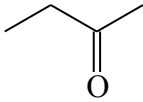
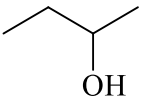
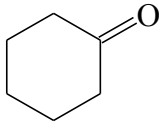
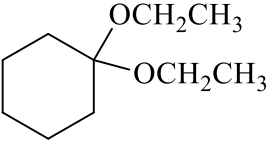


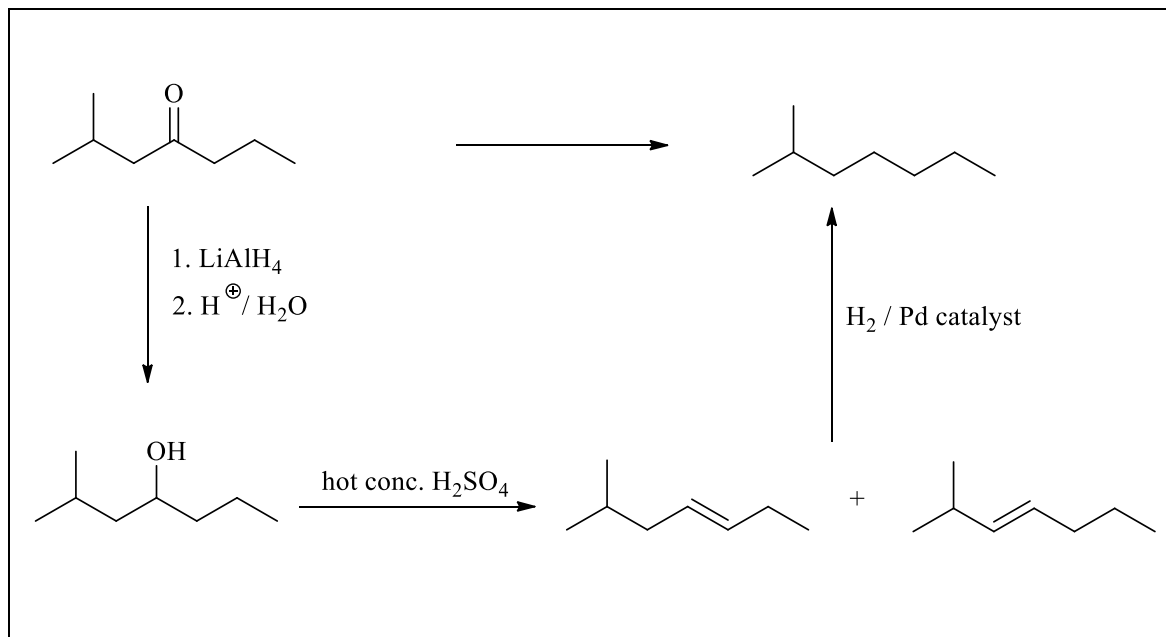
Marks
4

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

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
 Name: butanone	1. LiAlH ₄ 2. dilute HCl	
 Name: cyclohexanone	excess CH ₃ CH ₂ OH conc. H ₂ SO ₄ catalyst heat	

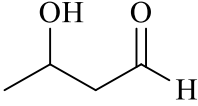
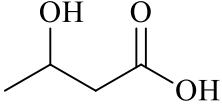
- Show clearly the reagents you would use to carry out the following chemical conversions. Note that more than one step is required and you should indicate all necessary steps and the constitutional formulas of any intermediate compounds.

