Candidate's Name: .....

School:.....

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Sign: .....

Centre No.					Personal No.		
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545/2
CHEMISTRY
Paper 2
JULY/AUG. 2023
2 hours

HOIMA DIOCESE EXAMINATIONS BOARD

UCE Mock Examination, 2023

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. Attempt any* **two** *questions from this section.*
Any additional question(s) answered will **not** *be marked.*
Answers to the questions **must** *be written on the answer sheets provided.*

In both sections **all** *working must be clearly shown and must be in* **blue** *or* **black** *ink.*

Any work done in **pencil** *will not be marked except drawings.*

Mathematical tables and silent non-programmable calculators may be used and where necessary use;
$H = 1, C = 12, O = 16, N = 14, S = 32, Cl = 35.5, Na = 23, Fe = 56, Mg = 24, Zn = 65, K = 39$

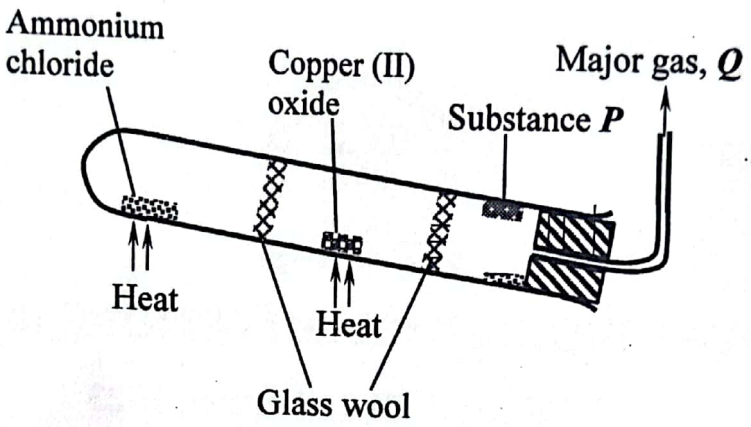
Density of water = 1 $g\ cm^{-3}$.
Specific heat capacity of water = 4.2 $J\ g^{-1}\ K^{-1}$.
1 mole of gas occupies 24 dm^3 at room temperature.
1 mole of gas occupies 22.4 dm^3 at s.t.p

For Examiners' Use Only														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total

SECTION A (50 MARKS)

Attempt **all** *questions in this section in the spaces provided only.*

1. When copper (II) oxide powder and ammonium chloride crystals were separately and concurrently heated strongly in a dry boiling tube shown in the diagram below, a gas reacted with copper (II) oxide.



(a) Name

(i) the process that took place as ammonium chloride was being heated. *(0½ mark)*

.....

(ii) the gas that reacted with copper (II) oxide. *(0½ mark)*

.....

(iii) substance, ***P***. *(0½ mark)*

.....

(iv) the major gas, ***Q***. *(0½ mark)*

.....

(b) (i) State what was observed as copper (II) oxide was being heated. *(01 mark)*

.....

.....

.....

(ii) Write equation of the reaction between copper (II) oxide and the gas. *(01½ marks)*

.....

.....

(c) State **one** use of the gas that reacted with copper (II) oxide. *(0½ mark)*

.....

2. The table below shows the periods in the Periodic table to which atoms of elements ***W***, ***X***, ***Y*** and ***Z*** belong whereby ***X*** and ***Z*** are non-metals.

Atoms of elements	***W***	***X***	***Y***	***Z***
Period	3	3	4	3

When the atoms combined, they formed compounds: W_2X_3 and YZ_2.

(a) Write the electronic configuration of atom

(i) ***W***. *(0½ mark)*

.....

(ii) ***Z***. *(0½ mark)*

.....

(b) State the type of bond that exist in compound, YZ_2. *(0½ mark)*

.....

(c) Using outermost shell electrons only, show how a compound is formed between atoms, ***W*** and ***Z***. *(01½ marks)*

(d) Write the formula of the

(i) carbonate of ***W***. *(0½ mark)*

.....

(ii) ion formed by the atom of element, ***X***. *(0½ mark)*

.....

(e) Give **two** properties of compound, W_2X_3. *(01 mark)*

.....

.....

3. A mixture of Sodium carbonate, Calcium oxide and Zinc nitrate was heated strongly in a dry test tube.

(a) Which of these substance(s) undergoes

(i) a physical change? *(01 mark)*

.....

(ii) a chemical change? *(0½ mark)*

.....

