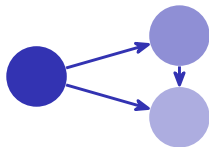


Organic Synthesis

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

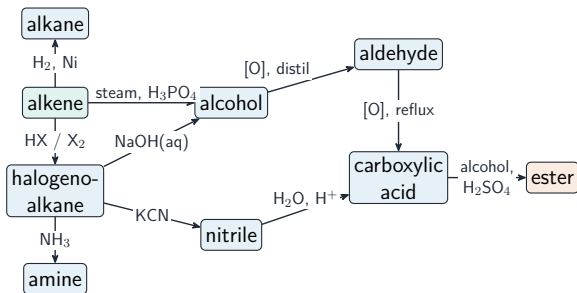
Identifying functional groups

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

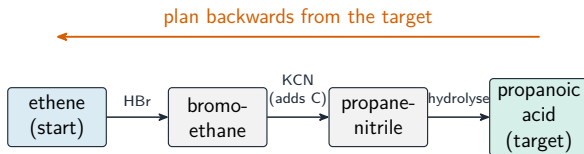
The reaction map



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

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** $\Rightarrow$ nucleophilic substitution $\Rightarrow$ propan-1-ol.
- Step 2: reflux with **acidified $K_2Cr_2O_7$** $\Rightarrow$ oxidation $\Rightarrow$ **propanoic acid**.
- Reflux (not distil) in step 2, or you stop at propanal.

Count carbons **first**. Same number $\Rightarrow$ substitute and oxidise. One **more** carbon $\Rightarrow$ 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

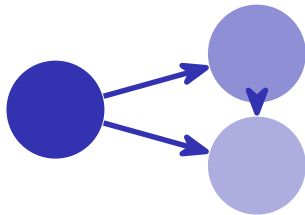
from the target to the start

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