Chemical Equations

chemical reaction	process that neither creates nor destroys atoms, but that rearranges atoms in chemical compounds. involve changes in energy.
chemical equation	uses chemical symbols to denote what occurs in a chemical reaction.

a chemical equation represents a chemical statement.

reactant	each chemical species that appears to the left of the arrow.	substances that are consumed in the course of a chemical reaction.
product	each species that appears to the right of the arrow.	substances that form during the course of a chemical reaction.

Chemical Equations (cont)

gases, liquids, and solids are labeled with (g), (l), and (s).	aqueous: chemical species that are dissolved in water; labeled (aq)

some nonmetals exist as polyatomic molecules: H2, N2, O2, F2, Cl2, Br2, I2, and P4.

Balancing Chemical Equations

law of conservation of mass	atoms can neither be created nor destroyed.
stoichiometric coefficients	numeric values written to the left of each species in a chemical equation to balance the equation.

Calculations

stoichiometric amount	quantity of reactant in the same relative amount as that represented in the balanced chemical equation.
limiting reactant	reactant used up first in a reaction, limits the amount of product that can form.
excess reactant	present in quantities greater than necessary to react with the quantity of the limiting reactant.

Calculations (cont)

theoretical yield	amount of product that forms when all the limiting reactant reacts to form the desired product; maximum obtainable yield, predicted by the balanced equation (the limiting reactant produces the theoretical yield).
actual yield	amount of product actually obtained from a reaction; almost always less than the theoretical yeild.
percent yield	determines the efficiency of a chemical reaction
	% yield = actual yield/theoretical yield (100%)
	temperature and pressure can affect percent yield.
atom economy	theoretical determination of how much of the starting mass of reactants can end up in the final mass of the desired product.
	atom economy = sum of molar mass of desired product/sum of molar masses of reactants (100%)

Types of Reactions

combination reaction	two or more reactants combine to form a single product - A + B --> AB
decomposition reaction	two or more products form a single reactant; opposite of combination reaction - AB --> A + B
combustion reaction	substance burns in the presence of oxygen. produces carbon dioxide gas and water.

Combustion Analysis

combustion analysis	experimental determination of an empirical formula by a reaction with oxygen to produce carbon dioxide and water.
organic compounds	containing C, H, and O, are carried out using an apparatus in combustion analysis.