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1  $\text{HCOOH} \rightarrow$  Methanoic acid

$\text{HOOC(CH}_2\text{)}_2\text{(CH}_2\text{)}_2\text{COOH}$  - Pentan-1,5-dioic acid

$\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$  - Butanoic acid

$\text{HO}_2\text{C}-\text{C}_2\text{H}_4-\text{CO}_2\text{H}$  - Ethanedioic acid

$\text{CH}_3(\text{CH}_2)_4\text{COOH}$  - Hexanoic acid

$\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{COOH}$  - Hex-5-enoic acid

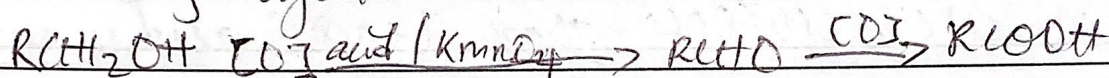
2i physical appearances - all simple aliphatic carboxylic acids up to  $\text{C}_6$  are liquids at room temperature, most other carboxylic acids are solid room temperature

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

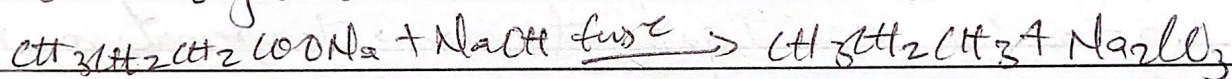
iii low molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water. This is largely due to their ability to form hydrogen bonds with water molecules. The water solubility of the acids decreases as the relative molecular mass increases

3 From Petroleum  
From Ethanol

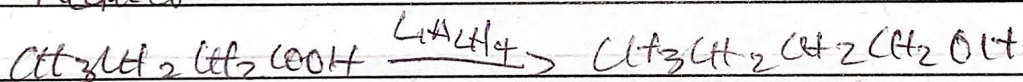
4 Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using oxidizing agents



5 Decarboxylation



Reduction



Butanoic acid

Butanol

esterification