Marks
3



Marks
1

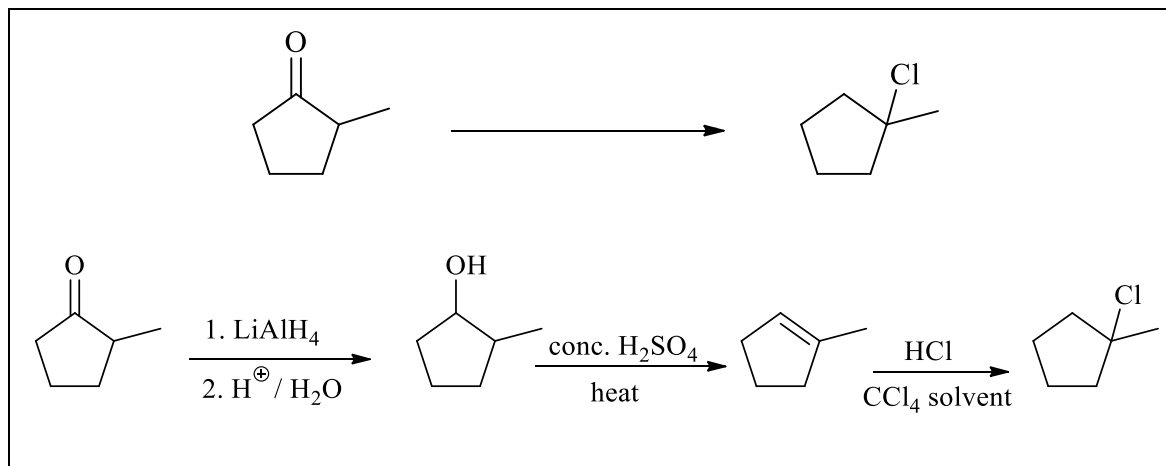
- Complete the following table. Make sure you complete the name of the starting material where indicated.

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
 Name: 3-hydroxybutanal	1. $[\text{Ag}(\text{NH}_3)_2]^+ / \text{OH}^-$ 2. H^+	

- Show clearly the reagents you would use to carry out the following chemical conversions. Note that more than one step is required and you should indicate all