CHE 171
Fall, 2005
Specific Objectives for Quiz 5

1. Be able to differentiate between methyl-, 1°, 2°, 3°, alkyl halides, allyl (allylic), benzyl (benzylic), vinyl (vinylic) halides and know which ones undergo nucleophilic substitution and/or elimination reactions.

2. Be able to name alkyl halides (or halo alkanes) using the IUPAC system or common names (including stereochemistry where applicable).

3. Know the general requirements for a substitution reaction and be able to identify the "substrate", the "nucleophile" and the "leaving group" for a given substitution reactiton.

4. Know what constitutes a good leaving group and be able to assess relative leaving group ability.

5. Know what constitutes a good nucleophile and be able to assess relative nucleophile strength; know that nucleophile strength and base strength are directly proportional except when the nucleophile is sterically hindered and/or when the reaction is conducted in polar protic solvent (like water or alcohols).

6. Be able to predict whether an equilibrium favors products or reactants based on the relative basicities of the leaving group and nucleophile.

7. Know the difference between polar protic and aprotic solvents.

8. Know what a mechanism is.

9. Be able to show (arrow pushing) S_N2 and S_N1 mechanisms and know the differences between the two.

10. Know that an S_N2 reaction at a stereogenic center proceeds with inversion of configuration because bond-making and bond-breaking occur simultaneously with backside attack of the nucleophile.

11. Know that an S_N1 reaction at a stereogenic center proceeds with racemization (loss of optical activity) because the nucleophile may attack either face of the planar carbocation intermediate.

12. Know that the order of reactivity for an S_N2 reaction is methyl-X > 1° > 2° (3° substrates do not undergo S_N2 reactions); the reverse is true for SN1 reactions 3° > 2° (1° and methyl substrates do not undergo S_N1 reactions because they cannot form stable carbocation intermediates).

13. Know that the S_N2 mechanism is favored in the presence of strong nucleophiles and polar, aprotic solvents and that the S_N1 mechanism is favored in the presence of weak nucleophiles and polar protic solvents.

14. Be able to predict whether a substitution reaction will proceed via an S_N2 or S_N1 mechanism based on the substrate, nucleophile, and solvent.