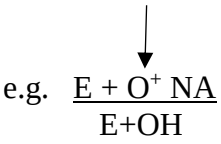
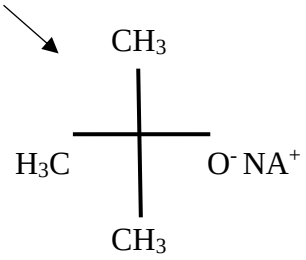
E-2 Reaction Problems on Rings

Solution process steps:

1. Locate the leaving group (wedge or dash)
2. Determine if there are hydrogens on the opposite end from the leaving group that are in anti-configuration. (i.e. If leaving group is a wedge there must be a hydrogen available that is a dash.) If no hydrogen is available double bond cannot format at that location.
3. Note the number of possible double bonds that can be formed. (can have up to 3 possible)
4. Identify if strong small base



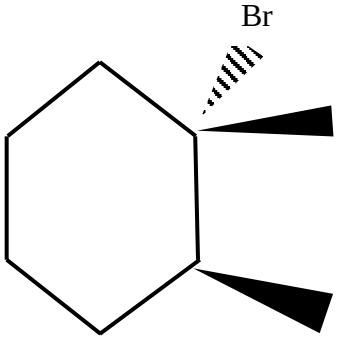
Large Base

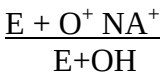


5. If a small base, the double bond will form at the most substituted carbon (i.e. most stable carbocation) or carbon with the least number of hydrogens attached.
6. If large base the double bond will form at the least substituted carbon (carbon with most hydrogens attached.)
7. Circle the carbon with the leaving group and identify hydrogen configurations that are possible with associated carbons as wedges or dashes.

Sample Problems and Solution Process

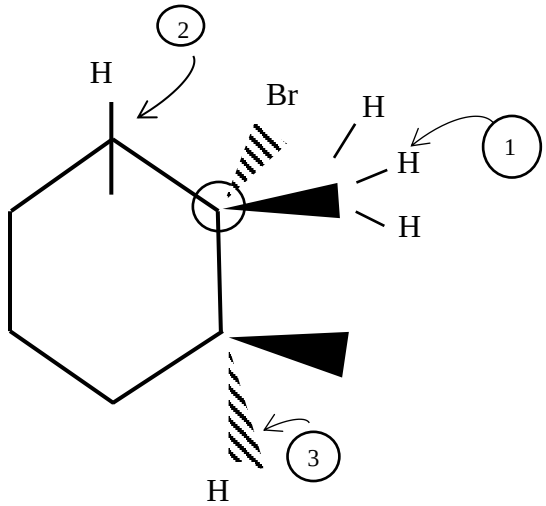
Problem 1





Step 1

Circle carbon that can have bond form (where leaving group attached) and any hydrogens that can be available for double bond formation (i.e. that can donate electrons to form double bond.)



Note: there are 3 possible locations

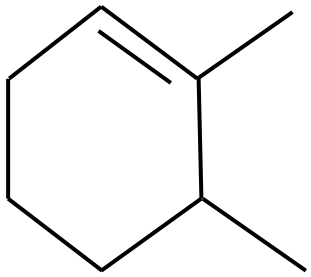
Step 2

Check out base. $\frac{E + O^+ NA^+}{E+OH}$ is a small base that will favor double bond formation at most substituted carbon.

