Mark schemes

1

1-chloropropane no visible change

Accept 'small amount of precipitate' or 'precipitate forms slowly'.

1

ethanoyl chloride white precipitate

Accept 'large amount of precipitate' or 'precipitate forms immediately'.

1

[2]

2

(a) GLC or distillation

1

(b) C=O

1

(c) (i) Cl has two isotopes

1

(ii) $CH_3\overset{+}{C}=O$

1

$C_4H_7ClO^{+\bullet} \rightarrow CH_3\overset{+}{C}=O + C_2H_4Cl^{\bullet}$

1

(d) (i) e.g. $CDCl_3$ or CCl_4

1

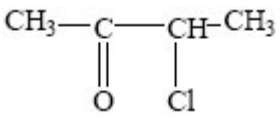
(ii) $Si(CH_3)_4$

1

(e) 0 and 3

1

(f)



1

(g) $CH_3CH_2CH_2COCl$ or $(CH_3)_2CHCOCl$

1

[10]

3

(a) **X** (O–H) <u>(alcohols)</u>

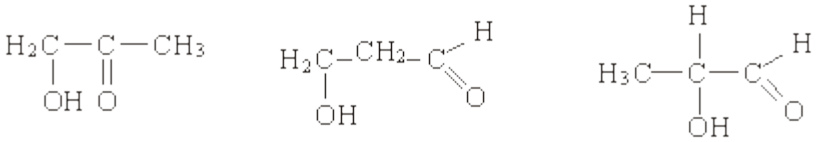
penalise acid or missing "alcohol"

1

Y C=O

allow carbonyl

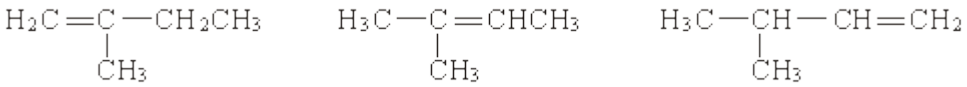
1



A

NOT acid

4

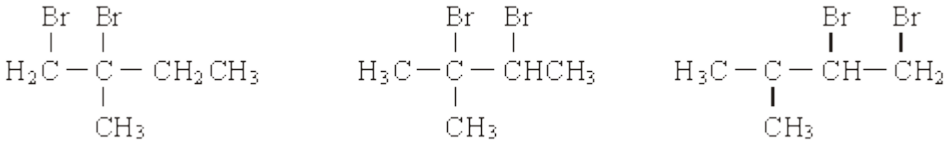
(b) 

Allow conseq dibromocompounds following incorrect unbranched alkenes

NOT allow dibromocompound consequent on a duplicate alkene

NOT allow monobromocompounds if HBr added

3



3

6:3:1 either next to correct structure or to none

1

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

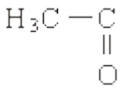
1

(max 10 marks)

[16]

4

(a) (i)



or $RCOCH_3$;

(or description in words)
(ignore trailing bonds)

1

(ii) H_3C — O or $ROCH_3$;

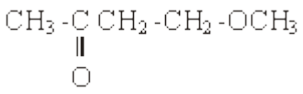
(allow 1 if both (i) and (ii) give CH_3- or H_3C– only)

1

(iii) CH_2CH_2 or two <u>adjacent</u> methylene groups;

1

(iv)



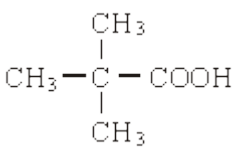
OR

$CH_3COCH_2CH_2OCH_3$;

1

(b) (i) OH <u>in acids</u> 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

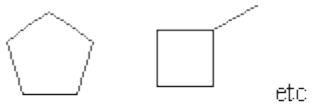
5

[9]

