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CHEMISTRY 102

1) Give the IUPAC names of the following compounds

Answer

- a) $\text{HCOOH} \rightarrow$ Methanoic acid
b) $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$ pentane-1,5-dioic acid
c) $(\text{CH}_3)_2\text{CHCH}_2\text{COOH} \rightarrow$ butanoic acid
d) $\text{HO}_2\text{C}-\text{CO}_2\text{H} \rightarrow$ ethanedioic acid
e) $(\text{CH}_2)_5\text{COOH} \rightarrow$ Hexanoic acid
f) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{COOH} \rightarrow$ Hex-4-enoic acid.

2) physical properties of carboxylic acids.

i) physical appearance.

All simple aliphatic carboxylic acids up to C₁₀ are liquids at room temperature. Most other carboxylic acids are solids at room temperature although anhydrous carboxylic acids also known as glacial ethanoic acid freezes to ice-like solid below room temperature.

ii) BOILING POINTS:

Boiling points increases with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts of comparable relative molecular mass.

iii) SOLUBILITY

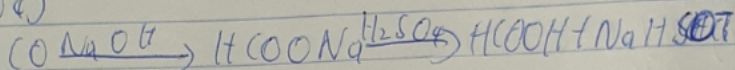
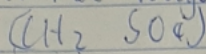
Lower molecular mass carboxylic acid with up to four carbon atoms in their molecules are soluble in water; this largely due to their solubility. to form hydrogen bonds with water molecules. This Water molecules solubility of the acids decreases as the relative molecular mass increases. because the structure becomes relatively mass hydrogen in nature and hence

covalent. Carboxylic acids are soluble in organic solvents

3) INDUSTRIAL PROPERTIES OF CARBOXYLIC ACIDS

1) From Carbon(II) Oxide

Methanoic acid is manufactured by the carbon(II) oxide under pressure to hot aqueous solutions of sodium hydroxide. The free carboxylic acid is led by careful reaction with tetraoxosulphate(VI) acid.



1) From petroleum

Liquid phase air oxidation of C₅-C₇ alkanes, obtainable from petroleum at high temperatures and pressure will give C₅-C₇ carboxylic acids with, methanoic, propanoic and butanoic acid as by products.

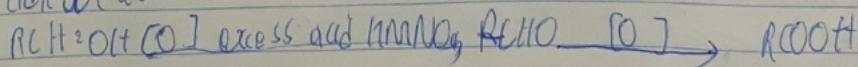
C₅-C₇ O₂ / high temperature and pressure → C₅-C₇ carboxylic acids

Q) With equations and brief explanation discuss the synthetic preparation of carboxylic acids.

Answer

① Oxidation of primary alcohols and aldehydes.

Oxidation of primary alcohols and aldehydes are to be used to prepare carboxylic acids using the usual oxidizing agents (i.e. K₂Cr₂O₇, O.KmnO₄) in acidic solution.



1) Carbonylation of organoal reagents

Aliphatic carboxylic acids are obtained by bubbling

(1) Esterification.

