CHEMISTRY

INSTRUCTIONS:

Section **A** consists of 10 structured questions. Attempt all the questions in this section. Answers to this section must be written in the spaces provided.

Section **B** consists of 4 semi-structured questions. Attempt any **TWO** questions from this section. Answers to the questions must be written in the ruled papers provided.

In both sections **all** working **MUST** be clearly shown.

For Examiner's Use Only														
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**TOTAL**

SECTION A

1. The electronic configuration of an atom, **B**, is 2:8:4.

   (a). State the group in the periodic table to which **B** belongs. (01 mark)

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   (b). Write the:

   (i). Electronic configuration of the ion of **B**. (01 mark)

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   (ii). Formulae of the hydride and the oxide of **B**. (02 marks)

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   (c). State the type of bond that exists exists between the hydride of B. (01 mark)

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2. Dilute nitric acid reacts with copper to form a colour less gas, which on exposure to air gives brown fumes, soluble in water.

(a). State the condition(s) under which nitric acid reacts with copper.

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(b). Name colourless gas.

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(c). Explain how the brown fumes are formed.

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(d). Give one other reaction by which the brown gas can be produced.

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(e). Write reaction to the reaction that takes place when the brown fumes dissolve in the water.

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3. (a). Carbon dioxide is prepared in the laboratory by the reaction between calcium carbonate and dilute hydrochloric acid.

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

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(ii). State what is observed when carbon dioxide gas is bubbled through limewater for a short while and later for a long time. (1mark)

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(ii). Write equation of reaction between carbon dioxide and magnesium. (1 mark)

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(b). Explain why the reaction between calcium carbonate and sulphuric can not be used to prepare carbon dioxide in the laboratory. (1½ marks)

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4. (a). Barium chloride solution is added to a solution of sodium sulphite.

(i). State what is observed. (½ mark)

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

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(b). Dilute hydrochloric acid is added to the product of reaction of reaction in (a) above, a colourless gas was evolved.

(i). Identify the colourless gas. (½ mark)

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(ii). Name one reagent that can be used to test for the colourless gas. (½ mark)

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(iii). State what would be observed if the colourless gas is bubbled through the reagent named in (b) (ii) above. (1 mark)

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(c). Write equation of reaction leading to formation of colourless gas in (b) above.

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5. (a). A compound P contains 52.17% carbon, 13.04% hydrogen and 34.78% oxygen. The vapour density is 23.

Determine the:

(i). Empirical formula of P. (03 marks)

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(ii). Molecular formula of P. (02 marks)

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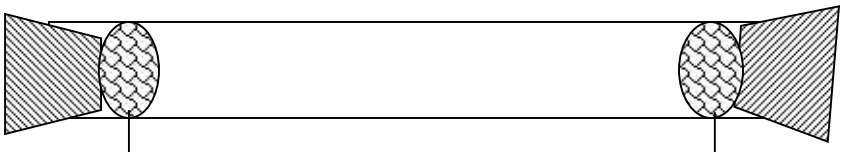
6. Two pieces of cotton wool were separately soaked in concentrated ammonia and concentrated hydrochloric acid and simultaneously used to seal the ends of a horizontal glass tube as shown below.



(a). Mark and label on the diagram the position where the white ring appeared.

(b). Explain why the ring appeared in the position you have marked. (2½ marks)

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(c). Write the equation for reaction that took place in the tube. (1½ marks)

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7. When lead (II) nitrate is heated it decomposes according to the following equation.

$$2Pb(NO_3)_{2\,(s)} \longrightarrow 2PbO_{\,(s)} + 4NO_{2\,(g)} + O_{2\,(g)}$$

(a). Calculate the mass of lead (II) nitrate necessary to produce 5.0g of oxygen on complete combustion. (2marks)

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(b). What mass of the solid residue would be left in (a) above. (2 marks)

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(c). How would you test for the oxygen gas produced in the above reaction. (1 mark)

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8. In contact process, pure sulphur dioxide is converted to sulphur trioxide.

