

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

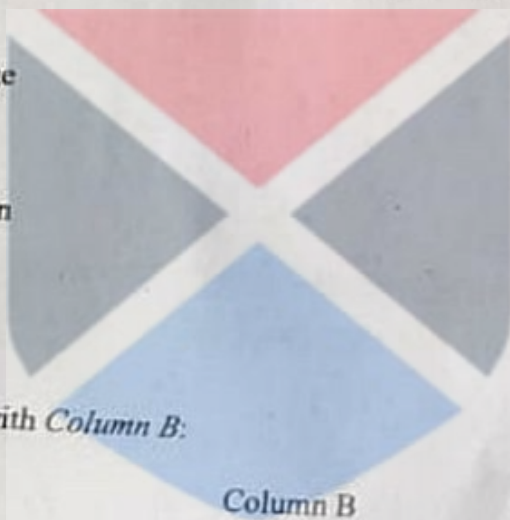
This paper consists of 11 printed pages and 1 blank page.

Turn Over

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

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



Question 2

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

Column A

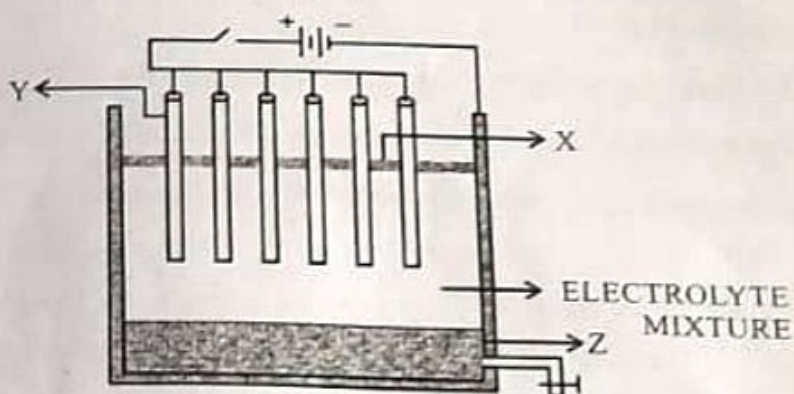
Column B

- | | |
|---------------------------|--|
| (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. $Zn - 2e^- \rightarrow Zn^{2+}$ |
| | 6. $S + 2e^- \rightarrow S^{2-}$ |

[5]

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

Study the diagram and answer the following:



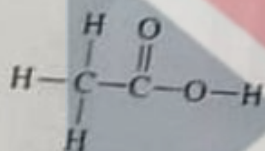
- (a) Name the constituent of the electrolyte mixture which has a divalent metal in it.
- (b) Name the powdered substance 'X' sprinkled on the surface of the electrolyte mixture.
- (c) What is the name of the process?
- (d) Write the reactions taking place at the electrodes 'Y' (anode) and 'Z' (cathode) 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: [5]
- 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]

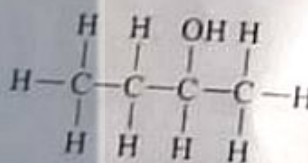
- 2-chlorobutane
- Methanal
- But-2-yne

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

1.



2.



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 / PbBr₂]

(b) The ion which could be discharged most readily during electrolysis is _____ . [Fe²⁺ / Cu²⁺]

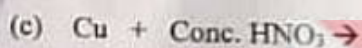
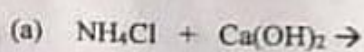
(iii) Arrange the following as per the instruction given in the brackets: [3]

(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]



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.

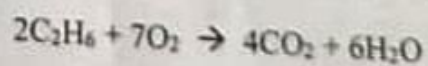
(ii) Identify the **alloy** in each case from the given composition: [2]

(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.
 - (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.

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- (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*:

[CCl_4 , PbO , NaCl , CuO , NH_4Cl]

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

