Name: .....

Centre/Index Number: ..... Signature: .....

545/2
CHEMISTRY
July/August 2023
2 hours

MASAKA DIOCESAN EXAMINATIONS BOARD

Uganda Certificate of Education

Joint Mock Examinations 2023

CHEMISTRY

Paper 2

2 hours

INSTRUCTIONS TO CANDIDATES:

*Section **A** consists of **10** structured questions. Attempt **all** questions in this section. Answers to the 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 these questions should be written on the special papers provided.

In both sections all working must be clearly shown
(C = 12, O = 16, H = 1, Cl = 35.5 one mole of a gas occupies 22.4dm^3 at s.t.p and 24dm^3 at r.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. Air is a mixture of gases.

   (a) State the percentage of oxygen in the air. (0½ mark)

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   (b) State two properties of air which show that it is a mixture. (02 marks)

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   (c) Sulphur was strongly heated in air.

   i) Write an equation for the reaction which took place. (1½ marks)

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   ii) State what was observed. (1½ marks)

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2. An element Y has two isotopes, $^{35}_{17}Y$ and $^{37}_{17}Y$

   (a) State what is meant by the term "Isotopes". (01 mark)

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(b) Write the electronic configuration of Y. (0½ mark)

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(c) State the group of Y in the periodic table. (01 mark)

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(d) Write the formula of the;

i) ion of Y. (01 mark)

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ii) compound formed when Y combines with oxygen. (01 mark)

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3. (a) In the extraction of iron, iron (III), oxide is reacted with carbon monoxide.

i) State the condition for the reaction. (0½ mark)

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ii) Write an equation for the reaction which takes place. (1½ marks)

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(b) Steam was passed over heated iron metal.

i) State what was observed. (0½ mark)

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ii) Write an equation for the reaction. (1½ marks)

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iii) State what would be observed if steam was instead passed over heated copper metal. (01 mark)

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4. An apparatus was set up as shown below, and then the beaker was heated to melt the copper (II) chloride crystals.

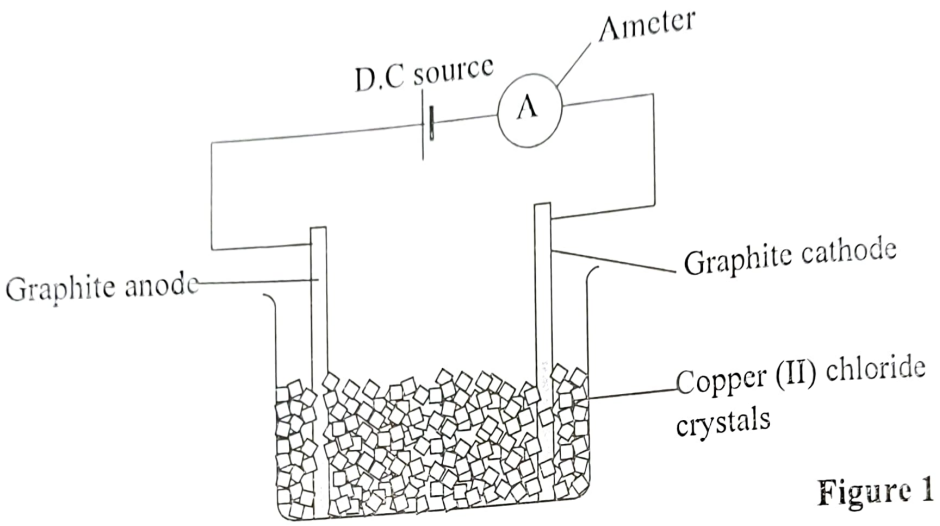

Figure 1

(a) State what was observed in the ameter;

i) before heating the crystals. (0½ mark)

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ii) after heating the crystals . (0½ mark)

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(b) Explain the observation in a(i). (1½ marks)

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(c) Write an equation for the reaction which takes place at the anode when the crystals are melted. (1½ marks)

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(d) State the reason why graphite electrodes are preferred in the experiment. (01 mark)

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5. (a) Zinc carbonate was strongly heated. State what was observed. (1½ marks)

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(b) Write an equation for the reaction when the residue in (a) is dissolved in dilute sulphuric acid. (1½ marks)

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(c) Sodium hydroxide solution was added to the solution obtained in (b) above, dropwise until in excess. State what was observed. (01 mark)

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6. Although nitrogen is generally unreactive, it readily reacts with burning magnesium.

(a) Give the reason why nitrogen is generally inert. (01 mark)

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(b) i) Explain why burning magnesium reacts with nitrogen. (1½ marks)

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ii) Write an equation for the reaction which takes place. (1½ marks)

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(c) Water was added to the product in (b). Write an equation for the reaction which took place. (1½ marks)

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7. When 2.3g of an impure sample of ammonium chloride was reacted with calcium hydroxide, 560cm^3 of gas was produced, measured at s.t.p.

