M1. (a) (i) H+ or proton acceptor **(1)**

$CH_3NH_2 + H_2O (\rightleftharpoons) CH_3^+NH_3 (+) OH^-$ **(1)**

(ii) CH_3NH_3Cl or HCl **(1)**

Or any ammonium compound or strong acid name or formula

(iii) extra OH^- reacts with $CH_3\overset{+}{N}H_3$

or reaction / equilibrium moves to left

or ratio salt / base remains almost constant **(1)**

Any 2

5

(b) <u>lone pair</u> (on N accepts H^+) **(1)**

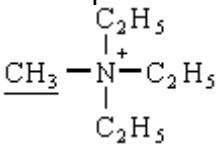
CH_3 increases electron density (on N)

donates / pushes electrons

has positive inductive effect **(1)**

2

(c) nucleophilic substitution **(1)**

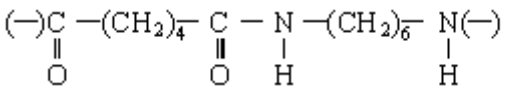


(1)

2

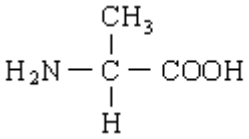
[9]

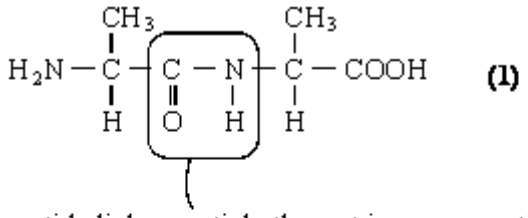
M2. (a) (i) hexane-1,6-diamine or 1,6-diaminohexane **(allow ammine)** or 1,6 hexan(e)diamine **(1)**

(ii)  **(1)**

Allow –CONH–

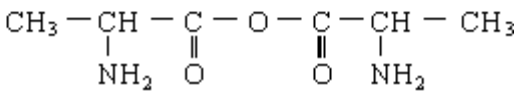
2

(b) (i)  **(1)**



peptide link essential : the rest is consequential on b(i)
(allow CONH)

allow anhydride

(ii) 

2

(c) (i) quaternary ammonium bromide salt **(1)**

(not ion, not compound)

Allow quarternery

(ii) *Reagent*: CH_3Br or bromomethane **(1)**

penalise CH_3Cl but allow excess for any halomethane

Condition: excess (CH_3Br) **(1)**

(iii) nucleophilic substitution **(1)**

4

[8]