CHE 171
Fall, 2005
Specific Objectives for Quiz 6

1. Know the two mechanisms by which nucleophilic substitution reactions can proceed and be able to differentiate between the two (be able to decide whether a reaction will proceed by a unimolecular or bimolecular mechanism and what effect(s) that has on the structure of the product(s)).

2. Be able to show (using curved arrows) an S_N2 and S_N1 mechanism; also be able to show the energetics of these mechanisms on an energy diagram.

3. Be able to show the product(s) of a substitution reaction (by either mechanism) where the reacting carbon center is a stereogenic center.

4. Be able to devise a synthesis for a given product (i.e., be able to determine what nucleophile must react with what substrate and under what conditions to give the desired product; often there's more than one possibility); see Table 7.8 in Smith for a good list of common transformations (R-X → R-Nu).

5. Know the structure of a C=C bond (one sigma and one pi bond, both C's sp^2 hybridized, 120° bond angles, etc.).

6. Be able to classify alkenes by their substitution patterns (mono-, di- (gem, cis, trans), tri-, tetra-) and know the relative stabilities of these classes of alkenes (more substituted = more stable).

7. Be able to identify the α and β carbons (and β hydrogens) of a given alkyl halide.

8. Know the general features of an elimination reaction (or β-elimination or dehydrohalogenation) and know that elimination can proceed by two different mechanisms (E1 or E2).

9. Know the general features of the E2 mechanism and be able to show an E2 mechanism (using curved arrows) and represent an E2 reaction on an energy diagram.

10. Know what a strong, non-nucleophilic base is and be able to give a few examples (butoxide ion, DBN, DBU).

11. Know that elimination reactions (by either E2 or E1) are generally regioselective and that the regioselectivity is governed by Zaitsev's rule—the major product in a β-elimination reaction has the more substituted double bond (is the more/most stable product).

12. know the general features of the E1 mechanism and be able to show an E1 mechanism (using curved arrows) and represent an E1 reacction on an energy diagram.

13. Know that an E2 reaction proceeds through an anti-periplanar transition state with respect to the CH and CX bonds and be able to show how this affects the structure of the product (see Smith's problem 8.17!).