• Complete the following table. Make sure you give the name of the starting material where indicated.

Marks 3

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
НО		$HO \bigcup_{O} O^{\Theta}$
ОН		ОН
ОН	concentrated H ₂ SO ₄	

• Complete the following table. Make sure you give the name of the starting material where indicated.

Marks 1

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
ОН	NaOH	

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Marks 2

• The structure of (–)-linalool, a commonly occurring natural product, is shown below.

Give the constitutional formula of the organic product formed from (–)-linalool in each of the following reactions. NB: If there is no reaction, write "no reaction".

Reagents / Conditions	Constitutional Formula of Product
Na ₂ Cr ₂ O ₇ in aqueous acid	
Na, then CH ₃ Br	

• Butanone is treated first with lithium aluminium hydride, LiAlH₄, in dry ether and then with aqueous acid to yield the alcohol, **A**.

Marks 4

$$\begin{array}{c} \text{OH} \\ \text{CH}_3-\text{C}-\text{CH}_2\text{CH}_3 \\ \text{butanone} \end{array} \qquad \begin{array}{c} \text{OH} \\ \text{CH}_3-\text{C}-\text{CH}_2\text{CH}_3 \\ \text{H} \\ \end{array}$$

 $\bf A$ is treated with concentrated sulfuric acid to give mainly the alkene $\bf B$ and two other alkenes $\bf C$ and $\bf D$. Alkenes $\bf B$ and $\bf C$ are diastereomers, $\bf B$ and $\bf D$ (and $\bf C$ and $\bf D$) are constitutional isomers. Give the structures for $\bf C$ and $\bf D$ and give systematic names for $\bf B$, $\bf C$ and $\bf D$.

В	С	D
H ₃ C H		
C=C H CH ₃		
H CH ₃		
Name:	Name:	Name:

Marks

3

• Give the name of the starting material where indicated and the constitutional formula(s) of the major organic product(s) formed in each of the following reactions.

$$Cr_2O_7^{2\Theta}/H^{\oplus}$$

$$OH$$
 $conc. H_2SO_4$ heat

Marks 5

$$OH$$
 $Na_2Cr_2O_7 / H^{\oplus}$

Name:

$$Br N(CH_3)_3$$

Marks 6

C

$$CH_3OH$$
 OH
 B
 C
 CH_3OH
 OH
 O

Give the reagent B and draw the constitutional formulas of the major organic products, A, C, D, E and F, formed in these reactions.

A	D	
В	E	•
С	F	•

Marks 3

$$\longrightarrow$$
 Br $N \equiv C^{\Theta}$

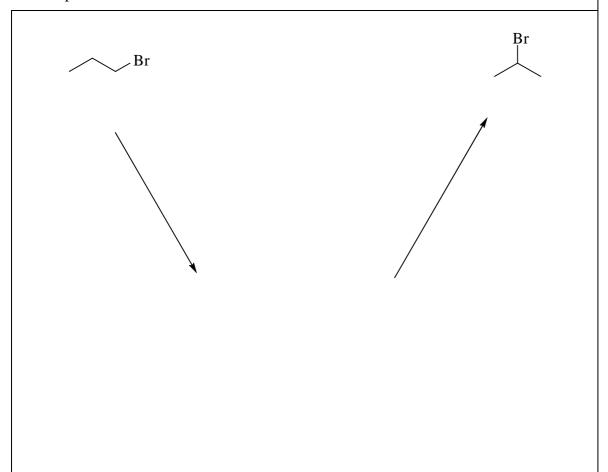
COOCH₃ $\frac{\text{dilute H}_2\text{SO}_4}{\text{heat}} \qquad \textbf{A} \qquad \frac{\text{SOCl}_2}{\text{Reagent } \textbf{D}} \qquad \textbf{B}$ Reagent C $\text{CH}_2\text{OH} \qquad \text{CON(CH}_3)_2$ Reagent F Reagent F

Give the reagents C, D and F and draw the structures of the major organic products, A, B and E, formed in these reactions.

		
\mathbf{A}	D	
D	T	
В	E	
C	F	
C	1	

Marks 6 • Show clearly the reagents you would use to carry out the following chemical conversion. Two steps are required. Give the structure of the intermediate compound.

Marks 5



How could you distinguish between the starting material and the product by ¹³C NMR spectroscopy?

Marks 5

Name:

$$\begin{array}{c}
O \\
O \\
O \\
K^{\oplus}
\end{array}$$

Marks 6

Give the reagents $\bf B$ and $\bf D$ and draw the structures of the major organic products, $\bf A$, $\bf C$, $\bf E$ and $\bf F$, formed in these reactions.

A	D	
В	E	
C	F	
	1	

Marks 5

$$Cr_2O_7^{2\Theta}/H^{\oplus}$$

Name:

$$\begin{array}{c} & \text{conc. H}_2SO_4 \\ \hline & \text{heat} \end{array}$$

Marks 6

B

1) LiAlH₄
2) H[®]/ H₂O

reagent A

OH

NaOH

C

reagent D

$$excess$$
 H_2NCH_3

C

Cl

CH₃OH

F

Give the reagents **A** and **D** and draw the structures of the major organic products, **B**, **C**, **E** and **F**, formed in these reactions.

A	D
В	E
С	F

Marks 5

Name:

$$OH \qquad \qquad Na_2Cr_2O_7 / H^{\oplus}$$

• Classify the starting materials of the following reactions as nucleophile or electrophile and indicate with $\delta \oplus$ and $\delta \ominus$ the polarisation of the C–Br and C=O bonds.

Marks 4

 $H^{\odot} + \begin{array}{c} H_{3}C \\ H_{3}C \end{array} \longrightarrow \begin{array}{c} H_{3}C$

• Consider the following reaction sequence.

A NaOH

OH

OH $\frac{1) \text{LiAlH}_4}{2) \text{H}^{\oplus}}$ B

SOCl₂

excess methanol

C

HN(CH₃)₂

C conc. HCl/heat

Draw the structures of the major organic products, A-F, formed in these reactions.

A	D
В	E
С	F

6