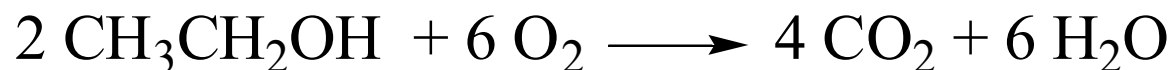


REACTIONS OF ALCOHOLS & ETHERS

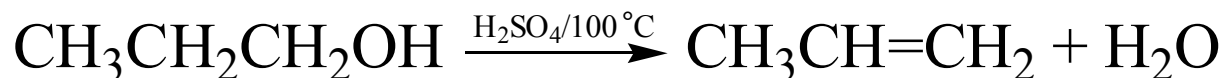
1. Combustion (Extreme Oxidation)

alcohol + oxygen \longrightarrow carbon dioxide + water



2. Elimination (Dehydration)

alcohol $\xrightarrow{\text{H}_2\text{SO}_4/100^\circ\text{C}}$ alkene + water

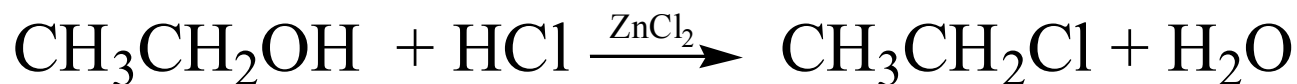
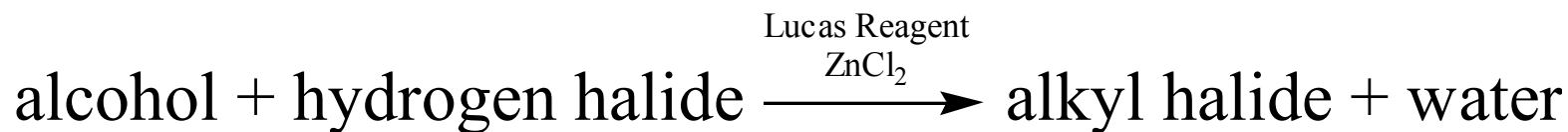


3. Condensation

excess alcohol $\xrightarrow{\text{H}_2\text{SO}_4/140^\circ\text{C}}$ ether + water



4. Substitution



- This reaction with the Lucas Reagent (ZnCl_2) is a qualitative test for the different types of alcohols because the rate of the reaction differs greatly for a primary, secondary and tertiary alcohol.
- The difference in rates is due to the solubility of the resulting alkyl halides
- Tertiary Alcohol \rightarrow turns cloudy immediately (the alkyl halide is not soluble in water and precipitates out)
- Secondary Alcohol \rightarrow turns cloudy after 5 minutes
- Primary Alcohol \rightarrow takes much longer than 5 minutes to turn cloudy

5. Oxidation

- Uses an oxidizing agent such as potassium permanganate (KMnO_4) or potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$).
- This reaction can also be used as a qualitative test for the different types of alcohols because there is a distinct colour change.

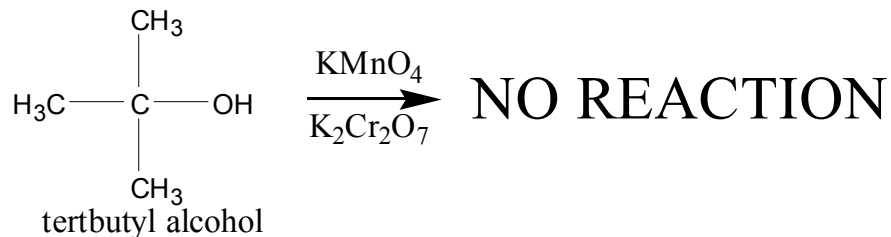
dichromate \rightarrow chromium $^{3+}$

(orange) \rightarrow (green)

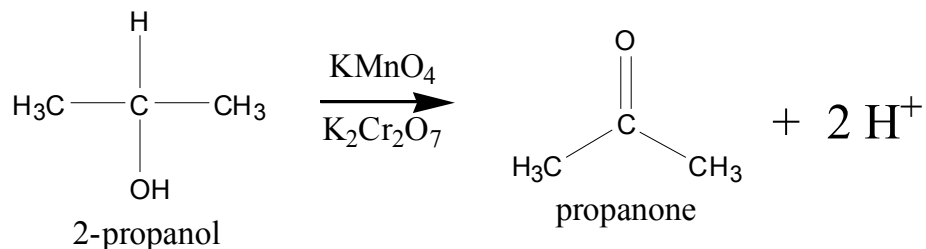
permanganate \rightarrow manganese (IV) oxide

(purple) \rightarrow (brown)

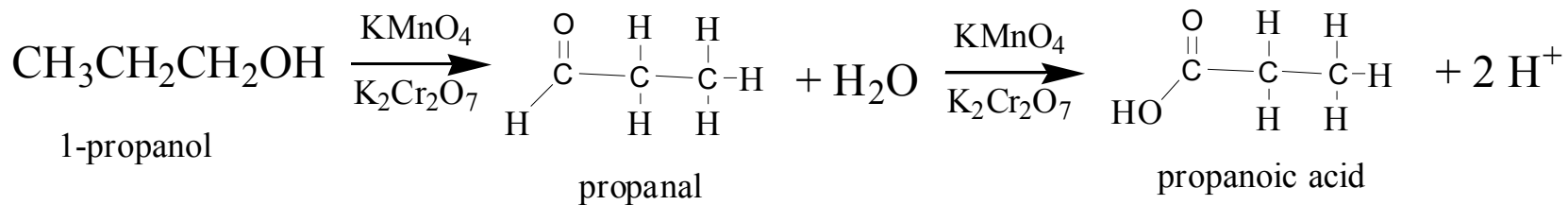
Tertiary Alcohol \longrightarrow not oxidized under normal conditions



