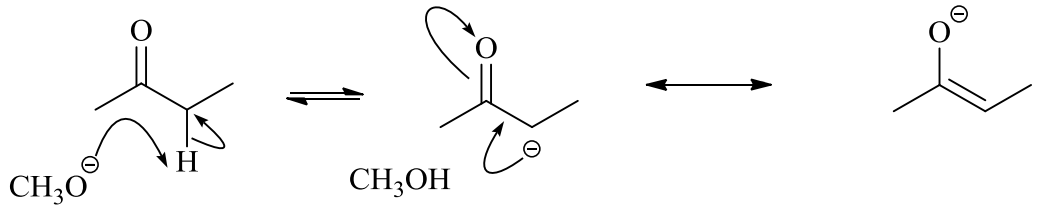
Marks 6

- Protons next to a carbonyl group can be removed by alkoxide bases as shown below.

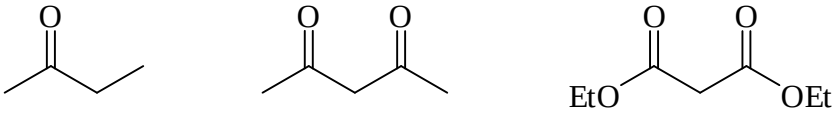


J **K** **L**

Apply your understanding of resonance to propose a structure **L** that explains how the carbonyl group increases the acidity of these hydrogens.

Add curly arrows to the reaction scheme above to complete a mechanism for the deprotonation of **J** to give **K**, and the stabilisation of **K** by resonance.

The pK_a values of compounds **J**, **M** and **N** are 9, 13 and 19, but not in that order. Match each compound with the correct pK_a, and explain your answer.



J **M** **N**

pK_a values:	**J = 19**	**M = 9**	**N = 13**

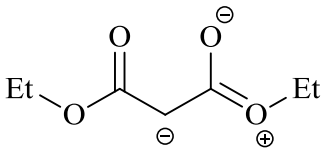
Reasoning for above assignments

M and N are stronger acids than J as the charge on the carbanion can be delocalised onto 2 carbonyl groups rather than 1(*i.e.* there are more resonance structures).

Enolate anions are stabilised by electron withdrawing groups which help reduce the negative charge on the carbon atom.

