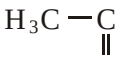
4.10, 4.11 TEST MS

1. (a) (i)



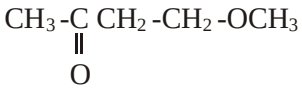
O or $RCOCH_3$; 1

(or description in words)
(ignore trailing bonds)

(ii) H_3C—O or $ROCH_3$; 1
(allow 1 if both (i) and (ii) give CH_3– or H_3C– only)

(iii) CH_2CH_2 or two adjacent methylene groups; 1

(iv)

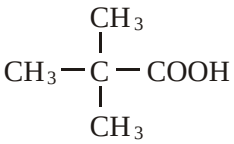


OR

$CH_3COCH_2CH_2OCH_3$; 1

(b) (i) OH in acids or (carboxylic) acid present

(ii)



(c)

reagent	$K_2Cr_20_7$ /H^+	$KMnO_4$ /H^+
Y	no reaction	no reaction
Z	orange to green or turns green	purple to colourless or turns colourless

5

[9]

2. (a) Pentan-2-one 1

(b) (i) 1680 – 1750 (cm^{-1}) 1

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

(iii) 4 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

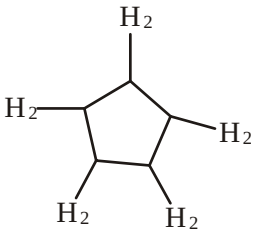
[9]

3. (a) **A** any C_5 alkene 1

B

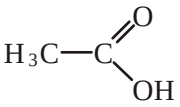
etc

penalise

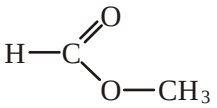


1

(b) **C**



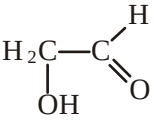
or



1

or CH_3COOH or $HCOOCH_3$

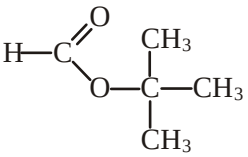
D



1

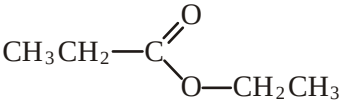
or $HOCH_2CHO$

(c) **E**



1

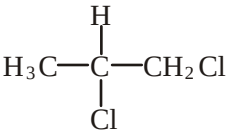
F



(allow C_2H_5)

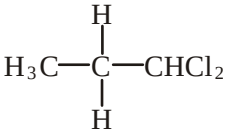
1

(d) **G**

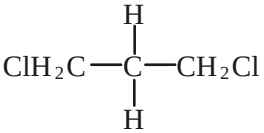


1

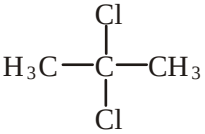
H



or

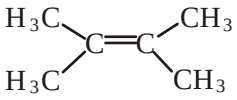


or



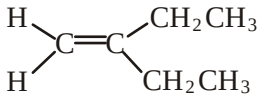
1

(e) **I**



1

J



(allow C_2H_5) **NOT** hex-3-ene 1

[10]

4. (a) $(CH_3)_4Si$ **(1)** 1

(b) 3 **(1)** 1

(c) 2 : 3 : 3 **(1)** 1

(d) methyl or CH_3 **(1)** 1

(e) *Group* ethyl or CH_2CH_3 or C_2H_5 **(1)**

Explanation CH_3 splits CH_2 → quartet or 4 peaks **(1)**
CH_2 splits CH_3 → triplet or 3 peaks **(1)** 3

(f) C = O **(1)** 1

(g) *Peak at m/z* = 43 CH_3CO^+ or $[CH_3CO]^+$ **(1)**
Peak at m/z = 57 $CH_3CH_2CO^+$ or $[CH_3CH_2CO]^+$ **(1)** 2

(h) $CH_3COCH_2CH_3$ **(1)** 1

[11]

5. (a) (i)

Reagent	Tollens	Fehlings or Benedicts	$K_2Cr_2O_7/H^+$ or acidified	$KMnO_4/H^+$	I_2/Na0H
Propanal	silver (mirror)	red ppt or goes red *(not red solution)*	goes green	goes colourless	No reaction
Propanone	no reaction	no reaction	no reaction	no reaction	Yellow (ppt)

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

3

(ii) propanal 3 peaks ignore splitting even if wrong 1
propanone 1 peak 1

(b) **X** is CH_3CH_2COOH or propanoic acid — if both name and formula given, both must be correct, but — 1

Y is $CH_3CH(OH)CH_3$ or propan-2-ol — allow propanol with correct formula — 1

Mark the type of reaction and reagent/condition independently.
The reagent must be correct or close to score condition

Step 1 — Oxidation — 1

$K_2Cr_2O_7/H^+$ or other oxidation methods as above
allow $Cr_2O_7^{2-}H^+$ if penalised above (ecf)
reflux (not Tollens/Fehlings) or heat or warm

Step 2				
	reduction or nucleophilic addition	reduction or nucleophilic addition	reduction or hydrogenation	1
	$NaBH_4$	$LiAlH_4$	H_2	1
	in (m)ethanol or water or ether or dry	ether or dry	Ni / Pt etc	1

Step 3 — esterification or (nucleophilic) addition-elimination or condensation — 1
(conc) H_2SO_4 or HCl — 1
warm (allow without acid reagent if **X** and **Y** given as reagents) — 1
or reflux or heat — 1

[15]