Ministry of Higher Education and Scientific Research
AL-Mustaqbal University College of Science
Department of Medical Physics

Organic Chemistry

Lecture 5

Alcohols & Phenols

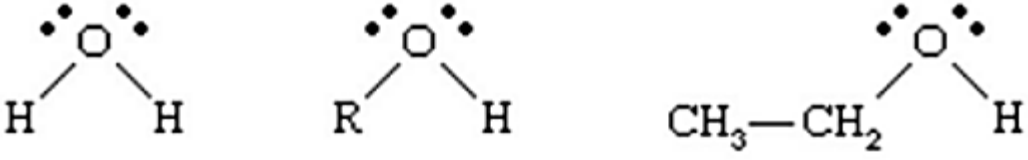
By

Dr. Assel Amer Hadi

Alcohol

- Any of a class of organic compounds characterized by one or more hydroxyl (—OH) groups attached to a carbon atom of an alkyl group (hydrocarbon chain).

- Alcohols may be considered as organic derivatives of water (H_2O) in which one of the hydrogen atoms has been replaced by an alkyl group, typically represented by R in organic structures.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, —CH_2CH_3.



water an alcohol ethanol

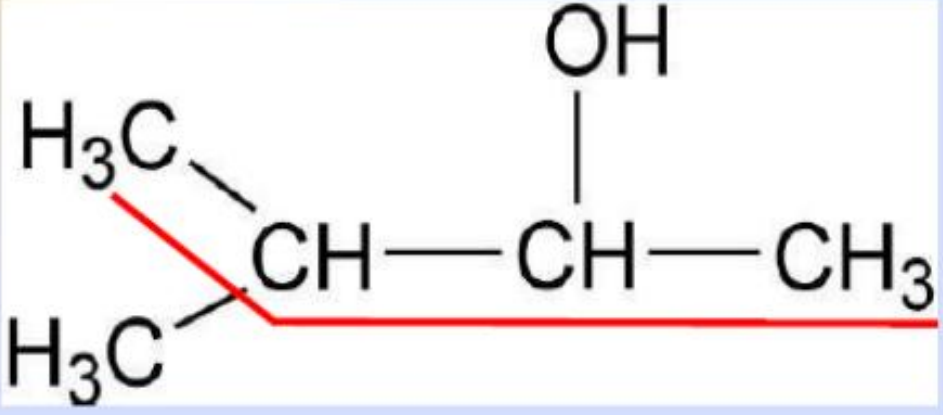
IUPAC RULES

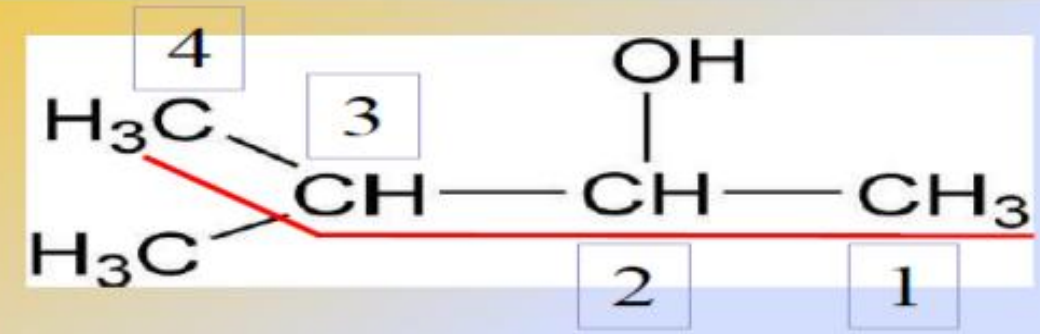
1. Select the longest continuous chain of carbon atoms containing the hydroxyl group.
2. Number the carbon atoms in this chain so that the one bonded to the –OH group has the lowest possible number.
3. Form the parent alcohol name by replacing the final *–e* of the corresponding alkane name by *–ol*. When isomers are possible, locate the position of the –OH by placing the number (hyphenated) of the carbon atom to which the –OH is bonded immediately before the parent alcohol name.

4. Name each alkyl branch chain (or other group) and designate its position by number.

This is the longest continuous chain that contains an hydroxyl group.

Select this chain as the parent compound.

