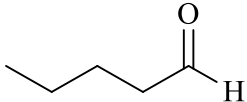
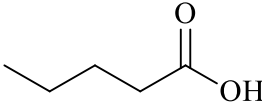
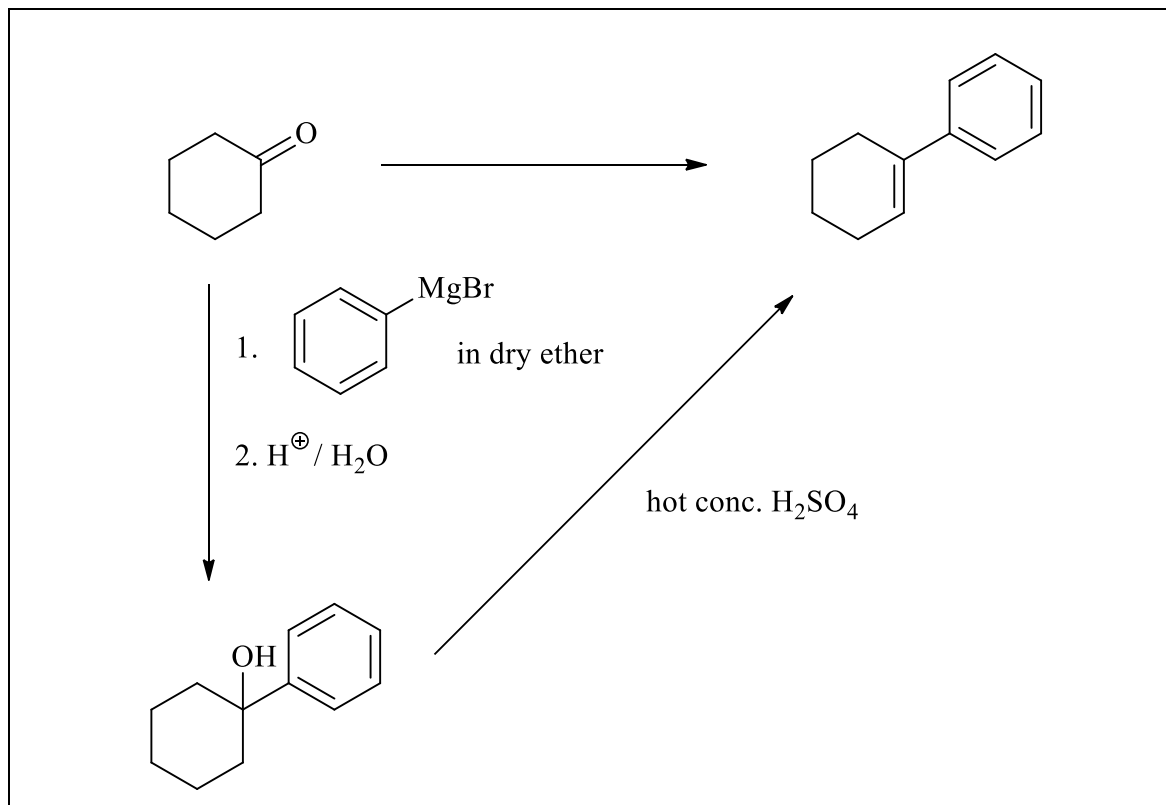


**Marks**  
**2**

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

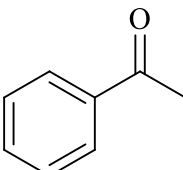
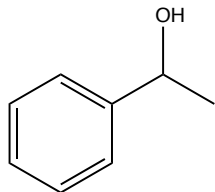
STARTING MATERIAL	REAGENTS/ CONDITIONS	STRUCTURAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
 <b>Name: pentanal</b>	$\text{Cr}_2\text{O}_7^{2-} / \text{H}^+$	

- Show clearly the reagents you would use to carry out the following chemical conversions. More than one step is required in each case. Give the structure of any intermediate compounds formed.



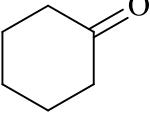
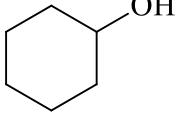
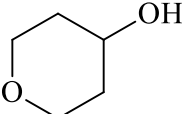
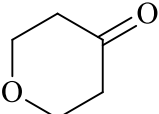
**Marks**  
**1**

• Complete the following table.