(a). State the conditions used in the contact process. (1½ marks)

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(b). Write equation for the reaction. (1mark)

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(c). Why is necessary to purify sulphur dioxide for contact process? (½ mark)

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(d). Explain how sulphur trioxide is converted into sulphuric acid. (2marks)

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(e). State one use of sulphuric acid. (½ mark)

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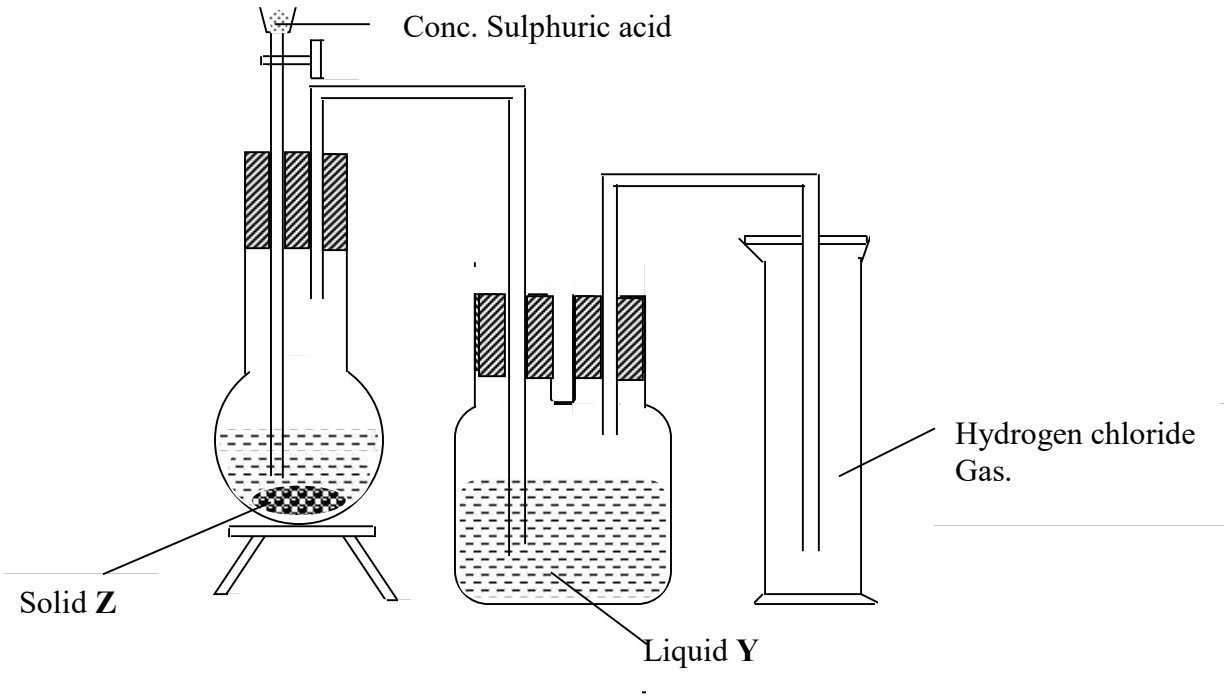
9. The diagram below shows the laboratory preparation of dry hydrogen chloride gas.



(a). Name the:

(i). Liquid **Y** (½ mark)

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(ii). Solid **Z** (½ mark)

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(b). State the role of liquid **Y** (½ mark)

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(c). (i). Write equation of reaction leading to the formation hydrogen chloride gas. (1½ marks)

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(ii). State the a property of sulphur dioxide that enables it to be collected by the method shown. (½ mark)

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(d). State what is observed when sulphur dioxide is bubbled through:

(i). Acidified potassium dichromate solution. (1mark)

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(ii). Moist hydrogen sulphide. (½ mark)

