

Carbon and Its Compounds

Basic Concepts (Questions 1-5)

1. What makes carbon special among all elements? Explain the unique properties of carbon that allow it to form a large number of compounds.
2. Define covalent bonding. Explain how carbon forms covalent bonds with other carbon atoms and with other elements.
3. What is catenation? Why does carbon show this property more than other elements? Give examples.
4. Explain the concept of tetravalency of carbon with examples. Draw the electron dot structure of methane.
5. What are the different allotropes of carbon? Describe the structure and properties of diamond and graphite.

Hydrocarbons (Questions 6-10)

6. What are hydrocarbons? Differentiate between saturated and unsaturated hydrocarbons with examples.
7. Write the molecular formula and draw the structural formula for the first three members of alkane series.
8. Define homologous series. List four characteristics of a homologous series.
9. What is the difference between alkanes, alkenes, and alkynes? Write one example of each with their molecular formulae.
10. Explain isomerism with examples. Draw the structural formulae of all possible isomers of butane (C_4H_{10}).

Functional Groups (Questions 11-15)

11. What are functional groups? Write the functional groups present in alcohols, aldehydes, ketones, and carboxylic acids.
12. Name the functional group present in the following compounds: CH_3OH , CH_3CHO , CH_3COOH , CH_3COCH_3
13. Write the structural formulae of ethanol and ethanoic acid. How can ethanol be converted to ethanoic acid?
14. What happens when ethanoic acid reacts with sodium carbonate? Write the chemical equation and identify the gas evolved.

15. Explain the difference between addition reactions and substitution reactions. Give one example of each.

Important Carbon Compounds (Questions 16-18)

16. Describe the properties and uses of ethanol. Why is ethanol mixed with petrol? What are the harmful effects of drinking ethanol?
17. Write the chemical equation for the combustion of ethane in air. What are the products formed?
18. What is saponification? Write the chemical equation for the saponification of ethyl ethanoate. What are the products formed?

Application-Based Questions (Questions 19-20)

19. A compound X has the molecular formula $C_2H_4O_2$. It turns blue litmus paper red and reacts with sodium carbonate to produce a gas that turns lime water milky. Identify compound X and write the chemical equations for both reactions.
20. An organic compound burns in air to produce carbon dioxide and water. When 0.1 mole of this compound is burnt, it produces 0.2 moles of CO_2 and 0.3 moles of H_2O . Determine the molecular formula of the compound if its molar mass is 30 g/mol.

Bonus Application Questions:

Additional Practice Questions:

- Why does carbon form compounds mainly by covalent bonding?
- Explain why carbon compounds are generally poor conductors of electricity.
- What is the role of concentrated sulphuric acid in the dehydration of ethanol?
- Differentiate between soaps and detergents. Why are detergents preferred over soaps in hard water?
- Explain the cleansing action of soaps with the help of diagrams.
- What are esters? How are they formed? Write the chemical equation for the formation of ethyl ethanoate.