HL Paper 3

Ethylamine, $\mathrm{C_2H_5NH_2}$, is a weak base.

a. Explain why ethylamine has basic properties. [1]

b. The $\mathrm{p}K_\mathrm{b}$ values at 298 K for diethylamine and triethylamine are given in Table 15 of the Data Booklet. Identify which of the two compounds is the stronger base and suggest a reason why it is stronger. [2]

Stronger base:

Reason:

Markscheme

a. non-bonding/lone pair of electrons on the N atom (enables proton/H^+ acceptance) / *OWTTE*;

b. diethylamine/$\mathrm{(C_2H_5)_2NH}$;

triethylamine/$\mathrm{(C_2H_5)_3N}$ more hindered / (electron pair on) nitrogen blocked by (three) ethyl/$\mathrm{CH_3CH_2}$ groups / (three) ethyl/$\mathrm{CH_3CH_2}$ groups reduce chance of effective collision between triethylamine/$\mathrm{(C_2H_5)_3N}$ and water/$\mathrm{H_2O}$/proton/$\mathrm{H^+}$ / *OWTTE*;

Allow for M2 "triethylamine/$(C_2H_5)_3N$ has limited ability to stabilise itself by hydrogen bonding formation" / OWTTE.

Examiners report

a. In (a) it was surprising at HL that many candidates did not state that the lone pair of electrons was on the nitrogen. In (b), only the better candidates mentioned the greater hindrance associated with triethylamine.

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