5 (a) **A** any C_5 alkene

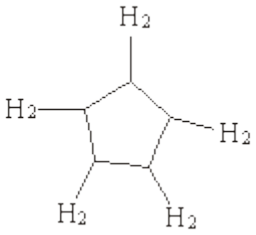
1

B



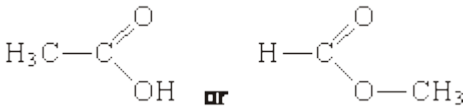
etc

penalise



1

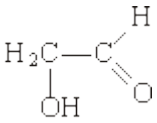
(b) **C**



or CH_3COOH or $HCOOCH_3$

1

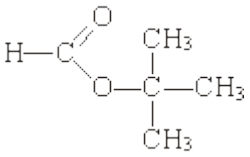
D



or $HOCH_2CHO$

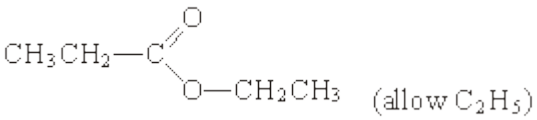
1

(c) **E**



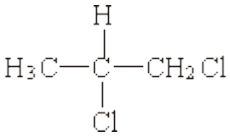
1

F



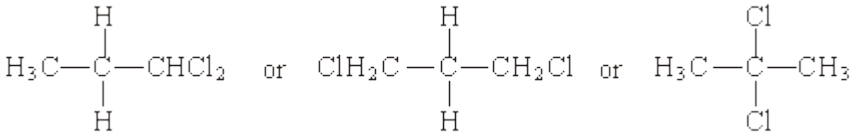
1

(d) **G**



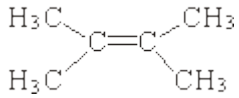
1

H



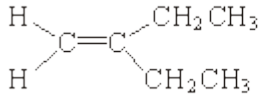
1

(e) **I**



1

J



NOT hex-3-ene

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	$K_2Cr_2O_7/H^+$	$KMnO_4/H^+$	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]

7 (a) Identity of **X**; 2-methylpropene **(1)**

Absorption at 1650 cm^{-1} indicates an alkene present **(1)**

OR a chemical answer e.g. Br_2 (aq) brown to colourless

2

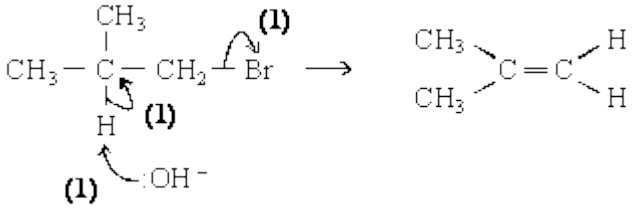
(b) Reagents

Step 1 KOH (allow NaOH) **(1)** alcoholic **(1)** warm **(1)**

Only allow solvent and warm if reagent correct

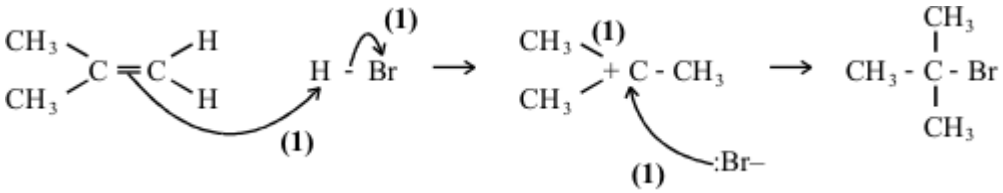
Step 2 HBr **(1)**

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 D

[1]

9 D

[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 × *(1)*

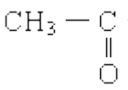
(ii) *Solvent*: $CDCl_3$ or CCl_4 **(NOT D_2O)**

Reason: proton free **(1)**

allow no hydrogens (atoms)

NOT H^+ / hydrogen ions

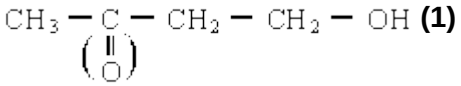
4

(d) (i)  **(1)**

(ii) –OH **(1)**

(iii) $-CH_2-CH_2-$ **(1)**

3

(e)  **(1)**

1

[11]