

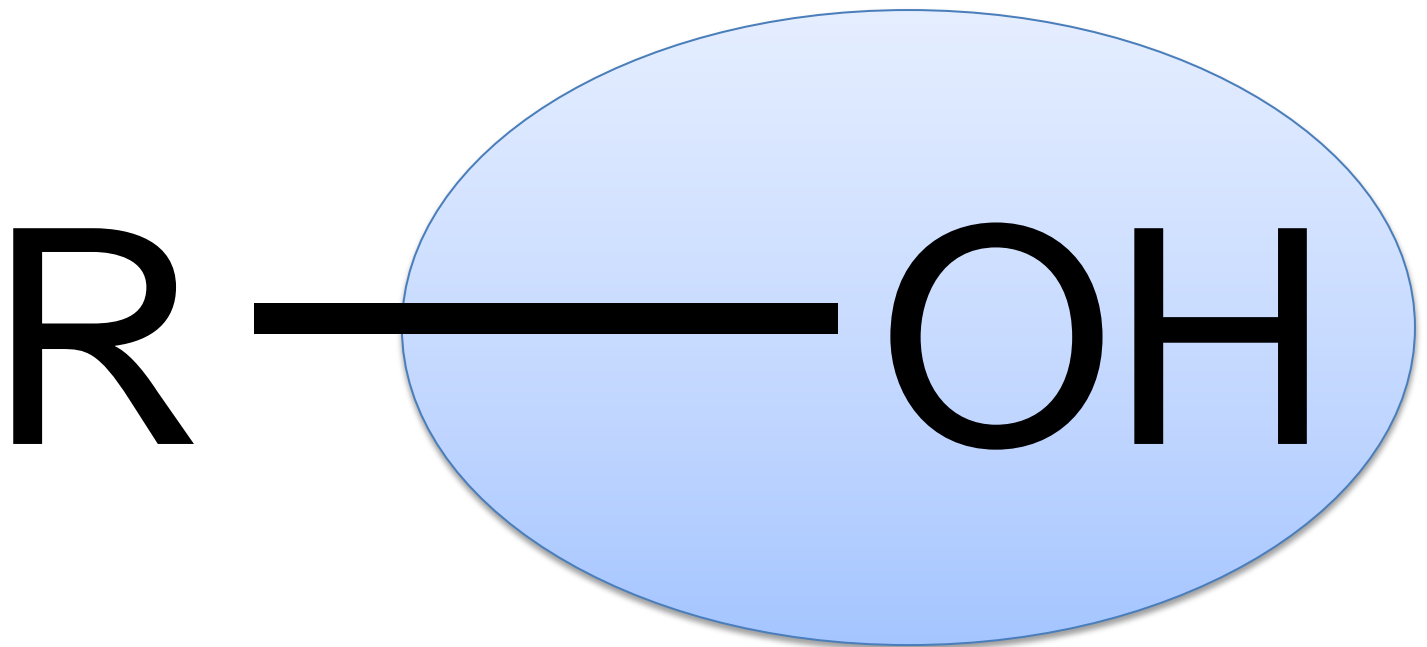
# Chemistry 2.5

# Organic Chemistry

Alcohol Chemistry

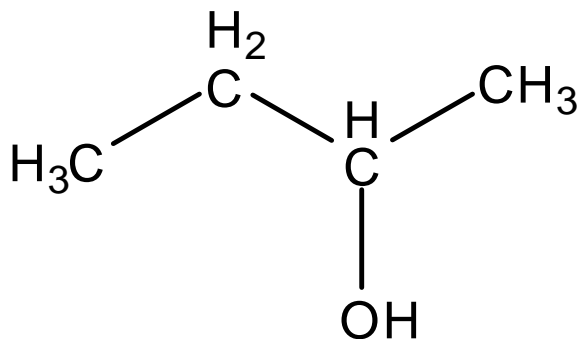
# Alcohol

- Alcohol is the functional group containing the O-H group

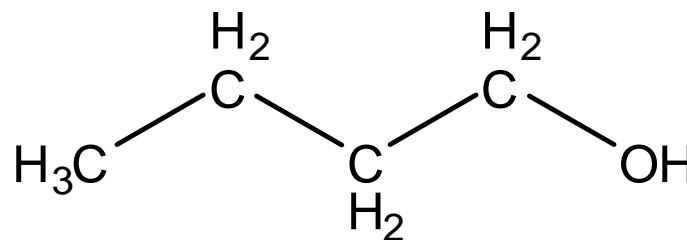


# How to name alcohol

- Alcohol end with the suffix **-#-ol**
- **#** indicate position of the OH group



Butan-2-ol



Butan-1-ol

# Physical properties #1

- Solubility
  - O-H group is polar because the **difference in EN** between oxygen and hydrogen
  - On the other hand the hydrocarbon chain is **non-polar**.
  - Therefore, **small alcohol** molecules ( $\leq 4$  carbon atoms) are **soluble in water**
  - Larger alcohol molecules (more than 5 carbons) are insoluble in water

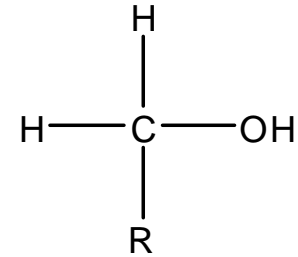
# Physical properties #2

- Boiling point
  - Melting and boiling points are much higher than alkane because of the polar OH group.
  - Like alkane, the b.p. of alcohol increases with the increasing size of the molecules.

