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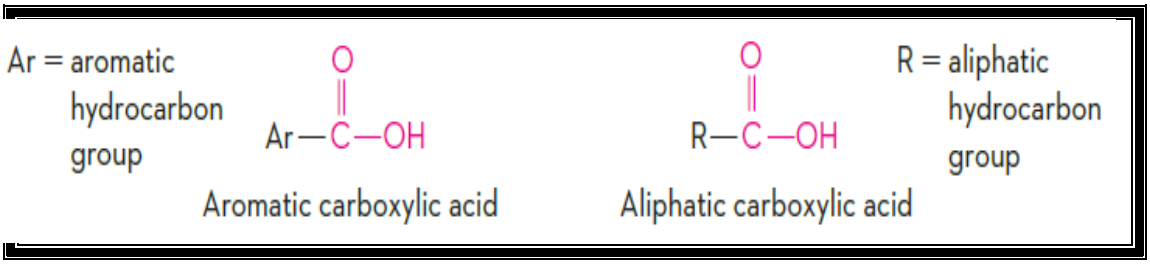
Lecture 5: Carboxylic acids

The functional group of the carboxylic acids is the carboxyl group (—COOH).

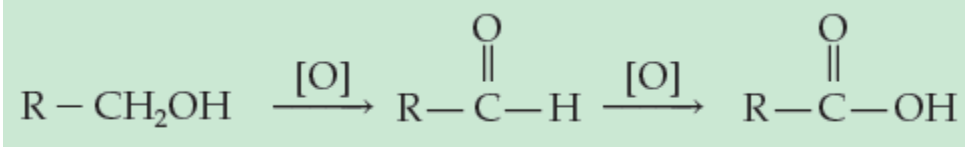
- Because the carboxyl group is extremely polar and carboxylic acids can form intermolecular hydrogen bonds with one another, they have higher boiling points and melting points than alcohols.
- The lower-molar-mass carboxylic acids are water-soluble and tend to taste sour and have unpleasant aromas.
- The longer-chain carboxylic acids are called fatty acids.
- In the IUPAC Nomenclature System, carboxylic acids are named by replacing the -e ending of the parent compound with -oic acid. When naming dicarboxylic acids, the -e is retained and the suffix -dioic is added. Often, common names are derived from the source of the carboxylic acid.

Carboxylic acids have the following general structure:



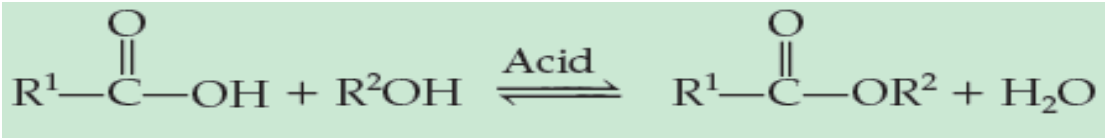
2.2.1 Preparation of Carboxylic Acids

Simple carboxylic acids can be made by **oxidation** of the appropriate primary alcohol or aldehyde.



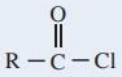
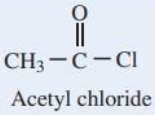
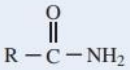
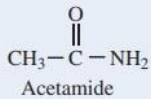
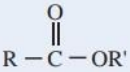
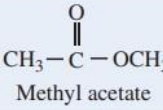
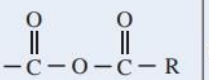
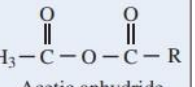
2.2.2 Esterification

Carboxylic acids react with alcohols to form esters and water



- Carboxylic acids are weak acids and are neutralized by strong bases to form salts. Soaps are salts of long-chain carboxylic acids (fatty acids)

Carboxylic Acids Derivatives

Group replacing - OH	Name	Structure	Example
–Cl	Acid chloride		 Acetyl chloride
$-NH_2$	Acid amide		 Acetamide
–OR'	ester		 Methyl acetate
–OOCR	Acid anhydride		 Acetic anhydride

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2.2.3 Some Important Carboxylic Acids

- Many carboxylic acids occur in nature. The stinging sensation of an ant bite is caused by methanoic (formic) acid, and ethanoic (acetic) acid provides the acidic zip to vinegars. Propanoic (propionic) acid is the product of bacterial fermentation of milk products.
- The hormone ghrelin, produced in the stomach, is sometimes called the "hunger hormone" because it stimulates the hypothalamus of the brain to signal that the body is hungry. However, the hormone alone does not have this effect. Ghrelin must be covalently bonded to a molecule of octanoic acid in order to have the hunger-stimulating effect on the hypothalamus.
- Fatty acids are long-chain monocarboxylic acids and can be isolated from a variety of sources including palm oil, coconut oil, butter, milk, lard, and animal fat.
- Human kidney stones are often formed from the calcium salt of oxalic acid.
- Salicylic acid is used as a disinfectant, Acetylsalicylic acid is aspirin association as a preventive measure against heart attacks and strokes caused by blood clots.