Secondary Alcohol \longrightarrow ketone + hydrogen ions



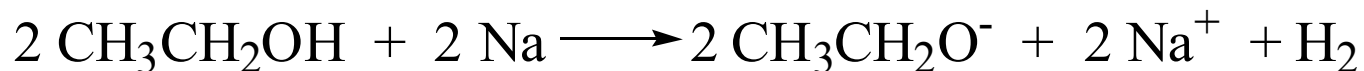
Primary Alcohol \longrightarrow aldehyde + water \longrightarrow carboxylic acid + hydrogen ions



6. Acid-Base Reactions

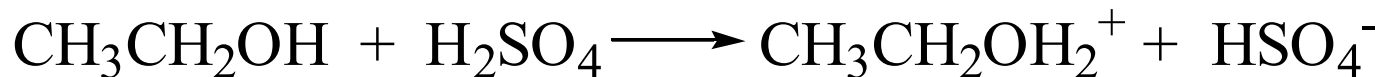
- Like water, alcohols can act as an acid or base, depending on what it is reacting with.
- When they react as an acid, the alkyl oxide ion ($\text{R-CH}_2\text{O}^-$) is formed.

ethanol + sodium \longrightarrow ethoxide ion + sodium ion + hydrogen



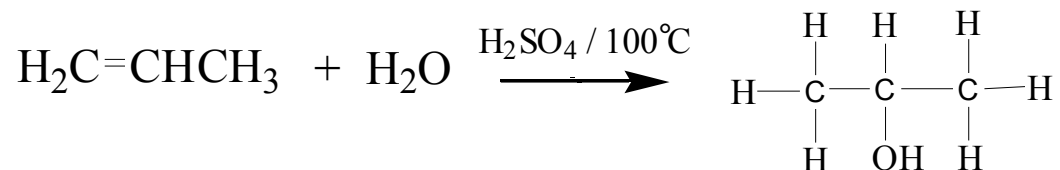
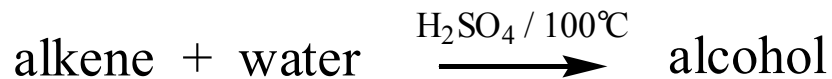
- When they react as a base, the alkyl oxonium ion ($\text{R-CH}_2\text{OH}_2^+$) is formed

ethanol + sulfuric acid \longrightarrow ethyloxonium ion + bisulfate ion



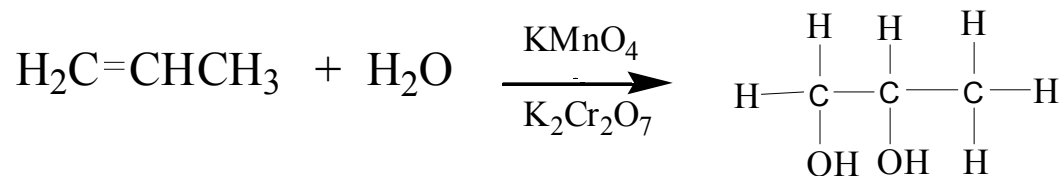
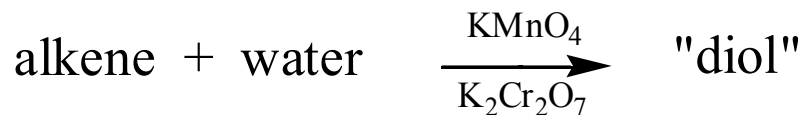
Preparation of Alcohols

1. Hydration of an Alkene



2. Oxidation of an Alkene

- This reaction uses an oxidizing agent like KMnO_4 or $\text{K}_2\text{Cr}_2\text{O}_7$ to produce a “diol”.

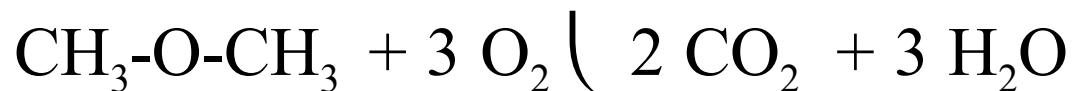


Reactions of Ethers

1. Ethers do not react with oxidizing or reducing agents.

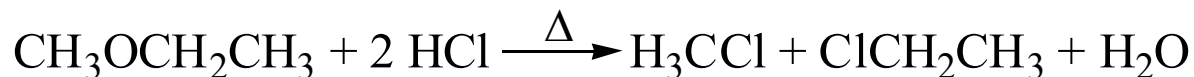
2. Combustion

ether + oxygen \rightarrow carbon dioxide + water



3. Reaction with Concentrated Binary Acids

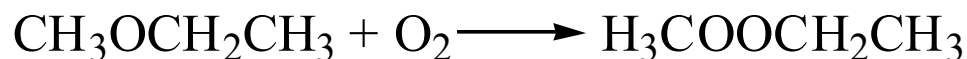
ether + 2 binary acid $\xrightarrow{\Delta}$ 2 alkyl halides + water



4. Reaction with Atmospheric Oxygen

- This is a slow reaction in which highly unstable peroxides are formed

ether + oxygen \longrightarrow peroxide



HOMework

- Pg 44 # 7-9
- Pg 48 # 12, 13 of Practice
- Pg 48 # 2-4, 6 of Section