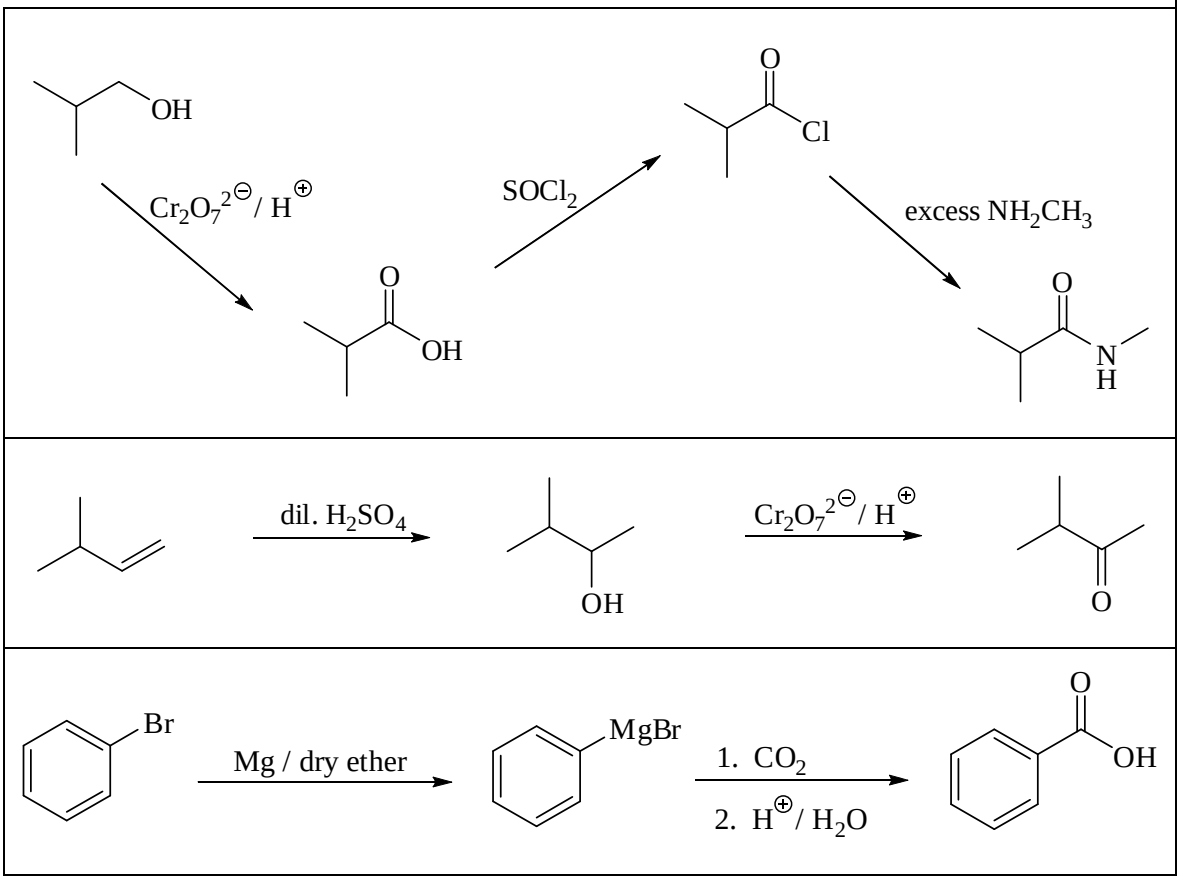
N is a weaker acid than M because the OEt group of the ester donates electron density towards the enolate anion, thus destabilising it.

Also the following resonance form of the ester would mean that the carbonyl group is less available to share the negative charge of the enolate anion.



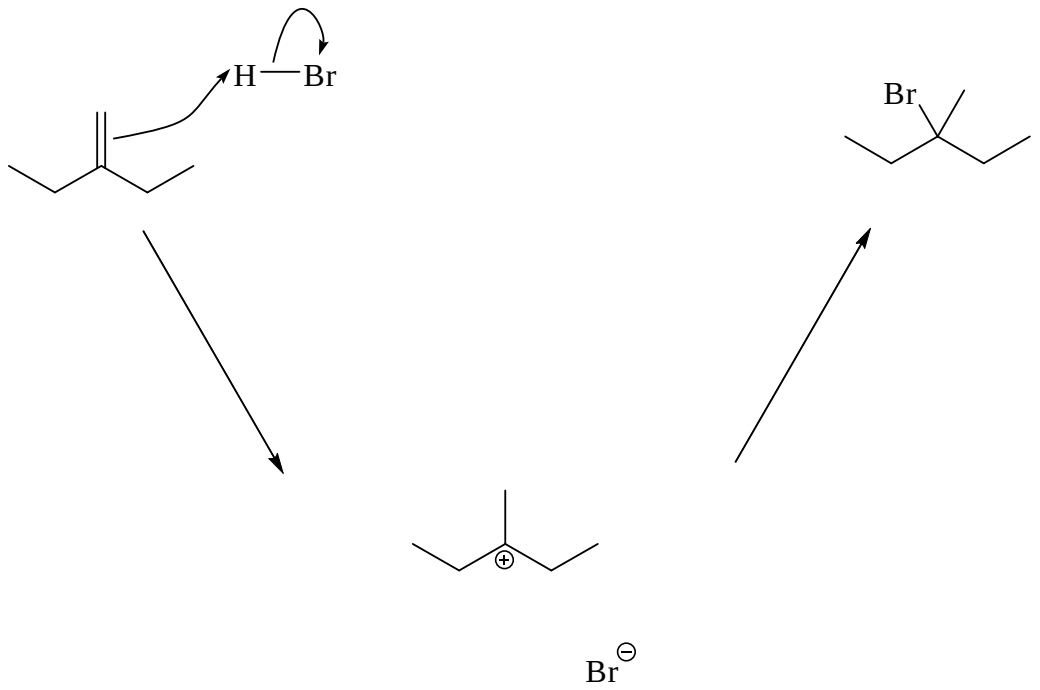
Marks 6

- Suggest reagents to accomplish the following transformations. More than one step is required in all cases.



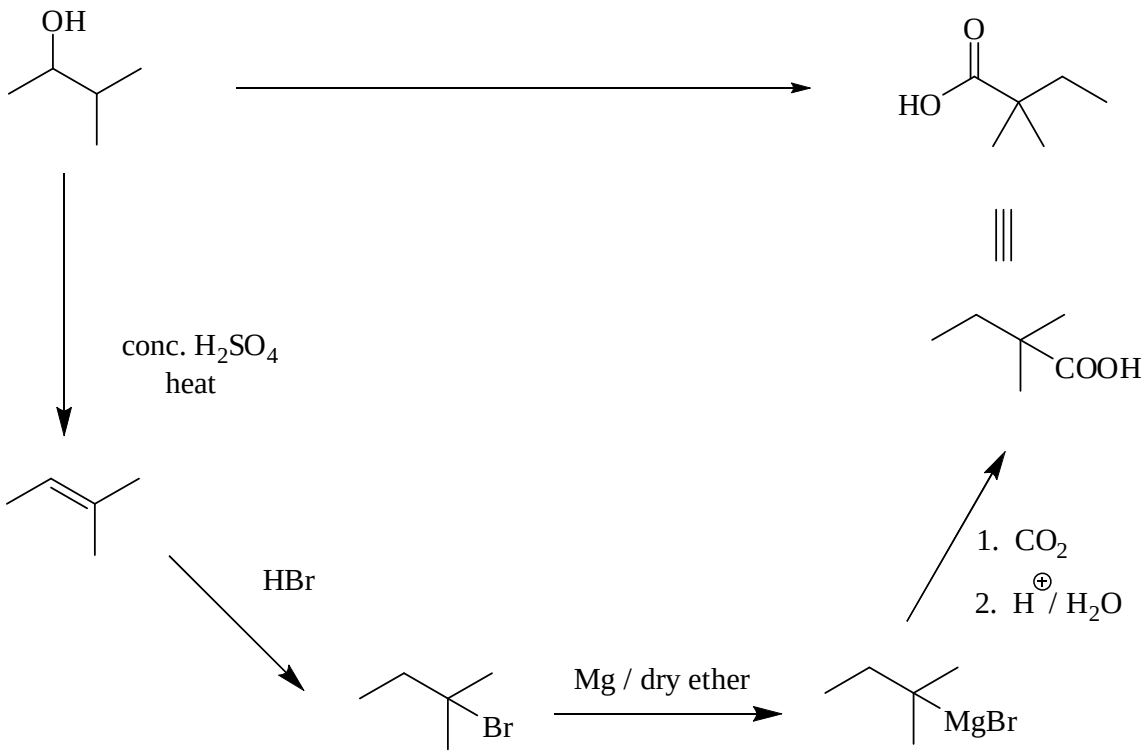
Marks 4

- Complete the two-step mechanism for the reaction given below. Draw partial charges, curly arrows and intermediate structures as appropriate to illustrate the bonding changes that take place.



Marks 4

- Show clearly the reagents you would use to carry out the following chemical conversion. Draw constitutional formulas for any intermediate compounds.
  NOTE: More than one step is necessary.

