MEGA LECTURE

TOPIC 16 TEST MS

1. (a) (i) Potassium (OR sodium) dichromate(VI) OR correct formula
OR potassium manganate(VII)

(Oxidation state not needed, but must be correct if included)

(Penalise errors in the formula or oxidation state, but mark conditions)

1

Acidified OR H_2SO_4 / HCl (*NOT with* $KMnO_4$) / H_3PO_4 / HNO_3

(Ignore heat or reflux)

(Credit "acidified" as part of reagent)

1

Oxidation or redox

1

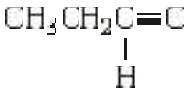
(ii) $NaBH_4$ OR $LiAlH_4$ OR H_2/Ni

1

$CH_3COCH_3 + 2[H] \rightarrow CH_3CH(OH)CH_3$

(Credit H_2 in the equation if H_2 has been chosen as reagent)

1

(b) (i) 

(Structure must show aldehyde structure)

(Credit C_2H_5 as alternative to CH_3CH_2)

(ii) M1 Tollens' reagent OR ammoniacal silver nitrate OR $AgNO_3 + NH_3$ | OR Fehling's solution | OR acidified potassium dichromate

1

M2 stays colourless | stays blue | stays orange

1

(Provided reagent is correct, credit "no reaction", "no change", "nothing", "no observation" for M2)

M3 silver mirror / deposit OR black / grey precipitate | red / brown / orange precipitate / solid | goes green

1

(Credit other correct reagents and observation)

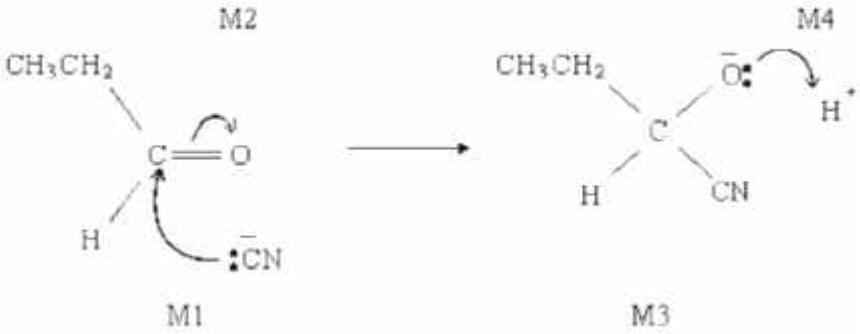
(For M1, penalise $AgNO_3$ alone, penalise $Ag(NH_3)_2^+$, penalise "potassium dichromate", etc., but, in each case, mark on and credit correct M2 and M3)

(If totally wrong reagent or no reagent, CE = no marks for M1,M2 or M3)

1

[9]

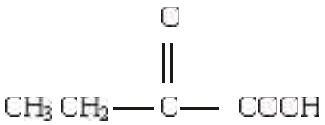
2. (a) nucleophilic addition **1**



4

(b) (i) 2-hydroxybutanenitrile **1**

(c) (i)

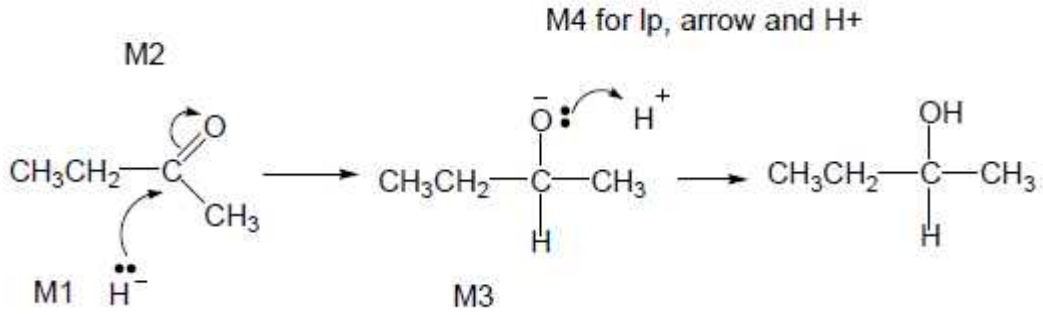


1

(ii) $CH_3CH=CHCOOH$ **1**

[8]

3. (c) (i) Nucleophilic addition **1**



- *M2 not allowed independent of M1, but allow M1 for correct attack on C+*
- *+ rather than δ+ on C=O loses M2*
- *M3 is for correct structure including minus sign but lone pair is part of M4*
- *Allow C_2H_5*
- *M1 and M4 include lp and curly arrow*
- *Allow M4 arrow to H in H_2O (ignore further arrows)*

4

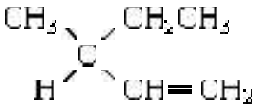
(ii) M1 Planar C=O (bond / group)
Not just planar molecule **1**

M2 Attack (equally likely) from either side
Not just planar bond without reference to carbonyl **1**

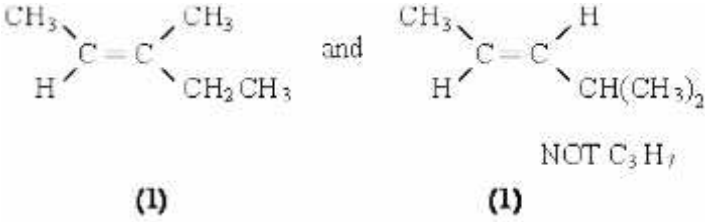
M3 (about product): Racemic mixture formed ***OR*** 50:50 mixture or each enantiomer equally likely **1**

[8]

4. (a) *Structure of* **P**:


(1)

Structures of **Q** and **R**:



(1) **(1)**

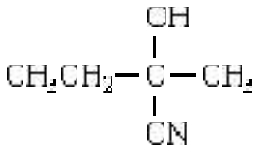
Q and R in any order

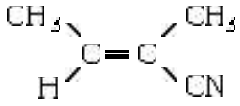
3

(b) (i) *Racemic mixture*: <u>equal</u> 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** H_2SO_4) **(1)**


Compound ***T***: **(1)**


Compound ***U***: **(1)**

6

[9]

5. (a) Pentan-2-one

1

(b) (i) 1680 – 1750 (cm^{-1})

1

(ii) 3230 – 3550 or 1000 – 1300 (cm^{-1})

1

(c)

Reagent	$K_2Cr_2O_7/H^+$	$KMnO_4/H^+$	Na	CH_3COOH/H_2SO_4
with **C**	no reaction	no reaction	no reaction	no reaction
with **D**	goes green	goes colourless	effervescence	smell

1
1
1

(penalise incomplete reagent e.g. $K_2Cr_2O_7$ or $Cr_2O_7^{2-}/H^+$ then mark on)

(d)

Reagent	Tollens	Fehlings or Benedicts
with **E**	silver (mirror)	red ppt or goes red *(not red solution)*

1
1

[8]

6. D **[1]**

7. B **[1]**

8. D **[1]**

9. A **[1]**

10. B **[1]**

11. C **[1]**

12. B **[1]**

13. B **[1]**