

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) An element in period 3, whose electron *affinity* is zero:
- (a) Neon
 - (b) Sulphur
 - (c) Sodium
 - (d) Argon
- (ii) An element with the *largest* atomic radius among the following is:
- (a) Carbon
 - (b) Nitrogen
 - (c) Lithium
 - (d) Beryllium

This paper consists of 11 printed pages and 1 blank page.

- (iii) The compound that is **not** an ore of aluminium:
- (a) Cryolite
 - (b) Corundum
 - (c) Fluorspar
 - (d) Bauxite
- (iv) The vapour density of CH_3OH is _____. (At. Wt. C=12, H=1, O=16)
- (a) 32
 - (b) 18
 - (c) 16
 - (d) 34
- (v) Which of the following reactions takes place at the anode during the electroplating of an article with silver?
- (a) $\text{Ag} - 1e^- \rightarrow \text{Ag}^{1+}$
 - (b) $\text{Ag} + 1e^- \rightarrow \text{Ag}^{1-}$
 - (c) $\text{Ag} - 1e^- \rightarrow \text{Ag}$
 - (d) None of the above
- (vi) The metallic hydroxide which forms a deep inky blue solution with excess ammonium hydroxide solution is:
- (a) $\text{Fe}(\text{OH})_2$
 - (b) $\text{Cu}(\text{OH})_2$
 - (c) $\text{Ca}(\text{OH})_2$
 - (d) $\text{Fe}(\text{OH})_3$
- (vii) An example of a cyclic organic compound is:
- (a) Propene
 - (b) Pentene
 - (c) Butene
 - (d) Benzene

- (viii) In the laboratory preparation, HCl gas is dried by passing through:
- (a) dilute nitric acid
 - (b) concentrated sulphuric acid
 - (c) dilute sulphuric acid
 - (d) acidified water
- (ix) The nitrate which on thermal decomposition leaves behind a residue which is yellow when hot and white when cold:
- (a) Lead nitrate
 - (b) Ammonium nitrate
 - (c) Copper nitrate
 - (d) Zinc nitrate
- (x) The salt formed when concentrated sulphuric acid reacts with KNO_3 above 200°C :
- (a) K_2SO_4
 - (b) K_2SO_3
 - (c) KHSO_4
 - (d) KHSO_3
- (xi) The property exhibited by concentrated sulphuric acid when it is used to prepare hydrogen chloride gas from potassium chloride:
- (a) Dehydrating property
 - (b) Drying property
 - (c) Oxidizing property
 - (d) Non-volatile acid property
- (xii) The hydrocarbon formed when sodium propanoate and soda lime are heated together:
- (a) Methane
 - (b) Ethane
 - (c) Ethene
 - (d) Propane

- (xiii) The acid which does **not** form acid salt by a basic radical:
- (a) H_2CO_3
 - (b) H_3PO_4
 - (c) H_2SO_4
 - (d) CH_3COOH
- (xiv) The general formula of hydrocarbons with single covalent bonds is:
- (a) $\text{C}_n\text{H}_{2n+2}$
 - (b) C_nH_{2n}
 - (c) $\text{C}_n\text{H}_{2n-2}$
 - (d) $\text{C}_n\text{H}_{2n-6}$
- (xv) The indicator which changes to pink colour in an alkaline solution is:
- (a) Blue Litmus
 - (b) Methyl Orange
 - (c) Red Litmus
 - (d) Phenolphthalein

Question 2

- (i) Match the *Column A* with *Column B*:

[5]

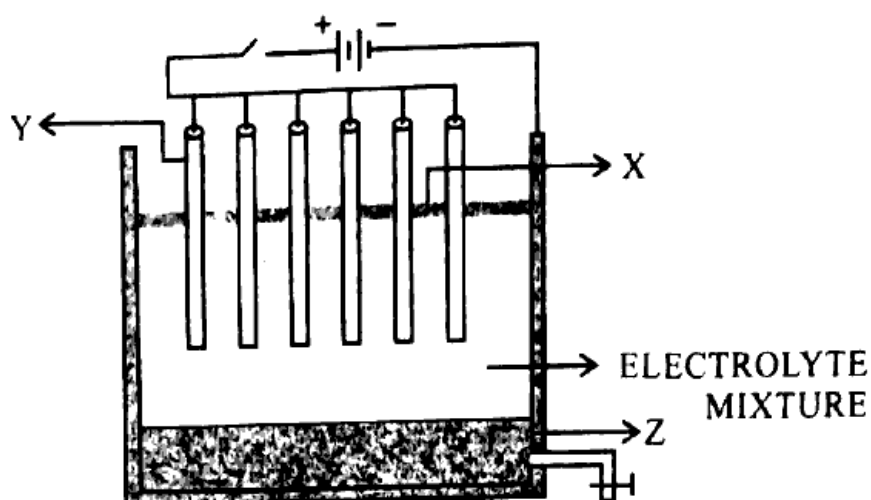
Column A

Column B

- | | |
|---------------------------|---|
| (a) Sodium Chloride | 1. has two shared pair of electrons |
| (b) Methane | 2. has high melting and boiling points |
| (c) Hydrogen chloride gas | 3. a greenhouse gas |
| (d) Oxidation reaction | 4. has low melting and boiling points |
| (e) Water | 5. $\text{Zn} - 2\text{e}^- \rightarrow \text{Zn}^{2+}$ |
| | 6. $\text{S} + 2\text{e}^- \rightarrow \text{S}^{2-}$ |

