NUCLEOPHILIC ADDITION: REDUCING C=O

This set of questions should only be used if your syllabus allows the reaction involving BH₄⁻ ions to be simplified to attack by H⁻ ions.

1. One way of using NaBH₄ to reduce the carbon-oxygen double bond in an aldehyde or ketone is to react the carbonyl compound with a solution of NaBH₄ in water to which a little sodium hydroxide has been added. Following the initial reaction, the reaction is completed by acidifying the solution.

Simplifying things so that the BH₄⁻ ion is considered as a source of hydride ions, H⁻, the mechanism for the reduction of an aldehyde like ethanal is:

a) Describe and explain what is happening during these reactions.

b) What type of alcohol is produced every time an aldehyde is reduced using NaBH₄?

2. NaBH₄ can also be used under different conditions by doing the reaction in an alcohol like ethanol as the solvent, followed by boiling the reaction mixture with water.

a) Write the mechanism for the reduction of the ketone propanone under these conditions.

b) What type of alcohol is produced every time a ketone is reduced using NaBH₄?