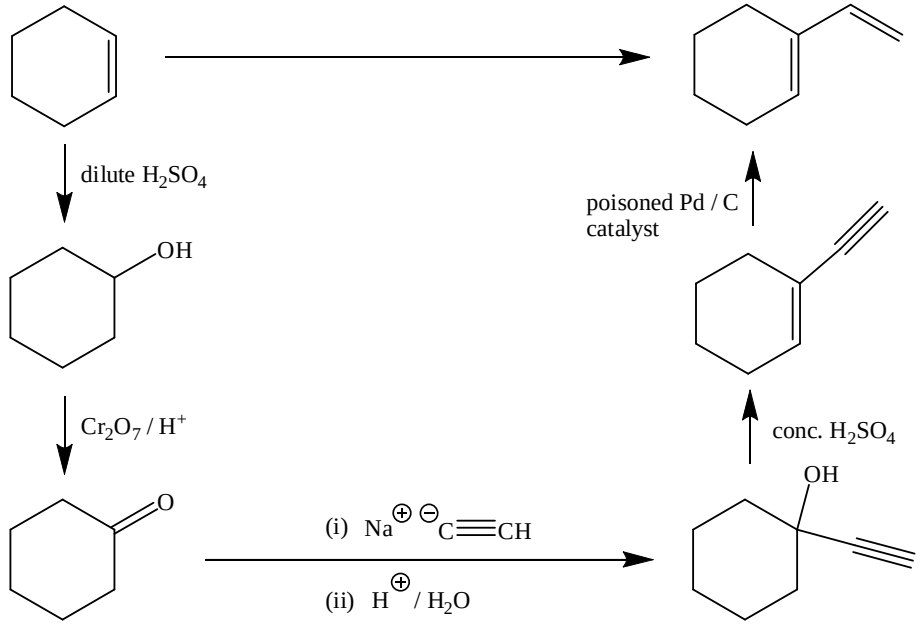


THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.

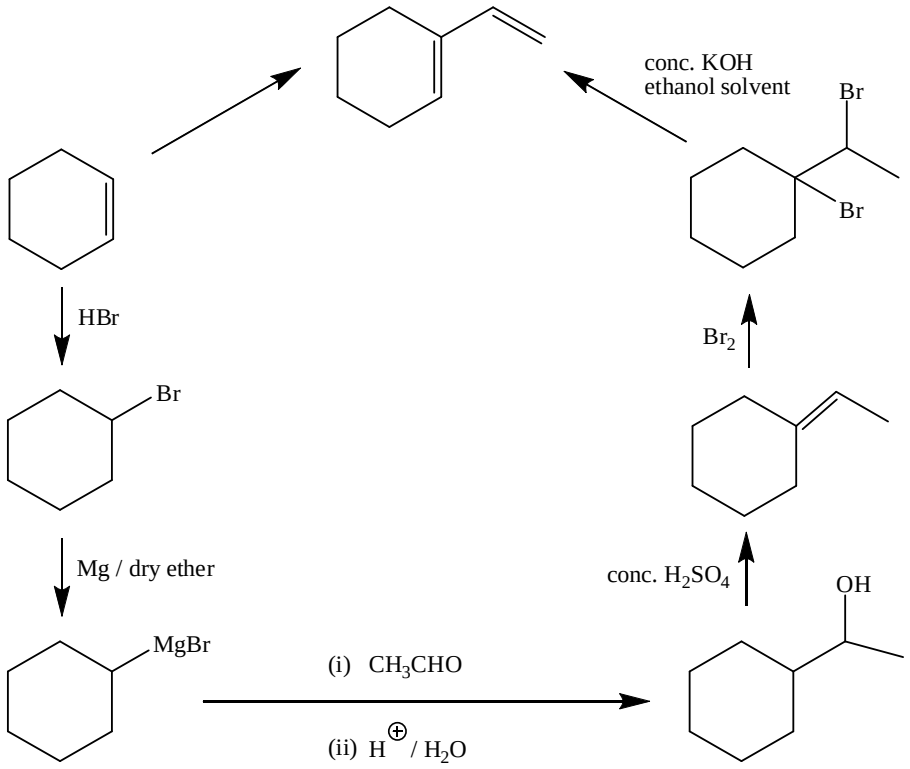
- Show clearly the reagents you would use to carry out the following chemical conversion. Draw constitutional formulas for any intermediate compounds.
  NOTE: More than one step is necessary.

