Name ……

School:…..…….……Reference No:……..

545/2
Chemistry
Paper 2
2 hours

KAMOTA MOCK EXAMINATIONS 2023

UGANDA CERTIFICATE OF EDUCATION

CHEMISTRY

PAPER 2

TIME: 2 HOURS

Instructions:

- This paper consists of two Sections **A** and **B**
- **Section A** consists of **10** structured questions. Attempt 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. Attempt **ONLY TWO** questions from this section. Answers to the questions must be written in the answer booklets provided
- In both sections all working must be shown clearly

FOR EXAMINER'S USE ONLY														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	TOTAL

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SECTION A:
All questions are compulsory

1. When calcium turnings were added into water in a beaker, bubbles of a colourless gas, **X** ,and a cloudy solution formed.
   a) State the identity of :
      (i) Gas **X** (½ mark)

   ……..
      (ii) The cloudy solution. (½ mark)

   …….

   b) Write equation for the reaction leading to the formation of gas **X.** (1½ mark)
   ……

   …….

   c) State.
      (i) How gas **X** could be identified in the laboratory. (1½ marks)

   ……

   ……

   ……..
      (ii) One laboratory use of the resultant solution in the beaker. (1 mark)
   ……

   …….
2. a) State the principle on which each of the following methods of separating mixtures works.
      (i) Chromatography (1 mark)
   ……

   …….
      (ii) Fractional Crystallization (1 mark)
   ……

   …….

   b) Sate what would be observed and give a reason for your observation, if a mixture of water and the following sub- stand was shaken, then allowed to stand for some time.
      (i) Ethanol
      - Observation (½ mark)

        ……
      - Reason (½ mark)

        ……..

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(ii) Eddible oil

- Observation (½ mark)

……

- Reason (½ mark)

……

c) Name a piece of apparatus that can be used to separate components of the mixture in (b) (ii) (1 mark)

……..

3. Ethanol obtained from glucose can be converted to ethene as shown below.

$$C_6H_{12}O_6 \xrightarrow{\text{STEP I}} C_2H_5OH \xrightarrow{\text{STEP II}} C_2H_4$$

a) Name the process that takes place in

(i) Step I (½ mark)

……..

(ii) Step II (½ mark)

……

b) State

(i) One other product formed together with ethanol in step I (½ mark)

……

(ii) The conditions for the conversion in step II (1½ marks)

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……

c) Ethene can be converted to a polymer J of relative molecular mass 16,800.

(i) Write the structural formula of **J**. (1 mark)

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(ii) Calculate the number of moles of ethene that make up **J**. (1 mark)

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(iii) Give one disadvantage of continued use of **J**. (½ mark)

……

……

4. a) Name one crystalline and one amorphous allotrope of carbon and in each case state one use of the allotrope that you have named.

(i) Crystalline carbon allotrope. (½ mark)

……

Use (½ mark)

……..

(ii) Amorphous carbon allotrope (½ mark)

……

Use (½ mark)

……

b) Write equation for the reaction to show

(i) Combustion of carbon monoxide (1 mark)

……

……

(ii) Reduction of iron (II, III) oxide by carbon monoxide. (1½ mark)

……

……

c) State one practical application of the reaction in (b) (ii) (½ mark)

……..

5. a) 2.0g of ammonium nitrate was dissolved in 100cm^3 of water; and the temperature of the water dropped from 25.0^0 C to 21.0^0 C.

a) Give a reason why there was a drop in the temperature of the water. (1 mark)

……

……

……

b) Calculate the molar enthalpy of solution of ammonium nitrate. (4 marks)

(H = 1, N = 14, O = 16, density of water is 1gcm^{-3} and the heat capacity of water = 4.2 Jg^{-1} k^{-1})

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6. a) (i) Define the term electrolyte. (1 mark)

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(ii) Water in which a small amount of acid has been added is an electrolyte whereas pure water is a non- electrolyte. Give a reason for this observation. (1 mark)

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b) Melton lead (11) bromide conducts electricity whereas solid lead (11) bromide does not. Explain briefly (2 marks)

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c) Name the particles by means of which electric current is conducted in
(i) Carbon electrodes (½ mark)

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(ii) Molten lead (11) bromide (½ mark)

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7. Under suitable conditions, hydrogen peroxide, solution $H_2O_{2\,(aq)}$ can decompose rapidly to produce oxygen.
   a) (i) Write equation for the decomposition of hydrogen peroxide. (1½ mark)

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   ……

   (ii) State two ways in which the decomposition of hydrogen peroxide can be made to occur rapidly. (1 mark)

   ……

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   ……..

   b) Burning magnesium ribbon was lowered into a jar of oxygen.
   (i) State what was observed. (1 mark)

   ……

   ……

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

   ……

   ……

8. The atomic numbers of elements **W**, chlorine and **Y** are **15, 17** and **20** respectively.
   a) Write the electronic configuration of an atom of element.
   (i) **W** (½ mark)

   ……..
   (ii) **Y** (½ mark)

   ……..
   b) State which one of the elements **W** or **Y** would form a chloride which is
   (i) A solid with high melting point. (½ mark)

   ……..
   (ii) A volatile liquid at room temperature. (½ mark)

   ……..
   c) Give reasons for your statement in (b) (1 mark)

   ……

   ……

   d) State how a chloride ion in aqueous solution can be identified. (1½ mark)

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9. a) Anhydrous sodium carbonate was dissolved in water to form carbonic acid and sodium hydroxide as shown in the equation below:

$Na_2 CO_{3(s)} + H_2 O_{(1)} \longrightarrow 2Na OH_{(aq)} + H_2 CO_{3(aq)}$

The solution turned red litmus blue

Give a reason

……

……

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……

b) Dilute sulphuric acid was added to sodium hydrogen carbonate solution.

