▶ Video explanation (YouTube Short)

Uses of Carboxylic Acids

Carboxylic acids and their salts and esters are used in industry, food, cleaning and medicine (NCERT 8.10). All of them carry the **–COOH** group, or a group made from it.

1. The uses at a glance

Compound	Use
Methanoic (formic) acid, HCOOH	rubber, textile, dyeing, leather and electroplating industries
Ethanoic (acetic) acid, CH_3COOH	solvent; vinegar in the food industry
Hexanedioic (adipic) acid, HOOC–$(CH_2)_4$–COOH	manufacture of nylon-6,6
Sodium benzoate, C_6H_5COONa	food preservative
Esters of benzoic acid	perfumery
Higher fatty acids (e.g. stearic acid, $C_{17}H_{35}COOH$)	soaps and detergents (as sodium salts)
Aspirin (acetylsalicylic acid)	relieves pain and fever

2. Nylon-6,6: the amide link

Adipic acid has a –COOH group at each end; hexamethylenediamine, $H_2N–(CH_2)_6–NH_2$, has an $–NH_2$ at each end. The nitrogen's lone pair attacks the carbonyl carbon, water is lost, and an **amide link –CO–NH–** forms. Repeating this at both ends of both molecules gives the long chain of nylon-6,6 (a condensation polymer), used for ropes and fabrics.

3. How soap works

Soap is the sodium salt of a long-chain fatty acid, e.g. sodium stearate $C_{17}H_{35}COO^-Na^+$. Its long hydrocarbon tail is non-polar and dissolves in grease; its $–COO^-$ head is ionic and is attracted to water. So soap holds grease and water together and the grease is washed away.

Solved example

Q. Why is sodium benzoate, not benzoic acid itself, added to cold drinks?
A. Sodium benzoate is the sodium salt of benzoic acid and dissolves readily in water, so it mixes evenly into the drink; in the acidic drink it acts as a preservative that stops microbes from growing.

Key takeaways

- Formic acid: industries (rubber, textile, dyeing, leather, electroplating).
- Acetic acid: solvent and vinegar.
- Adipic acid + diamine → amide links → nylon-6,6.

- Sodium benzoate: food preservative; benzoic esters: perfumes.
- Sodium salts of fatty acids = soap.
- Aspirin is itself a carboxylic acid.

Practice questions

1. (MCQ) Nylon-6,6 is made from hexamethylenediamine and: (a) acetic acid (b) adipic acid (c) benzoic acid (d) stearic acid
2. (MCQ) The food preservative among these is: (a) sodium stearate (b) sodium benzoate (c) sodium acetate (d) sodium formate
3. (MCQ) Vinegar is a dilute solution of: (a) formic acid (b) acetic acid (c) oxalic acid (d) citric acid
4. (Very short) Name the acid used in the leather and electroplating industries.
5. (Very short) Give the IUPAC name of adipic acid.
6. (Short) What link joins the units of nylon-6,6, and what small molecule is lost when it forms?
7. (Short) Explain how the two ends of a soap molecule help remove grease.
8. (Application) Aspirin is acetylsalicylic acid. Which functional group makes it an acid?

Answer key

1. (b) adipic acid.
2. (b) sodium benzoate.
3. (b) acetic acid.
4. Methanoic (formic) acid.
5. Hexanedioic acid.
6. The amide link –CO–NH–; water (H_2O) is lost.
7. The long non-polar hydrocarbon tail dissolves in grease; the ionic $–COO^-$ head stays in water; so the grease is held in water and washed away.
8. The carboxyl group, –COOH.

▶ Watch the video explanation