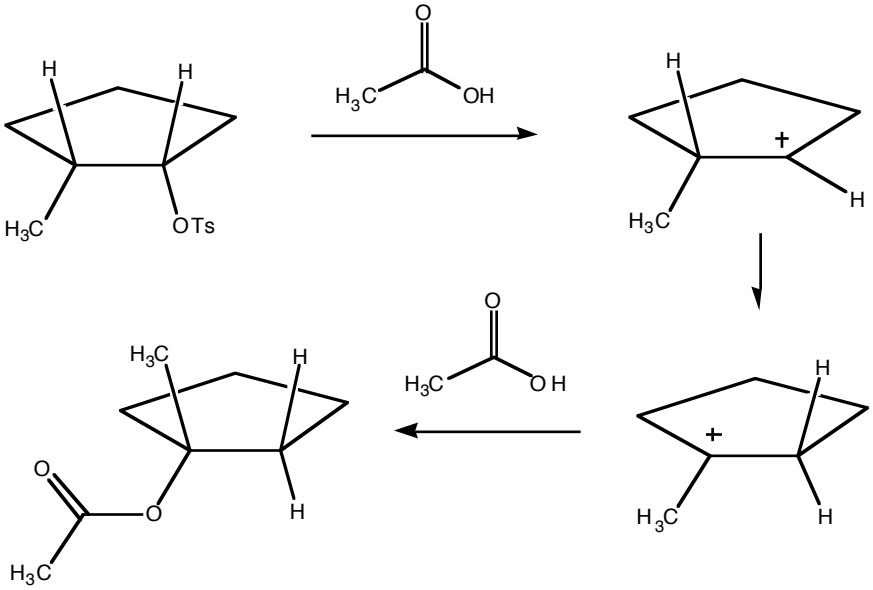
Answers to Problem 69, Chemistry 301X - 2006

Ionization of the tosylate to give an ion must be the slow, rate-determining step. But if it is a simple ionization to a secondary carbocation, followed by hydride (or deuteride) migration, the rate can't depend on the strength of the adjacent C-H or C-D bond.



That adjacent bond must break as the tosylate leaves. Only that way can there be what is called an isotope effect. Compounds **18** and **18d** must react through S_N1 mechanism (very slow syn E2 elim) and will do so at very nearly the same rate - the C—H or C—D bond isn't breaking.