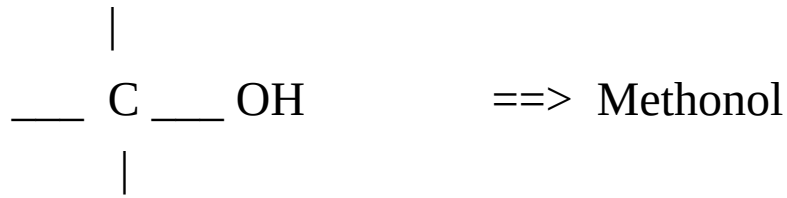
ALCOHOL, PHENOLS, AND ETHERS

ALCOHOLS

- Alcohols contain the hydroxyl unit as their functional group (-OH)).
- The general formula is R-OH, where R = an alkyl group e.g.



Physical Properties

- The hydroxyl group is polar and allows for hydrogen bonding.
- Due to the increased intermolecular forces, the melting and boiling points of alcohols are higher than the corresponding hydrocarbon. MP & BP increases with chain length.
- Since the hydroxyl group allows for hydrogen bonding, alcohols are quite soluble in water.
- As the hydrocarbon chain increases in length, the solubility in water decreases. Why?
- C_1 - C_5 = highly soluble; C_5 - C_7 = moderately soluble; C_8 and above = slightly soluble/insoluble

Naming Alcohols

- Remove the -e from the hydrocarbon name, replace with “ol”
- follow regular rules for naming

Examples:

$CH_3CH_2CH_2CH_2OH$ ==> ?

$CH_3CH(OH)CH_2CH_2CH(CH_3)CH_3$ ==> ?

$CH_3CH_2CH(OH)CH_2CH(CH_3)Cl$ ==>?

Common Names of Alcohols

1. Name the alkyl group to which the OH is attached, then add “alcohol” to the end

Examples:

IUPAC NAME	**COMMON NAME**
methanol	methyl alcohol
ethanol	ethyl alcohol
2-propanol	isopropyl alcohol

Classfication of Alcohols

1) **Primary alcohol** - one in which the carbon to which the OH group is attached is attached to only ONE other C atom.

E.g.

2) **Secondary alcohol** - one in which the carbon to which the OH group is attached is attached to only TWO other C atoms.

E.g.

3) **Tertiary alcohol** - one in which the carbon to which the OH group is attached is attached to only THREE other C atoms. E.g.

“Special Alcohols”

1) Alcohols which have 2 OH groups are called DIOLS or GLYCOL

   CH_2OHCH_2OH = 1,2-ethane**diol** or ethylene glycol

2) Alcohols which have 3 OH goups are called triols

   CH2OHCHOHCH2OH = 1,2, 3-propanetriol or glycerol or glycerin

PHENOLS

- An “alcohol-like” compound that have an hydroxyl group attached to a benzene ring

- phenols are important industrial chemicals which are used as antiseptics, plastics, cosmetics

ETHERS

- Ethers are compounds where both sides of the oxygen is bound to an akyl group
- General formula: R - O - R

Properties of ethers:

- much less polar than alcohols
- not soluble in water
- Lower MP and BP than alcohols
- chemically inert
- are all very flammable

Naming Ethers

IUPAC system

- Identify the longest chain and use it as the base name--one exception is if the shorter chain has a name altering functional group
- Name the shortest carbon chain with the "oxy" ending & treat it as a substituent
- Number location of ether bond on parent chain so that it is as low as possible
- Use other IUPAC rules for naming subsituents

Naming Ethers

- $CH_3CH_2CH_2$-O-CH_3 1-methoxypropane
- CH_3CHCl-O-CH_3 1-chloro-1-methoxyethane
- -CH_3CH_2-C(O-$CH_2CH_2CH_3$)HCH_3 2-propoxybutane

Common Name of Ethers

- Treat each carbon chain as a branch off the oxygen
- list each side with they “yl” ending
- Add ether to the end
- CH_3-O- CH_3 dimethyl ether
- CH_3- O- CH_2CH_3 methyl ethyl ether
- CH_3 CH_2-O-CH_2Cl chloromethyl ethyl ether

Homework

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