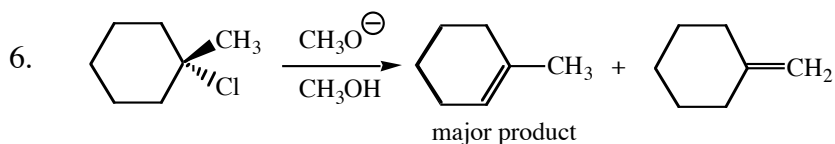
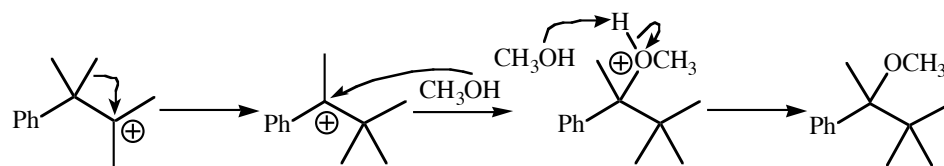
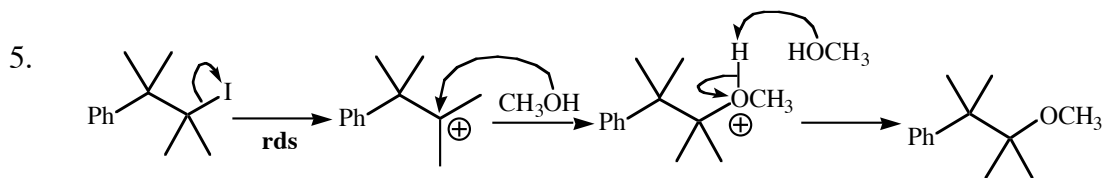
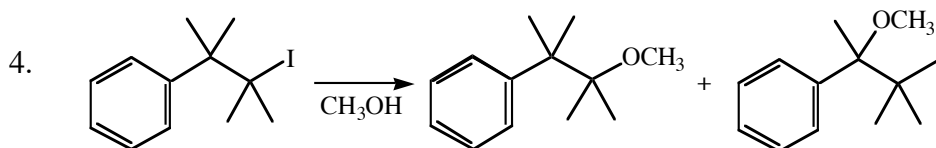
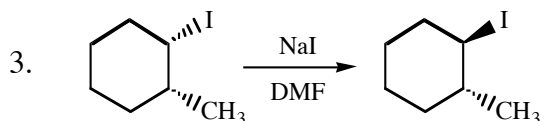
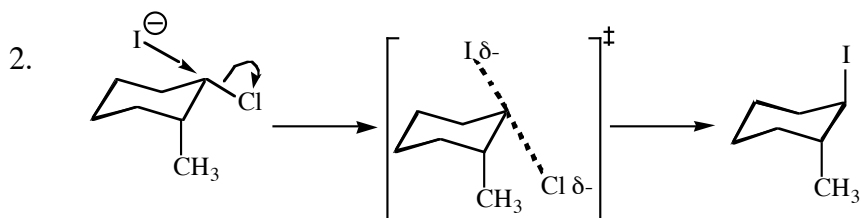
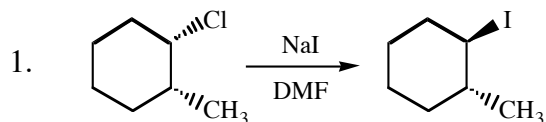


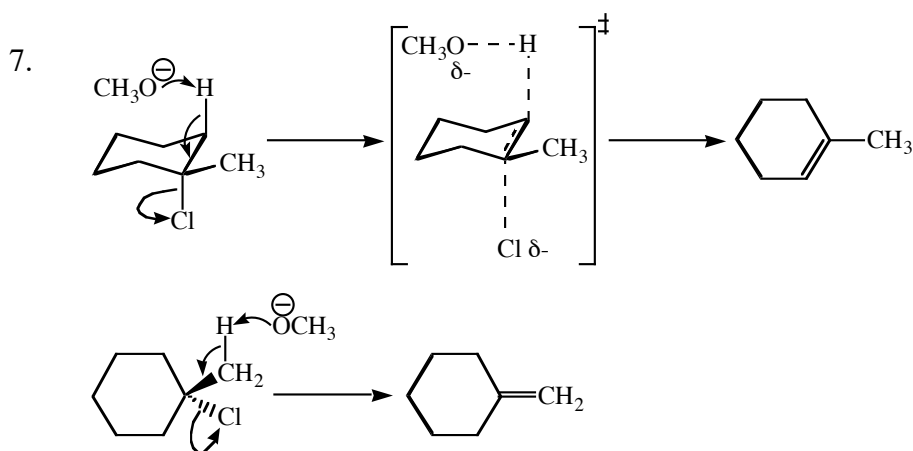
Statistics: High score = 97 Average = 65.0 Low score = 00

Standard deviation: Irrelevant - does not influence grades in this course.

