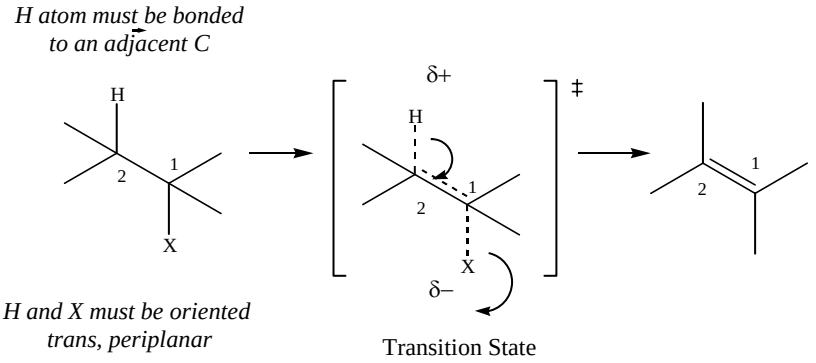
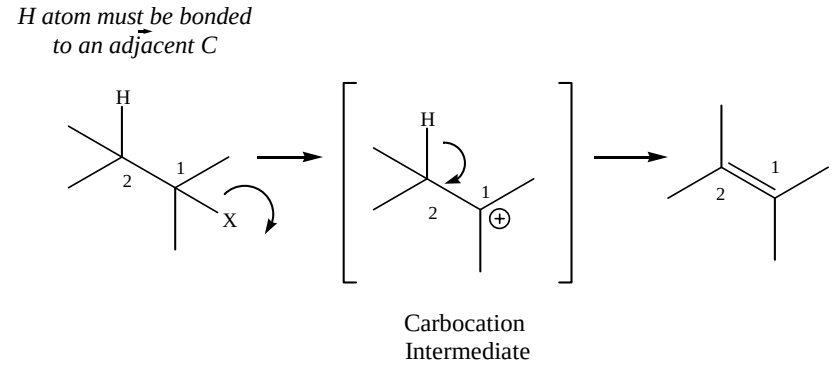
I. E_2 ELIMINATION



A. Characteristics of the E2 Elimination (Section 9.1-9.2; 10.4)

1. E_2 substitutions NEVER involve a carbocation intermediate.
2. The rate-determining step of the E_2 mechanism involves simultaneously breaking the C-X bond and the C-H bond of an adjacent C, while forming the C-C pi bond.
3. E_2 reactions occur with 1°, 2° and 3° alkyl halides.
4. STEREOCHEMISTRY OF E_2 ELIMINATIONS: There are two stereochemical requirements for E_2 elimination reactions.
   a. The four reacting atoms (H, LG and the two C atoms)must be in the same plane (i.e., periplanar).
   b. The hydrogen atom and the leaving group must be trans.
   c. The overall description of this required orientation of atoms is referred to as "antiperiplanar".

II. E_1 ELIMINATION



A. Characteristics of the E1 Elimination (Section 9.3-9.4; 10.4)

1. E_1 eliminations always involve a carbocation intermediate.
2. The rate-determining step of an E_1 elimination is formation of the carbocation.
3. The rate of the reaction will be determined by the stability of the carbocation generated in the reaction. (3°>2°>1°).
4. The rate at which an E_1 reaction occurs is also determined by the ability of the leaving group to stabilize a negative charge.
5. E_1 reactions often compete with the SN_1 substitution to give mixtures of substitution and elimination products.
6. Under thermodynamic conditions, E_1 eliminations occur to give the MOST SUBSTITUTED ALKENE PRODUCT
7. Polar solvents enhance the rate of an E_1 elimination reaction.

III. COMPETITION BETWEEN E1, E2, SN1, SN2 REACTIONS (SECTION 9.8)

IDENTIFYING WHICH REACTION WILL OCCUR

Reaction conditions for the SN_1 and E_1 mechansims are similar. Reactions are also similar for the SN_2 and E_2 reaction mechanisms. The following process can be used to help determine which reaction(s) is (are) favored under a given set of reaction conditions.

A. Identify the reactive functional group(s) in the starting material and the reaction mechanism favored for that functional group.

Functional Group	Reaction(s) Favored
1° Alkyl Halide, Tosylate	E_2, SN_2
2° Alkyl Halide, Alcohol, Tosylate	E_1, E_2, SN_1, SN_2
3° Alkyl Halide, Alcohol	E_1, SN_1

B. Identify the reaction conditions. Consider both pH (acidic or basic) and the solvent.

Reaction Condition	Reaction(s) Favored
Acidic *Reagents:* H^+, H_3O^+, HX, H_3PO_4, H_2SO_4, CH_3CO_2H (acetic acid)	E_1, SN_1
Basic *Reagents:* HO^-, NaOH, KOH, NH_3, RNH_2, RO^-Na^+(alkoxides)	E_2, SN_2
Solvents	
Polar, Protic	E_1, SN_1
Polar Aprotic	E_2, SN_2

C. Other Factors

1. Determine if elimination reactions can occur. Look for an sp^3 carbon adjacent to the sp^3 carbon bearing the leaving group (halogen or water). If the adjacent sp^3 carbon is bonded to at least one hydrogen, elimination may occur.
2. Determine if substitution can occur. Look for the presence of a nucleophile. If a nucleophile is present, substitution can occur.