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)*

(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 $\mathbf{C_{10}H_{18}}$ 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 (Na = 23). [5]

(ii) Calculate the percentage of water of crystallization in $CuSO_4.5H_2O$
(H = 1, O = 16, S = 32, 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]

(i) SO_4^{2-}, NO_3^- and OH^-

(ii) Pb^{2+}, Ag^+ and Cu^{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**	$Mg(OH)_2$ 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]

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$.

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? (H= 1, C = 12, 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 $-\overset{\overset{O}{\|}}{C}-$ 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)*