Types of Elimination and Nucleophilic substitution

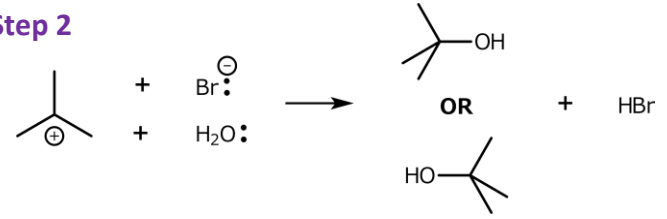
S_N1 – Nucleophilic Substitution, Unimolecular

- This is a 2 step reaction.
- 1st step is rate determining (RDS)
- Only 1 species is present in RDS = a unimolecular reaction.

Step 1

Requirements
Secondary or tertiary alpha-carbon
Good leaving group
Nucleophilic reagent

Step 2

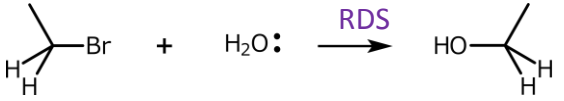


Stereochemistry at alpha-carbon is lost

- 1st step in S_N1 is the same as the 1st step in E1. **S_N1 and E1 compete.**

S_N2 – Nucleophilic Substitution, Bimolecular

- This is a 1 step reaction.
- Both reagent and substrate present in RDS = a bimolecular reaction.



Requirements
Methyl, primary or secondary alpha-carbon
Good leaving group
Nucleophilic reagent

Stereochemistry at alpha-carbon is inverted

Watch out for OH leaving groups – they only come off when an acid is present

- Strong bases are usually (but not always) nucleophilic.
- **S_N2 and E2 may compete.**

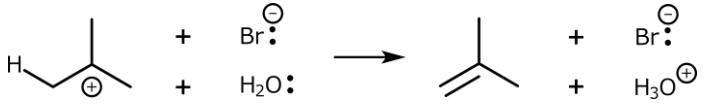
E1 – Elimination, Unimolecular

- This is a 2 step reaction.
- 1st step is rate determining (RDS)
- Only 1 species is present in RDS = a unimolecular reaction.

Step 1

Requirements
Secondary or tertiary alpha-carbon
Good leaving group
Abstractable H atom on beta-carbon

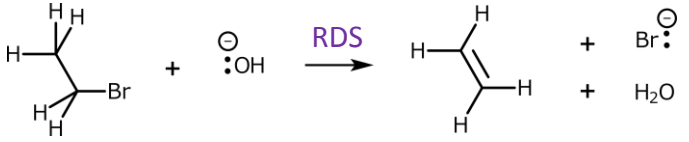
Step 2



- 1st step in E1 is the same as the 1st step in S_N1. **S_N1 and E1 compete.**

E2 – Elimination, Bimolecular

- This is a 1 step reaction.
- Both reagent and substrate present in RDS = a bimolecular reaction.



Requirements
A strong base
Abstractable H atom on beta-carbon

Watch out for OH leaving groups – they will deprotonate instead

- Strong bases are usually (but not always) nucleophilic.
- **S_N2 and E2 may compete.**

Mechanism Inspector is provided by The Royal Society of Chemistry and supported by Shire.

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