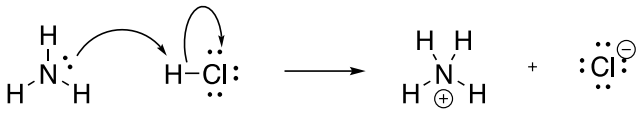
Name:

Proton Transfer Reaction

Notes:

- Occurs between a proton donor (acid, H-A) and a proton acceptor (base).
- Acid strength increases as conjugate base stability increases

Example Mechanism:



Indicate above:	**Nuc/E+/Acid/Base**	**Leaving group (LG) or conjugate base (CB)**	**Partial charges (δ+, δ-)**

List (for this example):	**Bonds broken**	**Bonds formed**

Second Example Mechanism:

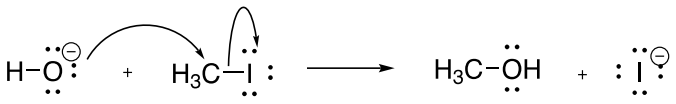
Name:

Bimolecular Nucleophilic Substitution (S_N2)

Notes:

- Bimolecular = two molecules collide
- Substitution = one group is replaced by another
- **Concerted** reaction: bond breaking and forming steps occur simultaneously
- Leaving groups tend to be weak bases

Example Mechanism:



Indicate above:	**Nuc/E+/Acid/Base**	**Leaving group (LG) or conjugate base (CB)**	**Partial charges (δ+, δ-)**

List (for this example):	**Bonds broken**	**Bonds formed**

Second Example Mechanism:

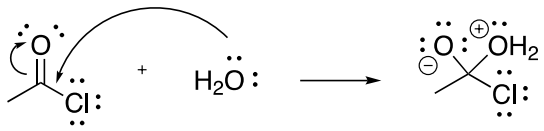
Name:

Nucleophilic Addition

Notes:

- Nucleophile adds to a polarized pi bond at the electron deficient sp^2 center **C=O, C=N**
- No group leaves, therefore it's an *addition* and not a substitution
- Product is a "tetrahedral intermediate" – often part of a multi-step mechanism

Example Mechanism:



Indicate above:	**Nuc/E+/Acid/Base**	**Leaving group (LG) or conjugate base (CB)**	**Partial charges (δ+, δ-)**

List (for this example):	**Bonds broken**	**Bonds formed**

Second Example Mechanism:

Name:

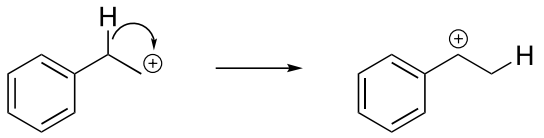
Carbocation Rearrangement

Notes:

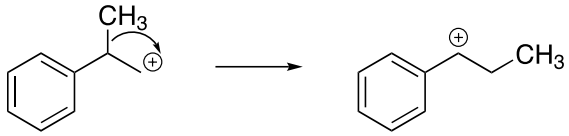
- H- (hydride) shifts over onto a carbocation (C+) OR a carbanion (CR_3^-) shifts over onto a carbocation.
  - Anionic group and cation swap places
- Occurs when a more stable carbocation can be formed.

Example Mechanism:

1,2-hydride shift:



1,2-methyl shift:



Indicate above:	**Nuc/E+/Acid/Base**	**Leaving group (LG) or conjugate base (CB)**	**Partial charges (δ+, δ-)**

List (for this example):	**Bonds broken**	**Bonds formed**

Second Example Mechanism:

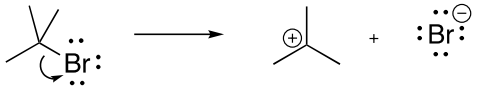
Name:

Heterolysis

Notes:

- Only bond breaking
- Unequal split of bonding electrons
    - One atom from bond ends electron deficient, the other electron rich
- The product electron deficient species tends to be unstable

Example Mechanism:



Indicate above:	**Nuc/E+/Acid/Base**	**Leaving group (LG) or conjugate base (CB)**	**Partial charges (δ+, δ-)**

List (for this example):	**Bonds broken**	**Bonds formed**

Second Example Mechanism:

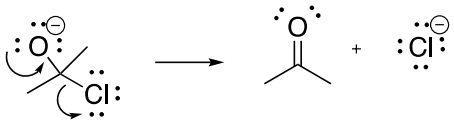
Name:

Nucleophilic Elimination

Notes:

- Lone pair electrons on an electronegative atom of a tetrahedral intermediate "collapse" to form a polarized pi bond.
- Leaving group is expelled when the pi bond is formed.

