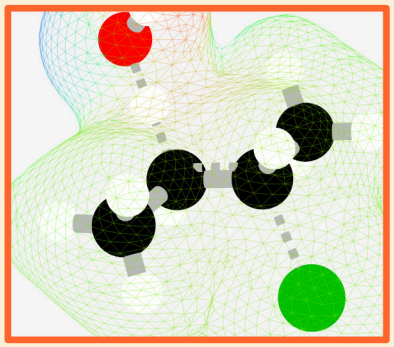
HIGHLIGHTS

- E1 mechanism
  - Unimolecular, two step reaction.
- E1 reaction is normally stereoselective favoring the *trans* or *E* geometry due to steric interactions.
- E1 is regioselective favoring more stable, Zaitsev, alkene.
- E2 mechanism
  - Concerted reaction that requires hydrogen and leaving group to be antiperiplanar
- E2 elimination can be stereospecific if only one proton can be removed.
- E2 elimination is normally regioselective but reagent can reverse normal selectivity
- E2 elimination in cycloohexanes requires the proton being removed and leaving group to both be axial.



The two most common elimination reactions at undergraduate are E1 and E2. These differ by the timing of the lose of the leaving group. An E1 elimination is a first order reaction. The first step, ionization of the substrate to give a carbocation and a leaving group, is the rate determining step. In the second step, a base removes a proton on an α carbon to form an alkene. E2 elimination is second order. It is a concerted process in which the base attacks the proton promoting formation of the π bond by kicking out the leaving group.

E2 eliminations are regio- and stereoselective but can be regio- and stereospecific. They require an antiperiplanar arrangement of proton and leaving group. This leads to good control. E1 eliminations only require the proton to be parallel to the carbocation intermediate. E1 elimination is regio- and stereoselective. It favors the more substituted alkene and the *E* or *trans*-geometry.

CHEMISTRY CLASSICS

ELIMINATION REACTIONS

E1 & E2 MECHANISMS

Eliminations

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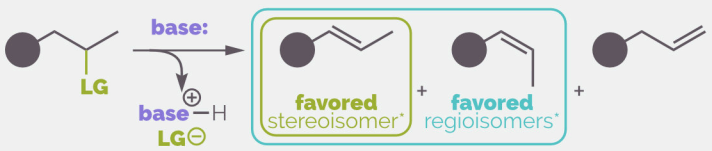
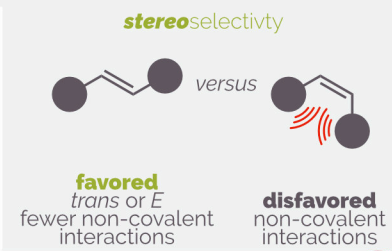
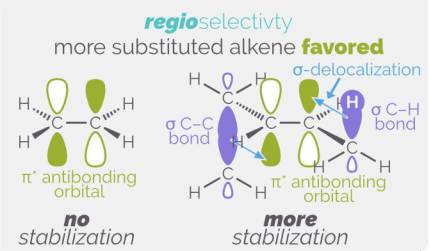
1. Elimination reactions