- (ii) The following sketch illustrates the process of conversion of **Alumina** to Aluminium: [5]

Study the diagram and answer the following:



- (a) Name the constituent of the electrolyte mixture which has a divalent metal in it.
- (b) Name the powdered substance 'X' sprinkled on the surface of the electrolyte mixture.
- (c) What is the name of the process?
- (d) Write the reactions taking place at the electrodes 'Y' (anode) and 'Z' (cathode) respectively.
- (iii) Fill in the blanks with the *choices* given in the brackets: [5]
- (a) Metals are good _____. [*oxidizing agents / reducing agents*]
- (b) Non-polar covalent compounds are _____ [*good / bad*] conductors of heat and electricity.
- (c) Higher the pH value of a solution, the more _____ [*acidic / alkaline*] it is.
- (d) _____, [*Silver chloride / Lead chloride*] is a white precipitate that is soluble in excess of Ammonium hydroxide solution.
- (e) Conversion of ethene to ethane is an example of _____. [*hydration / hydrogenation*]

(iv) State the terms / process for the following:

- The energy released when an atom in the gaseous state accepts an electron to form an anion.
- Tendency of an element to form chains of identical atoms.
- The name of the process by which Ammonia is manufactured on a large scale.
- A type of salt formed by partial replacement of hydroxyl radicals with an acid radical.
- The ratio of the mass of a certain volume of gas to the same volume of hydrogen measured under the same conditions of temperature and pressure.

(v) (a) Give the structural formula of the following organic compounds:

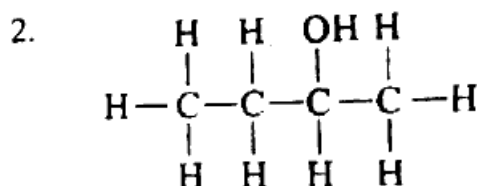
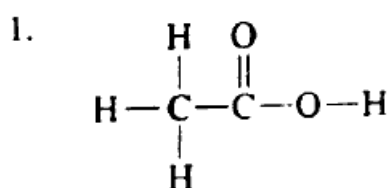
[5]

1. 2-chlorobutane

2. Methanal

3. But-2-yne

(b) Give the IUPAC name of the following organic compounds:



SECTION B (40 Marks)

(Attempt any four questions from this Section.)

Question 3

(i) Identify the cation in each of the following cases:

[2]

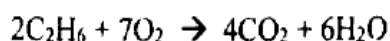
- Ammonium hydroxide solution when added to Solution B gives a white precipitate which does not dissolve in excess of ammonium hydroxide solution.
- Sodium hydroxide solution when added to Solution C gives a white precipitate which is insoluble in excess of sodium hydroxide solution.

- (ii) Fill in the blanks by choosing the correct answer from the brackets: [2]
- (a) During electrolysis, the compound _____ in its molten state liberates reddish brown fumes at the anode. [NaCl / PbBr_2]
- (b) The ion which could be discharged most readily during electrolysis is _____ . [Fe^{2+} / Cu^{2+}]
- (iii) Arrange the following as per the instruction given in the brackets: [3]
- (a) Al, K, Mg, Ca (*decreasing order of its reactivity*)
- (b) N, Be, O, C (*increasing order of non-metallic character*)
- (c) P, Si, F, Be (*decreasing order of valence electrons*)
- (iv) Complete and *balance* the following equations: [3]
- (a) $\text{NH}_4\text{Cl} + \text{Ca}(\text{OH})_2 \rightarrow$
- (b) $\text{CuSO}_4 + \text{NH}_4\text{OH} \rightarrow$
- (c) $\text{Cu} + \text{Conc. HNO}_3 \rightarrow$

Question 4

- (i) State a *relevant reason* for the following: [2]
- (a) Hydrogen chloride gas cannot be dried over quick lime.
- (b) Ammonia gas is not collected over water.
- (ii) Identify the **alloy** in each case from the given composition: [2]
- (a) aluminium, magnesium, manganese, copper
- (b) iron, nickel, chromium, carbon
- (iii) Solve the following *numerical* problem. [3]

Ethane burns in oxygen according to the chemical equation:



If 80 ml of ethane is burnt in 300 ml of oxygen, find the composition of the resultant gaseous mixture when measured at room temperature.

