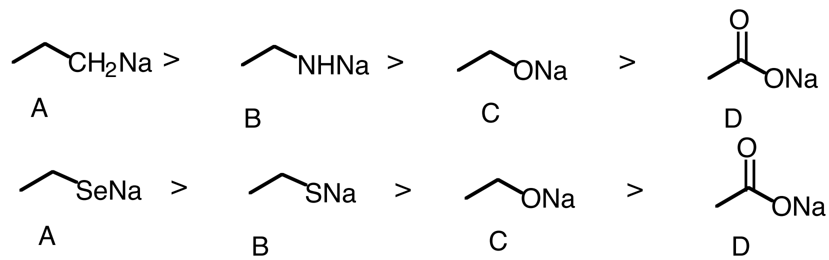
Stability/Reactivity/Selectivity Principles

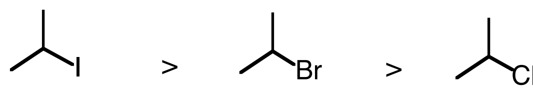
Key note: The "reactant" or "product" in the following is always **relative to the rate-determining-step of a reaction mechanism**. So it's always **crucial to know what the mechanism for a reaction is** in order to apply these principles.

1. **Reactant Stability/Reactivity**: The more stable the reactant, the less reactive it will be. In terms of rates, this means that the more stable the reactant, the slower it will react.

   - **Nucleophilicity in Ch. 6 Reactions**

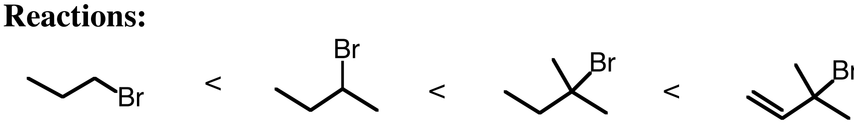


   - **Electrophilicity in Ch. 6 Reactions (Reactivity in S_N2, S_N1, E2, E1 Reactions)**



2. **Product Stability/Reactivity**: The more stable the product, the more favorable its formation will be. In terms of rates, this means that the more stable the product, the faster the reaction. (The concept here is that the more stable the product, the more favorable it will be to make that product.)

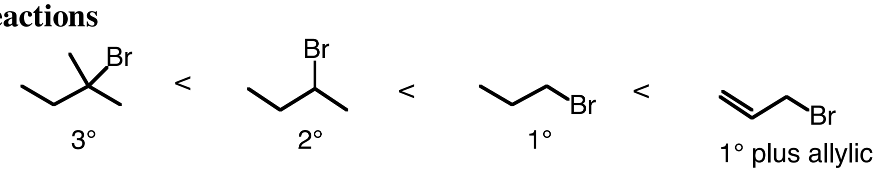
   - **S_N1, E1 Reactivity in Ch. 6 Reactions:**



   Why: Because of the stability of the cation produced in the rate-determining step

3. **Transition-State Stability/Reactivity**: The more stable the transition state, the faster the reaction will be. (The concept here is that the lower the transition state, the more easily it will be crossed.)

   - **S_N2 Reactivity in Ch. 6 Reactions**



   Why: Steric congestion in the S_N**2** transition-state. In the case of allylic halides, the transition state is stabilized for orbital reasons, not steric reasons.

4. **Reactant Stability/Reactivity/Selectivity**: The more stable the reactant, the less reactive it will be and the more selective it will be. (For a reaction where the same two reactants can give either of two products.)

   - **No examples from Chapter 6**
   - **From Chapter 4, selectivity in the reaction of bromine versus chlorine with alkanes via radical halogenation**