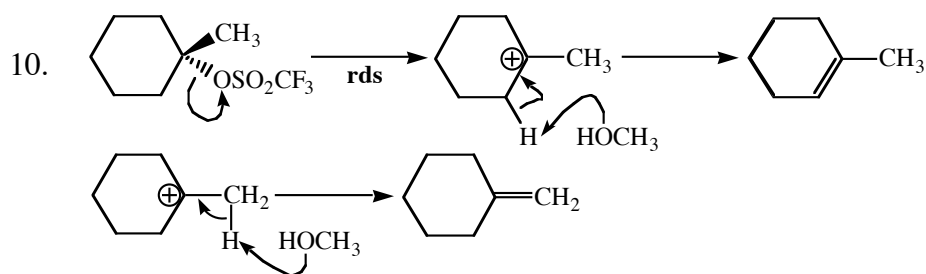
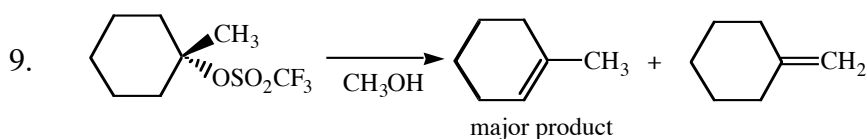
A note about exam keys: The answers presented here are usually significantly longer than expected from a student taking the exam. An exam key serves not only to reveal what was expected, but to instruct you as well.

To see the grade curve, consult the Chem 30A Home Page.

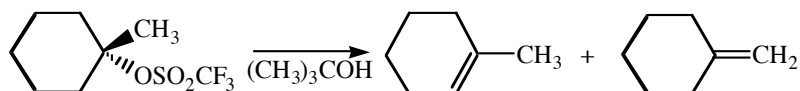




8. $\text{Rate} = k [\text{R-Cl}] [\text{CH}_3\text{O}^-]$



11. Note that the base (CH_3OH) is also the solvent for this reaction. Changing to a less polar solvent (*tert*-butanol) retards the carbon-leaving group bond ionization, but still allows the deprotonation to occur.



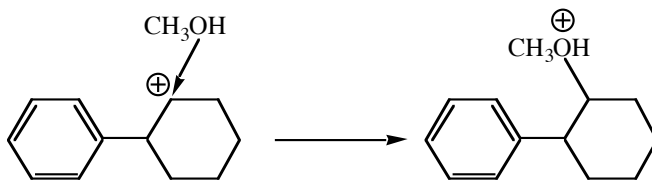
12. The most probable mechanism for this reaction is $\text{S}_{\text{N}}2$.

13. When choosing between elimination and substitution mechanisms, we examine E2 first (except in the case of primary alkyl halides).

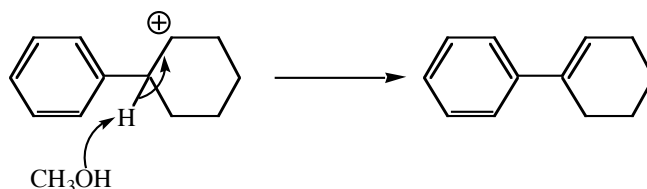
E2 requires (among other things) a strong base (typically hydroxide or an alkoxide). Methanethiolate (CH_3S^-) is a weak base. This disfavors E2.

We next consider $\text{S}_{\text{N}}2$, which requires a moderate nucleophile, a moderate leaving group and the carbon bearing the leaving group cannot be tertiary. Methanethiolate is a good nucleophile (formal negative charge, low electronegativity of sulfur), chloride is a moderate leaving group, and the carbon bearing the chlorine is secondary. The $\text{S}_{\text{N}}2$ conditions are reasonably met, so we predict the main reaction pathway is $\text{S}_{\text{N}}2$.

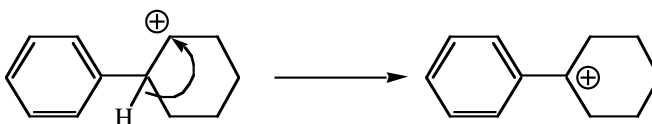
14. Fate #1: Capture a nucleophile



Fate #2: Lose proton; form π bond



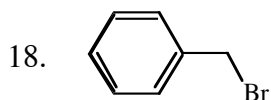
Fate #3: Rearrange



15. (a) CF_3SO_3^- (b) Methanol (c) $^+\text{CH}_2\text{N}(\text{CH}_3)_2$

16. In CH_3OH , fluoride is a **poor nucleophile**. The reason for this is **hydrogen bonding**.

17. R = H and X = Br.



19. Rates about equal.

20. Reason #1: Fluoride is a very poor leaving group.

Reason #2: A methyl carbocation (CH_3^+) is very unstable.

Reason #3: The solvent, $\text{CH}_3(\text{CH}_2)_{10}\text{CH}_2\text{OH}$, is of very low polarity.

21. There are many possible structures that meet the criteria of the question. Any one is acceptable as long as it has a good leaving group (such as iodide or triflate), exactly five carbons, but cannot engage in E2 elimination. For example, E2 can be prevented by replacing the β -hydrogens with methyl groups.

