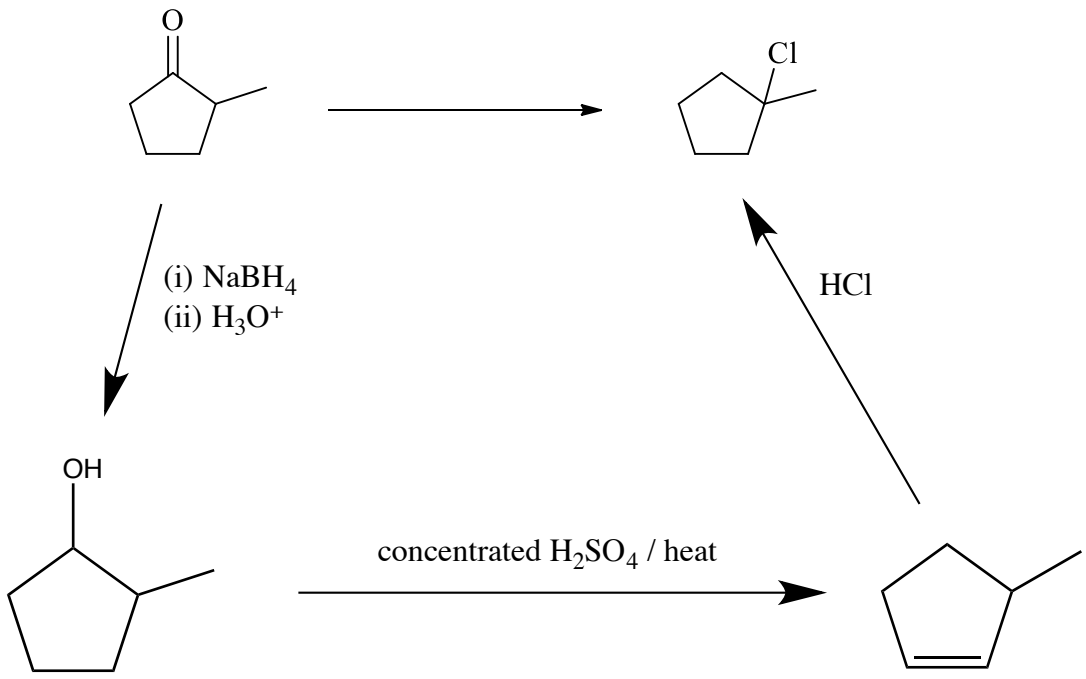
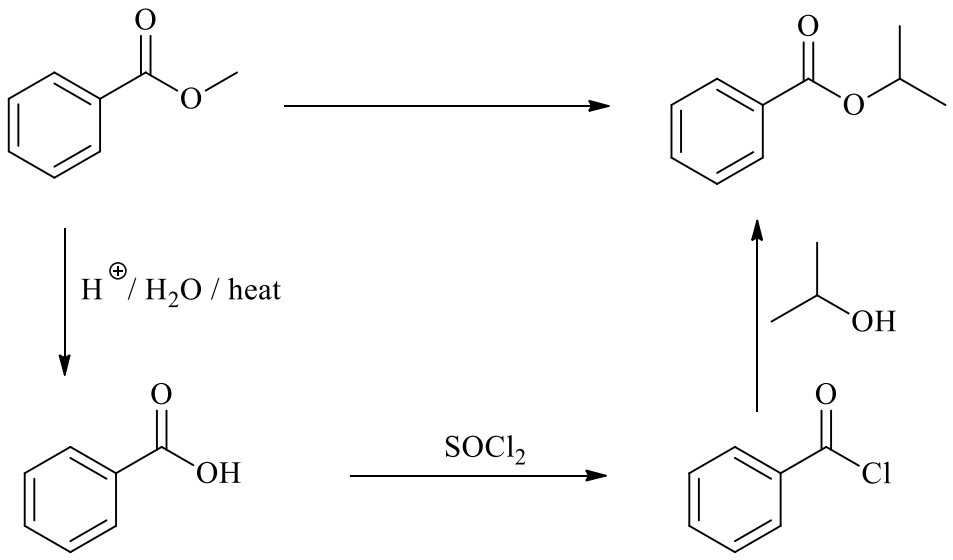
Marks 3