(i) State what was observed. (½ mark)

……..

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

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c) (i) Name one reagent that can be used to differentiate between aqueous sodium carbonate and aqueous sodium hydrogen carbonate. (1 mark)

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(ii) State what would be observed if the reagent you have named in (c) (i) was treated separately with aqueous sodium carbonate and aqueous sodium hydrogen carbonate. (1 mark)

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10. a) Sulphur dioxide can be prepared by burning iron pyrites, FeS_2, in air according to the following equation.

$4FeS_{2(s)} + 11O_{2(g)} \longrightarrow 2Fe_2 O_{3(s)} + 8SO_{2(g)}$

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Calculate the volume of sulphur dioxide evolved at room temperature when 9.60g of iron pyrites is reacted with excess oxygen. (2½ marks)
(Fe = 56, S = 32; 1 mole of a gas occupies 24 dm^3 at room temperature.)

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b) During the manufacture of sulphuric acid by the contact process, sulphur dioxide is heated with oxygen in the presence of a catalyst.

(i) Name the catalyst. (1 mark)

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(ii) Write equation for the reaction between sulphur dioxide and oxygen. (1½ marks)

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SECTION B (30 MARKS)

Answer any two questions only in this section. Extra – questions only in this section. Extra – questions answered will not be marked.

11. a) A pure dry sample of chlorine was prepared in a fume cupboard in the laboratory by adding concentrated hydrochloric acid from a tap funnel onto a solid, **R** in a flask and then

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heating the mixture. The gas evolved, was passed through water, then through a liquid, **T**, before it was collected.

(i) Identify **R**. (1 mark)

(ii) State why the preparation of chlorine was carried out in the fume cupboard. (1 mark)

(iii) Name **T** and state its role. (1 mark)

(iv) Give a reason why **T** was preferred for its role, which you have stated in (iii) (1 mark)

(v) Why was chloride passed through water? (½ mark)

(vi) State, giving a reason, a method by which chloride was collected. (1 mark)

(vii) Write equation for the reaction, which led to the formation of chlorine. (1½ marks)

b) Chlorine was bubbled through saturated potassium iodide solution, which was containing tetrachloromethane and the mixture shaken, and left to stand for some time.

(i) State what was observed. (2 marks)

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

c) When exposed to bright sunlight, chlorine water produces a colourless gas,

(i) Name the gas (½ mark)

(ii) Explain briefly, how the gas was formed. (2½ marks)

d) (i) Write equation for the reaction that can take place between iron and chlorine. (1½ mark)

(ii) Give a reason why the reaction in (d) (i) is regarded as oxidation. (1 mark)

12. A compound **Q** consists of **26.7%** carbon and **2.2%** hydrogen by mass; the rest being oxygen.

a) Calculate the empirical formula of **Q**. **(H = 1, C = 12, O = 16)** (3½ marks)

b) An aqueous solution of **Q** turns blue litmus paper pale red.

(i) Suggest how the P^H value of a **2M** aqueous solution of **Q** would compare with the P^H value of a **2M** hydrochloric acid. Give a reason for your suggestion. (2 marks)

(ii) Predict how **Q** would react with magnesium powder. (1½ arks)

(iii) Write an ionic equation for the reaction that you have predicted in (b) (ii) (1½ marks)

c) $100cm^3$ of a solution containing **4.5g of Q** per dm^3 of solution required exactly **0.12g** of magnesium powder for complete reaction.

(Mg=24, 1 mole of Q reacts with 1 mole of magnesium.)

Calculate

(i) The concentration of **Q** in mole per dm^3. (3 marks)

(ii) The formula mass of **Q**. (2 marks)

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d) Determine the molecular formula of **Q.** (2 marks)

13. Under suitable conditions iron can rust.
a) Sate (i) what is meant by the term "rusting." (1 mark)

(ii) The condition(s) necessary for iron to rust. (2 marks)

b) (i) Draw labeled diagram(s) for a set up of an experiment which can be used to show that the condition(s) you have stated in (a)(ii), is / are necessary for iron to rust. (5 marks)

(ii) State and explain observations that would be made if the experimental set up in the diagrams that you have drawn in (b) (i) was allowed to stand for some days. (4 marks)

c) (i) State two methods by which rusting can be prevented. (2 marks)

(ii) Give one reason why rusting must be prevented. (1 mark)

14. a) Describe the effect of heat on the nitrates of copper, potassium and silver, illustrating your answers with equations. (7 marks)

b) Potassium nitrate can be used in the preparation of nitric acid.
(i) State the conditions and write equation for the reaction that leads to the formation of nitric acid. (3 marks)

(ii) Draw a labeled diagram of the set up of apparatus used in the laboratory preparation of nitric acid. (3 marks)

c) Write equation for the reaction of nitric acid with sulphur. (1½ marks)

d) State one use of nitric acid. (½ mark)

END

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