

Chemguide – answers

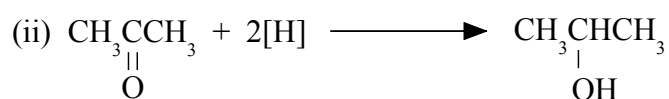
ALDEHYDES AND KETONES: REDUCTION

1. a) $[\text{AlH}_4]^-$ and $[\text{BH}_4]^-$

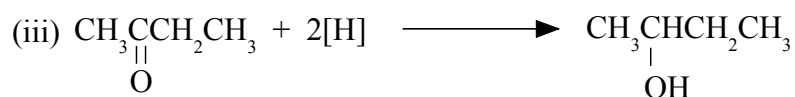
(You will find these written with or without the square brackets.)



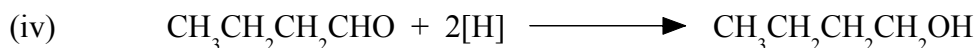
(If it helps you, you could just as well draw the detailed structures for everything. It does actually help, because the net effect of this reaction is to add a hydrogen at either end of the $\text{C}=\text{O}$ bond. These questions aren't actually asking for the fully displayed structures, so they aren't essential, but you can use them if you want to.)



(You could perfectly well condense these formulae as CH_3COCH_3 and $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$, but as things get more complicated, it *is* easier to show the structures more fully.)



(Flipping the butanone over as $\text{CH}_3\text{CH}_2\text{COCH}_3$ is, of course, fine.)



(Again, draw it out more fully if it helps.)

- c) (i) a primary alcohol
(ii) a secondary alcohol

2. a) It reacts violently with water and alcohols, and so these can't be used as solvents.

b) Perfectly dry ethoxyethane (diethyl ether)

c) A dilute acid such as dilute sulphuric or hydrochloric acid is added, and the mixture is fractionally distilled to collect the alcohol produced. (At this level, including the additional precaution of first destroying any excess lithium tetrahydridoaluminate(III) by adding some undried ethoxyethane is probably unnecessary. Check with past exam papers and mark schemes.)

d) Sodium tetrahydridoborate(III) is much less reactive, and doesn't react with alcohols (or water as long as it is alkaline). Reactions can be done in solution in an alcohol such as methanol or ethanol, and the mixture has to be heated under reflux or left for some time to react. The intermediate is boiled with water to release the product alcohol, and the mixture fractionally distilled.