Candidates' Name: ……..…….....……..

Random No.					Personal No.		

Signature: …….....……..……

(Do not write your school / Center name or Number anywhere on this booklet)

545/2

CHEMISTRY

Paper 2

July/August **2023**

2 hours

U KAMTEC EXAMINATIONS BOARD

CHEMISTRY

Paper 2

1½ 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* **one** *question from this section.*
Answers to the question ***must*** *be written in the answer sheets provided.*

In both sections, all working must be clearly shown.
Allow **ionic** *equations in all cases.*
Where necessary use:
(C = 12; O = 16; Na = 23; S = 32; Cl = 35.5)
1mole of gas occupies 24.01 at room temperature.

1mole of gas occupies 22.41 at s.t.p.

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

 TURN OVER

SECTION A

Answer all questions in this section.

1. When 2.0g of iron filings were added to 2.0g of sulphur in a mortar and pounded very well, a substance **W** was formed. But on heating **W** in a boiling tube, a substance **X** was formed.

   (a) Identify;

   (i) **W** *(½ mark)*

   ……

   (ii) **X** *(½mark)*

   ……

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

   ……

   ……

   (c) State what would be observed if dilute hydrochloric acid was added separately to;

   (i) **W** *(1mark)*

   ……

   ……

   ……

   (ii) **X** *(1½marks)*

   ……

   ……

2. (a) Zinc nitrate can be prepared in the laboratory by reacting solid **Q** with acid **R**.

(i) State the conditions for the reaction. *(1mark)*

……

……

……

(ii) Identify **Q** and **R**. *(1mark)*

……

……

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

……

……

(b) The zinc nitrate prepared in (a) when heated gave off a brown gas **T**.

(i) Identify **T**. *(½mark)*

……

……

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

……..

……..

3. When preparing carbon dioxide in the laboratory using calcium carbonate, acid L was used but not sulphuric acid.

(a) Identify **L**. *(½mark)*

……

(b) State the conditions for the reaction. *(1mark)*

……..

……..

(c) Write ionic equation for the reaction leading to formation of carbon dioxide.

(1½marks)

……

……

(d) Explain why sulphuric acid was not used in the preparation of carbon dioxide from calcium carbonate. *(2½marks)*

……

……

……

……

4. An atom of element **Z** found in period 3 of the periodic table forms an ion with a formula $\mathbf{Z^{3+}}$**.**

(a) Write the electronic configuration of **Z**. *(1mark)*

……

(b) State the group to which **Z** belongs in the periodic table. *(1mark)*

……

(c) When **Z** was burnt in oxygen, compound **U** was formed.

(i) Write the formula of **U**. *(1mark)*

……

(ii) State the type of bond that exists in **U**. *(1mark)*

……

(d) State one property of **U**. *(½mark)*

…….....……

5. Carbon has **allotropes** with a variety of applications.

(a|) Define the term an **allotrope.** *(1mark)*

……

……

……

(b) State the major allotropes of carbon. *(1½mks)*

……

……

(c) Name the allotrope of carbon which is used.

(i) in the sugar factory. *(1mark)*

……

(ii) as a fuel. *(1mark)*

……

(iii) in electrolysis. *(1mark)*

……

6. A compound **M** of molecular mass 106 consists of 43.4% sodium, 11.3% carbon, the rest being oxygen. (a) Calculate the;

(i) empirical formula of **M**. *(2½marks)*

……

……

……
……

……

……

……

……

(ii) molecular formula of **M**. *(1mark)*

……

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……

……

(b) Write the chemical name of **M**. *(1mark)*

……

(c) State one application of **M**. *(1mark)*

……

7. When sodium was burnt in air, a white solid **Y** and a yellow solid **A** were formed

(a) State condition for the formation of;

(i) **Y** *(½mark)*

……

……

(ii) **A** *(1mark)*

……

……

(b) Write the chemical name and formula of;

(i) **Y** *(1mark)*

……

……

(ii) **A** *(1mark)*

……

……

(c) Write equation for the reaction leading to formation of **A**. *(1½marks)*

……

……

8. To aqueous, copper(II) sulphate was added iron filings.

(a) State what was observed. *(1½marks)*

……

……

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

……

……

(c)) Explain the observations made in (a). *(1½marks)*

……

……

……

(d) State the name given to the reaction that took place. *(½mark)*

……

9. Ethene in the laboratory can be prepared by reacting sulphuric acid with liquid **D**.

(a) Identify **D**. *(½mark)*

……

(b) State the conditions for the reaction. *(1½marks)*

……

……

……

(c) Write equation for the reaction leading to formation of ethene. *(1½marks)*

……

……

(d) When many ethene molecules combine, a substance **E** of high molecular mass was formed.

(i) Write the chemical name and formula of **E**. *(1mark)*

……

……

……

(ii) State one use of **E**. *(½mark)*

……

……

10. (a) Electrolysis of aqueous copper II sulphate using graphite electrodes gives different products.

(i) State what would be observed at the anode. *(1½marks)*

……

……

(ii) Write equation for the reaction at the cathode. *(1½marks)*

……

……

(iii) State the application of this experiment. *(1mark)*

……

……

(b) The experiment in (a) was repeated using copper anode.

(i) State what was observed at the cathode. *(½mark)*

……

……

……

(ii) Write equation for the reaction at the anode. *(1½marks)*

……

……

……

SECTION B

Attempt any **one** *question.*

11. (a) When ammonia reacts with oxygen in presence of substance **G**, nitrogen monoxide is formed.

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

(ii) State the other conditions for the reaction. *(2marks)*

(iii) Write equation for the reaction. *(1½mark)*

(b) When litmus solution was added to the soil where ammonium sulphate had been applied, litmus turned red. Explain the observation made. *(5½mks)*

(c) State what would observed if excess aqueous ammonia was added to these aqueous solutions;

(i) Copper(II) sulphate. *(1$\frac{1}{2}$marks)*

(ii) Lead(II) nitrate. *(1mark)*

(d) Explain the observations made in c(i). *(2$\frac{1}{2}$marks)*

12. (a) Explain how dry chlorine can be prepared in the laboratory at room temperature using hydrochloric acid.

(NO DIAGRAM REQUIRED) *(7marks)*

(b) State what would be observed if chlorine was reacted with;

(i) cold dilute sodium hydroxide. *(1mark)*

(ii) hot iron. *(1½marks)*

(iii) aqueous iron II nitrate. *(1mark)*

(c) (i) Explain the observations made in b(iii). *(2½marks)*

(d) To the product in b(ii) was added silver nitrate solution.

(i) State what was observed. *(½mark)*

(ii) Write ionic equation for the reaction that took place. *(1mark)*

13. (a) Explain how sulphuric acid can be manufactured starting with sulphur. *(8marks)*

(b) (i) Describe the reaction of sulphuric acid with sucrose $C_{12}H_{22}0_{11}$. *(1½mks)*

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

(iii) State the property shown by sulphuric acid. *(1mark)*

(iv) (c) To dilute sulphuric acid was added aqueous barium nitrate.

(i) State would be observed. *(1marks)*

(ii) Write ionic equation for the reaction. *(1½marks)*

14. Lead II chloride can be prepared by precipitation.

a) State what is meant by the term **precipitation.**

(b) Describe how pure lead II chloride can be prepared in the laboratory using sodium chloride solution. *(4marks)*

(c) Explain the observation that when excess sodium hydroxide solution was added to aqueous lead II nitrate formed a white precipitate soluble. *(5½marks)*

(d) Sodium iodide solution was added to aqueous lead II nitrate.

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

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

(iii) State the practical application of the reaction in (d)(i). *(1mark)*

END

