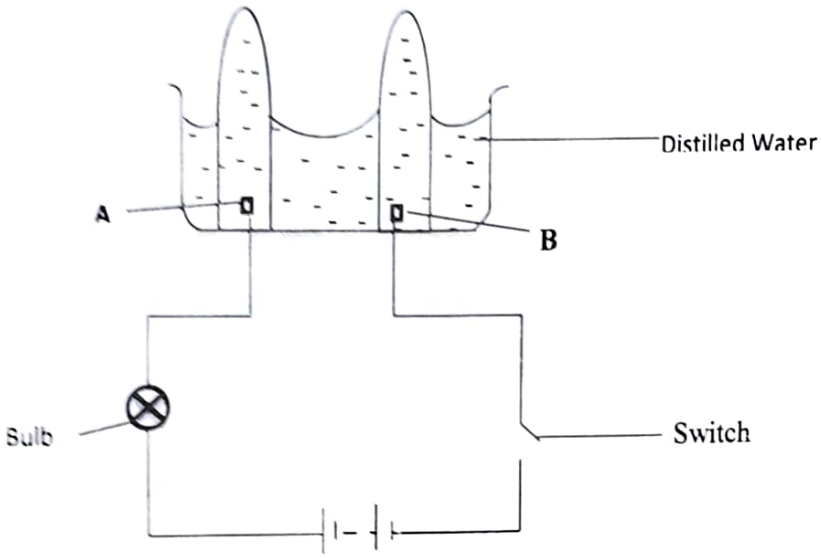
5. Study the diagram below and answer the questions that follow



(a) Explain why there was no observation made the switch was closed. (1 mark)

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(b) A small amount of concentrated sulphuric acid was added to distilled water and the switch was then closed.

(i) Explain the observation made. (1 ½ marks)

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.....

(ii) Write an equation for the reactions that took place at electrode **B.** (1 ½ marks)

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(c) State **one** application of electrolysis process. (1 mark)

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6. (a) State the conditions under which sulphuric acid can react with.

(i) Copper. (1 mark)

.....

(ii) Ethanol. (1 mark)

.....

(b).State the property of sulphuric acid which is shown by its reaction with,

(i) Copper. (1 mark)

.....

.....

(ii) Ethanol. (1 mark)

.....

.....

(c) Write an equation for the reaction between sulphuric acid and copper. (1 ½ marks)

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7. A hydrated salt contains 20.2% Iron, 23.0% oxygen, 11.5% sulphur and 45.3% water of crystallization. Its relative molecular mass is 278.

(a) Determine the molecular formula of the hydrated salt.

(Fe = 56; S = 32; O = 16; H = 1) (3 marks)

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(b) 6.95g of the hydrated salt were dissolved in distilled water to make 250cm^3 of solution. Calculate the concentration of the solution in moles per litre. (2 marks)

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8(a) In one experiment, metals **A**, **B** and **C** each were added separately to 50cm^3 of 1M copper (II) Sulphate solution. The initial temperature of copper (II) Sulphate solution was noted and recorded before the start of each experiment.

The highest temperature reached of the mixture after stirring was recorded as below.

Metal added to copper(II) sulphate solution	**A**	**B**	**C**
Highest temperature (°C) of the mixture	28.3	24.0	33.7
Initial temperature of copper (II)sulphate solution	24.0	24.0	24.0

(i) Arrange the metals **A**, **B** and **C** in order of reactivity starting with the most reactive and in each case give a reason for your answer. (2 marks)

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(i) Which metal did not show any visible reaction with copper (II) sulphate? (½ mark)

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(ii) State any other observation made inside the reaction vessels in which there was a reaction that occurred. (1 mark)

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(c) In the reaction vessels in which there was a reaction

(i) State whether the reaction was **exothermic** or **endothermic**. Give a reason for your answer. (1 mark)

.....

.....

(ii) State the type of enthalpy change of reaction in the above experiment (½ mark)

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9 (a) What is meant by the term rate of reaction? (1 mark)

.....

.....

(b) State any **two** factors that can affect the rate of a reaction (2 marks)

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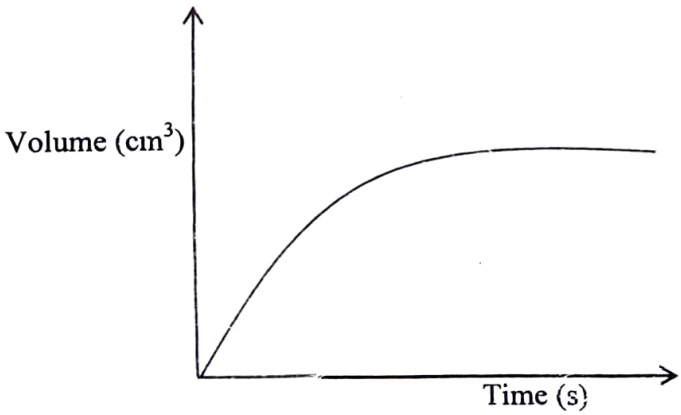
(c) In an experiment, hydrogen gas was prepared by reacting magnesium ribbon with dilute hydrochloric acid, and the volume of hydrogen gas evolved varied with time, as shown in the graph in the figure below:



(i) On the same axes in (c) above, sketch the curve that would be obtained if a few crystals of copper (II) sulphate were added into the reactants. (1 mark)

(ii) Explain your answer in (i) above. (1 mark)

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10 (a). An element **W** has mass number 27 and 14 neutrons.

