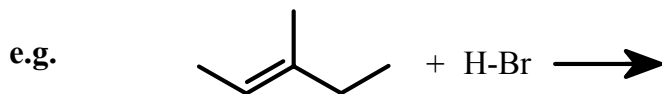
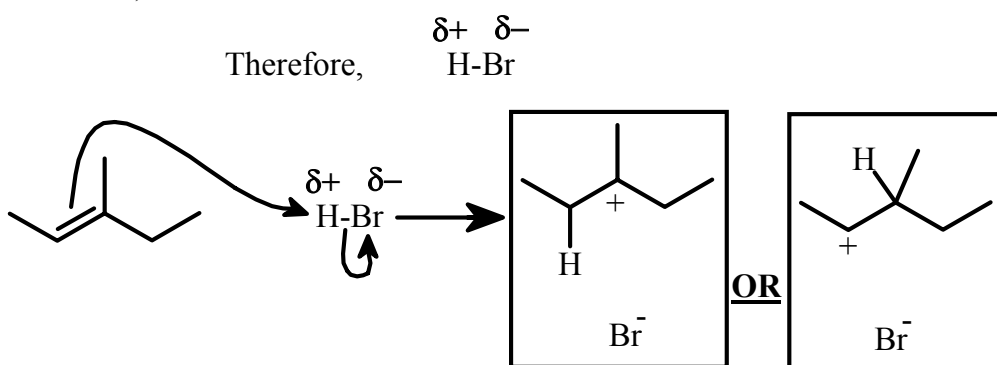


Alkene's undergo asymmetrical addition reactions where the electrons from the pi-bond are used to form a new sigma-bond. The examples we have looked at are the addition of HBr and H<sub>2</sub>O. We can predict the expected products if we understand how the reaction occurs (i.e. the mechanism).

### Tutorial

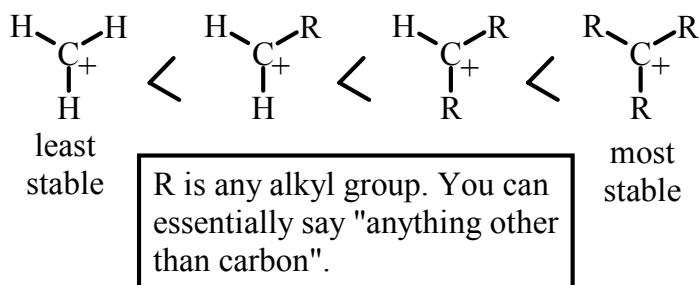


The first step is the breaking of the pi-bond and attack of the pi electrons to the electropositive end of the H-Br molecule. We can determine which end is electropositive by looking at electronegativity values (H = 2.1, Br = 2.8).

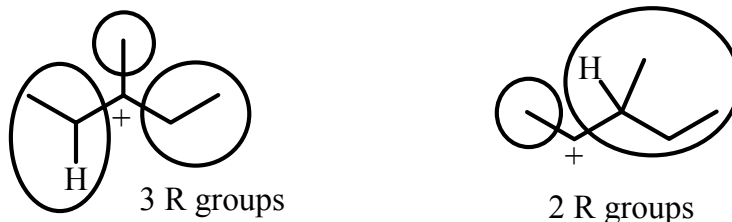


Hypothetically, either of these carbocations can be formed. However, if we look at each of them we can predict a difference in stability so one will dominate. The stability of the carbocation is directly related to the number of non-hydrogen substituents attached to the positively charged C.

Compare:

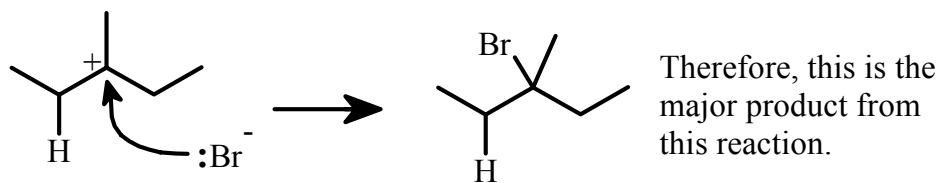


What did we have above?



The one here on the left is more stable and therefore, the major final product will arise from that carbocation.

Now we need to finish the reaction. The more stable carbocation intermediate will now be attacked by the bromide ion



A reasonable question to ask yourself is "does any of the other carbocation actually form product?" The answer is YES, but how much will depend on the difference between the stabilities of the two carbocations. If the least stable is a primary carbocation and the other is a tertiary, then very little primary carbocation will lead to product (probably  $<1\%$ ). However if one is  $1^\circ$  or one is  $2^\circ$  or one is  $2^\circ$  and the other is  $3^\circ$ , then we could get 20% of the minor product.

Try these practice questions and predict the major organic product from reaction with

A) HBr      and      B)  $\text{H}_2\text{O}$ ,  $\text{H}^+$

You should now be able to provide IUPAC names for all these products also.

**Practice Questions:**

