CHEMISTRY

(SCIENCE PAPER – 2)

Maximum Marks: 80

Time allowed: Two hours

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

*You will **not** be allowed to write during 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 A** is compulsory. Attempt **any four** questions from **Section B**.*

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

SECTION A (40 Marks)

*(Attempt **all** questions from this **Section**.)*

Question 1

Choose the correct answers to the questions from the given options. [15]

(Do not copy the questions, write the correct answers only.)

(i) Unsaturated hydrocarbons undergo:

(a) Addition reaction

(b) Substitution reaction

(c) Oxidation reaction

(d) Redox reaction

(ii) In the 2nd period Neon has maximum Ionization Potential because:

(a) It has unstable electronic configuration.

(b) It easily accepts electrons.

(c) It easily loses electrons.

(d) The outer most shell is completely filled.

(iii) Copper, Zinc and Tin are the metals alloyed to form:

(a) Duralumin

(b) Brass

(c) Bronze

(d) Solder

(iv) The metal hydroxide which reacts with both acids and alkalis to form salt and water is:

(a) Calcium hydroxide

(b) Magnesium hydroxide

(c) Aluminium hydroxide

(d) Ferric hydroxide

(v) Reaction of an alcohol with a carboxylic acid in the presence of concentrated H_2SO_4 is termed as:

(a) Halogenation

(b) Esterification

(c) Hydrogenation

(d) Dehydrohalogenation

(vi) Conversion of Ethanol to Ethene by the action of concentrated sulphuric acid involves:

(a) Dehydration

(b) Dehydrogenation

(c) Dehydrohalogenation

(d) Hydrolysis

(vii) The oxidizing agent in the equation $S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$ is:

(a) Sulphur

(b) Sulphuric acid

(c) Sulphur dioxide

(d) Water

(viii) Electron Affinity is maximum in:

(a) Mg

(b) Ar

(c) Li

(d) Br

(ix) The compound that is **not** a constituent of the electrolytic mixture used in the Hall-Heroult's process is:

(a) Al_2O_3

(b) $NaAlO_2$

(c) Na_3AlF_6

(d) CaF_2

(x) On passing ammonia gas over heated copper oxide for some time, a reddish-brown residue is left behind. What property of ammonia is demonstrated here?

(a) Basic property

(b) Oxidising property

(c) Reducing property

(d) Acidic property

(xi) Rotten egg smell is due to the liberation of:

(a) HCl gas

(b) H_2S gas

(c) Cl_2 gas

(d) SO_2 gas

(xii) Ammonia gas is collected by downward displacement of air since ammonia is:

(a) very slightly soluble in water.

(b) heavier than air.

(c) lighter than air.

(d) insoluble in water.

(xiii) Which of the following would occupy 22.4 litres at S.T.P.?

1. 32g of oxygen gas
2. 2 moles of hydrogen gas
3. 6.022×10^{23} molecules of ammonia

(a) 1 & 2

(b) 1 & 3

(c) 2 & 3

(d) 1, 2 & 3

[Atomic weights: O = 16, H = 1, N = 14]

(xiv) In the molecule of water, oxygen atom has:

(a) One shared pair of electrons.

(b) Three shared pairs of electrons.

(c) Two lone pairs of electrons.

(d) One lone pair of electrons.

(xv) A mineral from which the metal can be extracted economically and conveniently is known as:

(a) Matrix

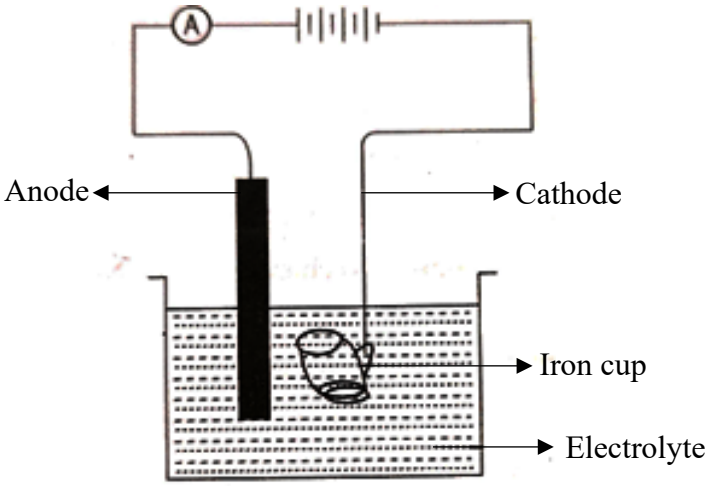
(b) Ore

(c) Flux

(d) Alloy

Question 2

(i) The following sketch represents the electroplating of an Iron cup with Nickel metal. [5]
Study the diagram and answer the following questions:



(a) During electroplating the iron cup is placed at the cathode. Why?

(b) Name the ion that **must** be present in the electrolyte.

(c) State one condition that is necessary to ensure that the deposit is smooth, firm and even.

(d) Write the reaction taking place at the cathode.

(e) What change would you observe at the anode?

(ii) Match the *Column A* with *Column B*: [5]

	Column A		**Column B**
(a)	Water	1.	Lithium
(b)	Alkali metal	2.	Iodine
(c)	Halogen	3.	Covalent compound
(d)	Calcium oxide	4.	Acetic acid
(e)	Weak acid	5.	Ionic compound
		6.	Sulphuric acid

(iii) Complete the following sentences by choosing the correct answer from the brackets: [5]

(a) The salt that can be prepared by Direct Combination is _____. *[$FeCl_3$ / $FeCl_2$]*

(b) The metallic oxide which can be reduced by using common reducing agents is _____. *[Fe_2O_3 / Al_2O_3]*

(c) The metal nitrate which on thermal decomposition forms a black residue is _____. *[zinc nitrate / copper nitrate]*

(d) During the electrolysis of copper sulphate solution, if _____ is used as electrodes, the colour of the electrolyte does not fade. *[copper / platinum]*

(e) The process of heating the concentrated ore in a limited supply or absence of air is _____ *[roasting / calcination]*

(iv) State the **terms** for the following: [5]

(a) The group obtained by removing one hydrogen atom from the parent alkane.

(b) Two metal plates or wires through which the current enters and leaves the electrolytic cell.

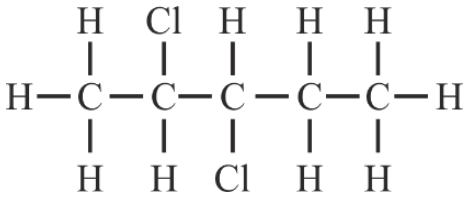
(c) The amount of substance which contains the same number of units as the number of atoms in carbon-12.

(d) The tendency of an atom to pull a shared pair of electrons towards itself in a compound.

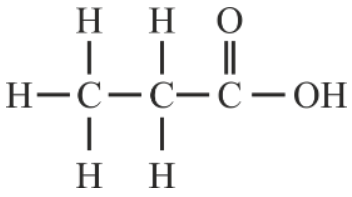
(e) The formula which represents the simplest ratio between the atoms of elements present in a compound.

(v) (a) Give the IUPAC names of the organic compounds represented by the structural formulae given below: [5]

1.



2.



(b) Draw the *structural diagram* for the following organic compounds:

1. 3-methyl pentane
2. propyne
3. methanal

SECTION B (40 Marks)

*(Attempt **any four** questions from this **Section**.)*

Question 3

(i) Rewrite the following statements by adding the correct word as shown in the example: [2]

Example:
Given Statement: Ammonia changes moist red litmus to blue.
Correct Statement: <u>Aqueous</u> ammonia changes moist red litmus to blue.

(a) Sulphuric acid acts as a dehydrating agent.

(b) Ammonia reacts with chlorine to give ammonium chloride and nitrogen.

(ii) Identify **only** the **anion** present in the following compound: [2]

(a) The compound on heating produces a colourless, odourless gas which turns lime water milky and has no effect on acidified potassium dichromate solution.

(b) The solution of the compound which on treating with concentrated sulphuric acid and freshly prepared ferrous sulphate solution produces a brown ring.

(iii) Mohan has three solutions **P**, **Q** and **R** having a pH of 13, 5 and 2 respectively. Which of the above solutions **P**, **Q** or **R**: [3]

(a) will react with Magnesium to liberate hydrogen gas?

(b) will liberate ammonia gas when it reacts with ammonium chloride?

(c) will contain molecules as well as ions?

(iv) The following table is related to an Industrial process of an acid. [3]

Name of the process	Reactant	Catalyst	Final product
(a)	$SO_2 + O_2$	(b)	(c)

Identify (a), (b) and (c).

Question 4

(i) Define the following terms: [2]

(a) Molar volume

(b) Normal salt

(ii) Draw the *electron dot* structure of: [2]

(a) Methane molecule

(b) Nitrogen molecule

[Atomic number: N = 7, C = 6, H = 1]

(iii) Complete and balance the following equations: [3]

(a) $Al_2O_3 + NaOH \rightarrow$

(b) $C_2H_5COONa + NaOH \xrightarrow[CaO]{\Delta}$

(c) $C_2H_4Br_2 +$ alcoholic $KOH \xrightarrow{\Delta}$

(iv) Choose the organic compound from the list given below to answer the following questions: [3]

Ethene	Ethanoic acid	Ethanol	Methanal

(a) The compound which does **not** have a double bond in its structure.