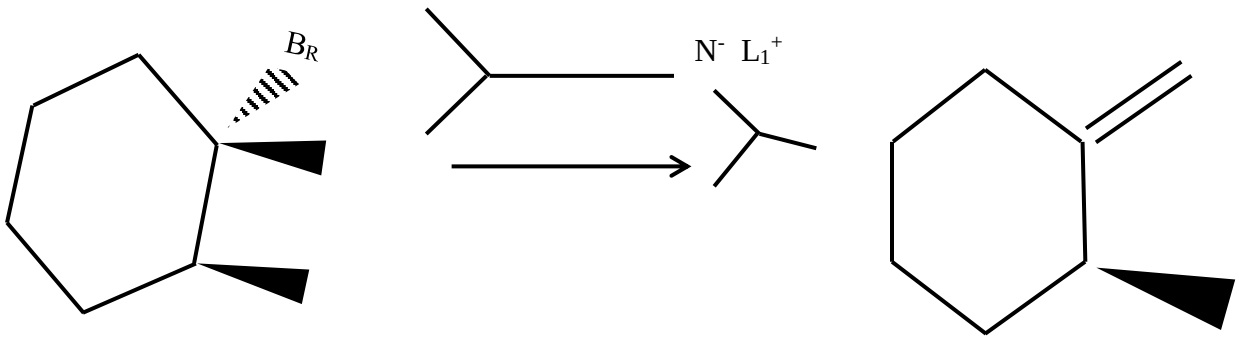
Step 3

However most substituted carbon (3) does not have a hydrogen that is anti to the Br leaving group. Therefore that double bond cannot be formed. Now check location 2 which has 2 hydrogens in which case one would be a wedge and the other a dash. Location 1 is less substituted that (2) so that (2) is the preferred site for the double bond.

Final Answer

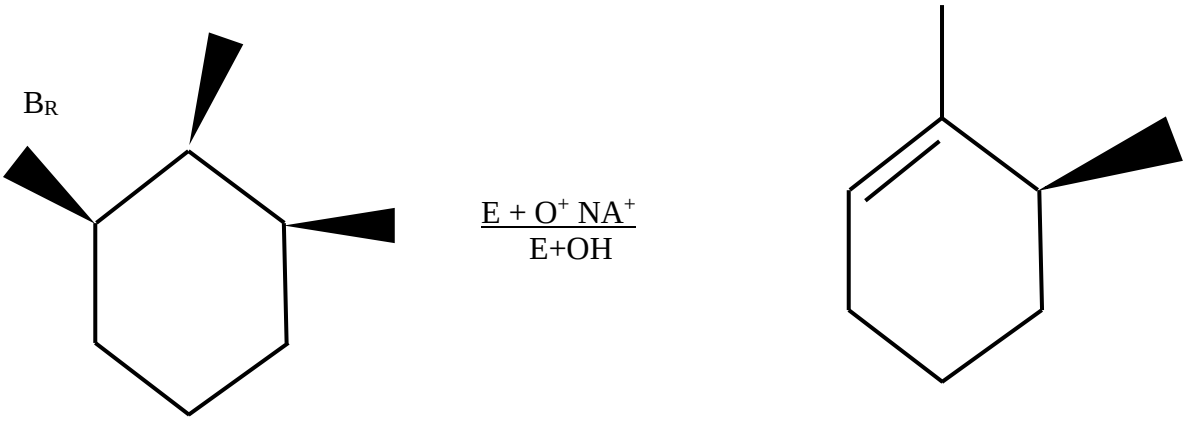


Problem 2



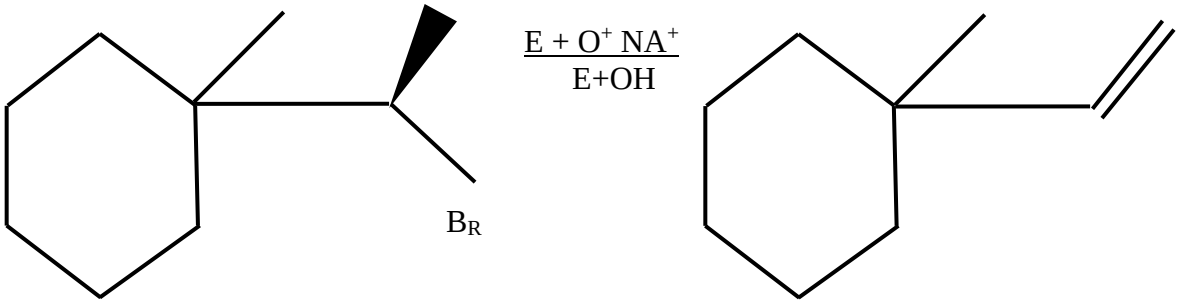
Reason – Big base goes to least substituted

Problem 3



Why? – Double bond can form where leaving group is anti to hydrogen.

Problem 4



Why?

Answer – only location that has available hydrogens is CH_3 group attached to carbon with B_R.