Basic Chemistry Tips to Memorize

Two Things an Atom "Wants"

- First, atoms want to have 8 electrons in its valence shell (or a full outer shell). Atoms will loose, steal, or share electrons to accomplish this end. Octet Rule
- Second they want to be neutral: If they can't be neutral by themselves, atoms will combine in different groupings to be neutral together.

Knowing these two things is the key to explaining the behavior of atoms in reactions.

Parts of a Chemical Reactions:

Before the Arrow are the **Reactants**, After the Arrow are the **Products**. The **Arrow** symbol means **"reacts to form"**. Think of it as an equal sign.

Numbers in a Chemical Reaction

- **Subscripts**: The small number under the atom that tells you how many there are. If you don't see any, there is only one atom.
- **Coefficients** are the big numbers in front of an atom of molecule that acts as a multiplier for the whole molecule (or atom).

When to Use Them:

- When **Writing Formulas** and **Predicting Products**: Use **Subscripts** to get the atomic ratios correct.
- When **Balancing** chemical reactions: Use **Coefficients** only.

Types of Chemical Reactions

- **Synthesis**: Going together
- **Decomposition**: Falling Apart
- **Single Replacement**: A single atom replaces another in a compound and the one it replaces is now single.
- **Double Replacement**: Two compounds switch partners.
- **Combustion**: A hydrocarbon (carbon-hydrogen molecule) combines with Oxygen (burns) and you always get Carbon Dioxide and Water.

Special Types of Atoms and Groups of Atoms

- **Diatomic Elements**: Seven elements that always come as pairs when they are alone. Hydrogen, Nitrogen, Oxygen, Fluorine, Chlorine, Bromine, Iodine.
- **Polyatomic Ions**: Groups of Charged Atoms in a compound that always travel together. They travel from one side of a chemical reaction to the other side of a chemical reaction (reactants to the products) in the same form. They can be thought of as a single atom when calculating oxidation numbers.

Oxidation Numbers and Charges of Atoms in a Chemical Reaction

- **Oxidation Numbers are not real**. They are simply imaginary tools that will help you predict the products of a chemical reaction. Oxidation Numbers can be thought of as the 'charge' an atom will have when it has a full valence shell OR they can be thought of as the number of bonds that atom can make.
- **The charges of atoms in a chemical equation are real**. Combined elements often have a charge. Uncombined elements are neutral and do not have a charge.

Solving Chemical Reactions

- Step One: Determine the type of chemical reaction (5 types). This will often give you a "heads up" on how the atoms will be arranged in the products.

- Step Two: Identify any polyatomic ions in the reaction. They will travel together in the same arrangement from the reactants to the products and usually switch partners.

- Step Three: Write all the atoms from the reactants side of the equation in the products side. Rearrange them as you think they should go. Remember that opposites mostly attract. Do not worry about the subscripts (except for polyatomic ions), they will be rearranged differently and often have different ratios.

- Step Four: Write the oxidation numbers above each atom (or polyatomic ion) in the products.

- Step Five: Use Subscripts to play with the ratios of atoms until you can make each compounds' oxidation numbers add up to zero--Or cancel out--Or become the same amount in the case of some nonmetal compounds.

- Step Six: Check for Diatomic Elements in the uncombined elements of your products. They always need to be paired with themselves.

- Step Seven: Balance the equation with Coefficients by writing the big multipliers in front of the parts of the reaction in such a way as to make the amount, and type of atoms exactly the same on both sides of the equation. (Satisfying the Law of Conservation of Mass.) Never balance with Subscripts