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



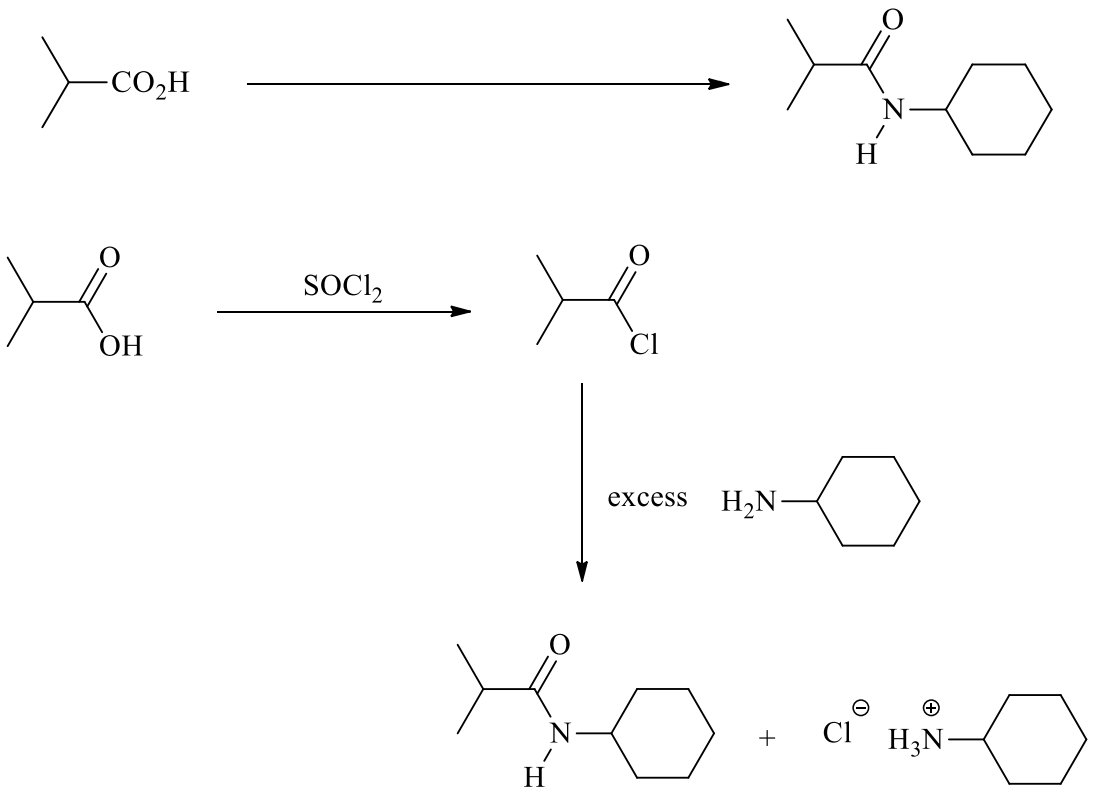
Marks
3

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



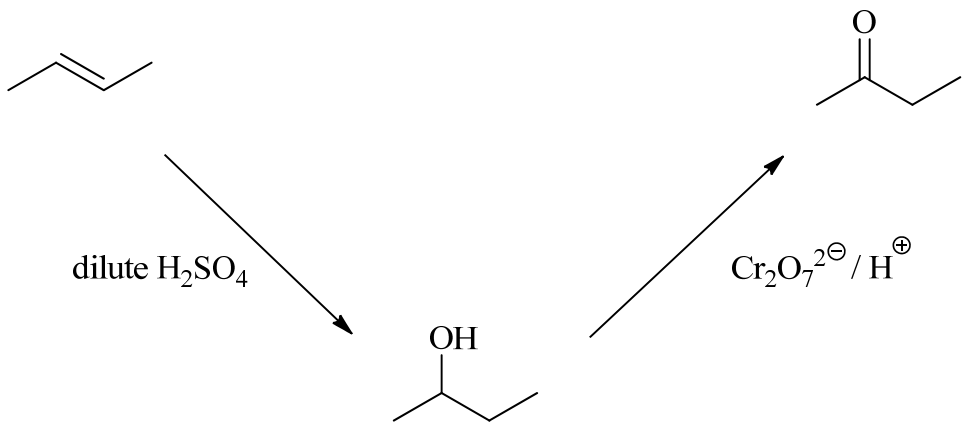
Marks
3

- Show clearly the reagents you would use to carry out the following chemical conversion. More than one step is required. Give the structure of any intermediate compounds formed. You have a supply of cyclohexylamine available.



Marks 8

- 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.



How can IR spectroscopy distinguish between the starting material, the intermediate and the product?

The product absorbs strongly in the 1650-1800 cm^{-1} region.

