TOPIC 16 TEST MS

1. (a) (i) Potassium (OR sodium) dichromate(VI) OR <u>correct</u> 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

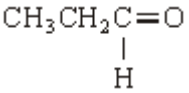
(ii) $NaBH_4$ OR $LiAlH_4$ OR H_2/Ni

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 $AgNO_3 + NH_3$ | <u>OR Fehling's solution</u> | <u>OR acidified</u> 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 <u>mirror</u> / <u>deposit</u> OR black / grey <u>precipitate</u> | red / brown / orange <u>precipitate / solid</u> | 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)*

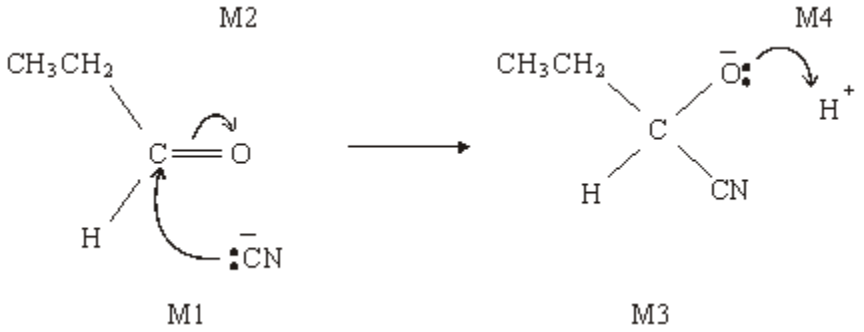
(If totally wrong reagent or no reagent, CE = no marks for M1,M2 or M3)

1

[9]

2. (a) nucleophilic addition

1



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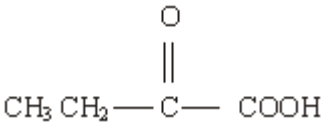
(b) (i) 2-hydroxybutanenitrile

1

(c) (i)



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(ii) $CH_3CH=CHCOOH$

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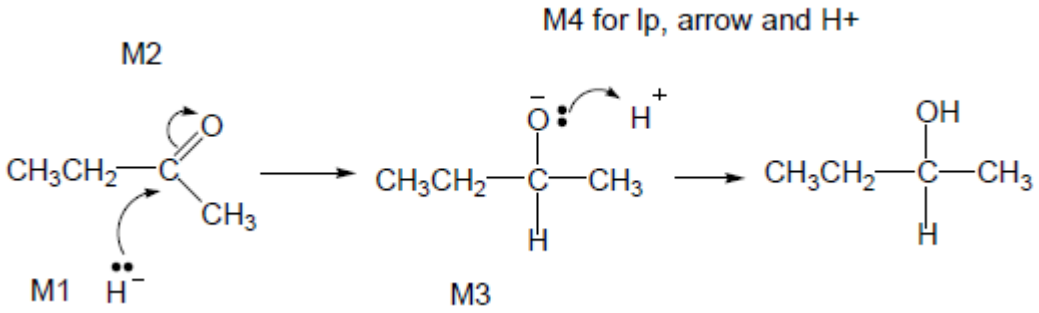
[8]

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 <u>H</u> 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

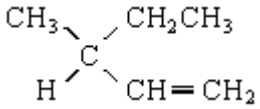
1

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

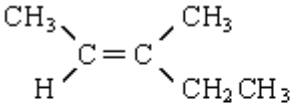
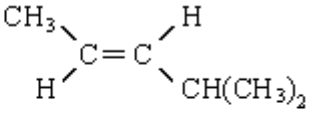
1

[8]

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


(1)

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


and


NOT C_3H_7

(1) **(1)**

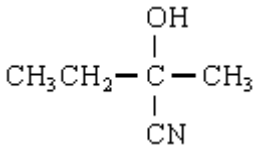
Q and R in any order

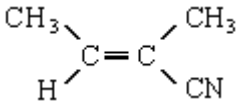
3

(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)**

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[9]

5. (a) Pentan-2-one

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(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]**