# 3 Types of alcohol

## 1. Primary alcohol

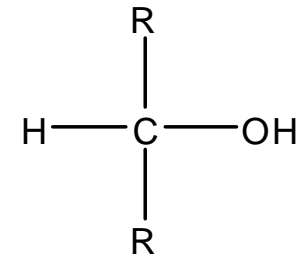
- End of the chain
- Connected to zero or one carbon



Primary 1°

## 2. Secondary alcohol

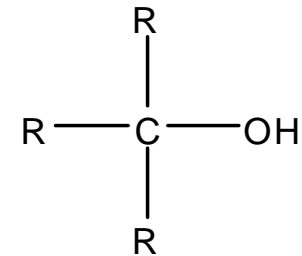
- Middle of the chain
- Connected to two carbons



Secondary 2°

## 3. Tertiary alcohol

- Branch chain carbon
- Connected to three carbons



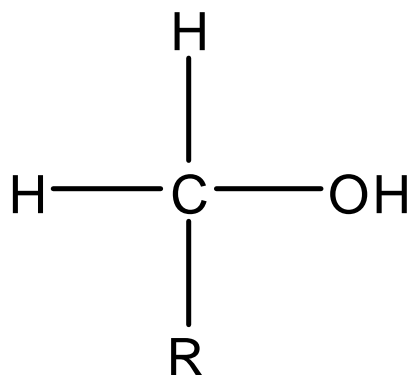
Tertiary 3°

# Chemical reactions

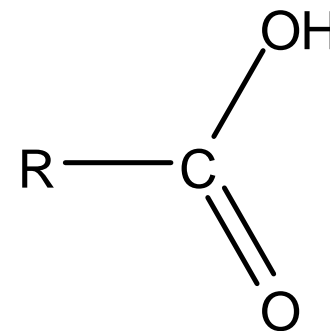
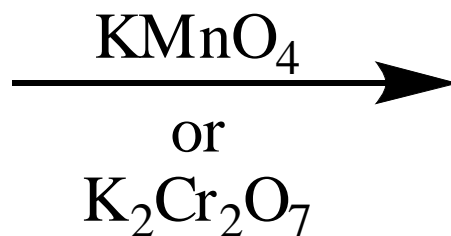
- Alcohols is a reactive functional group
- It can under go
  - Oxidation
  - Elimination
  - Substitution

# Oxidation

- 1° Alcohol → Carboxylic acid
- 2° Alcohol → Ketone (Level 3)



Primary 1°



carboxylic acid

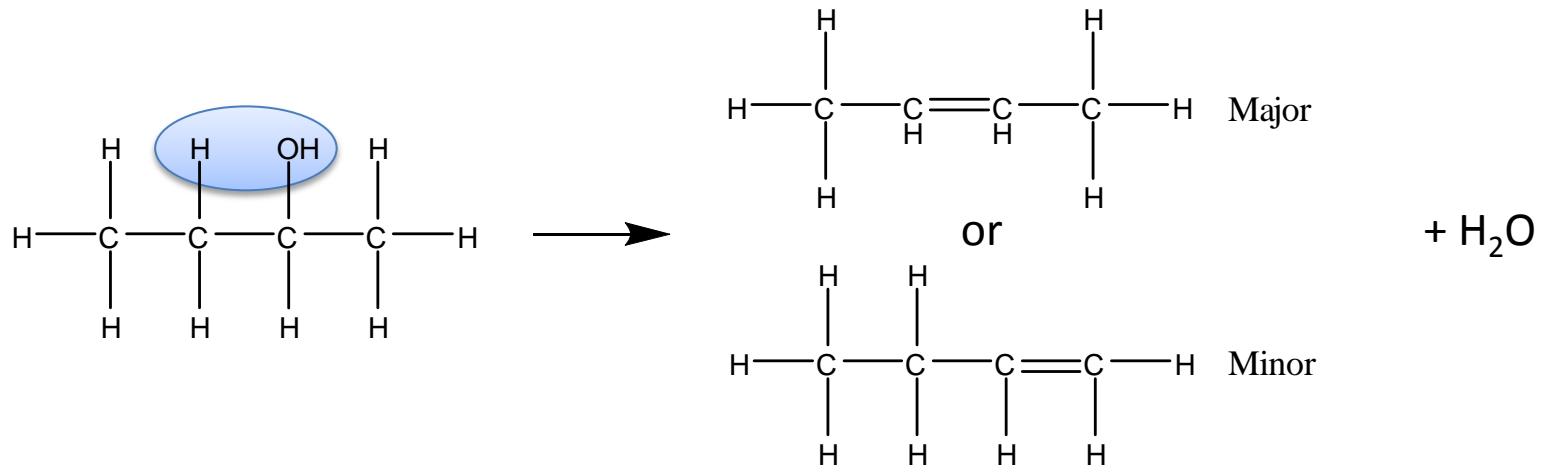


# Observation

- From **purple  $\text{MnO}_4^-$  to colourless  $\text{Mn}^{2+}$**   
Or
- From **orange  $\text{Cr}_2\text{O}_7^{2-}$  to green  $\text{Cr}^{3+}$**
- Reactions may require heats (such as warm water bath) to speed up the reaction.

# Elimination

- A double bond is formed by removing two groups in the molecules (in this case, H and OH forming water)
- Using concentrated  $\text{H}_2\text{SO}_4$  ( $\text{H}_2\text{SO}_4$  (conc.)) as a dehydrating agent.
  - $\text{H}_2\text{SO}_4$ (conc) removes water from ANYTHING. (see demo.)
- H poor gets poorer!



# Substitution

- A group is replaced by another group (or atom)
- In this case, the  $\text{-OH}$  group in the alcohol is replaced by a chlorine (Cl)