Marks 4

Route 1:

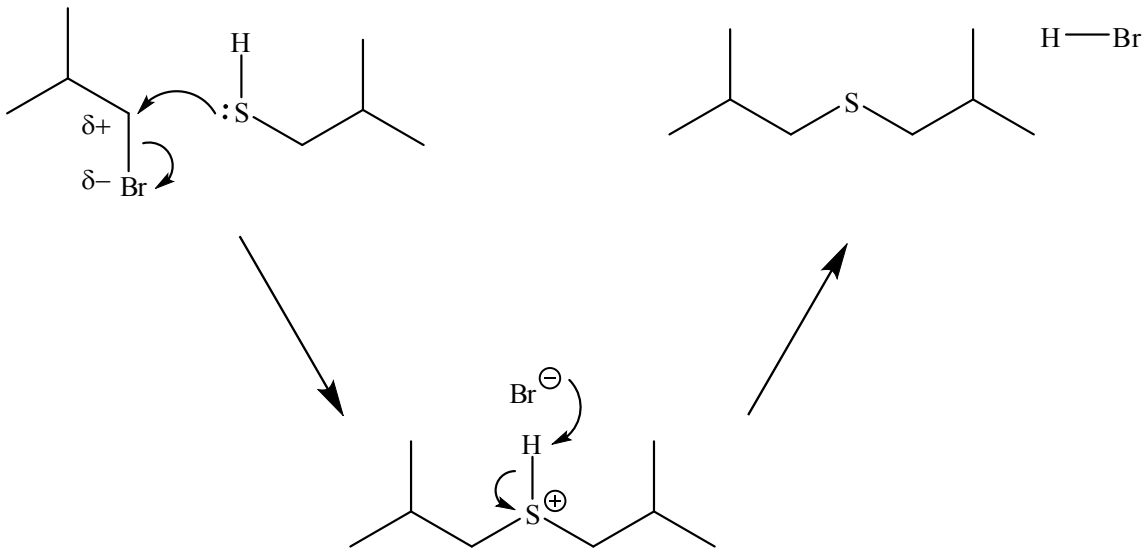


Route 2:



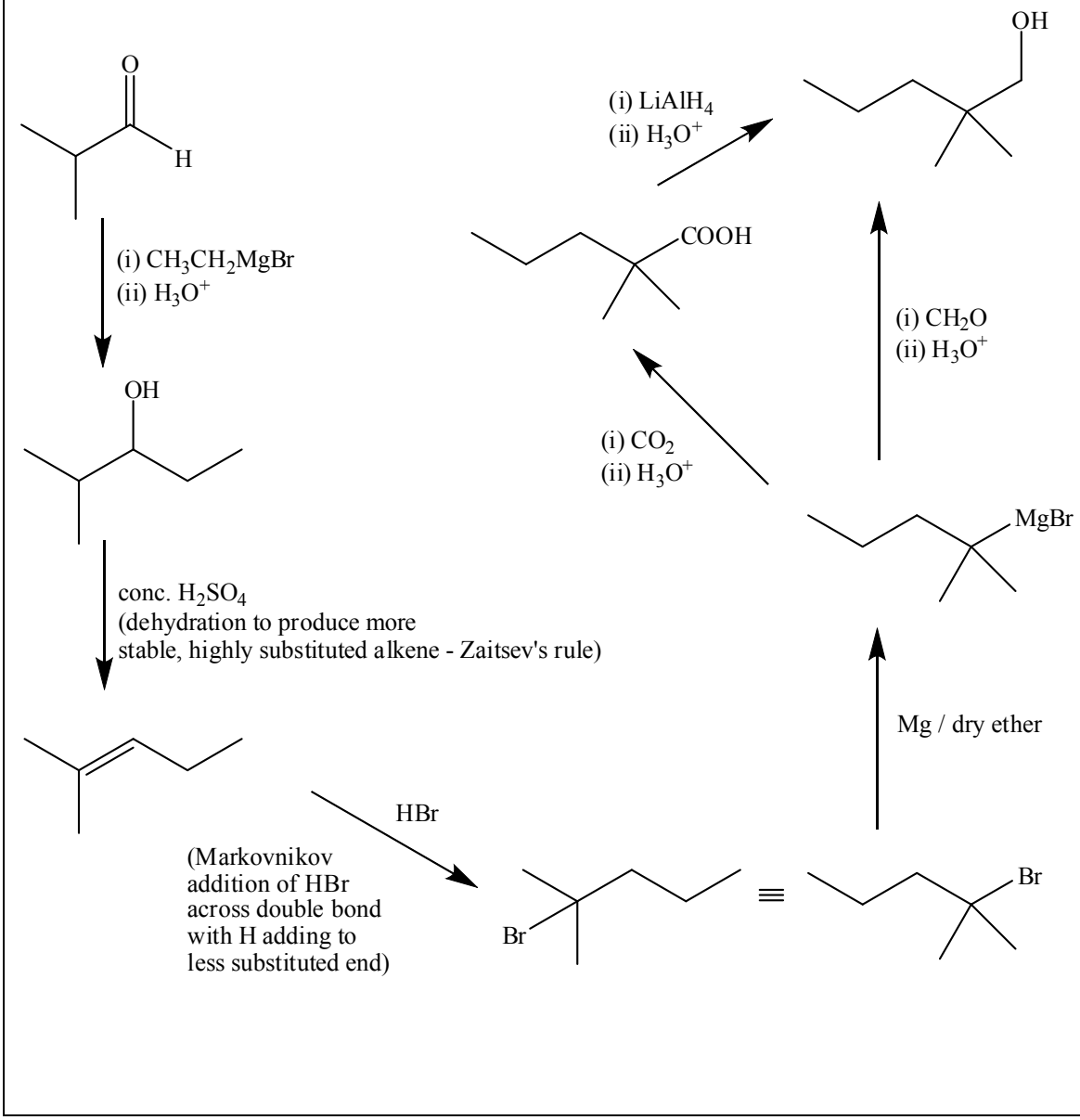
Marks 3

- Complete the two step mechanism for the reaction given below. Draw intermediate structures, curly arrows and partial charges as appropriate to illustrate the bonding changes that take place.



