

## Organic Chemistry: Some Basic Principles and Techniques — Assignment 1

Class 11 Chemistry · Topic-wise question bank covering every concept of the chapter · Narayan Gurukul Academy

Instructions: (1) Attempt all questions. This worksheet walks through every concept of the chapter, topic by topic.

(2) The interactive MCQ version of these questions (with instant answer reveal) is available on the notes page.

(3) Universal values:  $g = 10 \text{ m/s}^2$  unless stated. Give answers with correct SI units.

### Why Carbon — Tetravalency and Catenation

#### MCQ Questions (choose the correct option)

- Carbon forms a large number of compounds mainly because of
  - catenation and tetravalency
  - its high atomic mass
  - its metallic nature
  - its large size
- Catenation is the ability of carbon to
  - form chains and rings with other carbon atoms
  - gain electrons
  - lose electrons
  - form ionic bonds
- Tetravalency of carbon means carbon has a valency of
  - 4
  - 2
  - 3
  - 1
- Organic compounds are generally
  - covalent
  - ionic
  - metallic
  - coordinate

#### 1 Mark Questions

- What is catenation?
- What is meant by tetravalency of carbon?
- Why do organic compounds form a large number of compounds?

#### 2 Mark Questions

- Explain tetravalency and catenation of carbon with examples.
- Why are organic compounds covalent in nature? Explain briefly.

#### 3 Mark Questions

- Explain why carbon forms a very large number of compounds, referring to tetravalency, catenation and the strength of the C–C bond.
- Explain the unique nature of carbon: tetravalency, catenation, small size and the formation of multiple bonds.

### IUPAC Nomenclature — The Rules

**MCQ Questions (choose the correct option)**

1. The IUPAC name of  $\text{CH}_3\text{CH}_2\text{CH}_3$  is
  - (A) propane
  - (B) ethane
  - (C) butane
  - (D) methane
2. The longest continuous carbon chain in a molecule is called the
  - (A) parent chain
  - (B) branch
  - (C) functional group
  - (D) substituent
3. The suffix '-ol' in an IUPAC name indicates a
  - (A) alcohol
  - (B) aldehyde
  - (C) ketone
  - (D) acid
4. The IUPAC name of  $\text{CH}_3\text{CH}_2\text{OH}$  is
  - (A) ethanol
  - (B) methanol
  - (C) ethanal
  - (D) ethane

**1 Mark Questions**

1. What is the parent chain?
2. Write the IUPAC name of  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ .
3. What does the suffix '-al' indicate?

**2 Mark Questions**

1. Write the IUPAC rules for naming organic compounds.
2. Write the IUPAC names of  $\text{CH}_3\text{CH}_2\text{CHO}$  and  $\text{CH}_3\text{COCH}_3$ .

**3 Mark Questions**

1. Explain the IUPAC rules for naming organic compounds with an example involving a branched chain and a functional group.
2. Assign the IUPAC name of 2-methylbutane and explain the steps followed.

**Functional Groups****MCQ Questions (choose the correct option)**

1. The functional group present in  $\text{CH}_3\text{COOH}$  is
  - (A) carboxylic acid ( $-\text{COOH}$ )
  - (B) aldehyde ( $-\text{CHO}$ )
  - (C) alcohol ( $-\text{OH}$ )
  - (D) ketone ( $-\text{CO}-$ )

2. The functional group  $\text{-CHO}$  is called
  - (A) aldehyde
  - (B) ketone
  - (C) alcohol
  - (D) acid
3. The functional group present in  $\text{CH}_3\text{OCH}_3$  is
  - (A) ether
  - (B) ester
  - (C) amine
  - (D) amide
4. The functional group  $\text{-NH}_2$  is
  - (A) amino
  - (B) hydroxy
  - (C) carboxyl
  - (D) cyano

### 1 Mark Questions

1. Define a functional group.
2. Name the functional group present in  $\text{CH}_3\text{COCH}_3$ .
3. Write the formula of the carboxylic acid functional group.

### 2 Mark Questions

1. Define a functional group and list any four functional groups with their formulae.
2. Identify the functional groups in  $\text{CH}_3\text{CHO}$ ,  $\text{CH}_3\text{COOH}$  and  $\text{CH}_3\text{NH}_2$ .

### 3 Mark Questions

1. Explain the concept of a functional group and describe the functional groups containing oxygen, nitrogen and halogens with examples.
2. For the compounds  $\text{CH}_3\text{OH}$ ,  $\text{CH}_3\text{CHO}$ ,  $\text{CH}_3\text{COOH}$  and  $\text{CH}_3\text{CN}$ , name the functional group and the class of compound in each case.