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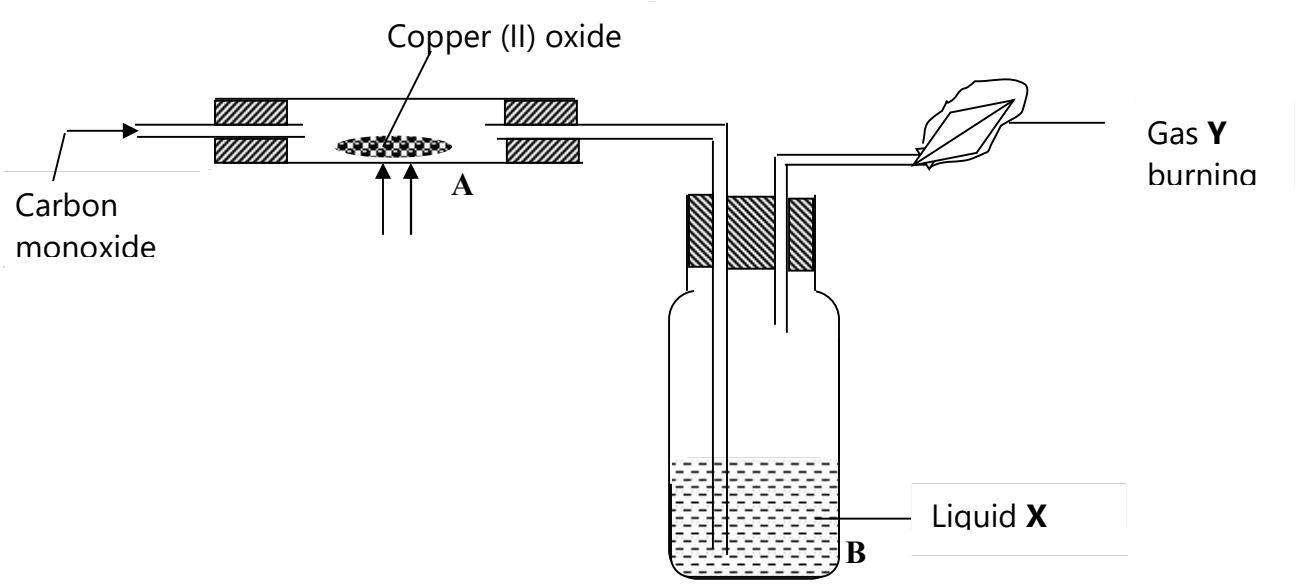
10. An experiment to investigate the effect of carbon monoxide on copper (II) oxide was carried out using the apparatus in the diagram below.



(a). Name two substances that may be used to produce carbon monoxide. (1 mark)

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(b). Write equation for the formation of carbon monoxide when the named reagents reacts. (1 marks)

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(c). (i). State what is observed when carbon monoxide was passed over heated copper (II) oxide in tube A. (½ mark)

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(ii). Write equation of reaction. (1mark)

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(d). (i). Suggest the name for liquid **X**

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(ii). What was observed in bottle **B** during the course of the experiment? (½ mark)

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(e). (i). Name gas **Y.** (½ mark)

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(ii). Name one other metallic oxide that can be reduced by carbon monoxide.

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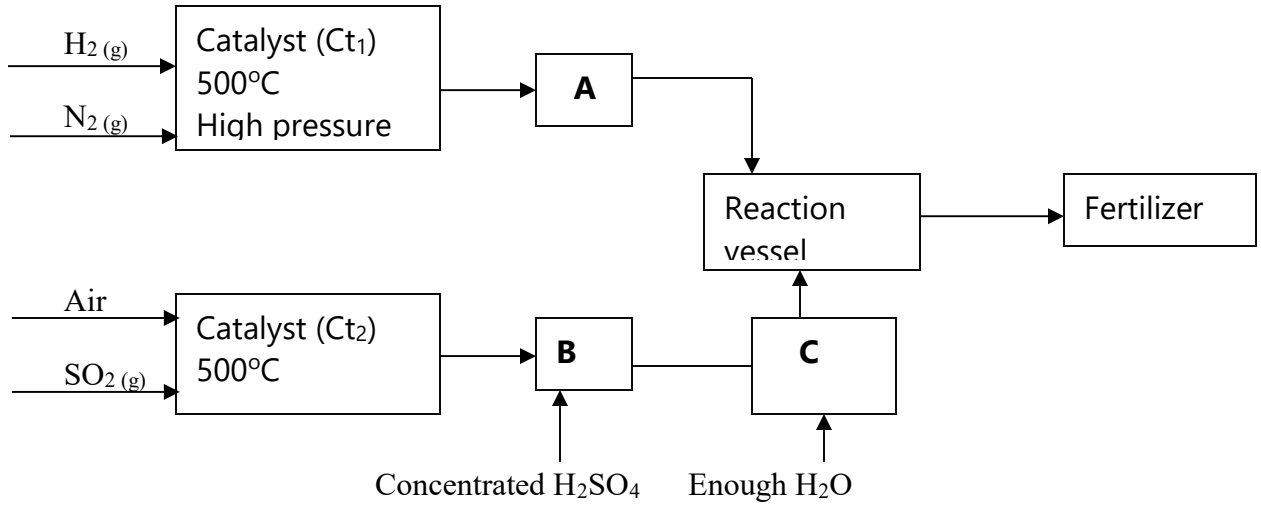
SECTION B

