



Ministry of higher education and scientific research  
AL-Mustaqbal University college  
Department of medical physics



# Organic chemistry(practical)

## Lecture 2

### Synthesis and Structure of Alcohols

By

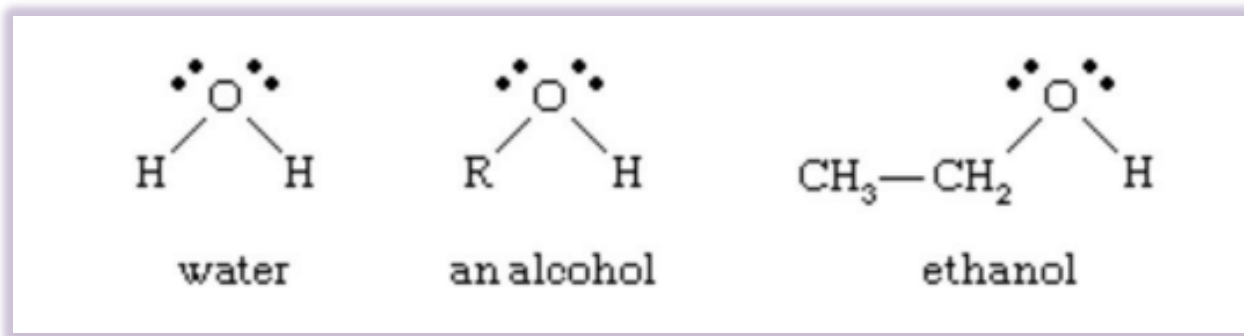
MSc. Elham Faisal

MSc. Wafaa Ajam

MSc .Issa Farahan

# Alcohol

- ❖ any of a class of organic compounds characterized by one or more hydroxyl ( $\text{—OH}$ ) groups attached to a carbon atom of an alkyl group (hydrocarbon chain).
- ❖ Alcohols may be considered as organic derivatives of water ( $\text{H}_2\text{O}$ ) in which one of the hydrogen atoms has been replaced by an alkyl group, typically represented by R in organic structures. For example, in ethanol (or ethyl alcohol) the alkyl group is the ethyl group,  $\text{—CH}_2\text{CH}_3$ .

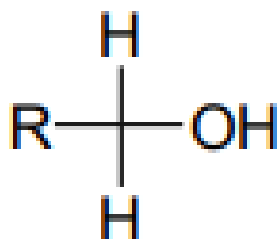


# General formula:-

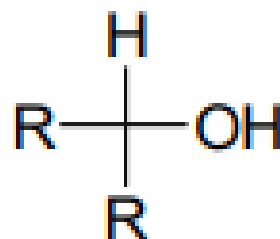


## Classification of Alcohol:-

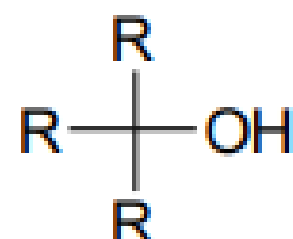
- Primary
- Secondary
- Tertiary



primary

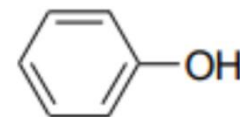


secondary

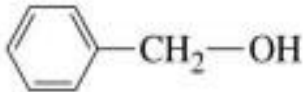
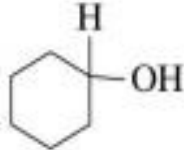
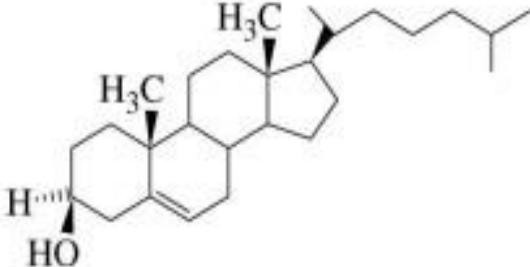
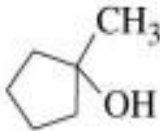
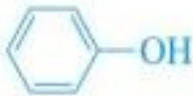

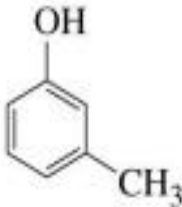
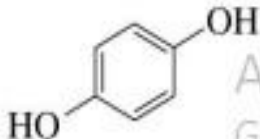


tertiary

Alcohols with the hydroxyl bound directly to an aromatic (benzene) ring are called phenols.



phenol

Type	Structure	Examples
Primary alcohol	$\begin{array}{c} \text{H} \\   \\ \text{R}-\text{C}-\text{OH} \\   \\ \text{H} \end{array}$	$\text{CH}_3\text{CH}_2-\text{OH}$ $\text{CH}_3\overset{\text{CH}_3}{\text{CH}}\text{CH}_2-\text{OH}$  ethanol    2-methyl-1-propanol    benzyl alcohol
Secondary alcohol	$\begin{array}{c} \text{R}' \\   \\ \text{R}-\text{C}-\text{OH} \\   \\ \text{H} \end{array}$	$\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}-\text{OH} \\   \\ \text{CH}_2 \\   \\ \text{CH}_3 \end{array}$   2-butanol    cyclohexanol    cholesterol
Tertiary alcohol	$\begin{array}{c} \text{R}' \\   \\ \text{R}-\text{C}-\text{OH} \\   \\ \text{R}'' \end{array}$	$\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_3-\text{C}-\text{OH} \\   \\ \text{CH}_3 \end{array}$ $\begin{array}{c} \text{Ph} \\   \\ \text{Ph}-\text{C}-\text{OH} \\   \\ \text{Ph} \end{array}$  2-methyl-2-propanol    triphenylmethanol    1-methylcyclopentanol
Phenols		   phenol    3-methylphenol    hydroquinone

Activate W  
Go to Settings

# Solubility of Alcohols:-

- ❖ The hydroxyl groups in alcohols can form hydrogen bonds with water, and many low molecular weight alcohols are miscible with water. Methanol, ethanol, and propanol are miscible in water. Butanol, with a four-carbon chain, is moderately soluble.
- ❖ Alcohols are more polar than hydrocarbons, and are better solvents for polar substances. (E.g. NaCl is partially soluble in Ethanol)
- ❖ The Hydroxyl group is said to be hydrophilic (water loving), whereas the alkyl (hydrocarbon) end is hydrophobic (water hating).
- ❖ Alcohols will also dissolve in hydrocarbon solvents.

# Boiling Points of Alcohols:-

- ❖ Because of hydrogen bonding, alcohols tend to have higher boiling points than comparable hydrocarbons and ethers.
- ❖ The boiling point of alcohol depends on which type of alcohol you're using, as well as the atmospheric pressure. The boiling point decreases as atmospheric pressure decreases, so it will be slightly lower unless you are at sea level.
- ❖ The boiling point of the alcohol ethanol is  $78.29\text{ }^{\circ}\text{C}$ , compared to  $69\text{ }^{\circ}\text{C}$  for the hydrocarbon hexane, and  $34.6\text{ }^{\circ}\text{C}$  for diethyl ether

Why is the boiling point of water  
higher than that of  
alcohol?



Water has more  
hydrogen bond  
than alcohol.

# TOXIC ALCOHOLS:

Poisonings by the toxic alcohols (methanol, ethylene glycol, isopropanol, diethylene glycol, and propylene glycol) can cause cellular dysfunction and death,<sup>1</sup> but symptoms may be nonspecific. Delays in diagnosis increase the risk of irreversible organ damage and death.



**With respect to acute toxicity, simple alcohols have low acute toxicities.**





THANK YOU :)