

34. Nitrogen compounds

34.1 Primary and secondary amines

Paper 4

Marking Scheme

Q1.

(a)	<p>M1 benzylamine > ammonia > phenylamine</p> <p>M1 M2 Any two for one mark, all three for two marks:</p> <ul style="list-style-type: none"> (basicity linked to) p orbital of N / lone pair on N AND being able to bond / accept / donate to / coordinate to a proton / H⁺ (benzylamine) R / alkyl / CH₂ group AND is electron donating / positive inductive effect / has + I effect (phenylamine) p orbital of N / lone pair on N is overlaps / incorporated / delocalised in the ring / π-bond system 	3
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Q2.

(a)	<p>chloroethane and ethylamine [1] heat, pressure, ethanol [1]</p> <p>N-ethyl ethanamide CH₃CONHC₂H₅ [1] LiAlH₄ [1]</p> <p>Other syntheses that work also got credit /</p>	4
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Q3.

(c)	lone pair on the N can accept a proton	1
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Q4.

(a)	<p>cyclohexylamine > ammonia > phenylamine</p> <ul style="list-style-type: none"> (order of basicity) linked to ability of N to accept a proton / donate its lone pair (to a proton) alkyl / cyclo / hexyl group is electron donating group / positive inductive group (and increases electron density on N) lone pair / p-orbital from N in phenylamine delocalised / overlaps with ring (and decreases electron density on N) <p>two for one mark, three for two marks</p>	3
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Q5.

(b)(i)	CH ₃ COCl AND HCl	1
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Q6.

(b)	no change [1]	1
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Q7.

(a)(i)	$\text{RNH}_2 + \text{H}^+ \rightarrow \text{RNH}_3^+$ OR $\text{RNH}_2 + \text{HCl} \rightarrow \text{RNH}_3\text{Cl}$ [1]	1
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