## Isomerism

### MCQ Questions (choose the correct option)

1. Isomers are compounds with the same molecular formula but different
  - (A) structures
  - (B) masses
  - (C) functional groups only
  - (D) physical states
2. Butane ( $\text{C}_4\text{H}_{10}$ ) has how many structural isomers?
  - (A) 2
  - (B) 1
  - (C) 3
  - (D) 4
3. Functional group isomerism occurs when compounds have the same molecular formula but different

- (A) functional groups
  - (B) chain lengths only
  - (C) positions only
  - (D) masses
4. Compounds having the same molecular formula but different spatial arrangement are called
- (A) stereoisomers
  - (B) chain isomers
  - (C) position isomers
  - (D) functional isomers

### 1 Mark Questions

1. Define isomerism.
2. How many structural isomers does butane have?
3. What is stereoisomerism?

### 2 Mark Questions

1. Define structural isomerism and explain chain and position isomerism with one example each.
2. Distinguish between functional group isomerism and stereoisomerism with examples.

### 3 Mark Questions

1. Explain the different types of structural isomerism (chain, position, functional group) with one example of each.
2. Explain isomerism in organic compounds, distinguishing between structural and stereoisomerism with examples.

## Hybridisation and Bonding in Organic Molecules

### MCQ Questions (choose the correct option)

1. In a saturated hydrocarbon, each carbon atom is
  - (A)  $sp^3$  hybridised
  - (B)  $sp^2$  hybridised
  - (C)  $sp$  hybridised
  - (D) unhybridised
2. The bond angle in a molecule with  $sp^2$  hybridisation is about
  - (A)  $120^\circ$
  - (B)  $109.5^\circ$
  - (C)  $180^\circ$
  - (D)  $90^\circ$
3. In ethyne ( $C_2H_2$ ), the carbon atoms are
  - (A)  $sp$  hybridised
  - (B)  $sp^2$  hybridised
  - (C)  $sp^3$  hybridised
  - (D) unhybridised
4. A carbon–carbon double bond consists of
  - (A) one sigma and one pi bond
  - (B) two sigma bonds
  - (C) two pi bonds

(D) one sigma bond only

### 1 Mark Questions

1. What is the hybridisation of carbon in methane?
2. What is the hybridisation of carbon in ethene?
3. What is a pi bond?

### 2 Mark Questions

1. Explain the hybridisation of carbon in ethane, ethene and ethyne.
2. Distinguish between a sigma and a pi bond.

### 3 Mark Questions

1. Explain  $sp$ ,  $sp^2$  and  $sp^3$  hybridisation in organic molecules with one example each, including bond angles.
2. Explain the formation of sigma and pi bonds in ethene and ethyne, and state the hybridisation of carbon in each.

## Electron Displacement Effects

### MCQ Questions (choose the correct option)

1. Inductive effect is the
  - (A) permanent polarisation of a sigma bond due to an electronegativity difference
  - (B) temporary polarisation
  - (C) delocalisation of pi electrons
  - (D) transfer of a proton
2. The inductive effect is transmitted through
  - (A) sigma bonds
  - (B) pi bonds
  - (C) space
  - (D) ions
3. Resonance (mesomeric) effect involves the
  - (A) delocalisation of pi electrons
  - (B) transfer of sigma electrons
  - (C) transfer of protons
  - (D) breaking of sigma bonds
4. Hyperconjugation involves the interaction of
  - (A) sigma C–H electrons with an empty p orbital or pi system
  - (B) lone pairs
  - (C) protons
  - (D) nuclei

### 1 Mark Questions

1. What is the inductive effect?
2. What is the resonance effect?
3. What is hyperconjugation?

### 2 Mark Questions

1. Explain the inductive effect with one example and distinguish between the +I and –I effects.

2. Explain the resonance (mesomeric) effect with one example.

### 3 Mark Questions

1. Explain the inductive, resonance (mesomeric) and hyperconjugation effects with examples and state their significance.
2. Compare the inductive, resonance and hyperconjugation effects, and explain their effect on the stability of carbocations.

## Reactive Intermediates and Types of Reactions

### MCQ Questions (choose the correct option)

1. A carbocation is a species with
  - (A) a positively charged carbon
  - (B) a negatively charged carbon
  - (C) an unpaired electron
  - (D) a radical
2. A free radical is a species with
  - (A) an unpaired electron
  - (B) a positive charge
  - (C) a negative charge
  - (D) a lone pair
3. In a substitution reaction, an atom or group of atoms is
  - (A) replaced by another atom or group
  - (B) added across a double bond
  - (C) removed
  - (D) rearranged
4. Addition reactions are characteristic of
  - (A) unsaturated compounds
  - (B) saturated compounds
  - (C) aromatic compounds only
  - (D) ionic compounds

### 1 Mark Questions

1. Define a carbocation.
2. What is a free radical?
3. Define a substitution reaction.

### 2 Mark Questions

1. Explain the nature of carbocations and carbanions with one example each.
2. Distinguish between substitution and addition reactions with one example each.

### 3 Mark Questions

1. Explain the formation and stability of carbocations, carbanions and free radicals, and classify organic reactions into substitution, addition and elimination with examples.
2. Classify organic reactions into substitution, addition, elimination and rearrangement reactions with one example of each.