

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.

This paper consists of 12 printed pages.

- (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 $\text{S} + 2\text{H}_2\text{SO}_4 \rightarrow 3\text{SO}_2 + 2\text{H}_2\text{O}$ 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:

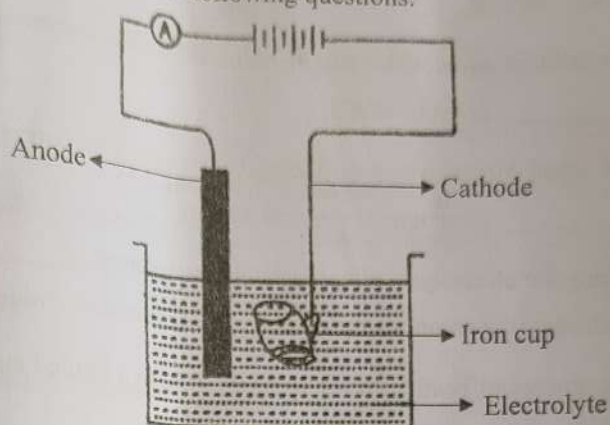
- (a) One shared pair of electrons.
- (b) Three shared pairs of electrons.
- (c) Two lone pairs of electrons.
- (d) One lone pair of electrons.

(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:



- During electroplating the iron cup is placed at the cathode. Why?
 - Name the ion that **must** be present in the electrolyte.
 - State one condition that is necessary to ensure that the deposit is smooth, firm and even.
 - Write the reaction taking place at the cathode.
 - 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 <i>b</i>
(b) Alkali metal	2. Iodine <i>c</i>
(c) Halogen	3. Covalent compound <i>a</i>
(d) Calcium oxide	4. Acetic acid
(e) Weak acid	5. Ionic compound <i>d</i>
	6. Sulphuric acid

CaO

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

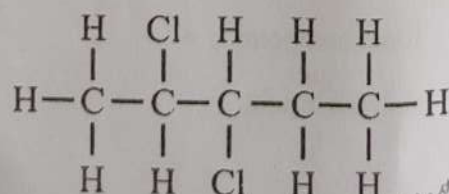
- The salt that can be prepared by Direct Combination is _____.
[FeCl₃ / FeCl₂]
- The metallic oxide which can be reduced by using common reducing agents is _____.
[Fe₂O₃ / Al₂O₃]
- The metal nitrate which on thermal decomposition forms a black residue is _____.
[zinc nitrate / copper nitrate]
- During the electrolysis of copper sulphate solution, if _____ is used as electrodes, the colour of the electrolyte does not fade. [copper / platinum]
- 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]

- The group obtained by removing one hydrogen atom from the parent alkane.
- Two metal plates or wires through which the current enters and leaves the electrolytic cell.
- The amount of substance which contains the same number of units as the number of atoms in carbon-12.
- The tendency of an atom to pull a shared pair of electrons towards itself in a compound.
- The formula which represents the simplest ratio between the atoms of elements present in a compound.

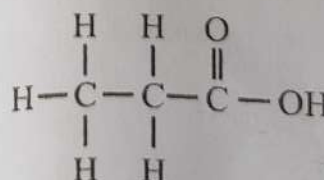
v) (a) Give the IUPAC names of the organic compounds represented by the structural formulae given below: [5]

1.



2,3-dichloropentane

2.



propanoic acid

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

1. 3-methyl pentane $\text{CH}_3 - \text{CH}_2 - \text{CH}(\text{CH}_3) - \text{CH}_2 - \text{CH}_3$
2. propyne $\text{HC} \equiv \text{C} - \text{CH}_3$
3. methanal $\text{H} - \text{C}(=\text{O}) - \text{H}$

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.

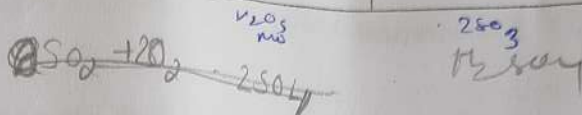
Correct Statement: Aqueous ammonia changes moist red litmus to blue.

- (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. *CO₂*
- (b) The solution of the compound which on treating with concentrated sulphuric acid and freshly prepared ferrous sulphate solution produces a brown ring. *NO₃⁻*
- (iii) Mohan has three solutions P, Q and R having a pH of 13, 5 and 2 respectively. [3]
- Which of the above solutions P, Q or R:
- (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)	$\text{SO}_2 + \text{O}_2$	(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) $\text{Al}_2\text{O}_3 + \text{NaOH} \rightarrow$
- (b) $\text{C}_2\text{H}_5\text{COONa} + \text{NaOH} \xrightarrow[\text{CaO}]{\Delta}$
- (c) $\text{C}_2\text{H}_4\text{Br}_2 + \text{alcoholic KOH} \xrightarrow{\Delta}$

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

Ethene	Ethanoic acid	Ethanol	Methanal
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- (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]
- $$\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$$
- (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 - $\text{HCl} \rightleftharpoons \text{H}^{1+} + \text{Cl}^-$ (*in solution state*) [2]
Y - $\text{PbBr}_2 \rightleftharpoons \text{Pb}^{2+} + 2\text{Br}^{1-}$ (*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.

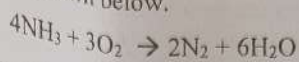
Name:

- (a) the cation present and Cu^{2+} Ag^{+}
- (b) the anion present in the salt given for identification. SO_4^{2-}

(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]



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 <i>Ca</i>	2, 6 <i>O</i>	2, 8, 7 <i>Cl</i>	2, 4 <i>C</i>

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

1. A and B *CaO*

2. D and C *CCl₄*

- (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. *$\text{Cu} + 6\text{HNO}_3 \rightarrow 4\text{NO} + 4\text{H}_2\text{O} + 2\text{Cu}(\text{NO}_3)_2$*

- (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

(a) ZnCl_2 from Zn *L*

(b) KNO_3 from KOH *1*

(c) CaCO_3 from CaCl_2 *3*

Column B

1. Precipitation

2. Direct combination *6*

3. Displacement reaction

4. Neutralization *W*

(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?

