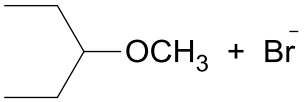
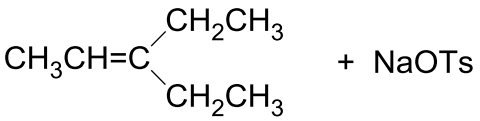
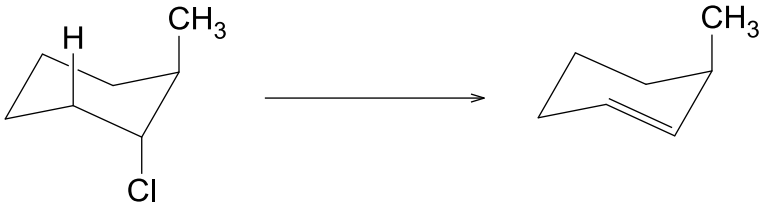
1.a) This must be $S_N2$ since there is no beta carbon (or H) in the substrate ($CH_3Br$)



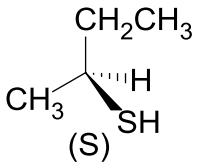

b) These are E2 conditions (strong base, 3° substrate, high temperature)



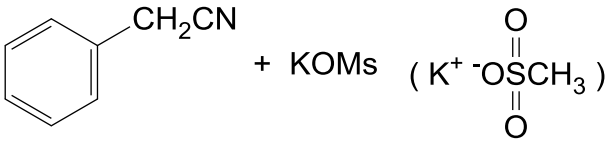

c) E2 conditions: fairly bulky, strong base. Look for anti H adjacent to leaving group




d) $S_N2$ with inversion of configuration. Product can be drawn a number of ways, as long as it is (S)

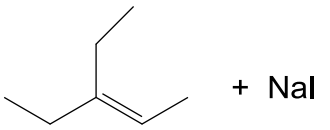



e) Can only be $S_N2$ since there is no beta H.

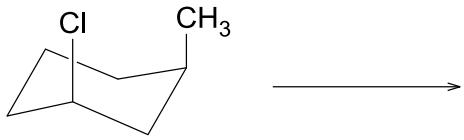



leaving group is a mesylate

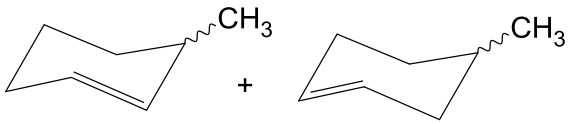
f) This is an E2 with a strong base – forms the Zaitsev (more highly substituted) product.

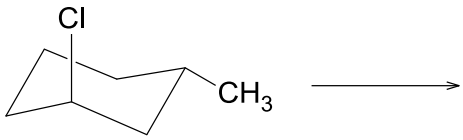


2. When drawn in their reactive conformations, it is clear that *cis* is less stable than the *trans*. *Cis* exists in a stable, but unreactive, diequatorial form – and therefore reacts very slowly. *Trans* exists primarily in its reactive conformation and reacts more rapidly. The squiggly line in the products indicates the $CH_3$ can be up or down.




cis, flips to unreactive but stable conformation




2 alkene products

trans is in its stable and reactive conformation