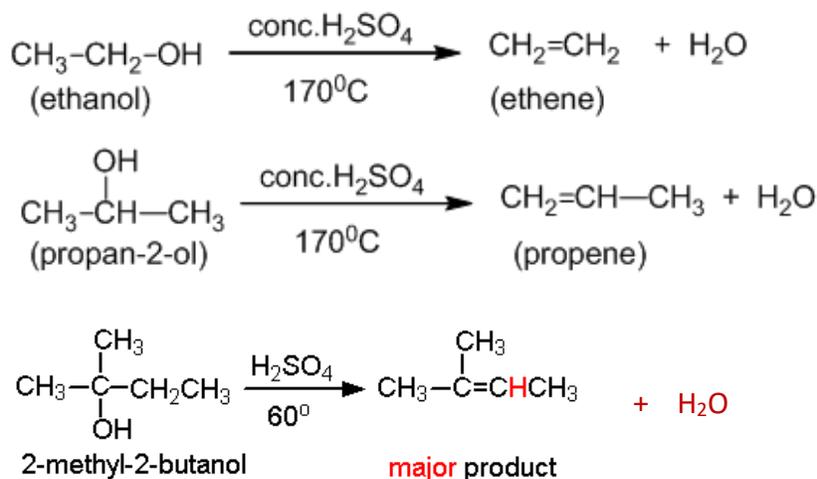


B. Dehydration:

Heating alcohols in concentrated sulfuric acid (H_2SO_4) at 180°C removes the OH group and a H from an adjacent carbon to produce an alkene, with water as a by-product. Since water is “removed” from alcohol, this reaction is known as a dehydration reaction. (water molecule is eliminated from the alcohol molecule).

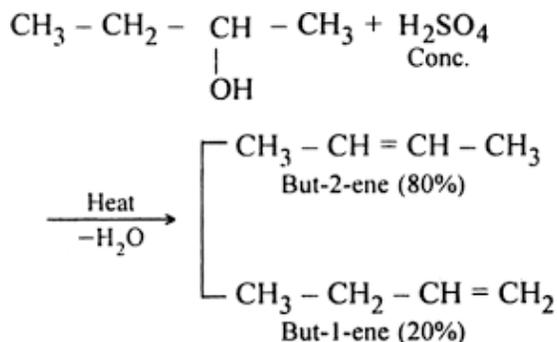
Alcohols dehydrate (lose water) in presence of concentrated sulfuric acid at warm temperature to produce alkenes. Water is produced as a by-product. They also dehydrate at lower temperature in presence of H_2SO_4 to give ethers as will be seen soon.



If there is more than one possible product of a dehydration reaction, the major product can be predicted from Zaitsev’s Rule:

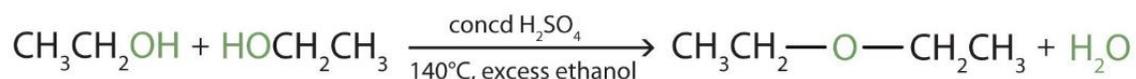
The Zaitsev’s Rule:

When an alkene is produced in an elimination reaction, the major product is the one with **the double bond formed by removing a hydrogen from the beta-carbon with the fewest hydrogens.**



Dehydration may happen at carbon 1 or carbon 2 to give two different products as seen in the second and third examples above.

- When alcohols dehydrate at high temperature (170 °C) and excess acid, an alkene is produced as shown in the above examples. This is called unimolecular dehydration.
- Alcohols may undergo bimolecular dehydration at low temperature (140 °C) where excess alcohol is used. The product under these conditions is an ether. Diethyl ether is produced upon oxidation of ethanol at 140 °C in excess ethanol as follows:



Two molecules of ethanol

Diethyl ether

Comparison:

