

5.4.1 Select amine preparation and distinguish nitrogen reactions

Name: _____ Class: _____ Date: _____

Total: 17 marks

KEY WORDS evidence • conditions

Objective

Select amine preparation and distinguish nitrogen reactions. All questions and marking guidance are original.

1 Key knowledge and worked examples

Amines accept H^+ through the nitrogen lone pair. Alkyl groups generally increase basicity relative to ammonia; interaction of the lone pair with the ring makes phenylamine less basic. Amides contain $-\text{CONH}-$ and are much less basic than amines.

■ Worked method

$\text{CH}_3\text{CH}_2\text{Br}$ with excess ethanolic ammonia gives ethylamine; excess ammonia reduces further substitution. $\text{CH}_3\text{CH}_2\text{CN}$ reduced with LiAlH_4 in dry ether then worked up gives propan-1-amine: keep the nitrile carbon. Nitrobenzene with $\text{Sn}/\text{concentrated HCl}$ gives an acidic phenylammonium mixture; alkali liberates phenylamine. Cold nitrous acid forms a diazonium salt from phenylamine, which then couples with phenol in alkaline solution.

2 Practice

2.1 Write butan-1-amine in condensed form and its equation with HCl . [2]

2.2 Explain why phenylamine is a weaker base than a typical primary alkylamine. [2]

2.3 Identify the product when propanenitrile is reduced. State reagents and count the product carbons. [3]

3 Exam-style questions

3.1 Plan preparation of phenylamine from nitrobenzene, including the work-up. Explain why the work-up is needed. [3]

3.2 Write the equation for ethanoyl chloride with excess ethylamine, including the salt by-product. [3]

3.3 State the two separate stages for making an azo product from phenylamine and phenol. Explain the cold condition and the colour. [4]