necessary steps and the constitutional formulas of any intermediate compounds.

Marks

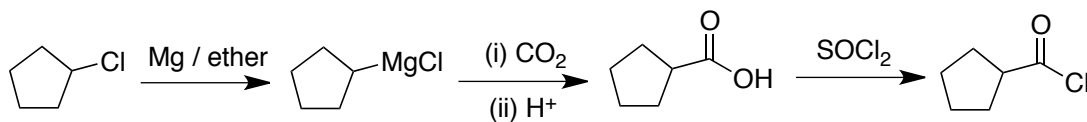
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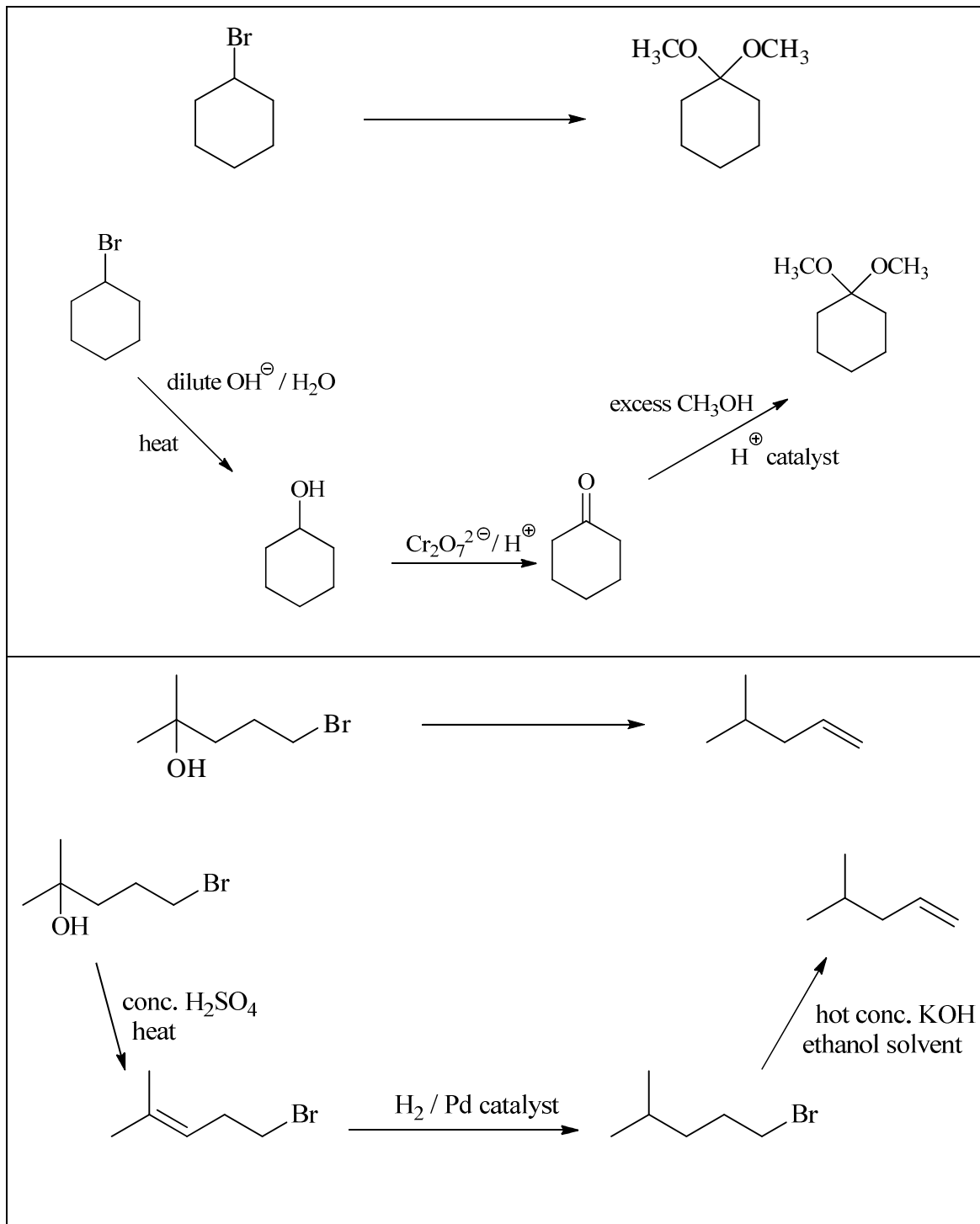
- Show clearly the reagents you would use to carry out the following chemical conversions. Note that more than one step is required and you should indicate all necessary steps and the constitutional formulas of any intermediate compounds.

