M1.(a) 1, 4-diaminobutane or butane -1, 4-diamine **(1)**

A: $BrCH_2CH_2Br$ **or** $ClCH_2CH_2Cl$ **(1)**

B: $NC\ CH_2CH_2CN$

Step 1: Br_2 or Cl_2 **(1) (ignore aq)**

Step 2: KCN **(1) (NOT HCN)**

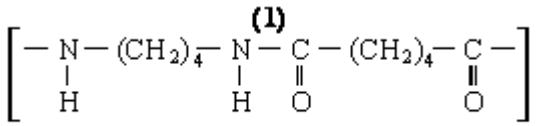
Step 3: H_2 / Ni **or** $LiAlH_4$ **or** Na / C_2H_5OH **(1) (NOT $NaBH_4$)**

Hydrogenation only for H_2 / Ni, **or** nucleophilic addition only for $LiAlH_4$**(1)**

OR reduction or addition

7

(b)



(1)

(1)

QL hydrogen bonding **(1)**

Polarity of H-bonding shown or discussed **(1)**

4

(c) Polyamides / peptide link can be hydrolysed **(1)**

OR polyalkenes cannot be hydrolysed

QL OH^- attacks peptide link or $C^{\delta+}$ **(1)**

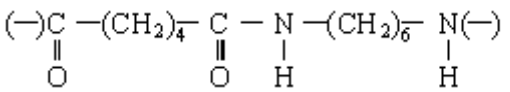
poly(ethene) non-polar **(1)**

3

[14]

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

(ii)

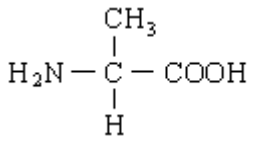


(1)

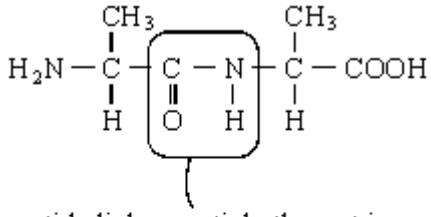
Allow –CONH–

2

(b) (i)



(1)

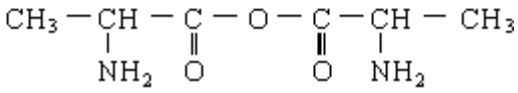


(1)

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]