The intermediate alcohol absorbs strongly in the 3000-3300 cm^{-1} region.

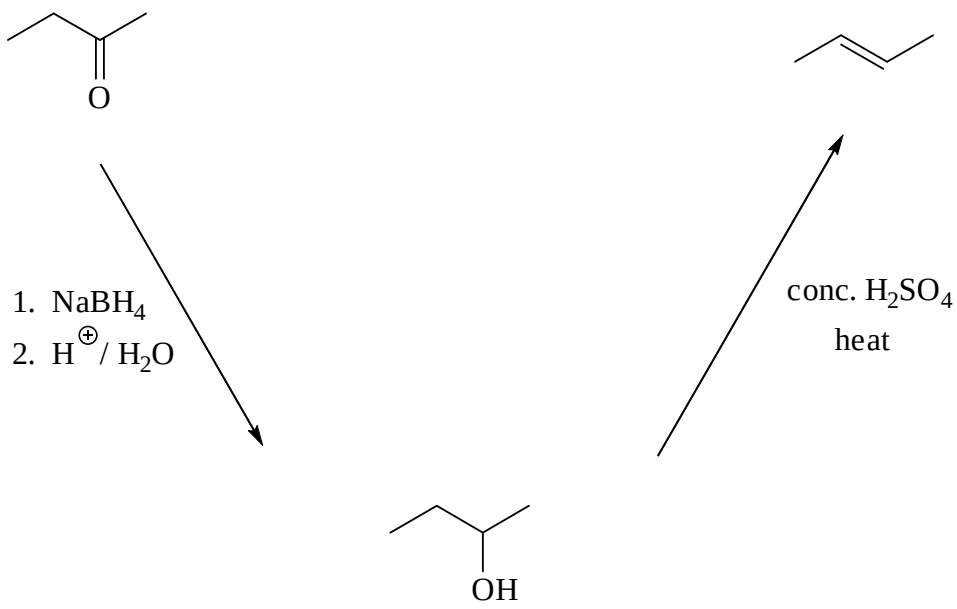
The starting material does not absorb strongly in either of these regions.

How can ^{13}C NMR spectroscopy distinguish between the starting material and the product?

The starting material is symmetrical and has only 2 resonances whilst the product has 4 resonances.

Marks 8

- 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.



How can IR spectroscopy distinguish between the starting material, the intermediate and the product?

The starting material absorbs strongly in the 1650-1800 cm^{-1} region due to the presence of the carbonyl (C=O) group.

The intermediate absorbs strongly in the 3000-3300 cm^{-1} region due to the presence of the alcohol (O-H) group .

The product does not absorb strongly in either of these regions.

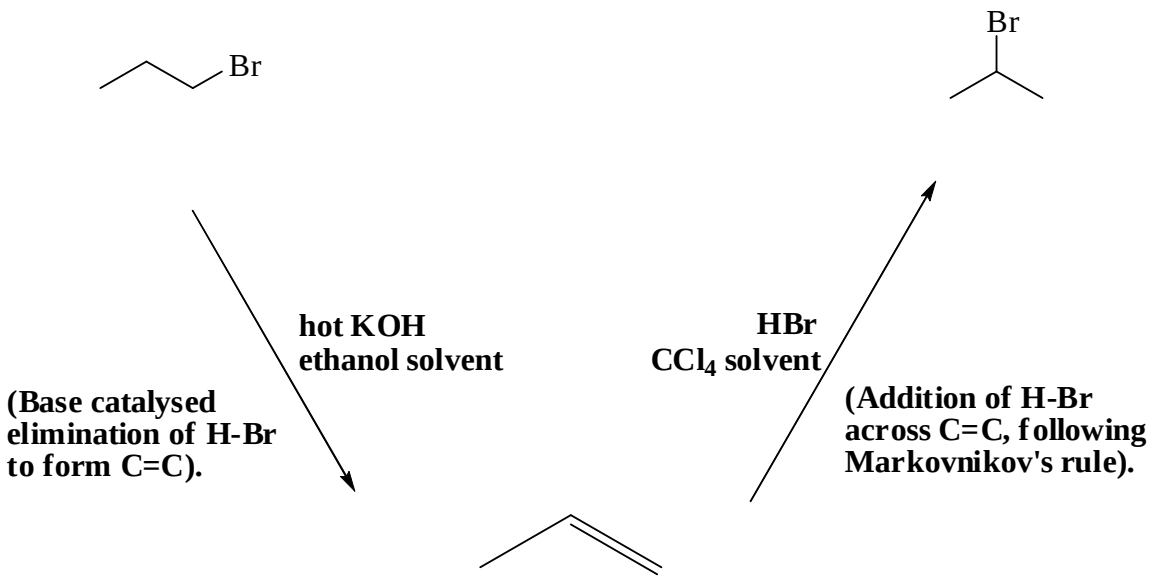
How can ^{13}C NMR spectroscopy distinguish between the starting material, the intermediate and the product?