(b) State what was observed when the mixture is heated. *(01½ marks)*

.....

.....

.....

(c) Write equation(s) of reaction for the substance(s) where a chemical change took place. *(01½ marks)*

.....

.....

.....

(d) Give **one** use of the substance(s) that undergoes a physical change. *(0½ mark)*

.....

.....

4. Organic compounds of general formula, C_nH_{2n} can be obtained from alcohols.

(a) Name the class of organic compounds with general formula, C_nH_{2n}. *(0½ mark)*

.....

(b) Name and write the structural formula of the **second** member of the class you have named in (a).

(i) Name: *(0½ mark)*

.....

(ii) Structural formula: *(0½ mark)*

.....

.....

.....

(c) Write equation of reaction and state the conditions for the reaction showing how the compound you have name in (b) (i) is obtained from an alcohol.

(i) Condition(s): *(01½ marks)*

.....

.....

.....

(ii) Equation: *(01 mark)*

.....

.....

(d) State what is observed when the compound you named in (b) (i) is bubbled through liquid bromine. *(01 mark)*

.....

.....

5. A small piece of Zinc granule was dropped into a test tube which was half full of a solution consisting of the **ions** of magnesium, copper and sulphate. The mixture was shaken for some time until no further change. The mixture was then filtered.

(a) (i) State what was observed. *(01½ marks)*

.....

.....

.....

(ii) Name the substance present in the residue. *(0½ mark)*

.....

(b) Sodium hydroxide solution was added to a small amount of the filtrate in another test tube dropwise until in excess. The mixture was filtered.

(i) State what was observed. *(01 mark)*

.....

.....

(ii) Write **ionic** equation leading to the formation of the substance in the residue. *(01½ marks)*

.....

.....

(iii) Write the formula of the **anion** present in the filtrate. *(0½ mark)*

.....

.....

6. When Excess dry carbon monoxide gas was passed over **2.32 g** of a hot oxide of iron, **1.68 g** of iron was formed.

(a) (i) Determine the empirical formula of the oxide of iron. *(02½ marks)*

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.....

(ii) Deduce the molecular formula of the oxide of iron. *(0½ mark)*

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(b) Write equation of the reaction between carbon monoxide and the oxide of iron. *(01½ marks)*

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7. An oily extract from sim-sim seeds was boiled with sodium hydroxide solution for some time leading to the formation of compound, ***T***.

(a) Name

(i) the compound, ***T***, formed in this reaction. *(0½ mark)*

.....

(ii) the process leading to the formation of compound, ***T***. *(0½ mark)*

.....

(b) State how the solid of compound, ***T***, is obtained from the reaction mixture.
(01½ marks)

.....

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.....

.....

(c) A solution of compound, ***T***, was added slowly to a solution of Calcium hydrogen carbonate until in excess.

(i) State what was observed. *(01 mark)*

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.....

(ii) Write an **ionic** equation of the reaction that took place. *(01½ marks)*

.....

.....

(d) Give **one** way in which a solution of Calcium hydrogen carbonate can be changed to react easily with the solution of compound, ***T***. *(0½ mark)*

.....

.....

8. The oxides of some metals are very useful during the preparation of oxygen gas in the laboratory.

(a) Name **one** metal whose oxide

(i) is used as a catalyst during the preparation of oxygen gas. *(0½ mark)*

.....

(ii) reacts with water to produce oxygen gas. *(0½ mark)*

.....

(b) **450.00** cm^3 of oxygen gas was produced at room temperature for the reaction of your answer in (a) (ii).

(i) Write equation of reaction leading to the formation of oxygen gas.
(01½ marks)

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.....

.....

Turn Over

(ii) Calculate the mass of the oxide that was used in this reaction. (*02½ marks*)

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.....

(c) Give **one** use of oxygen gas. (*0½ mark*)

.....

9. When **4.3** g of Sodium nitrate crystals were dissolved in **37.1** cm^3 of water in a plastic cup, the temperature of the water changed from **25** °C to **19** °C.

(a) Why was a plastic cup used in this experiment? (*0½ mark*)

.....

.....

(b) State and give a reason whether the dissolution of sodium nitrate is exothermic or endothermic. (*01 mark*)

.....

.....

.....

(c) Calculate

(i) the heat change that occurred. (*01½ marks*)

.....

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.....