- (iv) The following questions are pertaining to the laboratory preparation of **Ammonia gas** from **Magnesium nitride**: [3]
- (a) Write a balanced chemical equation for its preparation.
 - (b) Why is this method seldom used?
 - (c) How do you identify the *gas* formed?

Question 5

- (i) Write *one use* of the following *alloys*: [2]
- (a) Bronze
 - (b) Fuse metal
- (ii) Draw the *electron dot* structure for the following: [2]
- (a) Ammonium ion
 - (b) A molecule of nitrogen
- [At. No.: N = 7, H = 1]
- (iii) Give a *balanced chemical* equation for the following conversions with conditions: [3]
- (a) Ethene from ethanol
 - (b) Ethyne from calcium carbide
 - (c) Monochloromethane from methane
- (iv) Study the following *observations* and name the **anions** present in each of the reactions. [3]
- (a) When a crystalline solid 'P' is warmed with concentrated H_2SO_4 and copper turnings a *reddish brown* gas is released. <https://www.icseonline.com>
 - (b) When few drops of dilute sulphuric acid is added to Salt 'R' and heated, a colourless gas is released which turns moist lead acetate paper *silvery black*.
 - (c) When few drops of barium nitrate solution is added to the salt solution 'Q', a *white precipitate* is formed which is insoluble in HCl.

Question 6

- (i) Define / State: [2]
- (a) Electronegativity
- (b) Gay-Lussac's Law of combining volumes
- (ii) The *Empirical* formula of an organic compound is CHCl_2 . [2]
- If its relative molecular mass is 168, what is its molecular formula?
- [At. Wt. C = 12, H = 1, Cl = 35.5]
- (iii) Choose the substances given in the box below to answer the following questions: [3]
- | | | | |
|------|--------------------|--------|------------------|
| Iron | Magnesium sulphite | Zinc | Sodium sulphide |
| Lead | Ferric chloride | Copper | Ferrous sulphate |
- (a) The metal that will **not** produce hydrogen gas when reacted with dilute acids.
- (b) The compound that will produce sulphur dioxide gas when reacted with dilute HCl.
- (c) The solution of this compound produces dirty green precipitate with NaOH.
- (iv) State one *relevant observation* for each of the following: [3]
- (a) To the copper nitrate solution, initially few drops of sodium hydroxide solution is added and then added in excess.
- (b) Burning of ammonia in excess of oxygen.
- (c) Dry ammonia gas is passed over heated PbO .

Question 7

- (i) Name the following: [2]
- (a) Organic compounds with *same* molecular formula but *different* structural formula.
- (b) Group of organic compounds where the **successive members** follow a regular structural pattern, successive compounds differ by a ' CH_2 ' group.

- (ii) Give reason for the following: [2]
- (a) Ionisation potential decreases down a group.
 - (b) Ionic compounds do not conduct electricity in solid state.
- (iii) Calculate: [3]
- (a) The *percentage* of phosphorus in the fertilizer super phosphate $\text{Ca}(\text{H}_2\text{PO}_4)_2$ correct to 1 decimal point. [At. Wt. H=1, P=31, O=16, Ca=40]
 - (b) Write the empirical formula of C_8H_{18} .
- (iv) Answer the following questions with reference to electrorefining of copper: [3]
- (a) What is the anode made of?
 - (b) What do you observe at the cathode?
 - (c) Write the reaction taking place at the cathode.

Question 8

- (i) Arrange the following according to the *instructions* given in *brackets*: [2]
- (a) C_2H_2 , C_3H_6 , CH_4 , C_2H_4 (*In the increasing order of the molecular weight*)
 - (b) Cu^{2+} , Na^+ , Zn^{2+} , Ag^+ (*The order of Preferential discharge at the cathode*)
- (ii) Differentiate between the *following pairs* based on the *criteria* given in the *brackets*: [2]
- (a) Cane sugar and hydrated copper sulphate [*using concentrated H_2SO_4*]
 - (b) Sulphuric acid and hydrochloric acid [*type of salts formed*]
- (iii) Convert the following reactions into a *balanced chemical equation*: [3]
- (a) Ammonia to nitric oxide using oxygen and platinum catalyst.
 - (b) Sodium hydroxide to sodium sulphate using sulphuric acid.
 - (c) Ferrous sulphide to hydrogen sulphide using hydrochloric acid.

(iv) Choose the answer from the *list* which *fits* in the *description*:

[3]

[CCl₄, PbO, NaCl, CuO, NH₄Cl]

- (a) A compound which undergoes **thermal dissociation**.
- (b) An **amphoteric oxide**.
- (c) A compound which is a **non-electrolyte**.