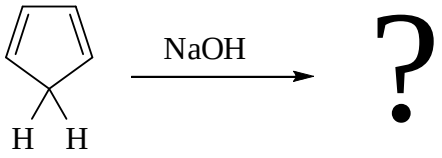
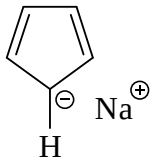
Marks 2

- Cyclopentadiene reacts with sodium hydroxide. Predict the structure of the product and explain its relative stability.

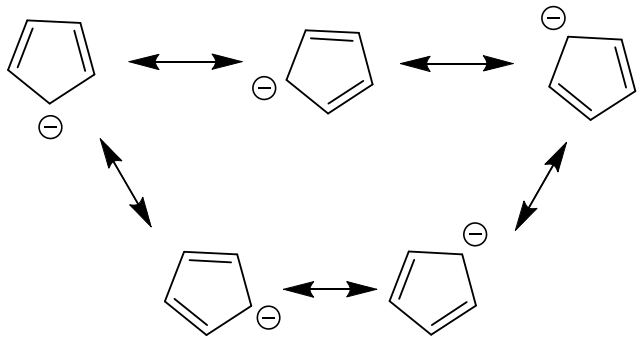


The product is the cyclopentadienyl anion.
This is an aromatic ring as it:



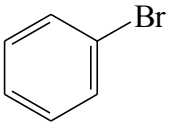
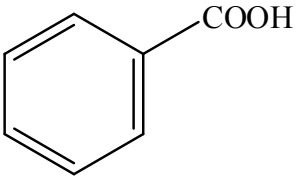
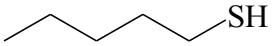
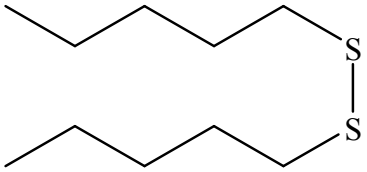
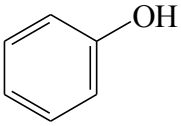
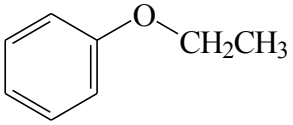
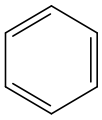
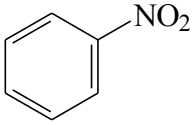
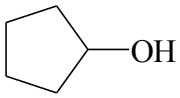
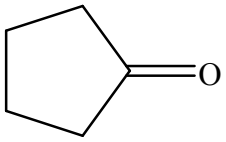
(i) flat
(ii) has 6π electrons (2 C=C bonds and a lone pair on the C^- atom) so satisfies Hückel's 4n+2 rule with n = 1
(iii) all C atoms are sp^2 hybridized.
(iv)

The negative charge is delocalized around the ring as shown in the resonance forms below:



