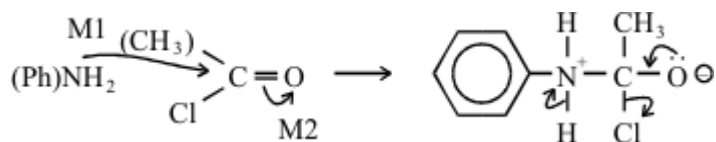


M1. (a) CH_3COCl or $(\text{CH}_3\text{CO})_2\text{O}$ (1)

AlCl_3 or H_2O or CH_2SO_4 loses this mark

CH_3COOH loses reagent and M3, M4 = max 3

nucleophilic addition–elimination (1)



M3: structure

M4: 3 correct arrows

Allow M1 for attack on $\text{CH}_3 - \text{C}=\text{O}$

Penalise Cl^- removing H^+

6

(b) Conc HNO_3 (1)

Conc H_2SO_4 (1)

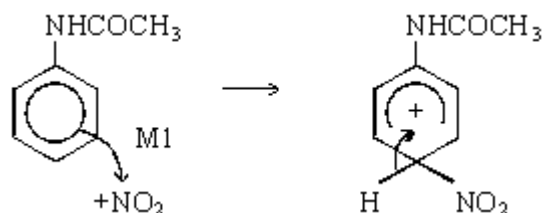
$\text{HNO}_3 + 2 \text{H}_2\text{SO}_4 \rightarrow \text{NO}_2^+ + \text{H}_3\text{O}^+ + 2 \text{HSO}_4^-$ (2)

(or H_2SO_4) (or $\text{H}_2\text{O} + \text{HSO}_4^-$)

$\text{HNO}_3 / \text{H}_2\text{SO}_4$ scores 1

Any 2

electrophilic substitution (1)



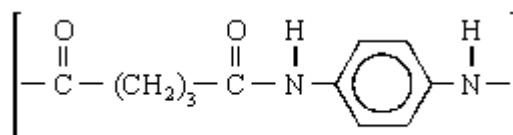
M2 structure

M3 arrow

6

(c) Sn (or Fe) / HCl or Ni / H_2 (1)

NOT LiAlH_4 , NaBH_4



(1)

(1)

3

[15]

M2.C

[1]

M3.A

[1]

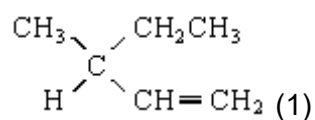
M4.B

[1]

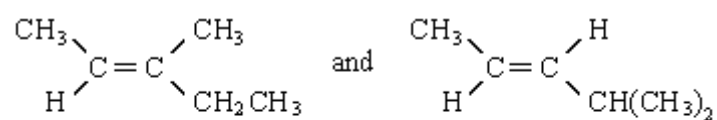
M5.C

[1]

M6. (a) Structure of P:



Structures of Q and R:



NOT C₃H₇

(1)

(1)

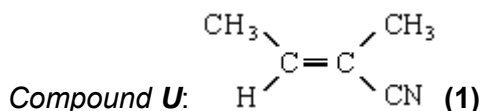
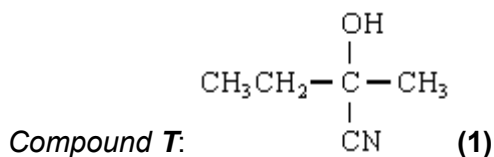
Q and R in any order

3

(b) (i) Racemic mixture: equal mixture of optical isomers / enantiomers
OR in explanation

Explanation: planar ($>C=O$) (1)
 attack from either side is equally likely (1)

(ii) *Reagent S:* HCN or (KCN / HCl or H₂SO₄) (1)

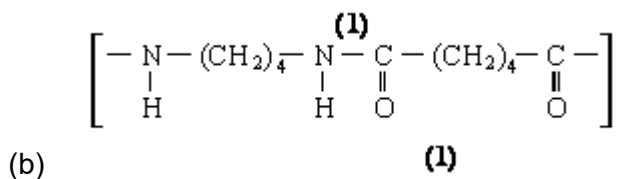


6

[9]

M7.(a) 1, 4-diaminobutane or butane -1, 4-diamine (1)
 A: BrCH₂CH₂Br or ClCH₂CH₂Cl (1)
 B: NC CH₂CH₂CN
 Step 1: Br₂ or Cl₂ (1) (ignore aq)
 Step 2: KCN (1) (NOT HCN)
 Step 3: H₂ / Ni or LiAlH₄ or Na / C₂H₅OH (1) (NOT NaBH₄)
 Hydrogenation only for H₂ / Ni, or nucleophilic addition only for LiAlH₄(1)
OR reduction or addition

7



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^{δ+} (1)
poly(ethene) non-polar (1)

3

[14]

M8.D

[1]