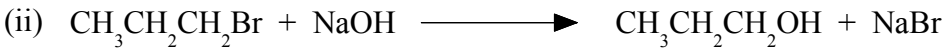
HALOGENOALKANES: REACTIONS WITH HYDROXIDE IONS

1. a) (i) Heating under reflux means heating the mixture with a condenser placed vertically in the flask. This stops loss of any volatile substances from the reaction mixture during the heating process.



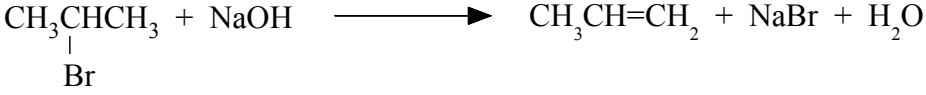
(ii) $CH_3CH_2CH_2Br + NaOH \longrightarrow CH_3CH_2CH_2OH + NaBr$

If you have chosen to write the ionic equation, you will have OH^- on the left-hand side and Br^- on the right. The sodium ions are spectator ions and so aren't included.

b) (i) $CH_3CH(OH)CH_3$

(ii) $CH_3CH_2CH_2CH_2OH$

(It is quite hard to get this wrong! Remember that this is a substitution reaction and so the OH group goes into the same position on the chain as the Br is removed from. In the second case, the OH group is usually written at the right-hand end of the chain if it is in the 1- position.)

2. a) 

$CH_3CH(Br)CH_3 + NaOH \longrightarrow CH_3CH{=}CH_2 + NaBr + H_2O$

b) (i) $CH_3CH(OH)CH_2CH_3$

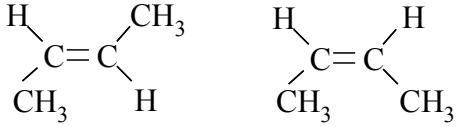
(It doesn't matter which of the middle carbon atoms you attach the OH group to. They are exactly equivalent. 2-bromobutane could be drawn with the bromine on either, depending on which end you started counting from.)

(ii) There are actually three possible products, although you may well only have written down two. You remove the bromine together with a hydrogen from a next-door carbon atom. That seems to produce

$CH_3CH_2CH{=}CH_2$ (if you remove the hydrogen from the right-hand carbon.)

$CH_3CH{=}CHCH_3$ (if you remove the hydrogen from the other middle carbon atom.)

But be careful! The second one has two geometric isomers:



Always show the proper angles around a double bond to avoid missing things like this.

3. a) (i) mainly substitution

(ii) a mixture of substitution and elimination

(iii) mainly elimination

b) To favour elimination:

(i) use a higher temperature

(ii) use a higher concentration of the sodium hydroxide solution,

(iii) use pure ethanol as a solvent

(Remember that to favour elimination, you need higher everything – temperature, concentration of sodium hydroxide, and proportion of ethanol in the solvent.)