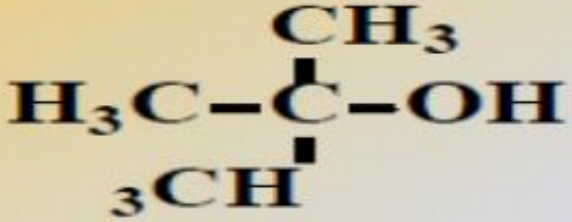




IUPAC name: 3-methyl-2-butanol

CH_3OH

IUPAC name: methanol
Common name:methyl alcohol



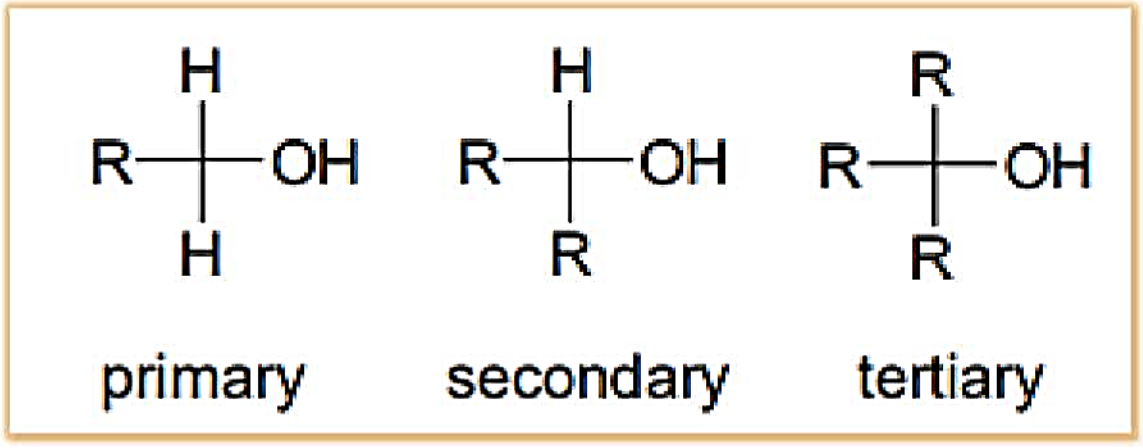
IUPAC name: 2-methyl-2-propanol

General Formula:-

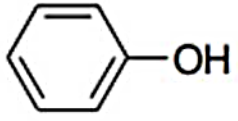
R-OH or $C_nH_{2n+}OH$

Classification of Alcohol:-

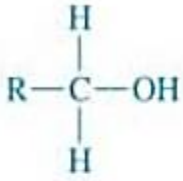
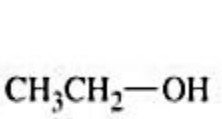
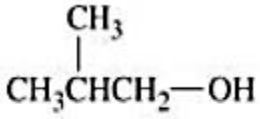
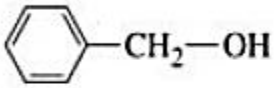
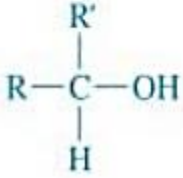
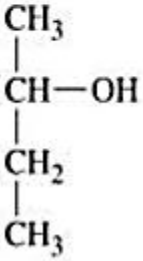
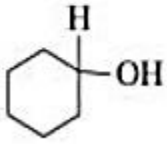
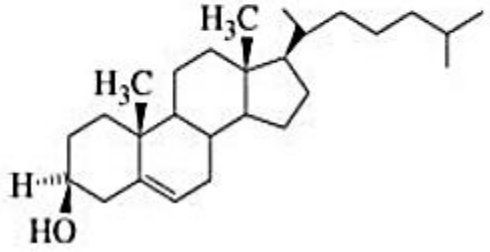
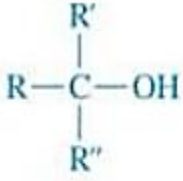
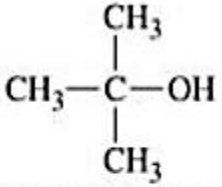
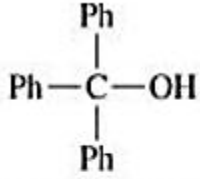
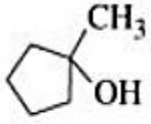
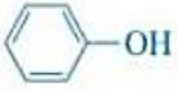
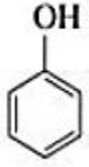
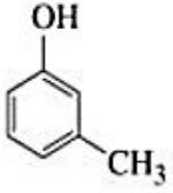
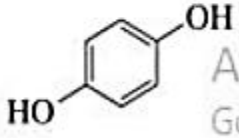
- Priamy
- Secondary
- Tertiary



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



phenol

Type	*Structure*	*Examples*		
Primary alcohol		 ethanol	 2-methyl-1-propanol	 benzyl alcohol
Secondary alcohol		 2-butanol	 cyclohexanol	 cholesterol
Tertiary alcohol		 2-methyl-2-propanol	 triphenylmethanol	 1-methylcyclopentanol
Phenols		 phenol	 3-methylphenol	 hydroquinone

Solubility of Alcohols:-

1) 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.
2) Alcohols are more polar than hydrocarbons, and are better solvents for polar substances. (E.g. NaCl is partially soluble in Ethanol)
3) The Hydroxyl group is said to be hydrophilic (water loving), whereas the alkyl (hydrocarbon) end is hydrophobic (water hating).
4) Alcohols will also dissolve in hydrocarbon solvents.

