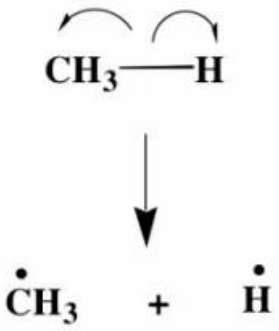
CHEMISTRY

L1 – ORGANICS

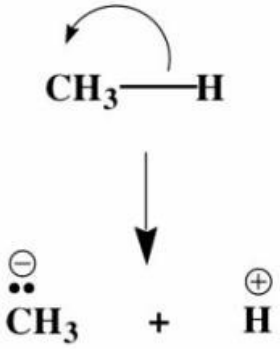
Bond Breaking

- Homolytically: each atom of bond gets one electron to form 2 radicals (odd electron species)



- Half headed arrow

- Heterolytically: atom of bond with higher electronegativity gets two electrons to form 2 even electron species



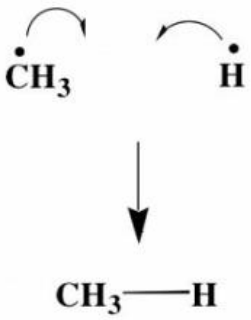
- Whole headed arrow.
- This is an acid reaction where we're giving up H+.

Homolytic – Decomposing into 2 uncharged atoms or radicals

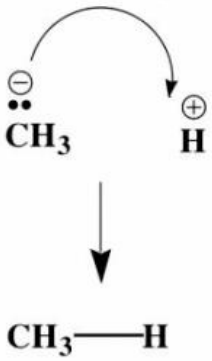
Heterolytic – An organic reaction in which the breaking of bonds leads to the formation of ion pairs

Bond Making

- Homogenic: 2 radicals (odd electron species) donate one electron each to form a bond



- Heterogenic: two electrons donated from one species to another to form a bond



Base + Acid

All reactions we will be learning about will fit into the following 8 categories:

Organic reactions

Most of the reactions which organic compounds undergo can be placed into one of the following reaction types:

1. **Acid-base equilibria; the relative strengths of acids and bases.**
2. **Nucleophilic substitution (displacement) at a saturated C atom.**
3. **Elimination reactions.**
4. **Electrophilic additions to multiple carbon-carbon bonds.**
5. **Electrophilic aromatic substitution.**
6. **Nucleophilic additions and substitutions at unsaturated atoms (carbonyl compounds and acid derivatives).**
7. **Reduction reactions.**
8. **Oxidation reactions.**
9. **Free radical substitution, addition and polymerization (not studied in Chemistry 2).**

Reaction type 1 – 6 invole:

- **Heterolytic** bond breaking and **Heterogenic** bond making

Reaction type 9 involves:

- **Homolytic** bond breaking and **Homogenic** bond making

Reaction 9 isn't important for this course.

Mechanism of reaction = HOW a reaction happens

Kinetics/Thermodynamics = WHY a reaction happens

ORBITAL DIAGRAMS

Atomic Orbital Diagram

e.g 

= Sodium

- **Hund's rule** states that for degenerate orbitals, the lowest energy is attained when the number of electrons with the same spin is maximized.
- Transition metals have a d orbital

Molecular Orbital Diagram

MO diagrams predict **physical** and **chemical** properties of a molecule such as shape, bond energy, bond length and bond angle.

Molecular Orbitals

The region an electron is most likely to be found in a molecule. A MO is defined as the combination of atomic orbitals.

Homonuclear Diatomics

Molecules consisting of two identical atoms are said to be homonuclear diatomic, such as: H_2, N_2, O_2, and F_2.

Heteronuclear Diatomics

Molecules consisting of two non-identical atoms are said to be heteronuclear diatomic, such as: CO, NO, HF, and LiF.

Bonding and Antibonding Orbitals

Antibonding – Out of phase orbitals that are unstable as regions with dense electron probabilities do not merge.

Bonding – In phase orbitals that are less energetic than antibonding orbitals. They come together constructively and so are stable