(Attempt any two questions from this section)

11. (a). (i). A fertilizer was labelled 20-30-40. What does this mean?
(ii). State one disadvantage of a fertilizer,

The figure below is a flow chart representing the manufacture of a fertilizer. Study it and answer the following questions



(i). What are the catalyst Ct_1 and Ct_2
(ii). Identify A, B and C.
(iii). Write equations for the reactions for the formation of A, B and C.
(iv). What is the fertilizer formed.
(v). Write equation to show the formation of the fertilizer.

(c). (i). Name one compound other than one formed above used as nitrogen fertilizer.
(ii). Give one disadvantage of using ammonia as a fertilizer.
(iii). Sometime lime is applied to soils. Give reason for your answer.

12. Carbon dioxide is prepared in the laboratory by reacting an acid with a carbonate.

(a). Write an ionic equation for reaction.

(b). Draw a labelled diagram of apparatus that can be used in laboratory to prepare and collection of dry carbon dioxide.

(c). Write equations to show how carbon dioxide reacts with each of the following and state what would be observed in each case.

(i). Sodium hydroxide solution.
(ii). Calcium hydroxide solution.
(iii). Magnesium metal.

(d). Name one process in each case by which the concentration of carbon dioxide in the atmosphere is:
(i). Increased
(ii). Decreased.

13. Explain each of the following observations and give balanced equations for reaction that occur.

(a). The PH of water left exposed to air was found to less than 7.

(b). A glass rod containing a drop of concentrated hydrochloric acid at the tip then brought into contact with ammonia gave off dense white fumes.

(c). Two pieces of blue litmus papers, one dry and other moist were placed in dry chlorine. There was no change on the first but the second was bleached.

(d). When aqueous ammonia is added to a solution of copper (II) sulphate solution dropwise until in excess a pale blue precipitate is formed and dissolved in excess to for a deep blue solution.

(e). When hydrated iron (II) sulphate is first heated gently and later strongly, a colourless vapour is formed and condenses to form a colourless liquid which turn blue cobalt chloride pink. On strong heating it decomposes to give dense white fumes and a colourless gas that decolorizes acidified potassium permanganate. The residue left reddish brown.

14. (a). (i). Draw a labelled diagram to how a sample of hydrogen can be prepared in the laboratory.
(ii). Write equation of reaction that takes place.

(b). Calcium, lead, potassium, and magnesium are part of the reactivity series.

(i). Arrange these metals in order of their reactivity starting with the most reactive metal

(ii). Describe how each of the following metals reacts with cold water or steam. Write the equation for reaction that takes place in each case.

(iii). Iron reacts with steam according to the following equation.

$$3Fe_{(s)} + 4H_2O_{(g)} \longrightarrow Fe_3O_{4(s)} + 4H_{2(g)}$$

Calculate the mass of iron required to produce $2.24dm^3$ of hydrogen gas at s.t.p. (Fe = 56, one mole of gas occupies 22.4dm3 at s.t.p)