(a) Write equation for the reaction. (1½ marks)

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(b) Determine the percentage of ammonium chloride in the sample. (03 marks)

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(c) State the method by which the impure sample can be purified. (0½ mark)

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(N = 14, H = 1, Cl = 35.5; one mole of a gas occupies 22.4dm^3 at s.t.p)

8. When solid Z was heated with concentrated sulphuric acid, a gas P, that produces dense white fumes with ammonia was given off.

(a) Identify;

i) the anion in Z. (0½ mark)

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ii) gas P (0½ mark)

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(b) Write an ionic equation for the reaction which leads to production of P. (1½ marks)

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(c) i) State what is observed when P is passed through lead (II) nitrate solution. (01 mark)

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ii) Write an equation for the reaction in c(i). (1½ marks)

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9. Ethanol can be obtained on a large scale by fermentation.

(a) i) Define the term fermentation. (01 mark)

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ii) State the process by which impure ethanol produced by fermentation can be concentrated in the laboratory. (01 mark)

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iii) Write an equation to show how ethanol can be converted into ethene. (01 mark)

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(b) When 4.5g of ethanol was burnt, the heat given off caused the temperature of 100cm^3 of water to rise by 25.5^{0}C.
Determine the heat of combustion of ethanol. (02 marks)
(Density of water = 1gcm^{-3}, specific heat capacity of water is 4.2Jg^{-1} ^{0}C^{-1}, C = 12, H = 1, O = 16)

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10. During the preparation of sulphur dioxide, sodium sulphite is reacted with an acid.

(a) Write an ionic equation for the reaction that takes place. (1½ marks)

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(b) Describe a test that is used to confirm presence of sulphur dioxide. (1½ marks)

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(c) In the laboratory, sulphur dioxide can be reacted with oxygen in presence of a catalyst.

i) Name the catalyst used. (0½ mark)

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ii) Write an equation for the reaction which takes place. (1½ marks)

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SECTION B: *(30 marks)*

(Answer any two questions from this section)

11. An aqueous solution of hydrogen peroxide decomposes in presence of manganese (IV) oxide.

(a) i) Write an equation for the decomposition of hydrogen peroxide. (1½ marks)

ii) State the role of manganese (IV) oxide in the reaction. (01 mark)

(b) i) With the aid of a suitable diagram, describe how the rate of evolution of oxygen would be measured at room temperature. (6½ marks)

ii) Sketch a graph to show how the volume of oxygen would vary with time. Label the graph A. (02 marks)

(c) In another experiment, the same volume and concentration of hydrogen peroxide was used but the temperature was increased to 30°C. Sketch a graph of volume of oxygen against time using the same axes as in (b). Label the graph B. (01 mark)

(d) $50cm^3$ of 0.2M hydrogen peroxide was completely decomposed at room temperature. Calculate the volume of oxygen given off at r.t.p
(1 mole of a gas occupies $24dm^3$ at r.t.p) (03 marks)

12. (a) Describe how a dry sample of hydrogen can be prepared.
(The diagram is not required) (04 marks)

(b) Describe the reaction which takes place between hydrogen and lead (II) oxide. (03 marks)

(c) Under suitable conditions, sulphuric acid reacts with copper metal.

i) State the conditions under which sulphuric acid reacts with copper. (01 mark)

ii) Write an equation for the reaction which takes place. (1½ marks)

(d) State what is observed and write an equation for the reaction when dilute sulphuric acid is added to;

i) calcium chloride solution. (2½ marks)

ii) copper (II) carbonate powder. (03 marks)

13. Fats and vegetable oils are important raw materials for the manufacture of soap.

(a) i) State the differences between fats and vegetable oils. (01 mark)

ii) Name one crop in Uganda that is a source of oil for the manufacture of soap. (01 mark)

(b) i) Define the term soap. (01 mark)

ii) Describe how you can prepare soap in the laboratory. (05 marks)

(c) i) Write formulae of two cations which cause water hardness. (02 marks)

ii) State one chemical method that can be used to remove permanent hardness from water. (½ mark)

(d) When soap is used to wash with hard water a scum is produced.

i) With the help of an equation explain what is meant by a scum. (2½ marks)

ii) State two problems caused by formation of a scum during washing. (02 marks)

14. Chlorine can be manufactured by electrolysis of concentrated sodium chloride solution using the mercury cathode cell.

(a) Name the material used as the anode. (01 mark)

(b) Write an equation for the reaction which takes place at the;

i) anode (1½ marks)

ii) cathode (1½ marks)

(c) i) With the help of a diagram describe how anhydrous iron (III) chloride can be prepared. (5½ marks)

ii) Describe a test that is used to confirm the presence of the anion in iron (III) chloride solution. (01 mark)

(d) State what is observed when chlorine is reacted with each of the following;

i) Sodium bromide solution. (01 mark)

ii) Warm turpentine. (01 mark)

iii) Iron (II) chloride solution. (01 mark)

(e) Write an equation for the reaction in d(i). (1½ marks)

END