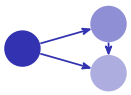
Organic Synthesis

A-Level Chemistry ▪ Topic 21

A-Level Chemistry



What we will cover

1. Identifying functional groups
2. The reaction map
3. Planning a route

built in many steps

1 Tests and routes

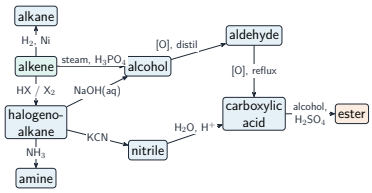
Identifying functional groups

add this	you see	functional group
bromine water	orange → colourless	C=C (alkene)
silver nitrate	a precipitate forms	halogenoalkane
acidified $K_2Cr_2O_7$	orange → green	1°/2° alcohol
2,4-DNPH	orange precipitate	aldehyde / ketone
a carbonate	fizzes (CO_2 given off)	carboxylic acid

Each test points to one **functional group** 官能团:

- bromine water decolourised → alkene
- $AgNO_3$ precipitate → halogenoalkane
- dichromate orange→green → alcohol
- fizz with carbonate → carboxylic acid

The reaction map



Each arrow turns one functional group into another.

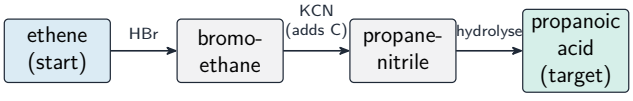
Learn it as a map you can travel around. **KCN** 氰化钾 is the only AS step that adds a carbon.

Planning a route

To devise a **synthetic route** 合成路线:

- compare target vs start (group? carbons?)
- work backwards, one reaction at a time
- write each step's **reagent** 试剂 & conditions

plan backwards from the target



2 Recap

Worked example – planning a synthesis

Suggest a two-step route from 1-bromopropane to propanoic acid, with reagents and conditions.

- Count the carbons first: 3 in, 3 out – so no carbon-adding step is needed.
- Step 1: reflux with aqueous NaOH ⇒ nucleophilic substitution ⇒ propan-1-ol.
- Step 2: reflux with acidified $K_2Cr_2O_7$ ⇒ oxidation ⇒ propanoic acid.
- Reflux (not distil) in step 2, or you stop at propanal.

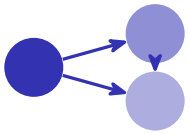
Count carbons first. Same number ⇒ substitute and oxidise. One more carbon ⇒ go via the nitrile (KCN in ethanol), then hydrolyse.

Topic 21 – key takeaways

1. **Tests** — each reagent identifies one functional group
2. **Map** — arrows convert one group to another
3. **Plan backwards** — from the target to the start
4. **Add a carbon** — the KCN step is the key

Check yourself

1. What test confirms a carboxylic acid?
2. Which way should you plan a synthesis?
3. Which reagent lengthens the carbon chain?
4. What must you state for each step?



Answers **1.** fizz (CO_2) with a carbonate **2.** backwards from the target **3.** KCN **4.** the reagent and conditions