The product is symmetrical and has only 2 resonances.

The starting material and the intermediate both have 4 resonances, but the chemical shifts will differ: the carbonyl C in the starting material is at higher chemical shift (180-200 ppm) than the C–OH carbon (~50 ppm).

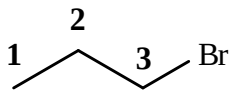
Marks 5

- 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.

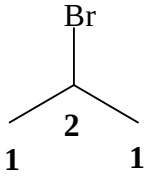


How could you distinguish between the starting material and the product by ^{13}C NMR spectroscopy?

The starting material has 3 different carbon environments so will give 3 resonances in the ^{13}C NMR.



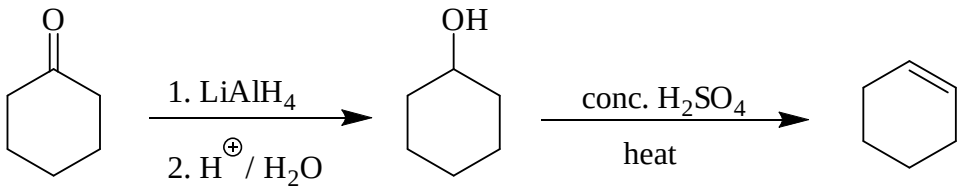
The produt has 2 different carbon environments so will give 2 resonances in the ^{13}C NMR.



The two carbon atoms labelled as '1' are equivalent.

Marks 6

- Show clearly the reagents you would use to carry out the following chemical conversion. Exactly one intermediate compound and hence two steps are required. Give the constitutional formula of the intermediate compound.

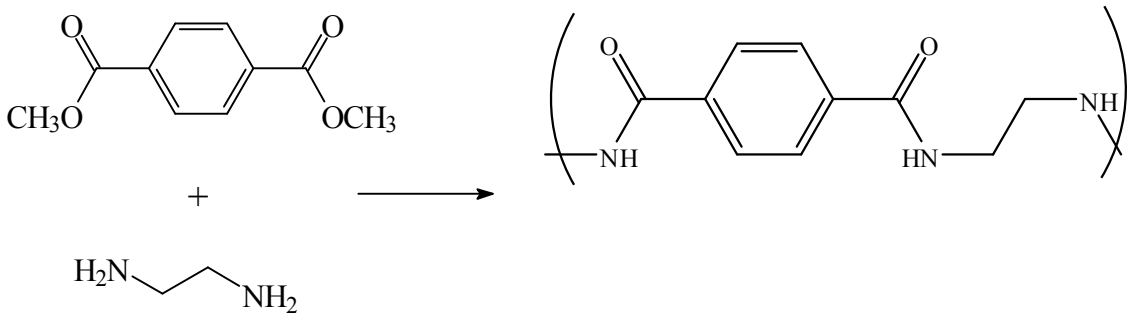
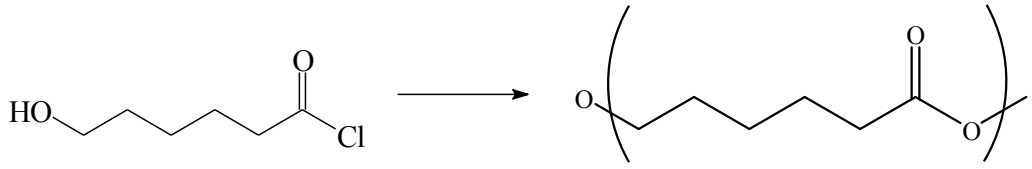


How could you distinguish between the starting material, the intermediate compound and the final product using infrared spectroscopy?

The starting material shows strong absorbance in the infrared, around 1700 cm^{-1} due to the carbonyl (C=O) group.

The iIntermediate shows strong and broad absorbance in the infrared, around 3500 cm^{-1} due to the alcohol (O–H) group.

The final product has no absorbance in these two regions of the infrared spectrum. (The C=C bond will absorb quite weakly around 1400 cm^{-1}.)

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

Marks 2