Amines Summary Map

Edexcel International A Level Chemistry · Unit 5 · Topic 19A Amines

1 Classes and names

19.1

- Count the **carbons on N**
- One: primary; two: secondary
- Three: tertiary; four: quaternary ion
- Propylamine or propan-1-amine



2 Preparing amines

19.4, 19.5

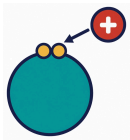
- **Excess ethanolic NH_3**, pressure
- Nitrile + **$LiAlH_4$** in dry ether
- $ArNO_2$ + **Sn, conc HCl**
- Then NaOH(aq) frees $ArNH_2$

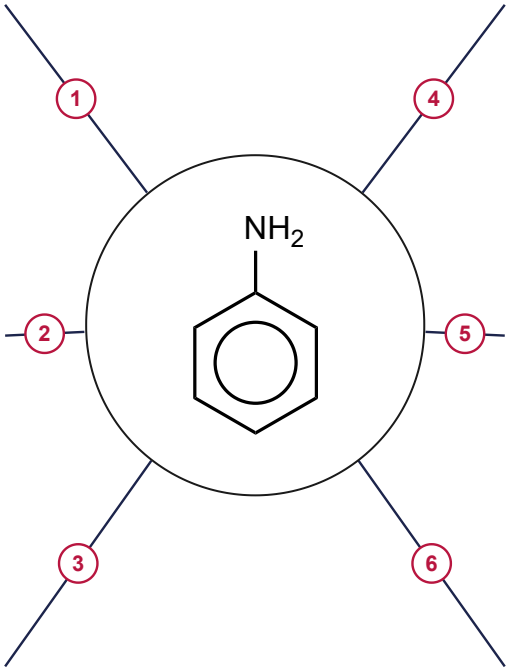


3 Bases

19.2, 19.3

- N lone pair accepts **H^+**
- $RNH_2 > NH_3 > C_6H_5NH_2$
- Alkyl releases electrons
- Ring **delocalises** the pair





4 Nucleophiles

19.2

- RX: **further substitution**
- Ends at the quaternary salt R_4N^+
- CH_3COCl: N-substituted amide
- HCl meets a **second mole** of amine



5 Copper(II) ions

19.2

- A little amine: **pale blue** solid
- $[Cu(OH)_2(H_2O)_4]$
- Excess: **deep blue** solution
- $[Cu(RNH_2)_4(H_2O)_2]^{2+}$



6 Diazonium and dyes

19.6

- $NaNO_2$ + dilute HCl, **below 5 °C**
- Warm: phenol + N_2
- Phenol in NaOH(aq): **azo dye**
- –N=N– extends delocalisation



Reactions of amines

butylamine and phenylamine

With	Butylamine	Phenylamine
Water	Mixes: alkaline solution	Separate layer; barely alkaline
HCl(aq)	$C_4H_9NH_3^+Cl^-$	$C_6H_5NH_3^+Cl^-$: dissolves
CH_3COCl	N-butylethanamide	N-phenylethanamide
Excess RX	Quaternary ammonium salt	Quaternary ammonium salt
$Cu^{2+}(aq)$	Deep blue with excess	Ligand through N
HNO_2, below 5 °C	Not required	$C_6H_5N_2^+$

Worked examples

Yield

- 12.3 g $C_6H_5NO_2$: 0.100 mol
- 7.44 g product: 0.0800 mol
- **80%**

Titration

- 0.0100 mol amine
- 25.0 cm^3 of HCl, 1 : 1
- **0.400 mol dm^{-3}**

Chain length

- Target butylamine
- From 1-bromopropane
- **KCN, then $LiAlH_4$**

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