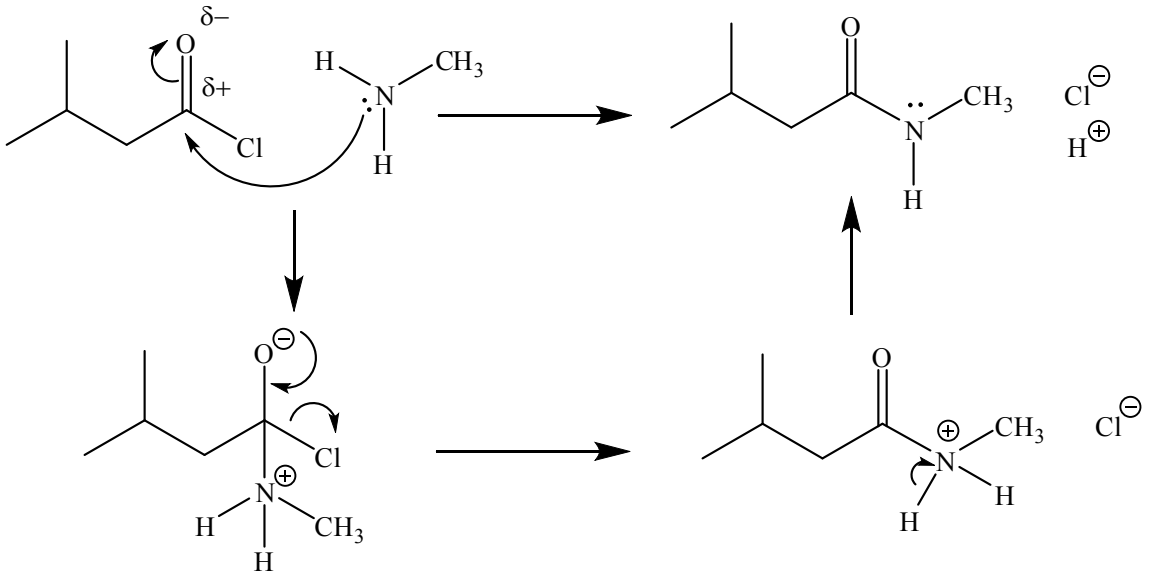
Marks 4

- Show clearly the reagents you would use to carry out the following chemical conversion. Draw constitutional formulas for any intermediate compounds.
  NOTE: More than one step is necessary.



4

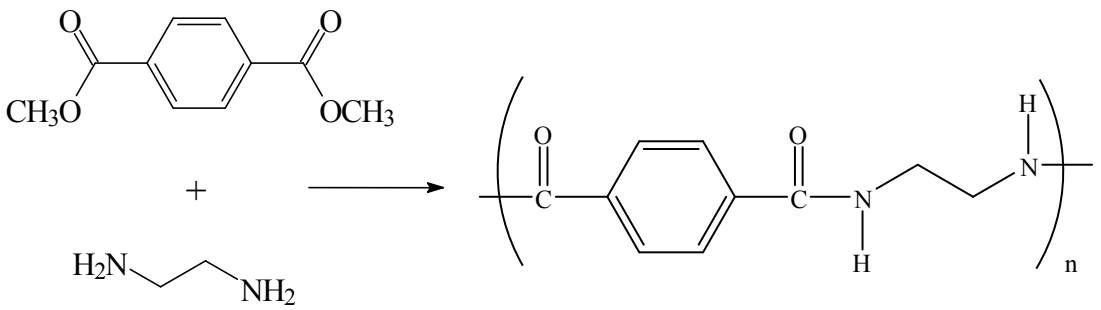
- Complete the three step mechanism for the reaction given below. Draw intermediate structures, curly arrows and partial charges as appropriate to illustrate the bonding changes that take place.

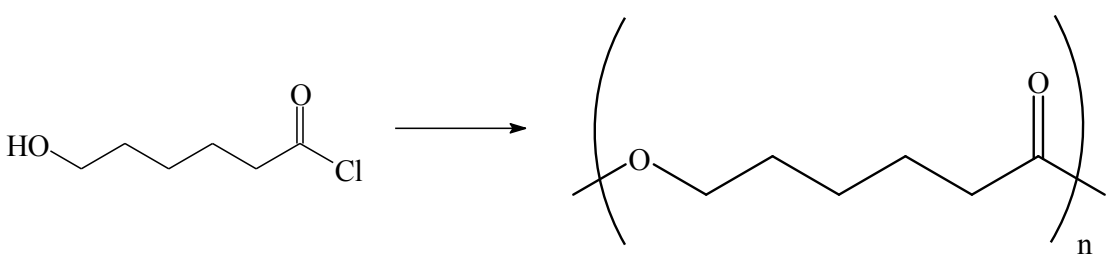


Marks

- Draw the repeating unit of the polymer formed in the following reactions.

2





4

- Show clearly the reagents you would use to carry out the following chemical conversion. Draw constitutional formulas for any intermediate compounds.
  NOTE: More than one step is necessary.