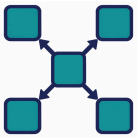
Organic Synthesis Map

AQA A-level Chemistry · 3.3.14 Organic synthesis

1 Aliphatic routes

3.3.14iv

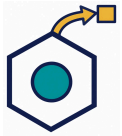
- Know each junction
- Alkene, alcohol, RX
- Acid, ester, amide
- Reagent and **conditions**



2 Aromatic routes

3.3.14iv

- Nitrate, then reduce
- Acylate with $AlCl_3$
- A ketone on the ring
- Ring stays intact

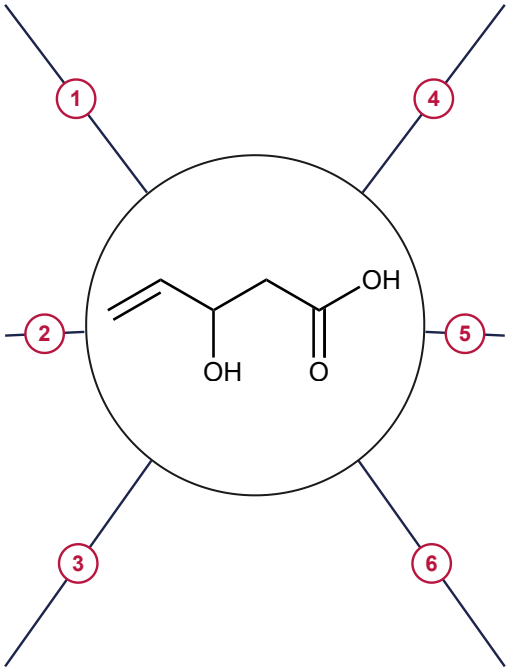


3 A longer chain

3.3.14iv

- KCN on RX: a nitrile
- KCN, then dilute acid, on C=O
- One more carbon
- $LiAlH_4$ gives an amine

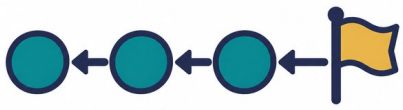




4 Working backwards

3.3.14iv

- Start at the **target**
- Which bond was last?
- Up to four steps
- Yields **multiply**



5 Atom economy

3.3.14iii

- Desired Mr ÷ all reactants
- From the equation
- Addition: 100%
- By-products lower it



6 Safer design

3.3.14ii

- **No solvent** where possible
- Non-hazardous starting materials
- KCN: toxic, HCN with acid
- Fewer steps, less waste



Key reagents for routes

reagent and conditions

Change	Reagent	Conditions
Alkene to RBr	HBr	Room temperature
RBr to ROH	NaOH(aq)	Reflux
ROH to RCOOH	Excess $K_2Cr_2O_7/H^+$	Reflux
RBr to RCN	KCN in ethanol	Reflux
RCN to RCH_2NH_2	$LiAlH_4$, then water; or H_2/Ni	Dry ether; heat and pressure

Worked examples

Overall yield

- 85.0% then 60.0%
- 0.850 × 0.600
- **51.0%**

Atom economy

- RBr + NaOH to ROH + NaBr
- 46 ÷ 149
- **30.9%**

Add one carbon

- Bromoethane to propylamine
- KCN, then $LiAlH_4$
- **$CH_3CH_2CH_2NH_2$**

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