Name..... Signature.....

School..... Index No.....

545/2
CHEMISTRY
Paper 2
July/August 2023
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, Na = 23, C = 12, O = 16, H = 1, Molar gas volume at s.t.p = 22.4dm^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. (a) Steel and Magnesium oxide are both important chemical substances.

(i) State **two** properties that make steel different from magnesium oxide. (2 marks)

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(ii) State the method by which the components in steel can be separated. (½mark)

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(b) Ammonium chloride was dissolved in water to form a uniform solution.

(i) State what was observed when, the solution is tested with methyl orange indicator. (½marks)

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(ii) Give a reason for your answer. (2 marks)

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2. The atom of element Z of mass number 31 has 15 protons.

(a) (i) State the number of neutrons in Z. (1 mark)

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(ii) Write the electronic configuration of the ion of Z. (1 mark)

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(b) To which group of the periodic table does Z belong? (½mark)

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(c) Write the formula of the oxide of Z and state the type of bond in the oxide.

Formular; ..... (1 mark)

Type of bond; ..... (½mark)

(d) An atom Q consists of 17 neutrons and 15 protons. Which term is used to describe the relationship between Q and Z.? (1 mark)

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3. (a) Gas W can be prepared using a mixture of Zinc granules, dilute hydrochloric acid and Copper (II) sulphate.

(i) Identify gas W (½ marks)

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(ii) Write equation for the reaction leading to the formation of gas W. (1½ marks)

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(iii) State the role of copper (II) sulphate in the mixture. (½ marks)

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(b) Give a reason why nitric acid cannot be used instead of hydrochloric acid in the production of gas W. (1 mark)

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(c) Gas W was burnt in excess air. State how the product formed can be identified in the laboratory. (1½ marks)

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4. (a) Define the term **rate of reaction.** (1 mark)

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(b) Oxygen can be prepared in the laboratory by decomposition of hydrogen peroxide.

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

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(ii) State **two** factors that can affect the rate of production of oxygen gas. (2 marks)

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(c) Name one other substance other than hydrogen peroxide that can be used to produce oxygen in the Laboratory. (½ marks)

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5. A compound R of formula mass 106 consists of 43.40% Sodium, 11.32% Carbon by mass and the rest being oxygen.

(a) Determine the molecular formula of R (Na = 23, C = 12, O = 16) (2 marks)

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(b) To an aqueous solution of R was added a solution containing copper (II) ions.

(i) State what was observed. (½ marks)

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

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(c) Zinc dust was added to the product in (b) and the mixture warmed.
Write down equation for the reaction that took place. (1½marks)

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6. Sodium Sulphite and Calcium Carbonate when separately treated with dilute hydrochloric acid, gaseous products were formed.

(a) Identify the gaseous products formed when dilute hydrochloric acid reacts with;

(i) Sodium sulphite (1 mark)

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(ii) Calcium carbonate (1 mark)

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(b) Write ionic equation for the reaction leading to the formation of the gaseous products identified in (a) (ii). (1½marks)

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(c) When 1.55 g of a mixture of calcium sulphate and calcium carbonate was treated with dilute hydrochloric acid, 22.4 cm^3 of carbon dioxide gas was evolved at s.t.p.
Find the mass of calcium carbonate in the mixture. (2½marks)

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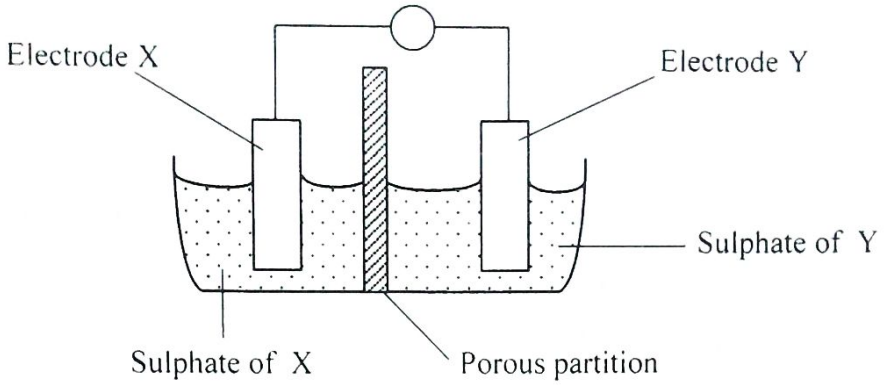
7. The diagram below shows a setup of a Daniell cell.



(a) Given that X and Y form divalent ions. Identify the metals that can be used as electrode X and Y.

