PRACTICE PAPER (2026–27)

Chapter 04: Carbon and Its Compounds

CLASS: X **SUBJECT: SCIENCE** **DURATION: 1½ hrs** **MAX. MARKS: 40**

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five Sections: **A**, **B**, **C**, **D**, and **E**.
3. **Section A** comprises 10 Multiple Choice Questions (including Assertion-Reason) of 1 mark each.
4. **Section B** comprises 4 questions of 2 marks each.
5. **Section C** comprises 3 questions of 3 marks each.
6. **Section D** comprises 1 question of 5 marks (with internal choice).
7. **Section E** comprises 2 Case Study Based Questions of 4 marks each.
8. Use of calculators is strictly prohibited.

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. Carbon forms four covalent bonds by sharing its four valence electrons with four univalent atoms, e.g., hydrogen. After the formation of four bonds, carbon attains the electronic configuration of:

   (a) Helium (b) Neon

   (c) Argon (d) Krypton

2. A molecule of ammonia (NH_3) has:

   (a) Only single bonds (b) Only double bonds

   (c) Only triple bonds (d) Two double bonds and one single bond

3. Which of the following is the correct molecular formula of cyclobutane?

   (a) C_4H_{10} (b) C_4H_8

   (c) C_4H_6 (d) C_4H_4

4. The difference in molecular masses between any two successive members of a homologous series is:

   (a) 12 u (b) 14 u

   (c) 16 u (d) 28 u

5. Vinegar is a solution of:

   (a) 50% – 60% acetic acid in alcohol (b) 5% – 8% acetic acid in alcohol

   (c) 5% – 8% acetic acid in water (d) 50% – 60% acetic acid in water

6. Which of the following compounds will give a brisk effervescence with sodium hydrogencarbonate?

   (a) C_2H_5OH (b) CH_3COOH

   (c) CH_3CHO (d) CH_3COCH_3

7. The conversion of ethanol to ethanoic acid using alkaline potassium permanganate is an example of:

   (a) Addition reaction (b) Substitution reaction

   (c) Oxidation reaction (d) Hydrogenation reaction

8. How many structural isomers are possible for the hydrocarbon pentane (C_5H_{12})?

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(a) 2 (b) 3

(c) 4 (d) 5

Directions for Q9 and Q10: In each of the following questions, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Mark the correct choice as:

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

9. **Assertion (A):** Diamond is a very hard substance and a poor conductor of electricity.
   Reason (R): In diamond, each carbon atom is bonded to four other carbon atoms in a rigid three-dimensional tetrahedral structure with no free electrons.

10. **Assertion (A):** Vegetable oils are generally considered healthier for cooking than animal fats.
    Reason (R): Animal fats generally contain unsaturated fatty acid chains, while vegetable oils contain saturated fatty acids.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Carbon neither forms C^{4+} cations nor C^{4-} anions easily to achieve a stable octet. Explain why.

12. Write the name and draw the electron dot structure of:
    a. Ethyne (C_2H_2)
    b. Carbon dioxide (CO_2)

13. What is a homologous series? State any two characteristic features of the members of a homologous series.

14. How can ethanol and ethanoic acid be differentiated on the basis of chemical tests using:
    a. Sodium hydrogencarbonate (baking soda)
    b. Litmus paper

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Explain the versatile nature of carbon that enables it to form an exceptionally large number of compounds. Discuss the two major properties responsible for this unique behaviour.

16. An organic compound X having molecular formula $C_2H_4O_2$ turns blue litmus red and gives off a colourless gas Y with brisk effervescence when treated with solid sodium carbonate.
    a. Identify compound X and gas Y.
    b. Write the balanced chemical equation for the reaction of compound X with sodium carbonate.
    c. State what happens when compound X reacts with ethanol in the presence of concentrated sulphuric acid. Name the reaction.

17. Explain the following reactions with one balanced chemical equation for each:
    a. Addition (hydrogenation) reaction in unsaturated hydrocarbons
    b. Substitution reaction in alkanes
    c. Saponification reaction

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SECTION – D

Question 18 carries 5 marks.

18. a. Explain the mechanism of the cleansing action of soaps with a suitable schematic diagram representing a micelle.

b. Why do soaps form an insoluble scum with hard water while synthetic detergents do not? Name the ions responsible for water hardness.

c. Why does a soap solution appear cloudy or translucent rather than transparent?

OR

a. An organic liquid A having the molecular formula C_2H_6O is warmed with alkaline potassium permanganate to yield a compound B. When compound A and compound B react together in the presence of concentrated sulphuric acid, a sweet-smelling liquid C is formed.

i. Identify compounds A, B, and C.

ii. Write balanced chemical equations for:
- The oxidation of compound A to compound B.
- The reaction between A and B to form compound C.

iii. What role does concentrated sulphuric acid play in the formation of compound C?

b. What is denatured alcohol? Why is ethanol denatured before commercial distribution?

SECTION – E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. **Read the passage given below and answer the questions that follow:**

> *The ability of carbon atoms to link with one another through covalent bonds gives rise to allotropes—different physical forms of the same chemical element. Diamond and graphite are two well-known crystalline allotropes of carbon. In diamond, each carbon atom is bonded tetrahedrally to four other carbon atoms forming a giant 3D lattice, making it the hardest natural substance known. In graphite, each carbon atom is bonded to three others in the same plane, forming hexagonal sheets held together by weak van der Waals forces. These sheets can slide over each other, rendering graphite soft and slippery. Furthermore, the fourth valence electron in graphite is delocalised and free to move, enabling graphite to conduct electricity efficiently.*

a. Why is graphite a good conductor of electricity while diamond is an insulator? **[1 Mark]**

b. State one industrial application of diamond and one of graphite based on their physical properties. **[1 Mark]**

c. Name the spherical fullerene allotrope containing 60 carbon atoms. Describe its structural geometry. **[2 Marks]**

OR

c. How can synthetic diamonds be prepared in the laboratory? How do they differ in properties and appearance from natural diamonds? **[2 Marks]**

20. **Read the passage given below and answer the questions that follow:**

> *Hydrocarbons are organic compounds composed solely of hydrogen and carbon. They are divided into saturated hydrocarbons (alkanes), in which carbon atoms are connected exclusively by single covalent bonds, and unsaturated hydrocarbons (alkenes and alkynes), which contain one or more double or triple carbon-carbon bonds. Alkanes are relatively unreactive and undergo substitution reactions, burning with a clean blue flame in sufficient oxygen. In contrast, unsaturated hydrocarbons undergo characteristic addition reactions across their multiple bonds, decolourising orange bromine water, and tend to burn with a yellow sooty flame due to higher carbon percentages.*

a. Write the general formula for the homologous series of:
(i) Alkenes (ii) Alkynes **[1 Mark]**

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b. Which of the following hydrocarbons will decolourise bromine water: C_2H_6, C_3H_6, C_4H_{10}, or CH_4? Give reason. **[1 Mark]**

c. Draw the structural formula and write the IUPAC name for all the open-chain structural isomers of butane (C_4H_{10}). **[2 Marks]**

OR

c. Explain why unsaturated hydrocarbons produce a yellow sooty flame upon combustion, whereas saturated hydrocarbons burn with a clean blue flame under normal conditions. **[2 Marks]**

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