(i) Write down the electronic configuration of **W.** (½ mark)

.....

(ii) **W** combines with Oxygen to form compound **R.** Write down the formula of **R** and state the type of bonding in **R.**.

Formula..... (1 mark)

Type of bonding.....

(iii) State any **<u>two</u>** properties of compound **R.** (2 marks)

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(b). Write an equation for the reaction between R and dilute hydrochloric acid.

(1 ½ marks)

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SECTION B. (30 marks)

Attempt any **two** questions from this section.

11. Glucose can be converted into ethanol by a catalytic reaction caused by the enzymes produced by yeast.

(a). Name:

(i) the reaction in which yeast converts glucose to ethanol. (1 mark)

(ii) the enzyme produced by yeast during the above reaction. (1 mark)

(b) Write the equation for the reaction leading to the formation of ethanol by the process named in a (i) above. (1½ marks)

(c) When ethanol was strongly heated together with concentrated sulphuric acid, gas **W** was formed.

(i) Identify gas **W.** (1 mark)

(ii) Write equation for the reaction leading to the formation of gas **W.** (1 ½ mark)

(d) (i)Name one reagent that can be used to identify **W** in the Laboratory. (1 mark)

(ii) State what is observed when the reagent named in d(i) is treated with gas **W.**

(1 mark)

(e) When treated at high pressure and temperature in the presence of a suitable catalyst, molecules of **W** react together to form a compound **P** of high molecular mass.

(i) Identify **P.** (½ mark)

(ii) Name the process leading to formation of compound **P** (1 mark)

(iii) State any **three** disadvantages of using **P** (3 marks)

(f) Differentiate between thermosetting and the thermo- softening plastics. (2 marks)

12(a) Describe the laboratory method for preparation of dry samples of sulphur dioxide from sodium sulphite. *(Diagram not required)* (5 marks)

(b) State what is observed when:

(i) Burning magnesium ribbon is lowered into a gas jar of sulphur dioxide. (1 ½ marks)

(ii) Sulphur dioxide gas is bubbled through a solution of iron (III) chloride. (1 ½ mark)

(iii) Write an equation for the reaction that took place in b (i) above. (1 ½ marks)

(c) When sulphurdioxide is reacted with more oxygen in presence of a catalyst, substance **X** is formed, **X** dissolves in water forming a solution **Z.**

(i) Name the catalyst used. (1 mark)

(ii) Identify substance **X.** (1 mark)

(iii) Write an equation for the formation of **X.** (1 marks)

(iv) Name solution **Z.** (1 mark)

(d) Solution **Z** was reacted with impure zinc to produce hydrogen gas.

(i) Write the equation for the reaction. (1 ½ marks)

(ii) If 6.5g of impure zinc sample reacted completely with $20cm^3$ of a 0.1M solution **Z**, calculate the percentage of zinc in impure sample s.t.p.

(Zn = 65) (1 ½ marks)

13(a) Differentiate between strong acid and concentrated acid. (2 marks)

(b) The table below shows the pH values for some unknown solutions formed.

Solution	**pH value**
A	6.2
B	12.0
C	7.0
D	2.0
E	9.8

Which of the above solutions is most likely to be formed when each of the following substances are dissolved in water? and give a reason for your answer.

(i) Carbon dioxide.
(ii) Ammonia gas.
(iii) Sodium oxide.
(iv) Hydrogen chloride gas.
(v) Sodium chloride. (5 marks)

(c)(i). Calcium oxide is a basic oxide. Define the term basic oxide. (1 Mark)

(ii). Describe the laboratory preparation of dry crystals of calcium nitrate from calcium oxide. (5 marks)

(d). Calcium nitrate crystals were strongly heated until no further change.

(i) State what was observed. (1 ½ marks)
(ii) Write the equation of reaction that took place. (1 ½ marks)

14 (a) Name the main **ore** from which the following metals are extracted?

(i) Sodium metal. (1 mark)
(ii) Iron metal. (1 mark)

(b) Iron is extracted from its ores in blast furnace using a reducing agent.

(i) Give the main reducing agent in the blast furnace and write equations for its formation. (2 marks)

(ii) Using equations, describe the use of calcium carbonate in the extraction of iron metal from its ore. (3 marks)

(c) State what is observed when iron metal is heated in dry sample of chlorine.

(2 marks)

(d) Explain why common reducing agents are not used in the extraction of sodium metal from its ore.

(2 marks)

(e) During extraction of sodium, calcium chloride is added to the ore.

(i). State the purpose of adding calcium chloride to the ore. (1 mark)

(ii). Write equations for the reactions at electrode during extraction of sodium metal.

(3 marks)

END