Boiling Points of Alcohols:-

A. Because of hydrogen bonding, alcohols tend to have higher boiling points than comparable hydrocarbons and ethers.
B. 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.
C. The boiling point of the alcohol ethanol is 78.29 °C, compared to 69 °C for the hydrocarbon hexane, and 34.6 °C for diethyl ether

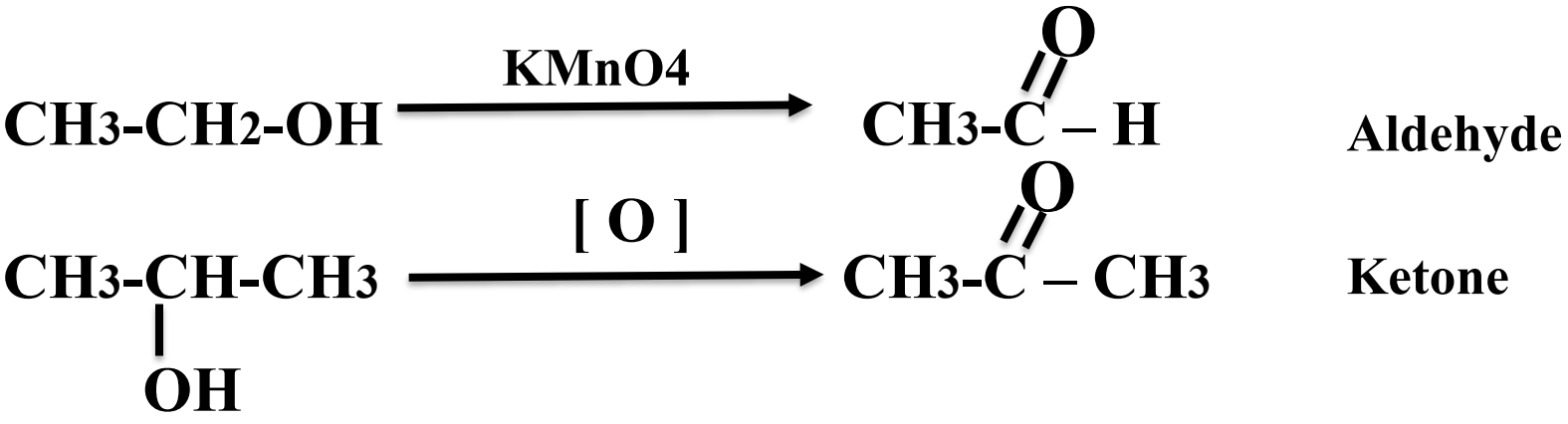
Q/ Why is the boiling point of water higher than that of alcohol?

Because: Water has more hydrogen bounds than alcohol.

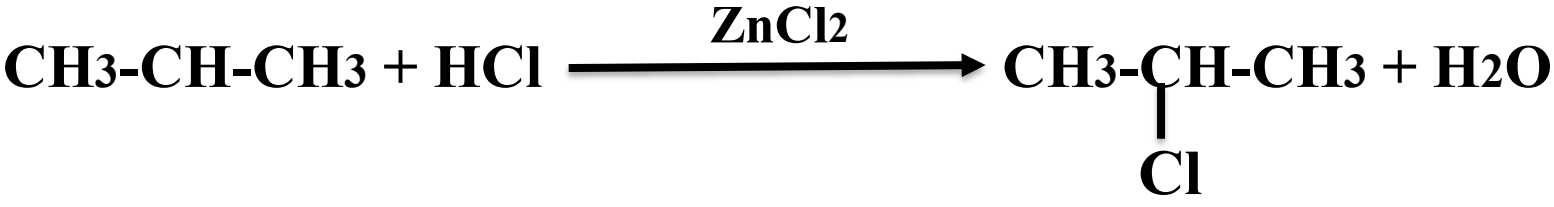
Reaction of Alcohols

1. Reaction of Alcohols with Metals

2. Oxidation of Alcohols



3. Reaction with Lucas Detector



Thank you