

NAME:ADENOPO DIVINE INIOLUWA

MATRIC NO:19 /MHS08/001

COURSE:CHM 102

DEPARTMENT:PUBLIC HEALTH

1a.HCOOH: Methanoic acid

b.HOOCCH₂CH₂CH₂COOH:Pentan-1,5 dioic acid

c.CH₃CH₂CH₂COOH:Butanoic acid

d.HO₂C-CO₂H:Ethanedioic acid

e.CH₃(CH₂)₄COOH:Hexanoic acid

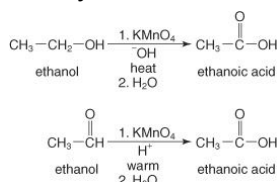
f. CH₃CH=CHCH₂CH₂COOH:Hex-4-eneoic acid

2.Physical appearance:Many carboxylic acids are colorless liquids with disagreeable odors. The carboxylic acids with 5 to 10 carbon atoms all have “goaty” odors (explaining the odor of Limburger cheese).They also participate in hydrogen bonding due to the presence of the carbonyl group (C=O) and the hydroxyl group.

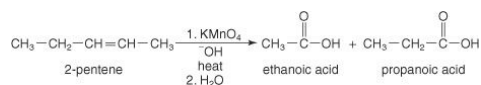
- Boiling point: The boiling point of a carboxylic acid is generally higher than that of water. Carboxylic acids exhibit strong hydrogen bonding between molecules. They therefore have high boiling points compared to other substances of comparable molar mass.
- Solubility:Solubility decreases as the carbon chain length increases because dipole forces become less important and dispersion forces become more predominant. Hexanoic acid [CH₃(CH₂)₄COOH] is barely soluble in water (about 1.0 g/100 g of water). Palmitic acid [CH₃(CH₂)₁₄COOH], with its large nonpolar hydrocarbon component, is essentially insoluble in water. The carboxylic acids generally are soluble in such organic solvents as ethanol, toluene, and diethyl ether.

3.

- The oxidation of primary alcohols and aldehydes
The oxidation of primary alcohols leads to the formation of aldehydes that undergo further oxidation to yield acids. All strong oxidizing agents (potassium permanganate, potassium dichromate, and chromium trioxide) can easily oxidize the aldehydes that are formed. Remember: Mild oxidizing agents such as manganese dioxide (MnO₂) and Tollen's reagent [Ag(NH₃)₂ + OH⁻] are only strong enough to oxidize alcohols to aldehydes



- Oxidation of alkenes
Alkenes are oxidized to acids by heating them with solutions of potassium permanganate (KMnO₄) or potassium dichromate (K₂Cr₂O₇).

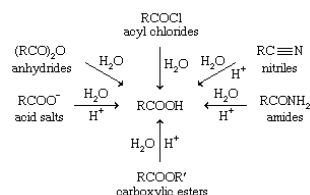


4. Synthesis Of Carboxylic Acids

Most of the methods for the synthesis of carboxylic acids can be put into one of two categories: (1) hydrolysis of acid derivatives and (2) oxidation of various compounds.

Hydrolysis of acid derivatives

All acid derivatives can be hydrolyzed (cleaved by water) to yield carboxylic acids; the conditions required range from mild to severe, depending on the compound involved.



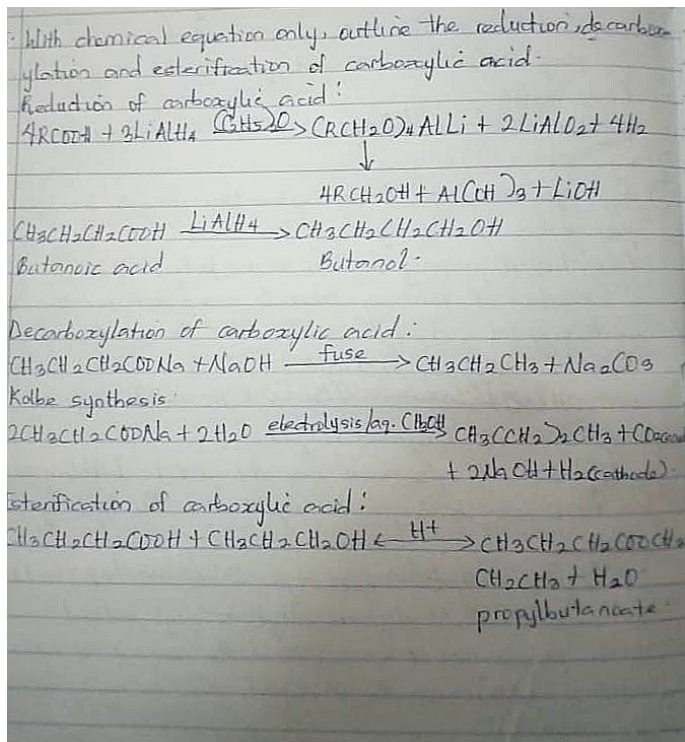
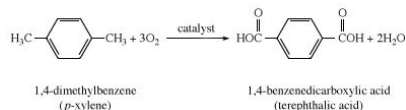
Chemical Compounds. Carboxylic acids and their derivatives. Synthesis of Carboxylic Acids. Hydrolysis of acid derivatives. [All acid derivatives can be hydrolyzed to yield carboxylic acids; the conditions required range from mild to severe.]

The easiest acid derivatives to hydrolyze are acyl chlorides, which require only the addition of water. Carboxylic acid salts are converted to the corresponding acids instantaneously at room temperature simply on treatment with water and a strong acid such as hydrochloric acid (shown as H^+ in the equations above). Carboxylic esters, nitriles, and amides are less reactive and typically must be heated with water and a strong acid or base to give the corresponding carboxylic acid. If a base is used, a salt is formed instead of the carboxylic acid, but the salt is easily converted to the acid by treatment with hydrochloric acid. Of these three types of acid derivatives, amides are the least reactive and require the most vigorous treatment (i.e., higher temperatures and more prolonged heating). Under milder conditions, nitriles can also be partially hydrolyzed, yielding amides: $\text{RCN} \rightarrow \text{RCONH}_2$.

Oxidation

The oxidation of primary alcohols is a common method for the synthesis of carboxylic acids: $\text{RCH}_2\text{OH} \rightarrow \text{RCOOH}$. This requires a strong oxidizing agent, the most common being chromic acid (H_2CrO_4), potassium permanganate (KMnO_4), and nitric acid (HNO_3). Aldehydes are oxidized to carboxylic acids more easily (by many oxidizing agents), but this is not often useful, because the aldehydes are usually less available than the corresponding acids. Also important is the oxidation of alkyl side chains of aromatic rings by strong oxidizing agents such as chromic acid, potassium permanganate, and nitric acid to yield aromatic carboxylic acids. Regardless of the number of carbon atoms in the side chain or the presence of any groups attached to them, if the first carbon in the alkyl chain is bonded to at least one hydrogen (and not to another aromatic ring), all but one of the carbons are removed, and only a COOH group remains bonded to the aromatic ring. Examples are the oxidations of toluene and 1-chloro-3-phenylpropane.

Terephthalic acid for the production of the polymer poly(ethylene terephthalate), abbreviated PET, is made by the catalyzed air oxidation of 1,4-dimethylbenzene (p-xylene). Treatment of this dicarboxylic acid or its dimethyl ester with ethylene glycol gives PET. PET can be fabricated into textile fibers (Dacron polyester), into film (Mylar), and into recyclable beverage containers.



5.