

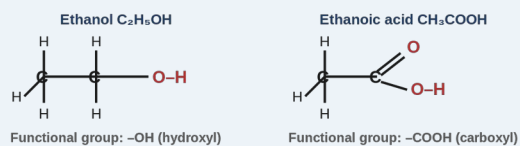
4.5 Alcohols

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1. KEY VOCABULARY

TERM	MEANING
Alcohol	An organic compound with the –OH functional group.
Hydroxyl group	The –OH functional group of alcohols.
Fermentation	Making ethanol from sugar using yeast.
Oxidation	Adding oxygen — alcohols can be oxidised to carboxylic acids.
Aqueous	Dissolved in water.

2. STRUCTURE — THE –OH GROUP



Alcohols (–OH): burn as fuels; react with sodium; can be oxidised to carboxylic acids.
 Carboxylic acids (–COOH): weak acids — turn litmus red, react with carbonates to give CO₂.
 Each is a homologous series with the same functional group and similar reactions.

3. THE FIRST ALCOHOLS

NAME	FORMULA
Methanol	CH ₃ OH
Ethanol	C ₂ H ₅ OH
Propanol	C ₃ H ₇ OH

4. MAKING ETHANOL

Fermentation: sugar → ethanol + carbon dioxide, using yeast, around 30 °C, no air. A renewable but slow batch process.
Hydration of ethene: ethene + steam → ethanol, with a catalyst. Fast and continuous, but uses a finite raw material.

5. REACTIONS & USES

Combustion: burns cleanly → CO₂ + water. Used as a fuel.
Oxidation: ethanol can be oxidised to ethanoic acid (e.g. by air or an oxidising agent).
Uses: fuel, solvent, and in alcoholic drinks.

6. THE WHY

Why fermentation needs no air: oxygen would oxidise the ethanol to ethanoic acid (vinegar) instead.
Why all alcohols react similarly: they all have the same –OH functional group.

7. COMMON EXAM MISTAKES

- ✗ "The functional group of alcohols is –COOH."
- ✓ It is –OH (hydroxyl). –COOH is carboxylic acids.
- ✗ "Fermentation is done with plenty of air."
- ✓ Fermentation is done WITHOUT air.
- ✗ "Ethanol is oxidised to carbon dioxide only."
- ✓ Oxidation of ethanol gives ethanoic acid.

8. SELF-CHECK · cover & quiz

Can you...

1. State the functional group of alcohols?
2. Name and give the formula of the first three alcohols?
3. Describe how ethanol is made by fermentation?
4. Describe how ethanol is made from ethene?
5. Compare the two methods of making ethanol?
6. State three uses of ethanol?