Marks

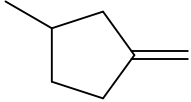
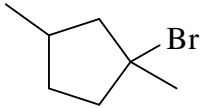
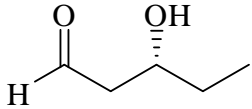
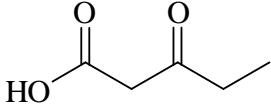
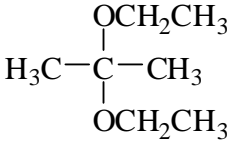

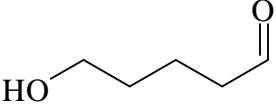
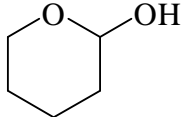
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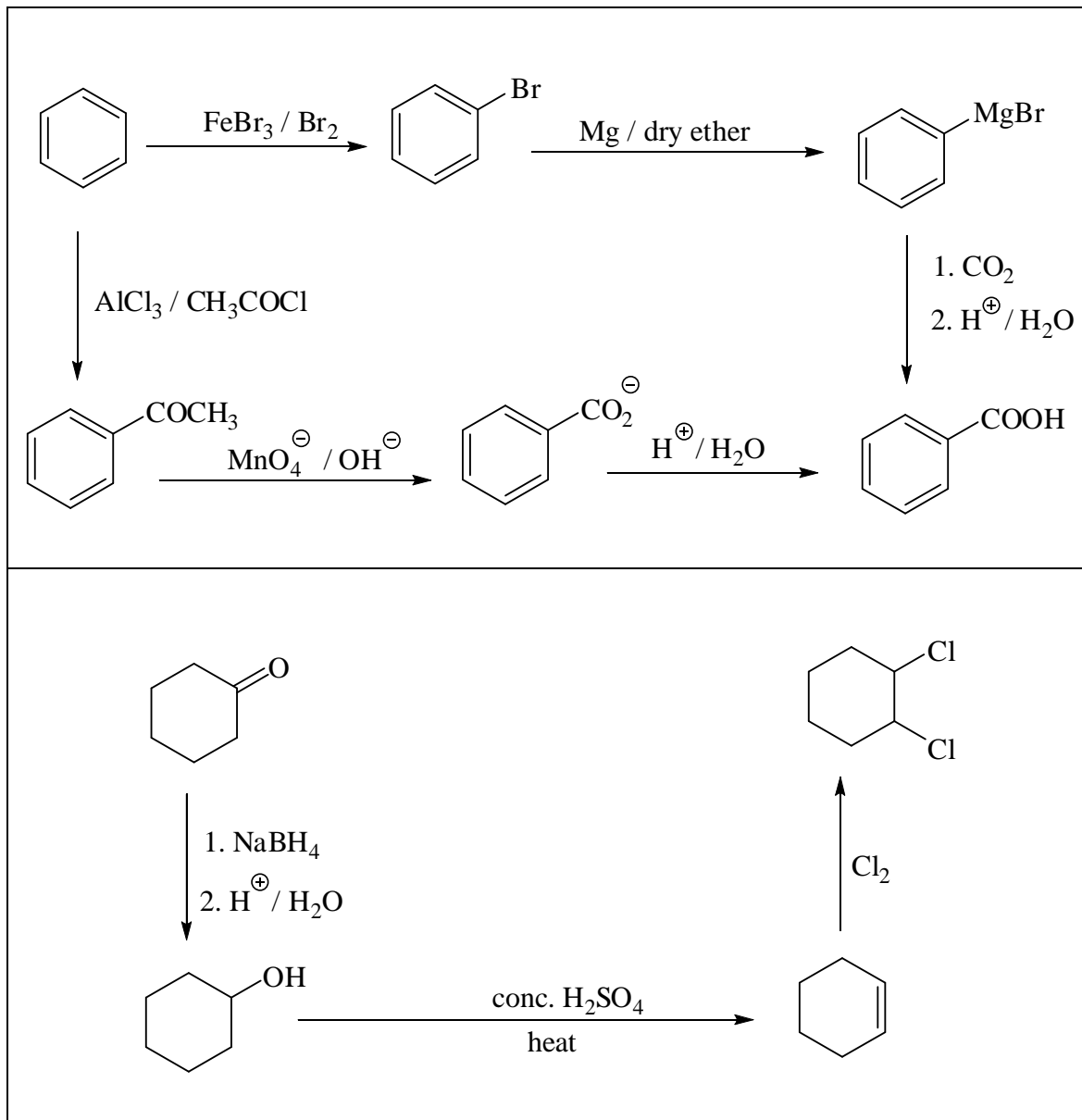
- Show clearly the reagents you would use to carry out the following chemical conversions. Note that more than one step is required and you should indicate all necessary steps and the constitutional formulas of any intermediate compounds.



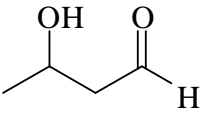
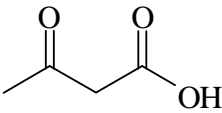
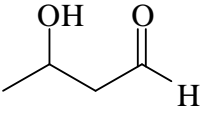
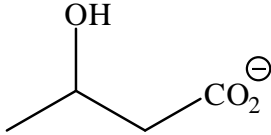
- Complete the following table.

