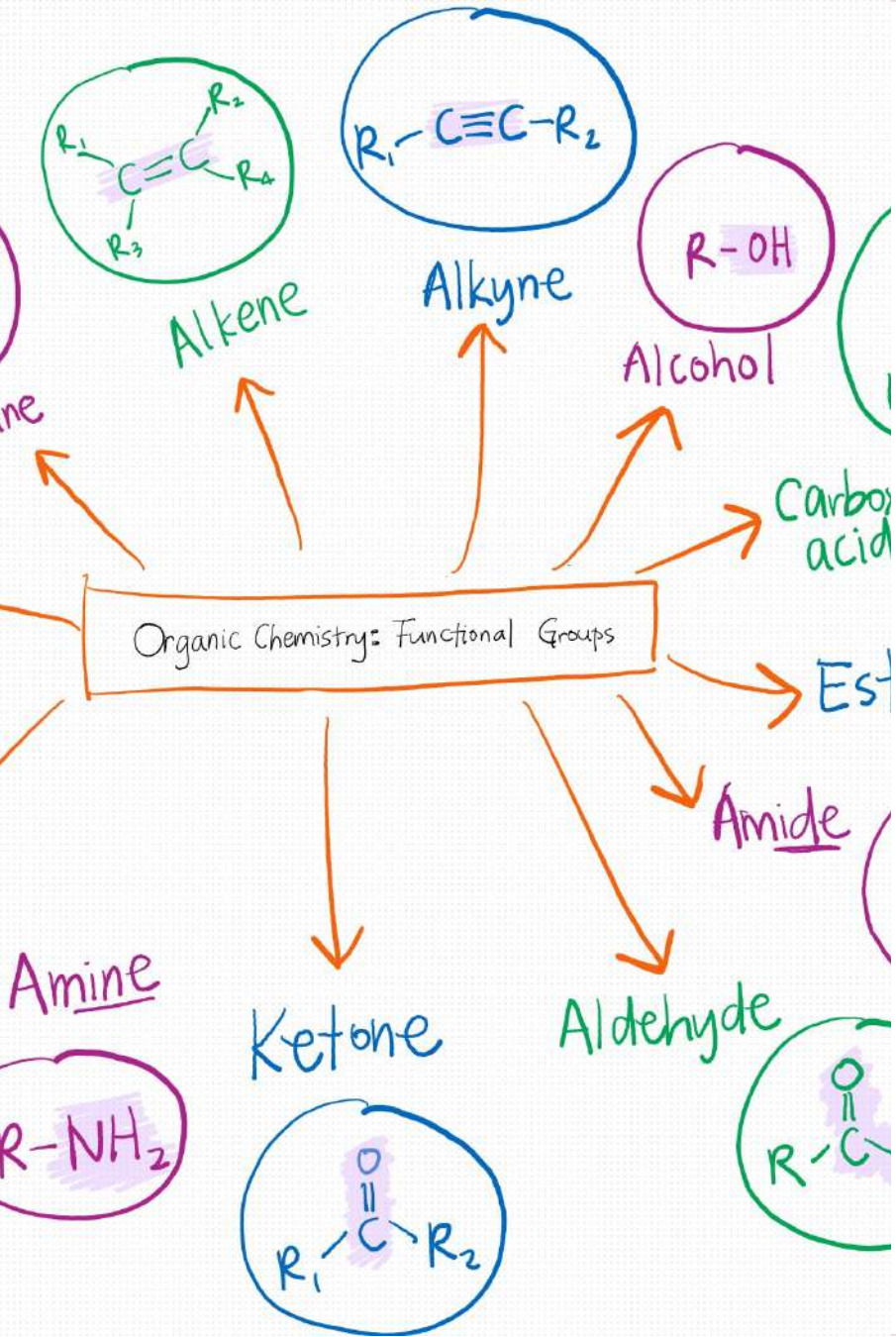


Mechanism of Organic Reactions

An overview of organic reactions, their classification, the importance of understanding their mechanisms, and factors influencing them.

EB by Ekta Bhandari

Addition Reactions

Electrophilic Addition

When an electron-deficient molecule adds to a double bond, with an electrophile reacting with π-electrons of the double bond.

