

CHEMISTRY
SCIENCE Paper – 2

(Two hours)

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during the first 15 minutes.*

This time is to be spent in reading the Question Paper.

The time given at the head of this paper is the time allowed for writing the answers.

*Section I is compulsory. Attempt **any four** questions from Section II.*

The intended marks for questions or parts of questions are given in brackets [].

SECTION I (40 Marks)

*Attempt **all** questions from this Section*

Question 1

- (a) Fill in the blanks from the choices given in brackets: [5]
- (i) The energy required to remove an electron from a neutral isolated gaseous atom and convert it into a positively charged gaseous ion is called _____. (electron affinity, ionisation potential, electronegativity)
- (ii) The compound that does not have a lone pair of electrons is _____. (water, ammonia, carbon tetra chloride)
- (iii) When a metallic oxide is dissolved in water, the solution formed has a high concentration of _____ ions. (H^+ , H_3O^+ , OH^-)
- (iv) Potassium sulphite on reacting with hydrochloric acid releases _____ gas. (Cl_2 , SO_2 , H_2S)
- (v) The compound formed when ethene reacts with Hydrogen is _____. (CH_4 , C_2H_6 , C_3H_8)

This Paper consists of 8 printed pages.

(b) Choose the **correct answer** from the options given below:

[5]

(i) A **chloride** which forms a precipitate that is soluble in excess of ammonium hydroxide, is:

1. Calcium chloride
2. Ferrous chloride
3. Ferric chloride
4. Copper chloride

(ii) If the molecular formula of an organic compound is $C_{10}H_{18}$ it is:

1. alkene
2. alkane
3. alkyne
4. Not a hydrocarbon

(iii) Which of the following is a common characteristic of a **covalent compound**?

1. high melting point
2. consists of molecules
3. always soluble in water
4. conducts electricity when it is in the molten state

(iv) To increase the **pH** value of a neutral solution, we should add:

1. an acid
2. an acid salt
3. an alkali
4. a salt

(v) **Anhydrous iron(III) chloride** is prepared by:

1. direct combination
2. simple displacement
3. decomposition
4. neutralization

- (c) Identify the **substance** underlined, in each of the following cases: [5]
- (i) **Cation** that does not form a precipitate with ammonium hydroxide but forms one with sodium hydroxide.
 - (ii) The **electrolyte** used for electroplating an article with silver.
 - (iii) The **particles** present in a liquid such as kerosene, that is a non electrolyte.
 - (iv) An **organic compound** containing -- COOH functional group.
 - (v) A **solid** formed by reaction of two gases, one of which is acidic and the other basic in nature.
- (d) Write a *balanced chemical equation* for each of the following: [5]
- (i) Action of cold and dilute Nitric acid on Copper.
 - (ii) Reaction of Ammonia with heated copper oxide.
 - (iii) Preparation of methane from iodomethane.
 - (iv) Action of concentrated sulphuric acid on Sulphur.
 - (v) Laboratory preparation of ammonia from ammonium chloride.
- (e) State **one** relevant observation for each of the following reactions: [5]
- (i) Addition of ethyl alcohol to acetic acid in the presence of concentrated Sulphuric acid.
 - (ii) Action of dilute Hydrochloric acid on iron (II) sulphide.
 - (iii) Action of Sodium hydroxide solution on ferrous sulphate solution.
 - (iv) Burning of ammonia in air.
 - (v) Action of concentrated Sulphuric acid on hydrated copper sulphate.
- (f) (i) Draw the *structural formula* for each of the following: [5]
- 1. 2, 3 – dimethyl butane
 - 2. diethyl ether
 - 3. propanoic acid

- (ii) From the list of terms given, choose the most appropriate term to match the given description.
(*calcination, roasting, pulverisation, smelting*)
1. Crushing of the ore into a fine powder.
 2. Heating of the ore in the absence of air to a high temperature.
- (g) (i) Calculate the number of gram atoms in 4.6 grams of sodium ($\text{Na} = 23$). [5]
- (ii) Calculate the percentage of water of crystallization in $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
($\text{H} = 1, \text{O} = 16, \text{S} = 32, \text{Cu} = 64$)
- (iii) A compound of X and Y has the empirical formula XY_2 . Its vapour density is equal to its empirical formula weight. Determine its molecular formula.
- (h) Match the atomic number 2, 4, 8, 15, and 19 with each of the following: [5]
- (i) A solid non metal belonging to the third period.
 - (ii) A metal of valency 1.
 - (iii) A gaseous element with valency 2.
 - (iv) An element belonging to Group 2.
 - (v) A rare gas.

SECTION II (40 Marks)

Attempt **any four** questions from this Section

Question 2

- (a) Arrange the following as per the instruction given in the brackets: [4]
- (i) He, Ar, Ne (*Increasing order of the number of electron shells*)
 - (ii) Na, Li, K (*Increasing Ionisation Energy*)
 - (iii) F, Cl, Br (*Increasing electronegativity*)
 - (iv) Na, K, Li (*Increasing atomic size*)

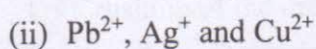
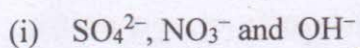
- (b) State the *type of Bonding* in the following molecules: [2]
- (i) Water
 - (ii) Calcium oxide
- (c) Answer the following questions: [2]
- (i) How will you distinguish between Ammonium hydroxide and Sodium hydroxide using copper sulphate solution?
 - (ii) How will you distinguish between dilute hydrochloric acid and dilute sulphuric acid using lead nitrate solution?
- (d) Identify the salts **P** and **Q** from the observations given below: [2]
- (i) On performing the flame test salt **P** produces a lilac coloured flame and its solution gives a white precipitate with silver nitrate solution, which is soluble in Ammonium hydroxide solution.
 - (ii) When dilute HCl is added to a salt **Q**, a brisk effervescence is produced and the gas turns lime water milky.

When NH_4OH solution is added to the above mixture (after adding dilute HCl), it produces a white precipitate which is soluble in excess NH_4OH solution.

Question 3

- (a) Draw an *electron dot diagram* to show the formation of each of the following compounds: [4]
- (i) Methane
 - (ii) Magnesium Chloride
- [H = 1, C = 6, Mg = 12, Cl = 17]
- (b) State the *observations* at the anode and at the cathode during the electrolysis of: [4]
- (i) fused lead bromide using graphite electrodes.
 - (ii) copper sulphate solution using copper electrodes.

- (c) Select the ion in each case, that would get selectively discharged from the aqueous mixture of the ions listed below: [2]



Question 4

- (a) Certain blank spaces are left in the following table and these are labelled as A, B, C, D and E. Identify each of them. [5]

	Lab preparation of	Reactants used	Products formed	Drying agent	Method of collection
(i)	HCl gas	NaCl + H_2SO_4	A _____	conc. H_2SO_4	B _____
(ii)	NH_3 gas	C _____	$\text{Mg}(\text{OH})_2$ NH_3	D _____	E _____

- (b) Write *balanced chemical equations* to show: [3]
- (i) The oxidizing action of conc. Sulphuric acid on Carbon.
- (ii) The behavior of H_2SO_4 as an acid when it reacts with Magnesium.
- (iii) The dehydrating property of conc. Sulphuric acid with sugar.
- (c) Write balanced chemical equations to show how SO_3 is converted to Sulphuric acid in the *contact process*. [2]

Question 5

- (a) (i) Propane burns in air according to the following equation: [4]
- $$\text{C}_3\text{H}_8 + 5\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}.$$
- What volume of propane is consumed on using 1000 cm^3 of air, considering only 20% of air contains oxygen?
- (ii) The mass of 11.2 litres of a certain gas at s.t.p. is 24 g. Find the *gram molecular mass* of the gas.

- (b) A gas cylinder can hold 1 kg of hydrogen at room temperature and pressure: [4]
- (i) Find the number of moles of hydrogen present.
 - (ii) What weight of CO_2 can the cylinder hold under similar conditions of temperature and pressure? ($\text{H} = 1, \text{C} = 12, \text{O} = 16$)
 - (iii) If the number of molecules of hydrogen in the cylinder is X , calculate the number of CO_2 molecules in the cylinder under the same conditions of temperature and pressure.
 - (iv) State the law that helped you to arrive at the above result.
- (c) Write a *balanced chemical equation* for the preparation of each of the following salts: [2]
- (i) Copper carbonate
 - (ii) Ammonium sulphate crystals

Question 6

- (a) Give a *balanced chemical equation* for each of the following: [4]
- (i) Action of conc. Nitric acid on Sulphur.
 - (ii) Catalytic oxidation of Ammonia.
 - (iii) Laboratory preparation of Nitric acid.
 - (iv) Reaction of Ammonia with Nitric acid.
- (b) Identify the **term** or **substance** based on the descriptions given below: [4]
- (i) Ice like crystals formed on cooling an organic acid sufficiently.
 - (ii) Hydrocarbon containing a triple bond used for welding purposes.
 - (iii) The property by virtue of which the compound has the same molecular formula but different structural formulae.
 - (iv) The compound formed where two alkyl groups are linked by $\text{--}\overset{\text{O}}{\parallel}{\text{C}}\text{--}$ group.
- (c) Give a *balanced chemical equation* for each of the following: [2]
- (i) Preparation of ethane from Sodium propionate
 - (ii) Action of alcoholic KOH on bromoethane.

Question 7

- (a) Name the following: [4]
- (i) The process of coating of iron with zinc.
 - (ii) An alloy of lead and tin that is used in electrical circuits.
 - (iii) An ore of zinc containing its sulphide.
 - (iv) A metal oxide that can be reduced by hydrogen.
- (b) Answer the following questions with respect to the electrolytic process in the extraction of aluminum: [3]
- (i) Identify the components of the electrolyte other than pure alumina and the role played by each.
 - (ii) Explain why powdered coke is sprinkled over the electrolytic mixture.
- (c) Complete the following by selecting the correct option from the choices given: [3]
- (i) The metal which does not react with water or dilute H_2SO_4 but reacts with concentrated H_2SO_4 is _____. (Al/Cu/Zn/Fe)
 - (ii) The metal whose oxide, which is amphoteric, is reduced to metal by carbon reduction _____. (Fe/Mg/Pb/Al)
 - (iii) The divalent metal whose oxide is reduced to metal by electrolysis of its fused salt is _____. (Al/Na/Mg/K)