(ii) the enthalpy of solution of sodium nitrate. *(01½ marks)*

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10. Manganese (IV) oxide is an oxidising agent that can react with hydrochloric acid.

(a) What is an **oxidising agent**? *(01 mark)*

.....

.....

.....

(b) State

(i) the condition(s) required for the reaction to take place. *(01 mark)*

.....

.....

(ii) what is observed in the reaction apparatus. *(01 mark)*

.....

.....

(iii) **one** of the precautions taken in this reaction and give a reason for your answer. *(0½ mark)*

.....

.....

(c) Write equation of the reaction that takes place. *(01½ marks)*

.....

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SECTION B (30 MARKS)

Attempt any **two** *questions from this section.*
Write the answers to these questions on the answer sheets/booklets provided.

11. The reaction between Sulphuric acid and Carbon leads to the formation of Carbon dioxide and gas, ***Q***.

(a) (i) Name gas, ***Q***. *(0½ mark)*
(ii) State the condition(s) for the reaction. *(01 mark)*
(iii) Write equation of the reaction that takes place. *(01½ marks)*

(b) (i) Apart from carbon, name **one** other non-metal and **one** metal that can react with Sulphuric acid under similar conditions to produce gas, ***Q***. *(01 mark)*
(ii) Write equation of reaction in each case for the non-metal and metal you have named with the acid. *(03 marks)*

(c) A compound, ***Y***, can also react with Sulphuric acid to produce gas, ***Q***, in the laboratory.

(i) Name compound, ***Y***. *(0½ mark)*
(ii) Describe how a dry sample of gas, ***Q***, can be prepared from Sulphuric acid and compound, ***Y***. *(06½ marks)*

(d) State how gas, ***Q***, can be identified in the laboratory. *(01 mark)*

12. A sample of hydrogen chloride gas was produced when **7.45** g of Potassium chloride crystals were reacted with an acid.

(a) (i) Name the acid used in this reaction. *(0½ mark)*
(ii) State the condition(s) for the reaction. *(01 mark)*
(iii) Write equation of the reaction that takes place. *(01½ marks)*
(iv) Calculate the volume of hydrogen chloride gas that was produced in this reaction. *(02½ marks)*

(b) Describe how a dry sample of hydrogen chloride gas can be prepared from potassium chloride and the acid you have named in (a) (i). *(05½ marks)*

(c) Chlorine water forms a solution of hydrogen chloride when exposed to sunlight.

(i) Name another substance produced in this reaction. *(0½ mark)*
(ii) Write equation of the reaction that takes place. *(01½ marks)*

(d) Explain why an aqueous solution of hydrogen chloride gas liberates carbon dioxide gas from hydrogen carbonates whereas a solution of hydrogen chloride in methylbenzene does not. *(02½ marks)*

13. Starch and polythene are polymers.

(a) What is a **polymer**? *(02 marks)*

(b) State **one** major difference between starch and polythene. *(01 mark)*

(c) Name the monomer(s) of these two polymers. *(01 mark)*

(d) Give **one** other polymer in the category of
(i) starch. *(0½ mark)*
(ii) polythene. *(0½ mark)*

(e) Briefly describe how the monomer(s) of
(i) starch can be converted to an alcohol. *(03½ marks)*
(ii) polythene can be prepared from an alcohol. *(04½ marks)*
(No diagram is required in both cases)

(f) The monomer(s) of polythene can react with bromine water.
(i) State what is observed. *(01 mark)*
(ii) Write equation of the reaction that takes place. *(01 mark)*

14. Explain the following observations, illustrating your answer(s) with equation(s) where necessary.

(a) When Silver nitrate crystals were heated strongly in a dry test tube, reddish brown fumes were produced that were able to relight a glowing splint. A grey solid was left as the residue. *(03½ marks)*

(b) When electrolysis of a concentrated solution of sodium chloride solution was done using carbon electrodes, a solution that turned litmus solution to blue was formed at the end. *(04 marks)*

(c) When dissolved in water, ammonium chloride exists as shown in the equation below:

$$NH_4Cl\ (s) + H_2O\ (l) \longrightarrow NH_4OH\ (aq) + HCl\ (aq)$$

The solution of ammonium chloride turns litmus paper to Red and readily reacts with solid sodium carbonate with effervescence taking place. *(03½ marks)*

(d) Sodium hydroxide pellets turn to a liquid when left in open air on a watch glass for a few hours. However, after some days a white solid is formed on the watch glass. *(04 marks)*

END