

Mark schemes

1	1-chloropropane no visible change <i>Accept 'small amount of precipitate' or 'precipitate forms slowly'.</i>	1
	ethanoyl chloride white precipitate <i>Accept 'large amount of precipitate' or 'precipitate forms immediately'.</i>	1
		[2]
2	(a) GLC or distillation	1
	(b) C=O	1
	(c) (i) Cl has two isotopes	1
	(ii) $\text{CH}_3 \overset{+}{\text{C}} = \text{O}$	1
	$\text{C}_4\text{H}_7\text{ClO}^+ \rightarrow \text{CH}_3 \overset{+}{\text{C}} = \text{O} + \text{C}_2\text{H}_4\text{Cl}^+$	1
	(d) (i) e.g. CDCl_3 or CCl_4	1
	(ii) $\text{Si}(\text{CH}_3)_4$	1
	(e) 0 and 3	1
	(f) $\begin{array}{c} \text{CH}_3 - \text{C} - \text{CH} - \text{CH}_3 \\ \parallel \quad \\ \text{O} \quad \text{Cl} \end{array}$	1
	(g) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COCl}$ or $(\text{CH}_3)_2\text{CHCOCl}$	1
		[10]

Allow a mark for identifying correct dibromocompound with three peaks even if integration ratio is wrong

1

if 6:3:1 missing or wrong, no marks for splitting

Only award a mark for splitting if it is clear which integration number it refers to

6 singlet or drawn

1

3 doublet or drawn

1

1 quartet/quadruplet or drawn

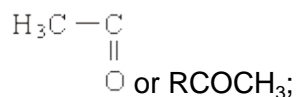
1

(max 10 marks)

[16]

4

(a) (i)



(or description in words)
(ignore trailing bonds)

1

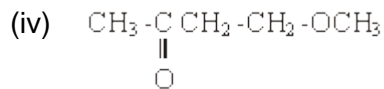
(ii) $\text{H}_3\text{C}-\text{O}$ or ROCH_3 ;

(allow 1 if both (i) and (ii) give CH_3- or $\text{H}_3\text{C}-$ only)

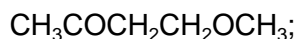
1

(iii) CH_2CH_2 or two adjacent methylene groups;

1



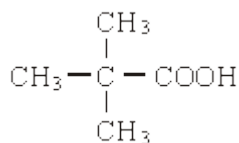
OR



1

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

(ii)



(c)

reagent	$K_2Cr_2O_7 / H^+$	$KMnO_4 / H^+$
Y	no reaction	no reaction
Z	orange to green or turns green	purple to colourless or turns colourless

5

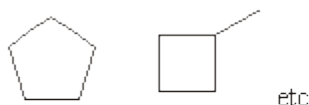
[9]

5

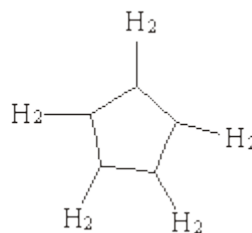
(a) **A** any C_5 alkene

1

B

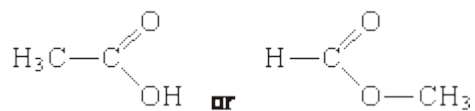


penalise



1

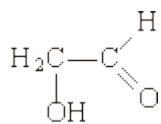
(b) **C**



or CH_3COOH or $HCOOCH_3$

1

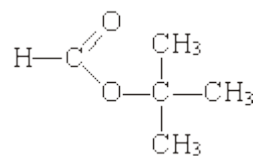
D



or $HOCH_2CHO$

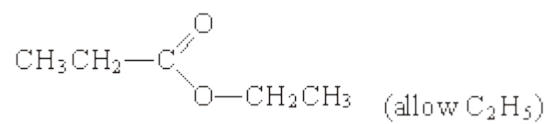
1

(c) **E**



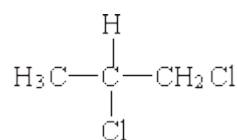
1

F



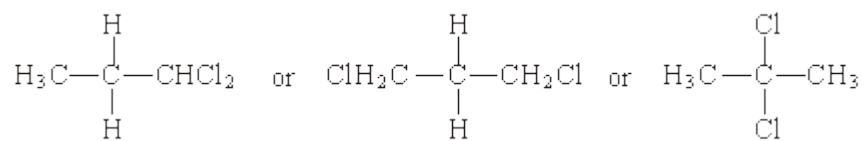
1

(d) **G**



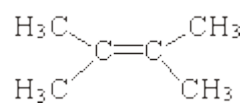
1

H



1

(e) **I**



1

J



1

[10]

