**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 H2SO4 / HCl (*NOT with KMnO4*) / H3PO4 / HNO3

*(Ignore heat or reflux)*

*(Credit “acidified” as part of reagent)*

**1**

         Oxidation or redox

**1**

(ii)     NaBH4 OR LiAlH4 OR H2/Ni

**1**

         CH3COCH3 + 2[H] → CH3CH(OH)CH3

*(Credit H2 in the equation if H2 has been chosen as reagent)*

**1**

(b)     (i)      

*(Structure must show aldehyde structure)*

*(Credit C2H5 as alternative to CH3CH2)*

|  |  |  |  |
| --- | --- | --- | --- |
| (ii)     M1    Tollens’ reagent OR ammoniacal silver nitrate OR AgNO3 + NH3 | 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 AgNO3 alone, penalise Ag(NH3), penalise “potassium dichromate”, etc., but, in each case, mark on and credit correct M2 and M3)*

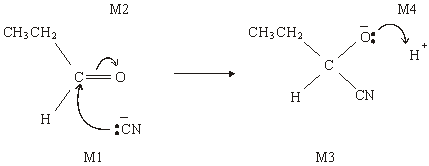
*(If totally wrong reagent or no reagent, CE = no marks for M1,M2 or M3)*

**1**

**[9]**

**2.**          (a)     nucleophilic addition

**1**

****

**4**

(b)     (i)      2-hydroxybutanenitrile

**1**

(c)     (i)



**1**

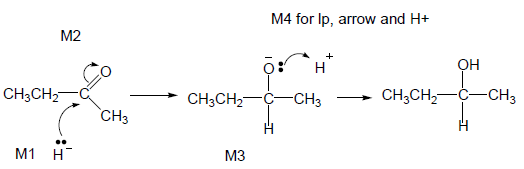
(ii)     CH3CH=CHCOOH

**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 C2H5*

*•  M1 and M4 include lp and curly arrow*

*•  Allow M4 arrow to H in H2O (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

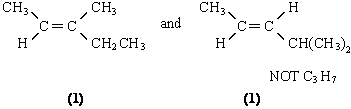
**1**

**[8]**

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

 (1)

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



*Q and R in any order*

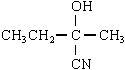
**3**

(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)**

*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 | K2Cr2O7/H+ | KMnO4 /H+ | Na | CH3COOH/ H2SO4 | **1** |
| with **C** | no reaction | no reaction | no reaction | no reaction | **1** |
| with **D** | goes green | goes colourless | effervescence | smell | **1** |

*(penalise incomplete reagent e.g. K2Cr2O7 or Cr2O7 2–/H+ then mark on)*

(d)

|  |  |  |  |
| --- | --- | --- | --- |
| Reagent | Tollens | Fehlings or Benedicts | **1** |
| with **E** | silver (mirror) | red ppt or goes red *(not red solution)* | **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]**