(i) X ..... (½ mark)

(ii) Y ..... (½ mark)

(b) Write half cell equations for the reactions that took place at the electrode.

(i) X .....

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(1 mark)

(ii) Y .....

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(1 mark)

(c) Suggest with a reason the electrode acting as the cathode. (2 marks)

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8. (a) Define the term **heat of combustion.** (1 mark)

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(b) Methane burns in oxygen according to the equation.

$CH_{4(g)} + 2O_{2(g)} \longrightarrow CO_{2(g)} + 2H_2O_{(l)}$

Given that the enthalpy of combustion of methane is –890 KJ Mol^{-1}.

(i) Calculate the mass of methane that must be burnt to produce –5050 KJ of heat. (2½marks)

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Turn Over

(ii) Which of the two substances, methane and ethane, would produce more heat? Briefly explain your answer. (1½marks)

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9. (a) Complete each of the following organic reactions and in each case name the major product.

(i) $C_2H_5OH_{(l)} \xrightarrow[180^0C]{\text{Conc } H_2SO_4}$ ..... (1 mark)

Name of major product ..... (½marks)

(ii) $C_6H_{12}O_{6(l)} \xrightarrow[35^0C]{\text{yeast}}$ ..... (1 mark)

Name of major product ..... (½marks)

(b) Name a reagent that can be used to identify the major product in (a) (i) above. (1 mark)

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(c) Write the equation for combustion of the major product in (a) (ii) above. (1½marks)

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10. (a) Common salt is prepared in the laboratory by reacting Sodium hydroxide and hydrochloric acid.
Name the process of salt formation used. (1 mark)

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(b) To an aqueous solution of common salt was added silver nitrate solution followed by dilute nitric acid.

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

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

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(c) Name **one** method that can be used to isolate common salt from its mixture with Sodium Carbonate. (½marks)

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SECTION B

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

11. (a) (i) Draw a labelled diagram of the setup of apparatus that can be used to prepare sulphur dioxide in the laboratory. (3½ marks)

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

(b) State what is observed and write equation for the reaction in each case when sulphur dioxide is:

(i) passed through a jar containing red flowers. (2 marks)

(ii) treated with hydrogen sulphide. (2 marks)

(c) Using sulphur dioxide as a starting material describe the preparation of sulphuric acid on industrial scale (include equations in your answer). (6 marks)

12. During the extraction of nitrogen from air the mixture is first passed through heated copper, then through sodium hydroxide solution.

(a) State the reason for passing the air:

(i) Over heated copper. (1 mark)

(ii) Through sodium hydroxide solution. (1 mark)

(iii) Write equations for the reactions that take place in a(i) and a(ii) above. (3 marks)

(b) Describe the manufacture of ammonia using nitrogen as one of the raw materials. (4½ marks)

(c) Ammonia gas was dissolved in water and the resultant solution added to a solution of zinc sulphate drop wise until in excess.

(i) State what was observed. (1½marks)

(ii) Explain your observation. (4 marks)

13. (a) Describe how iron (III) chloride can be prepared in the laboratory. (diagram not required) (3 marks)

(b) Iron (III) chloride was dissolved in water and the resultant solution divided into two parts.
State what was observed when:

(i) Sodium hydroxide was added to the first portion drop wise until in excess. (1 mark)

(ii) Lead (II) nitrate solution was added to the second portion and warmed. (1½ mark)

(c) Extraction of iron is a reduction process that goes on in three stages.
Write equations to illustrate the chemical reaction that accompany the following processes in iron extraction.

(i) Formation of carbon monoxide from coke. (2½marks)

(ii) Reduction of the ore. (1½marks)

(iii) Removal of silicon dioxide by quick lime. (2½marks)

(d) Describe the reactions between iron and each one of the following;

(i) Hydrochloric acid. (1½marks)

(ii) Steam. (1½marks)

14. (a) Graphite is one of the crystalline allotropes of carbon.

(i) Define the term allotropes. (1 mark)

(ii) Draw the structure of graphite. (2 marks)

(iii) State why graphite conducts electricity while other allotropes do not. (1 mark)

(b) Explain each of the following observations.

(i) When a carbon dioxide is bubbled through calcium hydroxide for a long time, a white precipitate is formed which dissolves to form a colorless solution. (4 marks)

(ii) When a charcoal stove is used in a poorly ventilated room suffocation occurs; (2 marks)

(iii) Carbon dioxide is not satisfactorily prepared from calcium carbonate and dilute sulphuric acid. (3 marks)

(iv) Ammonia gas in the laboratory cannot be dried using sulphuric acid. (2 marks)

END