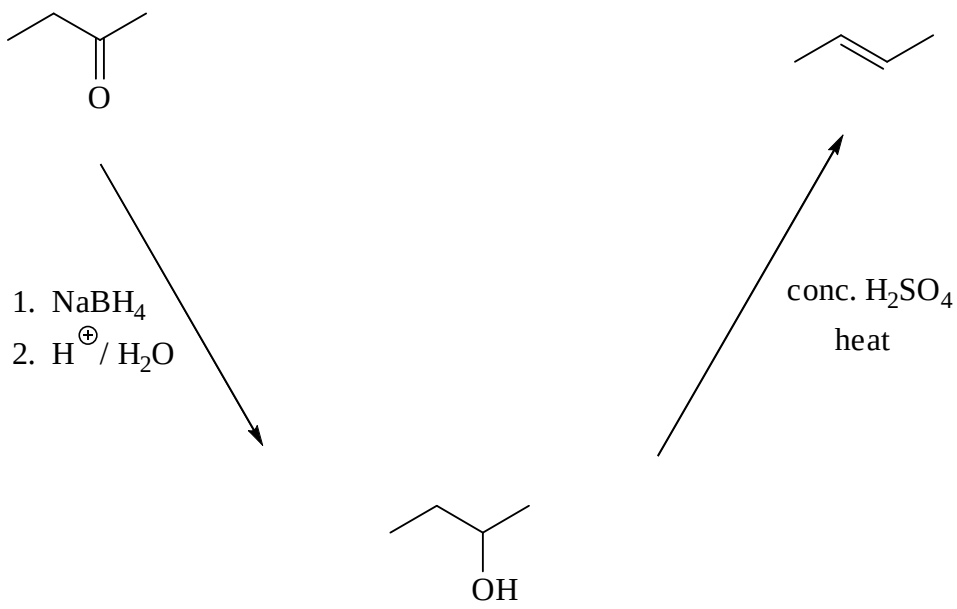
Marks 8

- 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).