

HL Questions on Reduction reactions

1. 2-methylbutanoic acid can be reduced using lithium aluminium hydride, LiAlH_4 .
The organic product goes via an intermediate which cannot be isolated as it is even more readily reduced than 2-methylbutanoic acid.
Identify the intermediate and the final organic product by giving their systematic (IUPAC) names and write equations for the two steps in the reaction.

2. There are four different alcohols that are structural isomers with the molecular formula $\text{C}_4\text{H}_{10}\text{O}$.
 - i. Identify the four different structural alcohols by giving their systematic (IUPAC) name.
 - ii. Three of the four different alcohols can be prepared by reducing an aldehyde or a ketone using sodium borohydride, NaBH_4 .
Identify which three together with the aldehyde or ketone that can be used to prepare it.
 - iii. Explain why the fourth alcohol cannot be prepared by reducing an aldehyde or ketone.

3. Phenylamine can be prepared by firstly refluxing nitrobenzene with a mixture of tin metal and concentrated hydrochloric acid then reacting the organic product formed from this first step with sodium hydroxide solution.
 - i. Identify the role played by the tin metal in this reaction.
 - ii. State the name of the intermediate organic compound formed in this reaction and state the half-equation for its formation.
 - iii. State the equation for the reaction of this intermediate organic product with sodium hydroxide to form phenylamine.