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	HBr / CCl ₄ (solvent)	 Markovnikov addition with H adding to less substituted end of double bond
	$\text{H}^{\oplus} / \text{Cr}_2\text{O}_7^{2\ominus}$	 Oxidation of aldehyde and alcohol to give non-chiral product
	dilute H^{\oplus}	 + CH ₃ CH ₂ OH Hydrolysis of acetal
	H^{\oplus} catalyst	

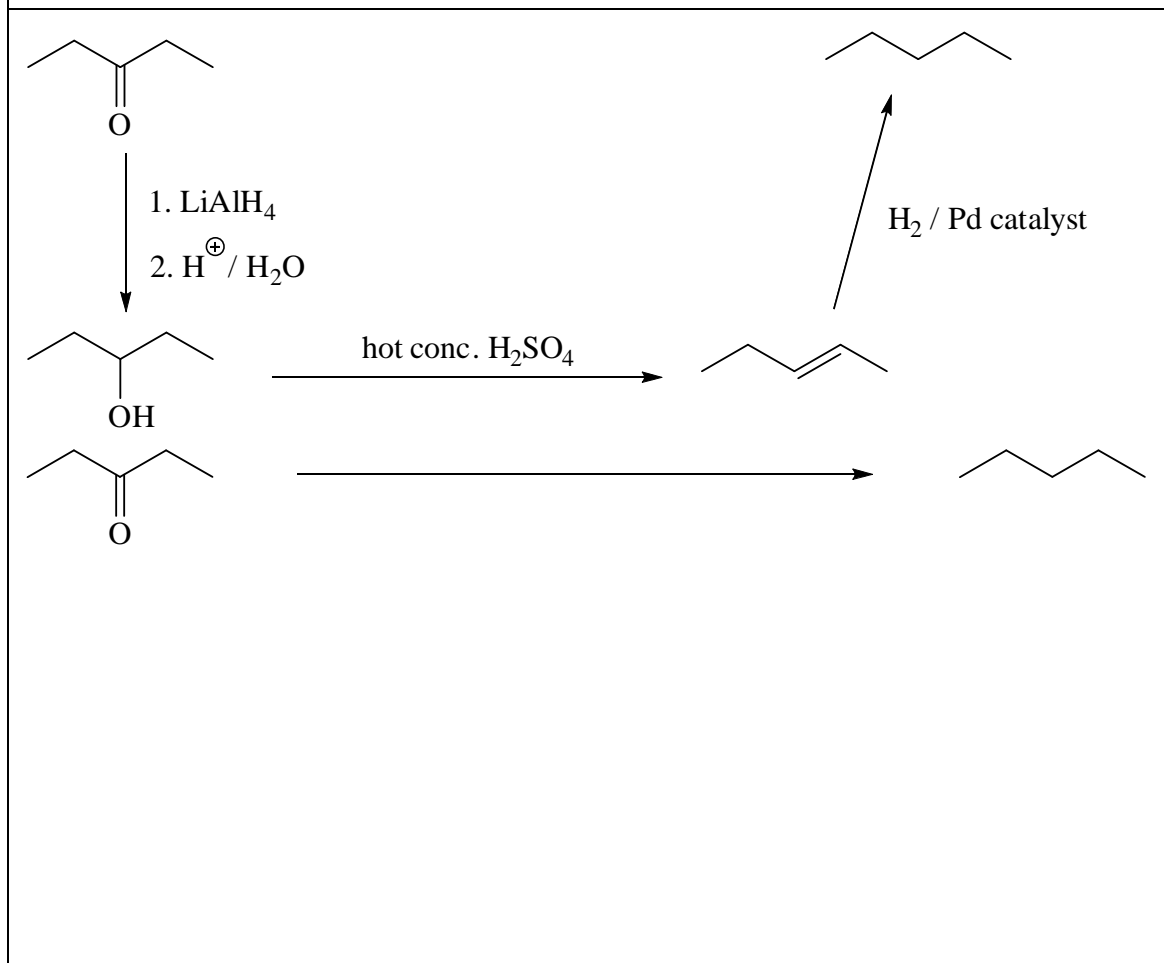
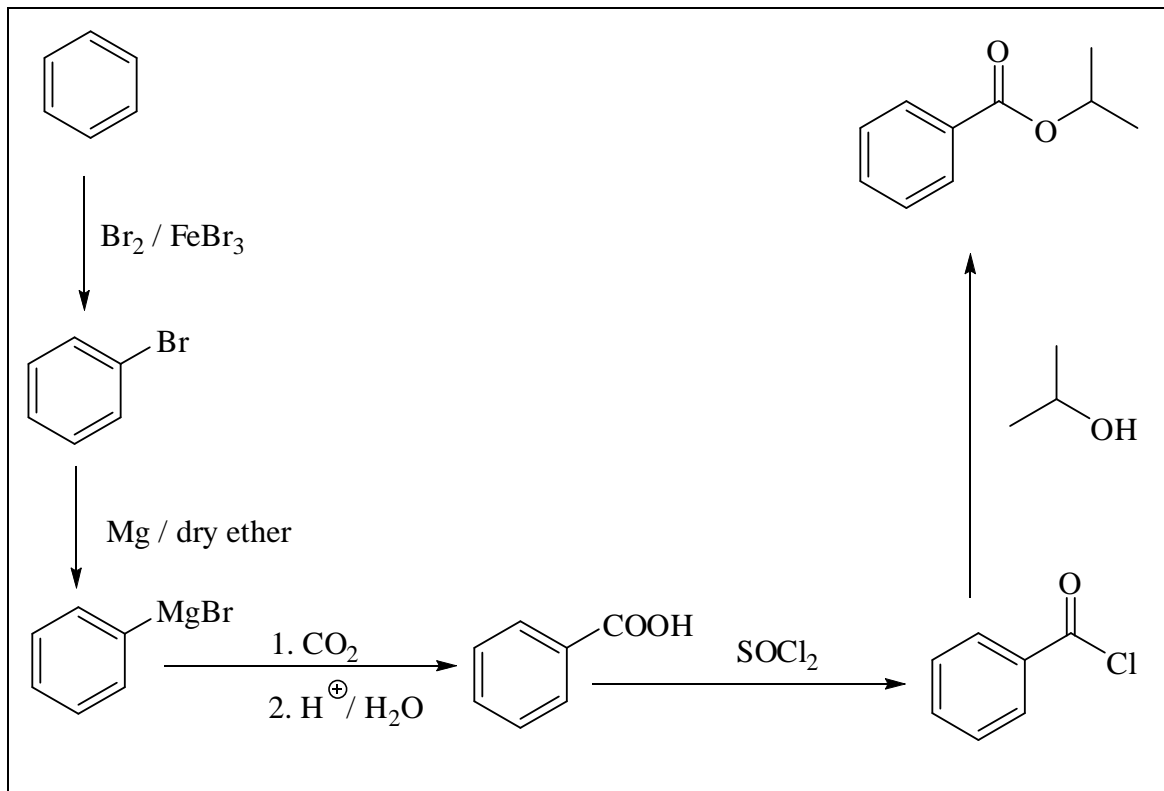
- Show clearly the reagents you would use to carry out the following chemical conversions. Draw constitutional formulas for any intermediate compounds. Note: More than one step is required in both cases.