Example Mechanism:



Indicate above:	**Nuc/E+/Acid/Base**	**Leaving group (LG) or conjugate base (CB)**	**Partial charges (δ+, δ-)**

List (for this example):	**Bonds broken**	**Bonds formed**

Second Example Mechanism:

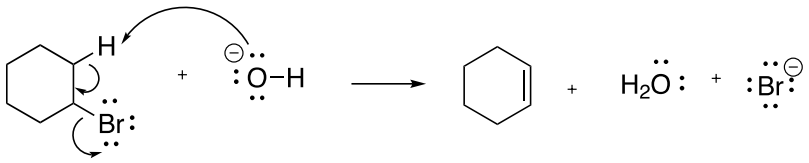
Name:

Bimolecular Elimination (E2)

Notes:

- A new pi bond is formed
- Reactant has H and a leaving group attached to adjacent carbons
  - H-C-C-LG
- Both H & LG are eliminated from the substrate in a concerted fashion (bond breaking and forming occur at the same time)
- Requires a strong base

Example Mechanism:



Indicate above:	**Nuc/E+/Acid/Base**	**Leaving group (LG) or conjugate base (CB)**	**Partial charges (δ+, δ-)**

List (for this example):	**Bonds broken**	**Bonds formed**

Second Example Mechanism:

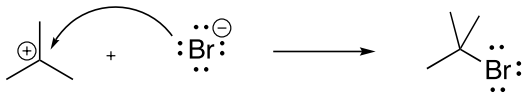
Name:

Coordination

Notes:

- Only bond forming
- Occurs between a subtype of nucleophiles and electrophiles:
    - **Lewis acid:** electron acceptor (metals, metalloid, carbocations C+). This is electrophile.
    - **Lewis base:** electron donor (atoms with a lone pair). This is the nucleophile.

Example Mechanism:



Indicate above:	**Nuc/E+/Acid/Base**	**Leaving group (LG) or conjugate base (CB)**	**Partial charges (δ+, δ-)**

List (for this example):	**Bonds broken**	**Bonds formed**

Second Example Mechanism:

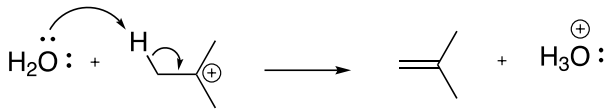
Name:

Electrophilic Elimination

Notes:

- One way to react carbocations
- Electrophilic atom (often H^+) is eliminated and a new pi bond is formed.
- Since the carbocation is very reactive, a weak base (or nucleophile) is sufficient

Example Mechanism:



Indicate above:	**Nuc/E+/Acid/Base**	**Leaving group (LG) or conjugate base (CB)**	**Partial charges (δ+, δ-)**

List (for this example):	**Bonds broken**	**Bonds formed**

Second Example Mechanism:

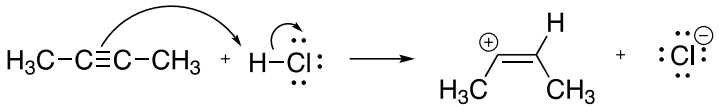
Name:

Electrophilic Addition

Notes:

- Non-polar pi bond (alkene, alkyne) reacts with a strong electrophile (like H-A or X-X).
- Product carbocation is very unstable
- Elementary step tends to be part of a multi-step mechanism

Example Mechanism:



Indicate above:	**Nuc/E+/Acid/Base**	**Leaving group (LG) or conjugate base (CB)**	**Partial charges (δ+, δ-)**

List (for this example):	**Bonds broken**	**Bonds formed**

Second Example Mechanism: