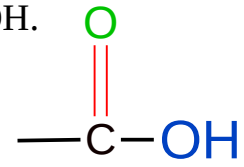
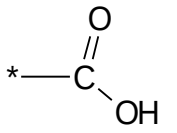
Carboxylic acids

Carboxylic acid: It is an organic compound containing the Carboxyl group -COOH.



Carboxyl group: Consists of a carbonyl group bonded with a hydroxyl group.

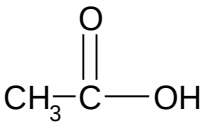
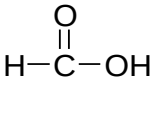
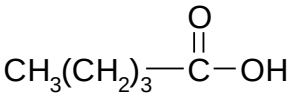
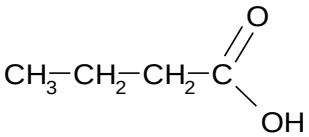
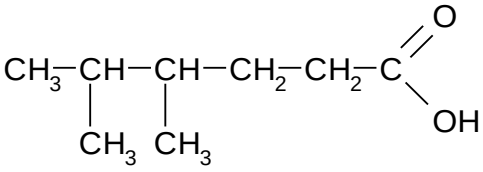
General formula :   //

Naming : Add the Suffix (-oic) to the end of the alkene, and the word acid to the beginning of the name. (Alkane + oic+ Acid)

Figure 22.10 Stinging ants defend themselves with a venom that contains formic acid.
Identify *another name for formic acid.*

CH_3COOH Ethan**oic** acid (acetic acid) (Vinegar)	$HCOOH$ Methan**oic** acid (formic acid) **The simplest carboxylic acid**, consisting of a carboxyl group linked to a hydrogen atom **Common name**: **formic acid** Some insects produce it as a defensive device

Name the following compounds:

 or CH_3COOH	 or $HCOOH$
	
$CH_3(CH_2)_7COOH$	$CH_3(CH_2)_4COOH$
	CH_3CH_2COOH

Q: Write the formulas for:	
Butanoic acid	4,4-dimethyl heptanoic acid
Propanoic acid	Heptanoic acid

Carboxylic acid properties:

1 – Polar 2- Active 3- Has a pungent taste

4 - Litmus paper changed from blue to red

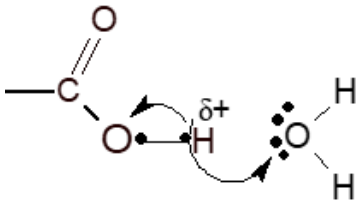
5 - It is **weakly ionized in water**, and ionization produces hydronium and acid anions, which are in equilibrium with water and non-ionizing acid.

Example: ionization of ethanoic acid (acetic acid):

$CH_3COOH_{(aq)} + H_2O_{(l)} \rightleftarrows CH_3COO^-_{(aq)} + H_3O^+_{(aq)}$

ethanolic acid (acetic acid) — Ethanoate ion (Acetate ion)

Explain: **Carboxylic acids are ionized in water** because oxygen atoms are highly electronegaty, and they attract electrons away from the hydrogen atom in the ***hydroxyl group***, and as a result, H^+ protons can transfer to another atom that has a pair of unpaired electrons such as the oxygen atom in the water molecule.



Classification of carboxylic acids

Carboxylic acids

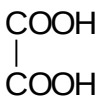
Monocarboxyl

Formic acid
HCOOH

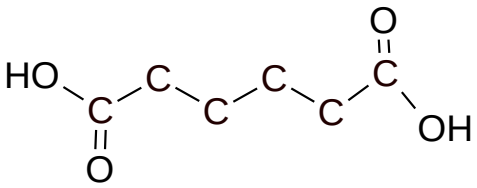
Acetic acid
CH_3COOH

Dicarboxyl

Oxalic acid

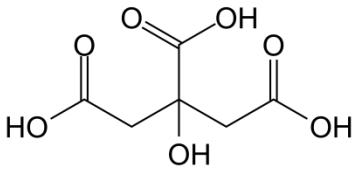


adipic acid



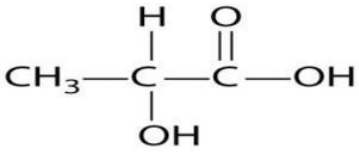
Tricarboxyl

Citric acid



Note: Some other acids have an additional functional group such as OH

Example: lactic acid in milk



The acid containing two functional groups - COOH, - OH is often ***more soluble*** in water and **more acidic than acids containing one carboxyl group**.