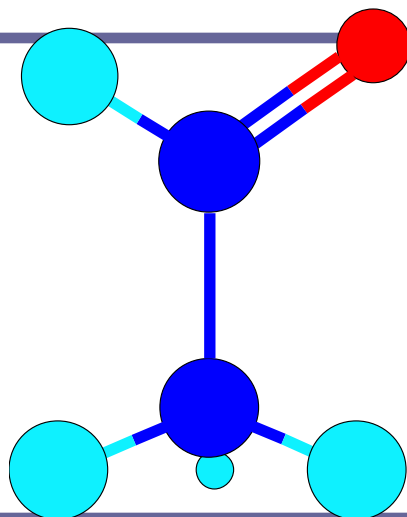


# 12.3 FUNCTIONAL GROUPS AND HOMOLOGOUS SERIES



# **LEARNING OUTCOMES**

---

**At the end of the lesson the students should be able to :**

- **Define functional group.**
- **Name functional groups and classify organic compounds according to their functional groups.**
- **Define homologous series and explain general characteristics of its members.**

# FUNCTIONAL GROUP

---

- an atom or group of atoms in an organic molecule which characterised the molecule and enables it to react in specific ways which determines its chemical properties.

## **THE IMPORTANCE OF THE FUNCTIONAL GROUP**

---

- i. A basic by which organic compounds are divided into different classes.
- ii. A basic for naming organic compounds
- iii. A particular functional group will always undergo similar types of chemical reactions.

# HOMOLOGOUS SERIES

---

- series of compounds where each member differs from the next member by a constant  $-\text{CH}_2$  unit
- Members of the same homologous series are called **homologs**.

# HOMOLOGS FEATURES

---

1. Obey a general formula:

Examples:

- Alkane:  $C_nH_{2n+2}$
- Alkene:  $C_nH_{2n}$
- Alcohol :  $C_nH_{2n+1}OH$

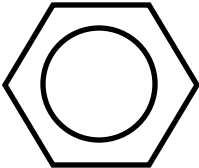
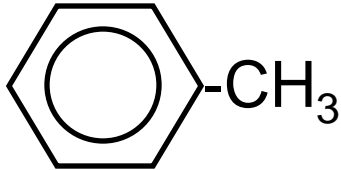
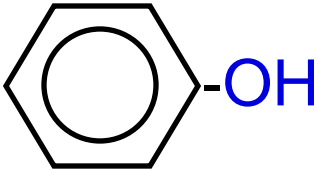
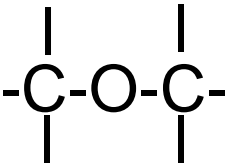
2. Differ from the successive homolog by a  $CH_2$  unit

3. Show a gradual change in the physical properties

- 
4. Have same functional group
  5. Have similar chemical properties
  6. Can be prepared by similar general methods

# CLASSIFICATION OF ORGANIC COMPOUND

Class of Compound	Functional Group		Example
	Structure	Name	
Alkane			$\text{CH}_3\text{-CH}_3$
Alkene	$\begin{array}{c}   \quad   \\ \text{-C}=\text{C-} \end{array}$	carbon-carbon double bond	$\text{CH}_3\text{CH}=\text{CH}_2$
Alkyne	$\text{-C}\equiv\text{C-}$	carbon-carbon triple bond	$\text{CH}_3\text{C}\equiv\text{CCH}_3$

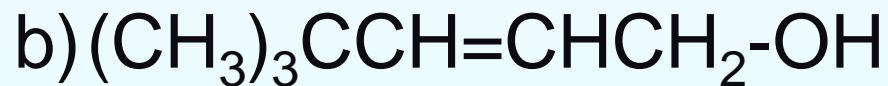
Aromatic		Benzene ring	
Haloalkane	X (F, Cl, Br, I)	Halogen	CH <sub>3</sub> Cl
Alcohol	-OH	Hydroxyl	CH <sub>3</sub> -OH
Phenol	-OH	Hydroxyl	
Ether		Alkoxide	CH <sub>3</sub> -O-CH <sub>3</sub>

Aldehyde	$\begin{array}{c} \text{-C=O} \\   \\ \text{H} \end{array}$	Carbonyl	$\begin{array}{c} \text{CH}_3\text{-C=O} \\   \\ \text{H} \end{array}$
Ketone	$\begin{array}{c} \text{R-C=O} \\   \\ \text{R} \end{array}$	Carbonyl	$\begin{array}{c} \text{CH}_3\text{-C=O} \\   \\ \text{CH}_3 \end{array}$
Carboxylic acid	$\begin{array}{c} \text{-C=O} \\   \\ \text{OH} \end{array}$	Carboxyl	$\begin{array}{c} \text{CH}_3\text{-C=O} \\   \\ \text{OH} \end{array}$
Ester	$\begin{array}{c} \text{-C-O-C-} \\    \quad   \\ \text{O} \quad \quad \quad \end{array}$	Carboalkoxy	$\begin{array}{c} \text{CH}_3\text{-C=O} \\   \\ \text{OCH}_3 \end{array}$
Acyl chloride	$\begin{array}{c} \text{-C=O} \\   \\ \text{Cl} \end{array}$		$\begin{array}{c} \text{CH}_3\text{-C=O} \\   \\ \text{Cl} \end{array}$

Anhydride	$\begin{array}{c} \text{O} \quad \text{O} \\ \parallel \quad \parallel \\ -\text{C}-\text{O}-\text{C}- \end{array}$		$\begin{array}{c} \text{O} \quad \text{O} \\ \parallel \quad \parallel \\ \text{CH}_3\text{C}-\text{O}-\text{CCH}_3 \end{array}$
Amide	$\begin{array}{c} -\text{C}=\text{O} \\   \\ \text{N}- \\   \end{array}$	Carboxamide	$\begin{array}{c} \text{CH}_3-\text{C}=\text{O} \\   \\ \text{NH}_2 \end{array}$
Amine	$-\text{NH}_2$	Amino	$\text{CH}_3-\text{NH}_2$
Nitrile	$-\text{C}\equiv\text{N}$	Cyano group	$\text{CH}_3\text{C}\equiv\text{N}$

## EXERCISE:

1. Identify the functional group in the following molecules



c)