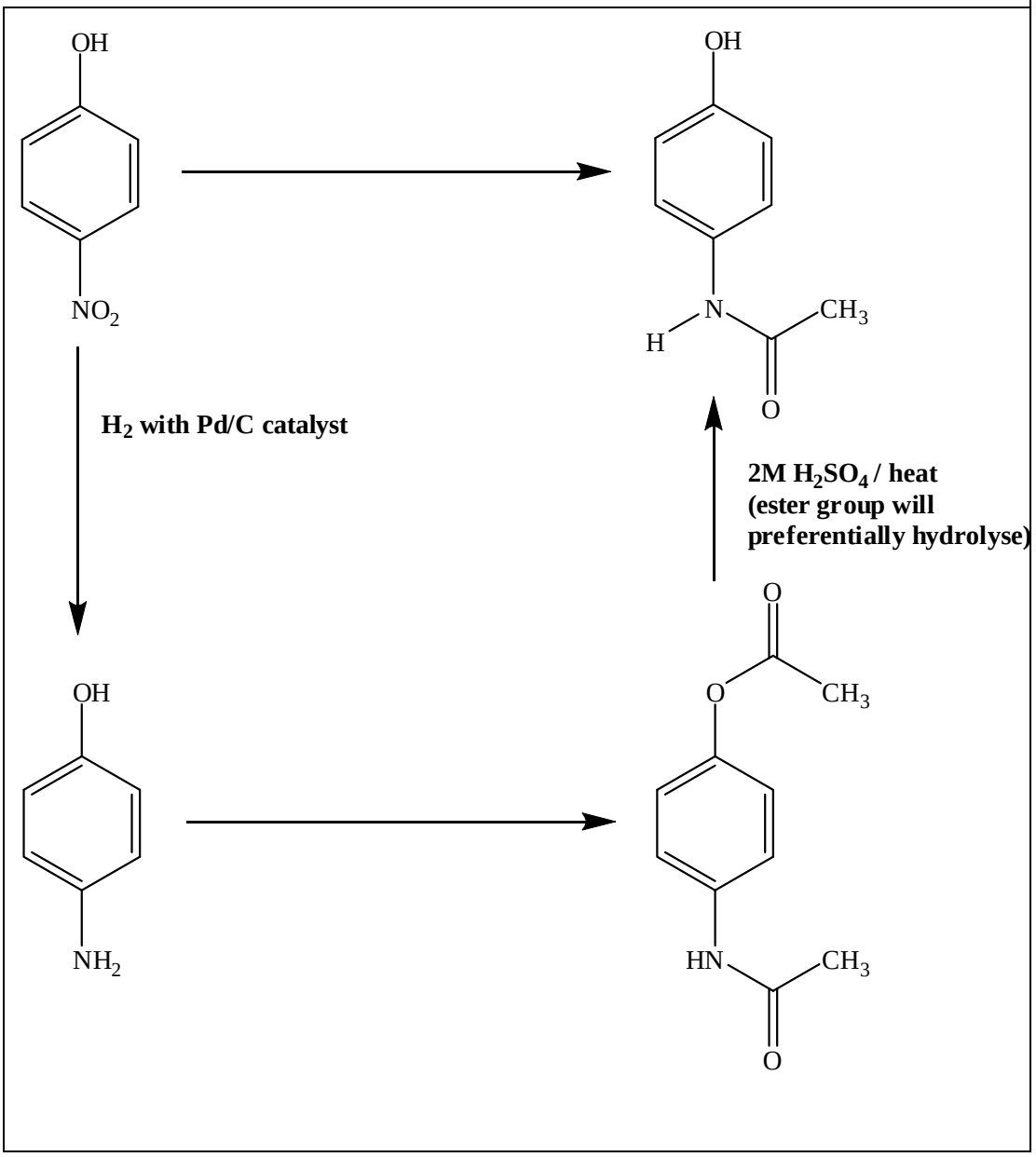
- Complete the following table.

Marks 6

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
$CH_3CH_2\underset{\displaystyle Br}{\underset{\vert}{C}}HCH_2CH_3$	**$(CH_3)_3N$**	$CH_3CH_2\underset{\displaystyle Br^{\ominus}\ \ {}^{\oplus}N(CH_3)_3}{\underset{\vert}{C}}HCH_2CH_3$
	1. Mg / dry ether 2. CO_2 3. $H^{\oplus}$ / H_2O	
	I_2 / air	
	**(i) NaOH** **(ii) CH_3CH_2Br**	
	**conc. HNO_3 / conc. H_2SO_4**	
	$Cr_2O_7^{2\ominus}$ / $H^{\oplus}$	

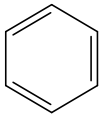
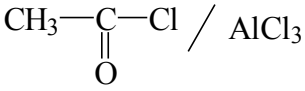
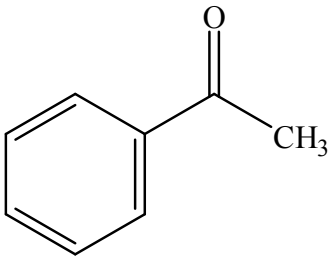
Marks 3

- 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.



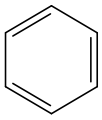
- Complete the following table.

Marks 1

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

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

Marks 1

STARTING MATERIAL	REAGENTS/CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	**HNO_3 / H_2SO_4 (30-40°C)**