- 6** (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 ₂ Cr ₂ O ₇ /H ⁺	KMnO ₄ /H ⁺	Na	CH ₃ COOH/ H ₂ SO ₄	
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 Cr₂O₇²⁻/H⁺ then mark on)

(d)

Reagent	Tollens	Fehlings or Benedicts	
with E	silver (mirror)	red ppt or goes red <i>(not red solution)</i>	1
			1

[9]

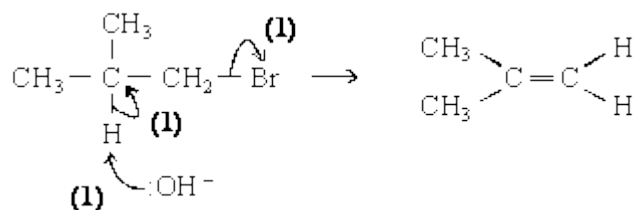
- 7** (a) Identity of **X**; 2-methylpropene **(1)**
Absorption at 1650 cm⁻¹ indicates an alkene present **(1)**
OR a chemical answer e.g. Br₂ (aq) brown to colourless

2

- (b) Reagents
 Step 1 KOH (allow NaOH) (1) alcoholic (1) warm (1)
Only allow solvent and warm if reagent correct

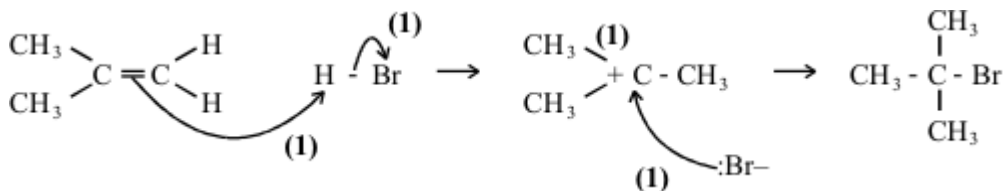
Step 2 HBr (1)

Mechanism: A → X



Or a carbocation mechanism

Mechanism X → B



11

- (c) A gives three peaks (1)
 B gives one peak (1)

Allow one for "A has more peaks than B" when no number of peaks is given

2

[15]

8

[1]

9

[1]

10

- (a) R: O-H (alcohols) (1)
 S: C=O or carbonyl (1)

2

- (b) aldehyde (1) -CHO or RCHO (1)

1

(c) (i) Reason 1: TMS inert or non-toxic or volatile / easily removed

Reason 2: single (intense) peak

peak of 12 protons

has 12 equivalent protons

all protons in same environment

OR

peak / signal upfield of others

highly shielded

more shielded

peak away from others or $\delta = 0$ or low

not solvent, not cheap

any 2 reasons x (1)

(ii) Solvent: CDCl_3 or CCl_4 (**NOT D_2O**)

Reason: proton free (**1**)

allow no hydrogens (atoms)

NOT H^+ / hydrogen ions

4

(d) (i) $\text{CH}_3 - \underset{\text{O}}{\underset{\parallel}{\text{C}}} - \text{CH}_2 - \text{CH}_2 - \text{OH}$ (**1**)

(ii) $-\text{OH}$ (**1**)

(iii) $-\text{CH}_2 - \text{CH}_2 -$ (**1**)

3

(e) $\text{CH}_3 - \underset{\text{O}}{\underset{\parallel}{\text{C}}} - \text{CH}_2 - \text{CH}_2 - \text{OH}$ (**1**)

1

[11]