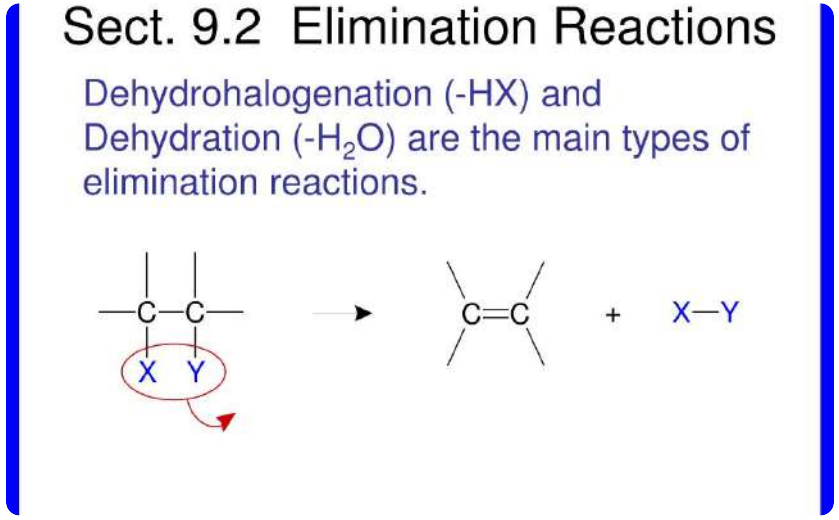
Nucleophilic Addition

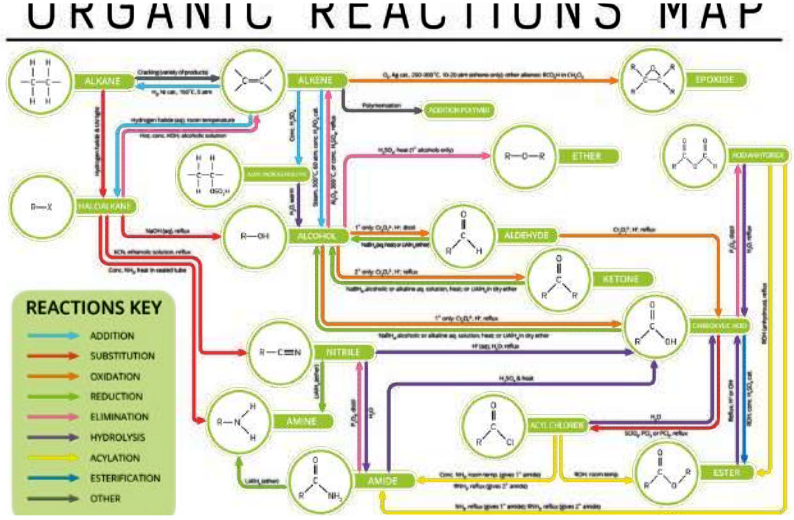
When an electron-rich molecule adds to a double bond, with a nucleophile reacting with π-electrons of the double bond.

Radical Addition

When a radical reacts with a multiple bond or alkene to form a new covalent bond.

Elimination Reactions





E1

A reaction that occurs in two steps where the leaving group first leaves, and then the proton is removed to form the double bond.

E2

A one-step reaction that involves the removal of a proton and a leaving group, resulting in the formation of a double bond.

Substitution Reactions

1

SN1

A two-step reaction mechanism that involves the formation of a carbocation, followed by the attack of a nucleophile.

2

SN2

A one-step mechanism in which a nucleophile attacks the electrophilic carbon, resulting in the displacement of a leaving group.

3

Radical Substitution

A reaction in which a radical initiates the formation of a new covalent bond by replacing another atom or group.

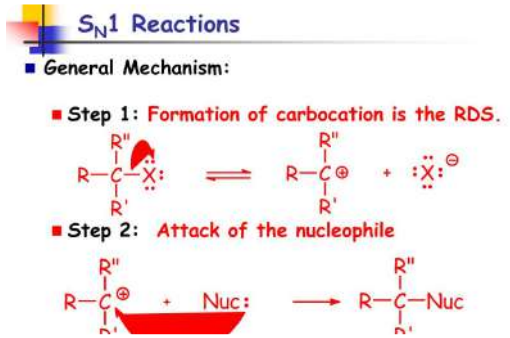
Reaction Intermediates and Transition States

- Intermediate: A transient reactive molecule that is formed during the reaction but is not the final product.
- Carbocations: The positively charged intermediate that is formed in the reaction.
- Carbanions: The negatively charged intermediate that is formed in the reaction.
- Free Radicals: The neutral intermediate that is formed in the reaction.
- Transition State: The highest energy state in the reaction, and it is in between the reactant and product states.

Factors Influencing Reaction Mechanisms

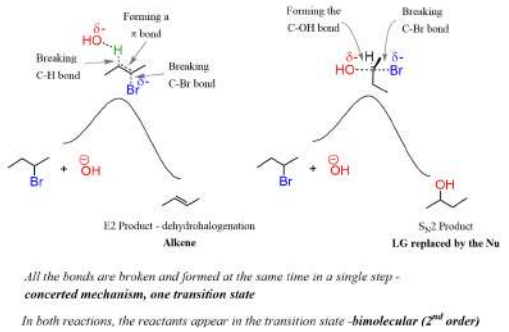
Factor	Description
Nature of reactants and reactivity	This factor includes the type of atoms, functional groups, and the reactivity of the reactants.
Temperature and Pressure	These factors can affect the rate and equilibrium of the reaction.
Presence of a Catalyst	Catalysts can speed up reactions and provide alternative reaction pathways.

Common Organic Reaction Mechanisms



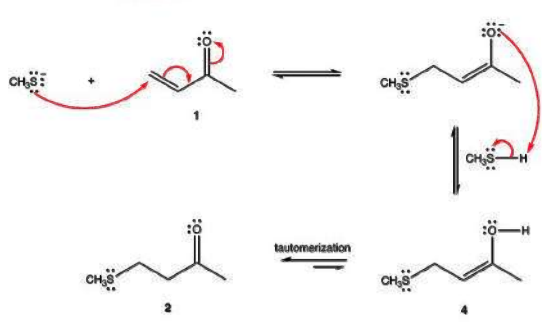
SN1 Nucleophilic Substitution Reaction

A two-step mechanism involving the formation of a carbocation intermediate.



E2 Elimination Reaction

A one-step mechanism that results in the removal of a proton and a leaving group.



Addition Reactions

A reaction that involves the addition of a small molecule to a multiple bond, forming a new single bond.

Conclusion

1 Recap of Organic Reaction Mechanisms

An overview of the classification and common mechanisms involved in organic reactions, including addition, elimination, and substitution reactions.

2 Importance of Studying Reaction Mechanisms

Understanding reaction mechanisms is crucial for designing and controlling reactions, predicting products, and creating new compounds in synthetic organic chemistry.