CHEMISTRY ♦ FALL 2007 ♦ MR. BRESLYN

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Name:
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Chemical Reactions: Reactants → Products

For example, photosynthesis.

Six molecules of water plus six molecules of carbon dioxide produce one molecule of sugar plus six molecules of oxygen.

$$6H_2O + 6CO_2(g) \xrightarrow[\text{chlorophyll}]{\text{light}} C_6H_{12}O_6 + 6O_2(g)$$

When a chemical rxn takes place, the chemical properties of the *products* are different than the *reactants*.

Evidence of Chemical Rxns

- Changes in heat and light.
- Color changes.
- Formation of a precipitate.
- Release of a gas.

Important

In a chem. rxn bonds are broken (reactants) and new bonds are formed (products).

Chemical Equation – a statement of what we know about a chem. rxn.

Example: Water is broken down into hydrogen and oxygen gas by electricity.

→ indicates *change*

Common Symbols

→	yields
(s)	solid
(l)	liquid
(aq)	aqueous
(g)	gas
ppt	precipitate
N.R.	no rxn
	reversible rxn
	catalyst

Balancing Chem Equations - in order for a chem. equation to accurately describe the chem. rxn, we must make sure the number of atoms on each side of the equation are equal. Otherwise we would have created or destroyed matter - breaking the law of conservation of mass.

To balance equations:

1. Write correct formulas for reactants and products. Check for diatomics.
2. Count the number of atoms on each side.
3. Balance the elements one at a time until both sides of the equation equal.
4. Make sure the coefficients are in the lowest possible ratio.

Note: balance equations by changing *coefficients*, not subscripts.

coefficient - the number before an element, ion, or compound in a chem. equation. Shows the # of molecules.

$$\mathbf{2}Fe_2O_3$$

subscripts – small number to the lower right of chem. symbols. Shows # of each element in molecule.

$$2Fe_{\mathbf{2}}O_{\mathbf{3}}$$

See http://theodoregray.com/PeriodicTable/MSP/BalanceReactions to check any balanced equation.

Types of Chem Rxns - it is useful to categorize chem. rxns into categories.

Combination (or synthesis)– two or more substances react to form one substance.	A + B → C $Fe(s) + S(s) \rightarrow FeS(s)$
Decomposition – a compound is broken down into two or more substances.	AB → A + B $H_2O(l) \rightarrow H_2(g) + O_2(i)$
Single Replacement – atoms in one compound take the place of atoms in another compound.	A + BC → AB + C $Cl_2(aq) + 2KBr(aq) \rightarrow 2KCl(aq) + Br_2(aq)$
Double Replacement	AB + XY → AY + XB $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$
Combustion – when a substance combines with oxygen (O_2). All products are combined with O_2.	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + Energy
Neutralization – special type of double replacement.	acid + base → salt + water $HCl + NaOH \rightarrow NaCl + H_2O$

precipitate – a solid that forms during a chem. rxn.

exothermic rxn – gives off energy

endothermic rxn – takes in energy

Remember:

hydrogen gas = H_2
oxygen gas = O_2
nitrogen gas = N_2
fluorine gas = F_2
chlorine gas = Cl_2
bromine gas = Br_2
iodine gas = I_2

Predicting Chemical Reactions

We can *often* predict the products of chemical reactions by knowing the <u>oxidation numbers</u> of each element and the <u>type of reaction</u>.

Ca + HCl →

H_2O →

$Mg(OH)_2$ + HCl →

Rxn = Reaction