(b) The compound which in its pure form turns into an ice like solid on cooling.

(c) The compound which is used for artificial ripening of fruits.

Question 5

(i) Name the **main metal** used in making of the alloys given below: [2]

(a) Duralumin

(b) Stainless steel

(ii) Differentiate between the following pairs based on the criteria given: [2]

(a) Sulphuric acid and Nitric acid *(using barium chloride solution)*

(b) Unsaturated and Saturated hydrocarbons *(type of bond present)*

(iii) Calcium carbonate reacts with dilute hydrochloric acid as given below: [3]

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$$

(a) What is the mass of 5 moles of calcium carbonate? *(Relative molecular mass of calcium carbonate is 100)*

(b) How many moles of HCl will react with 5 moles of calcium carbonate?

(c) What is the volume of carbon dioxide liberated at S.T.P. at the same time?

(iv) Identify the *gas evolved* in each of the following reactions: [3]

(a) Methane undergoes complete combustion.

(b) Copper carbonate is heated.

(c) MnO_2 reacts with concentrated HCl.

Question 6

(i) **X** - $HCl \leftrightharpoons H^{1+} + Cl^{-}$ *(in solution state)* [2]

Y - $PbBr_2 \leftrightharpoons Pb^{2+} + 2Br^{1-}$ *(in molten state)*

From the above reactions **X** or **Y**, identify the reaction which exhibits:

(a) electrolytic dissociation

(b) ionization

(ii) Give reasons for the following: [2]

(a) Inert gases do not form ions.

(b) Covalent compounds have a low melting and boiling point.

(iii) Arrange the following as per the instructions given in the brackets: [3]

(a) Carbon, Fluorine, Beryllium *(decreasing order of atomic size)*

(b) Sulphuric acid, Phosphoric acid, Acetic acid *(increasing order of number of replaceable H atoms per molecule)*

(c) Potassium, Lithium, Sodium *(increasing order of ionization potential)*

(iv) Identify the following: [3]

(a) An element in period 1 which can be placed in both group 1 and group 17 of the Periodic Table.

(b) The element having electronic configuration 2, 8, 6.

(c) The most electronegative element of period 3.

Question 7

(i) Rita was given an unknown salt for identification. She prepared a solution of the salt and divided it into two parts. [2]

- To the first part of the salt solution, she added a few drops of ammonium hydroxide and obtained a reddish-brown precipitate.
- To the second part of the salt solution, she added a few drops of silver nitrate solution and obtained a white precipitate.

Name:

(a) the cation present and

(b) the anion present in the salt given for identification.

(ii) Fill in the blanks by choosing the correct answer from the bracket: [2]

(a) Carbon tetrachloride is a _____ *[polar / non-polar]* covalent molecule.

(b) During electrolysis of acidulated water, the gas liberated at the anode is _____ *[oxygen / hydrogen]*.

(iii) Ammonia burns in oxygen as shown below. [3]

$$4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$$

If 240 cc of ammonia is burnt in 300 cc of oxygen, find out the composition of the resultant gaseous mixture at room temperature.

(iv) The following table shows the electronic configuration of the atoms A, B, C and D. [3]

Element	A	B	C	D
Electronic configuration	2, 8, 8, 2	2, 6	2, 8, 7	2, 4

(a) Write the formula of the compound formed between:

1. A and B
2. D and C

(b) Which of the above elements will exhibit catenation?

Question 8

(i) Choose the correct answer from the list given below: [2]

zinc blende, C_2H_2, calamine, CH, haematite

(a) The ore which can be concentrated by magnetic separation.

(b) Empirical formula of Ethyne.

(ii) Give balanced equation for the following reactions: [2]

(a) Copper reacts with concentrated Nitric acid.

(b) Aluminium nitride is treated with warm water.

(iii) Match the salts underlined in Column A with the most suitable method of preparation given in Column B. [3]

	Column A		**Column B**
(a)	$\underline{ZnCl_2}$ from Zn	1.	Precipitation
(b)	$\underline{KNO_3}$ from KOH	2.	Direct combination
(c)	$\underline{CaCO_3}$ from $CaCl_2$	3.	Displacement reaction
		4.	Neutralization

(iv) Hydrogen chloride gas is prepared in the laboratory by the action of concentrated sulphuric acid on sodium chloride. [3]

(a) Give balanced chemical equation for the above reaction.

(b) State the method of collection of the gas formed above.

(c) What is the property of sulphuric acid that makes it a suitable reagent for the reaction?