

**CHEMISTRY**  
**(SCIENCE PAPER – 2)**

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*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.*

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**Section A** is compulsory. Attempt **any four** questions from **Section B**.

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

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**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

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**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  $\text{CH}_3\text{OH}$  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)  $\text{Ag} - 1\text{e}^- \rightarrow \text{Ag}^{1+}$
  - (b)  $\text{Ag} + 1\text{e}^- \rightarrow \text{Ag}^{1-}$
  - (c)  $\text{Ag} - 1\text{e}^- \rightarrow \text{Ag}$
  - (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  $\text{KNO}_3$  above  $200^\circ\text{C}$ :
- (a)  $\text{K}_2\text{SO}_4$
  - (b)  $\text{K}_2\text{SO}_3$
  - (c)  $\text{KHSO}_4$
  - (d)  $\text{KHSO}_3$
- (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)  $\text{H}_2\text{CO}_3$
  - (b)  $\text{H}_3\text{PO}_4$
  - (c)  $\text{H}_2\text{SO}_4$
  - (d)  $\text{CH}_3\text{COOH}$
- (xiv) The general formula of hydrocarbons with single covalent bonds is:
- (a)  $\text{C}_n\text{H}_{2n+2}$
  - (b)  $\text{C}_n\text{H}_{2n}$
  - (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

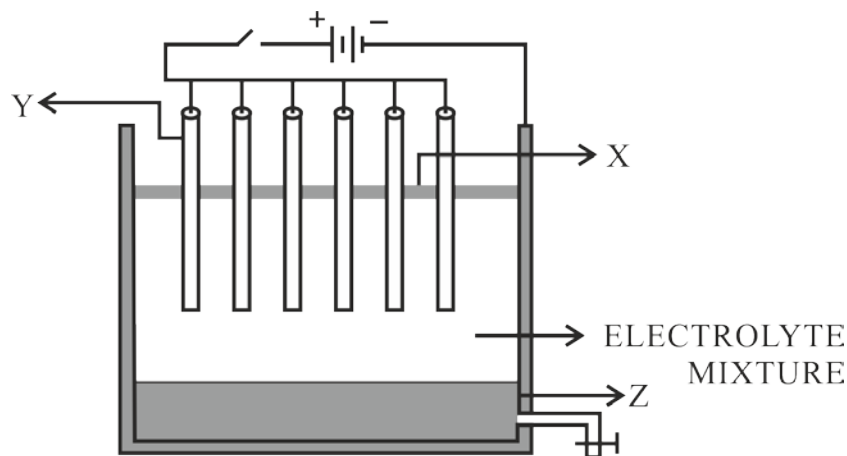
## Question 2

- (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*]

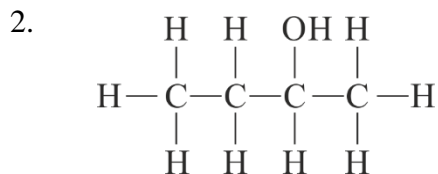
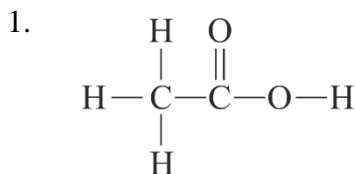
(iv) **State the terms / process** for the following: [5]

- (a) The energy released when an atom in the gaseous state accepts an electron to form an anion.
- (b) Tendency of an element to form *chains* of identical atoms.
- (c) The name of the process by which *Ammonia* is manufactured on a large scale.
- (d) A type of salt formed by partial replacement of hydroxyl radicals with an acid radical.
- (e) 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]

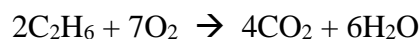
- (a) Ammonium hydroxide solution when added to Solution **B** gives a white precipitate which does not dissolve in excess of ammonium hydroxide solution.
- (b) Sodium hydroxide solution when added to Solution **C** gives a white precipitate which is insoluble in excess of sodium hydroxide solution.

- (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)  $NH_4Cl + Ca(OH)_2 \rightarrow$
- (b)  $CuSO_4 + NH_4OH \rightarrow$
- (c)  $Cu + Conc. HNO_3 \rightarrow$

#### 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  $\text{H}_2\text{SO}_4$  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  $\text{CHCl}_2$ . [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<sub>2</sub>**' 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  $\text{C}_8\text{H}_{18}$ .
- (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)  $\text{C}_2\text{H}_2$ ,  $\text{C}_3\text{H}_6$ ,  $\text{CH}_4$ ,  $\text{C}_2\text{H}_4$  (*In the increasing order of the molecular weight*)
  - (b)  $\text{Cu}^{2+}$ ,  $\text{Na}^+$ ,  $\text{Zn}^{2+}$ ,  $\text{Ag}^+$  (*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  $\text{H}_2\text{SO}_4$* ]
  - (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]

[CCl<sub>4</sub>, PbO, NaCl, CuO, NH<sub>4</sub>Cl]

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