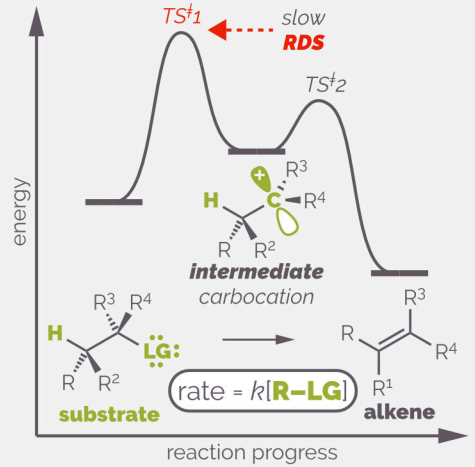


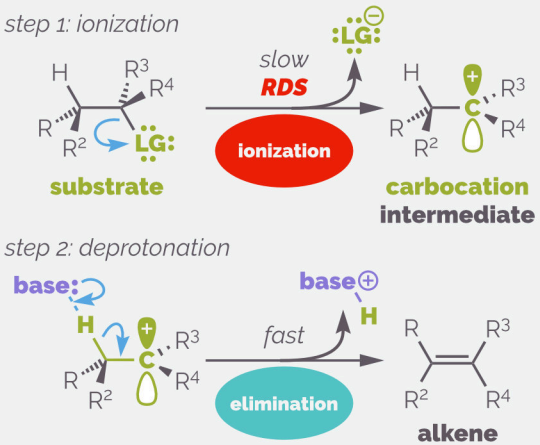


2. Notes

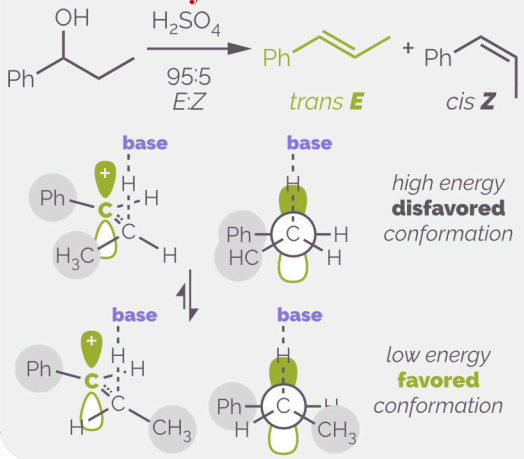
- Discussion of which mechanism operates is a different summary
- Selective reaction - mechanism allows multiple products (one may be favored)
- Specific reaction - mechanism controls product (no choice)
- More substituted alkene sometimes called Zaitsev product (other is Hofmann product)

3. E1 elimination

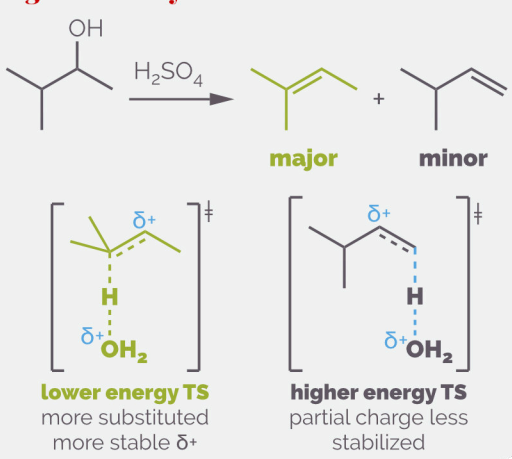




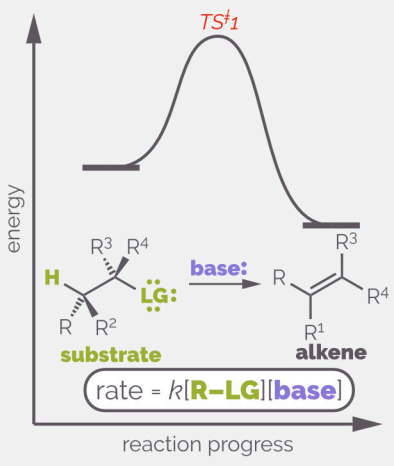
stereoselectivity

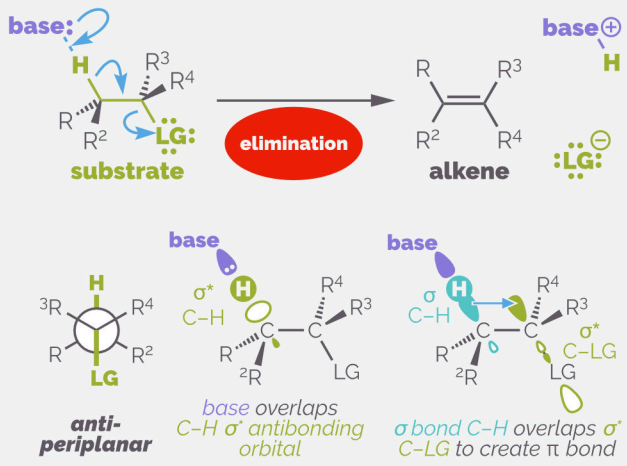


regioselectivity

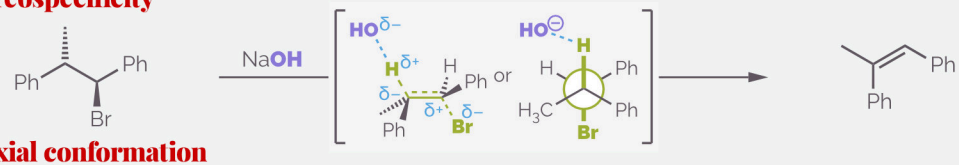


4. E2 elimination

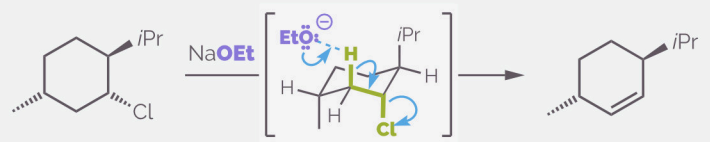




stereospecificity



diaxial conformation



Reagent-controlled regioselectivity