- Complete the following table.

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	$\text{Cr}_2\text{O}_7^{2-} / \text{H}^+$	
	$[\text{Ag}(\text{NH}_3)_2]^{\oplus} / \text{OH}^{\ominus}$	

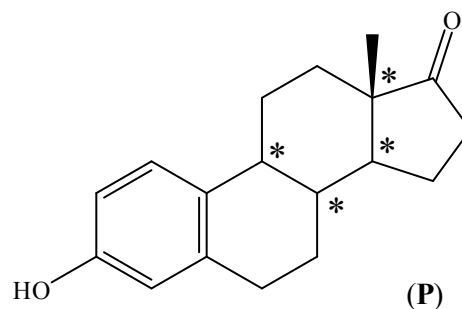
- Show clearly the reagents you would use to carry out the following chemical conversions. Draw constitutional formulas for any intermediate compounds.
Note: More than one step is required in both cases.



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Marks
6

- The structure of estrone (**P**), an important female hormone, is shown on the right.



Give the molecular formula of estrone (**P**).



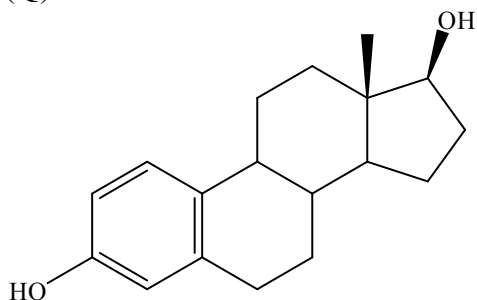
Identify the functional groups present in estrone (**P**).

Phenol, ketone

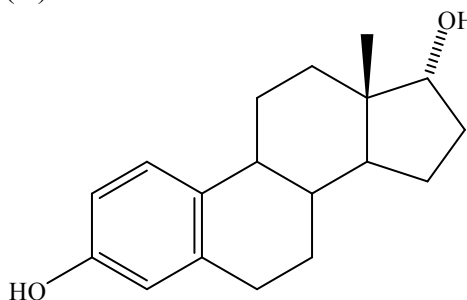
How many stereogenic (chiral) centres are there in estrone (**P**)? **4 (marked *)**

Treatment of estrone (**P**) with LiAlH_4 in dry ether (solvent) followed by aqueous acid gives alcohols (**Q**) and (**R**), which are diastereomers. Draw the structures of (**Q**) and (**R**).

(Q)

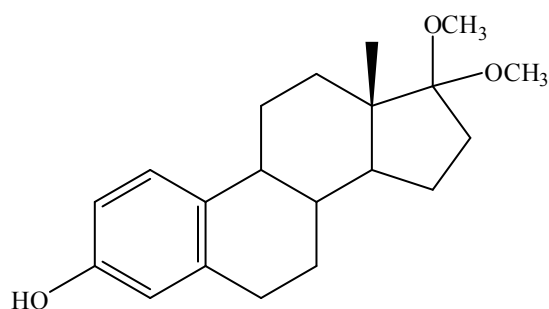


(R)



Reaction of estrone (**P**) with excess methanol and HCl gives an acetal (**S**). Give the constitutional formula of (**S**).

(S)

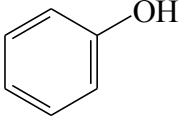
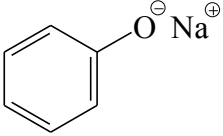
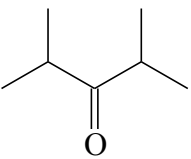
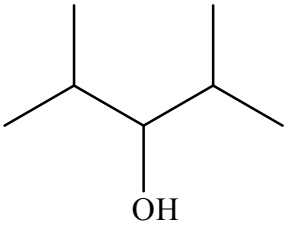


What are the reagents and reaction conditions that will convert the acetal (**S**) back to estrone and methanol?

H^+ / H_2O / heat

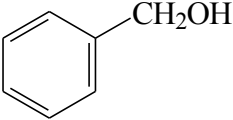
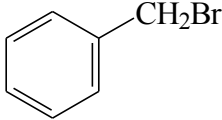
Marks
2

- Complete the following table.

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

Marks
4

- Complete the following table. Make sure you give the name of the product or starting material where requested.

STARTING MATERIAL	REAGENTS/CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	<p style="text-align: center;">PBr₃</p>	
<p style="text-align: center;">CH₃CH₂CH₂Br</p>	<p style="text-align: center;">(CH₃CH₂)₃N</p>	<p style="text-align: center;">(CH₃CH₂)₃(CH₃CH₂CH₂)N⁺ Br⁻</p>
<p style="text-align: center;">CH₃CH₂CH₂CH₂CHO</p> <p>Name: pentanal</p>	<p style="text-align: center;">1. NaBH₄ 2. H⁺ / H₂O</p>	<p style="text-align: center;">CH₃CH₂CH₂CH₂CH₂OH</p>