STARTING MATERIAL	REAGENTS/CONDITIONS	THE MAJOR ORGANIC PRODUCT(S)
	<ol style="list-style-type: none"><li>1. NaBH<sub>4</sub></li><li>2. H<sup>+</sup> / H<sub>2</sub>O</li></ol>	

Marks  
2

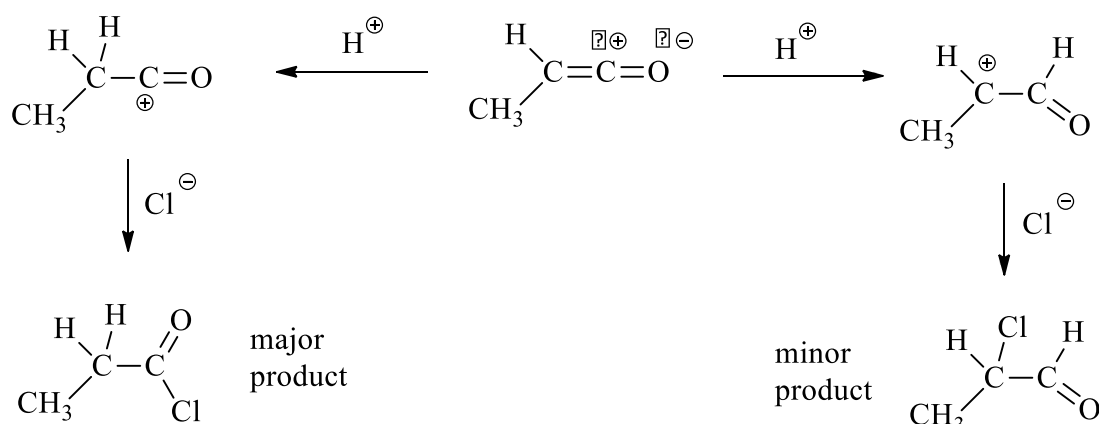
• Complete the following table.

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	<b>1. LiAlH<sub>4</sub> in dry ether</b> <b>2. H<sup>+</sup> / H<sub>2</sub>O</b>	
	$\text{Cr}_2\text{O}_7^{2-} / \text{H}^+$	

**Marks**  
**2**

- Hydrogen chloride, HCl, reacts with the compound  $\text{CH}_3\text{CH}=\text{C}=\text{O}$  in an electrophilic addition reaction. Use your knowledge of the mechanism of electrophilic addition to a  $\text{C}=\text{C}$  double bond to predict the major product of this reaction. Explain your reasoning.

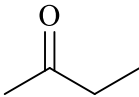
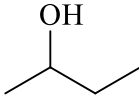
**Electrophilic addition of  $\text{H}^+$  to the  $\text{C}=\text{C}$  double bond gives 2 possible carbocations. Due to polarisation, the carbon of the carbonyl  $\text{C}=\text{O}$  double bond has a partial positive charge. The  $\text{H}^+$  electrophile will not attack that carbon (like charges repel), so the carbocation on the left in the scheme below is formed preferentially. This carbocation then leads to the acid chloride as the major product.**



**THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.**

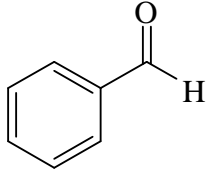
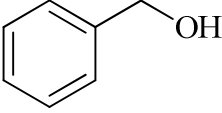
**Marks**  
**1**

• Complete the following table.

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	1. NaBH <sub>4</sub> 2. H <sup>⊕</sup> / H <sub>2</sub> O	

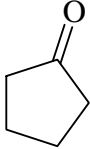
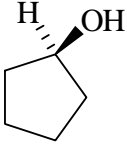
**Marks**  
**1**

- Complete the following table. Make sure you indicate any relevant stereochemistry.

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	1. NaBH <sub>4</sub> 2. H <sup>+</sup> / H <sub>2</sub> O	

**Marks**  
**1**

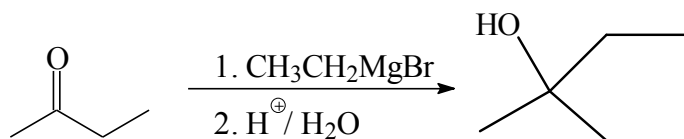
- Complete the following table.

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	1. $\text{LiAlH}_4$ /dry ether 2. $\text{H}^+/\text{H}_2\text{O}$	



**Marks**  
**2**

- Give the stick representation of the product formed when butanone is reacted with ethylmagnesium bromide ( $\text{CH}_3\text{CH}_2\text{MgBr}$ ), followed by aqueous acid.



State whether the product formed by this reaction is *achiral*, the *(S)*-enantiomer, the *(R)*-enantiomer, a *meso*-compound or a *racemic mixture*.

**Achiral. The central carbon has 2 identical  $\text{CH}_3\text{CH}_2$  groups on it alongside the OH and  $\text{CH}_3$  groups.**