7.1

Evidence of a Chemical Reaction	**Types of Chemical Reactions**
Change in Color	Combination: A+ B -> AB
Formation of Gas (bubbles)	Decomposition: AB -> A + B
Heat (or a flame) Produced or absorbed	Single Replacement: A + BC -> AC + B
Formation of a Solid (precipitate)	Double Replacement: AB+CD -> AD + CB
	Combustion: a carbon containing compound burns in oxygen gas to produce the gases carbon dioxide (C02), water (H20), and energy in the form of heat or a flame

7.1

Formation of Gas
Evidence of a Chemical Reaction
1 Change in Color

7.10 Energy in Chemical Reactions

Energy Units	1 kilojoule (kJ) = 1000 joules (J)
	used to show the energy change in a reaction

7.10 Energy in Chemical Reactions (cont)

Heat of Reaction: the amount of heat absorbed or released during a reaction that takes place at a constant pressure.	ΔH= H(products) - H(reactants)
Exothermic Reaction: energy is released	**HEAT IS WRITTEN AS A PRODUCT**
	-ΔH
	the energy of the products is lower than the reactants
Endothermic Reaction: heat is absorbed	**HEAT IS WRITTEN AS A REACTANT**
	+ΔH
	the energy of the products is higher than the reactants

7.10 Energy in Chemical Reactions

Energy Units	1 kilojoule (kJ) = 1000 joules (J)
	used to show the energy change in a reaction

Characteristics of Oxidation and Reduction

Always Involves	*May Involve*
Oxidation	
Loss of electrons	Addition of oxygen
	Loss of hydrogen
Reduction	
Gain of electrons	Loss of oxygen
	Gain of hydrogen

Percent Yield

Percent yield (%) =	actual yield/theoretical yield x100%
Theoretical Yield: expected value (calculated)	**Actual Yield**: Measured value (mass of the product) (given value)
	less than the theoretical yield
How do you find the percent yield of a reaction?	*Step 1*:State given and needed quantities
	Step 2: Use coefficients to write mole-mole factors; write molar mass factors.
	Step 3: Calculate the percent yield by dividing the actual yield (given) by the theoretical yield and multiplying the result by 100%.

Gas

Air is a mixture of	78% Nitrogen gas, and 21% Oxygen gas, argon, carbon dioxide, and water vapor
Kinetic Molecular Theory of Gases	helps us understand gas behavior

1. A gas consists of small particles (atoms or molecules) that move randomly with high velocities

Gas (cont)

Gas molecules moving in random directions at high speeds cause a gas to fill the entire volume of a container.

2. The attractive forces between the particles of a gas are usually very small.

Gas particles are far apart and fill a container of any size and shape.

3. The actual volume occupied by gas molecules is extremely small compared to the volume that the gas occupies.

The volume of the gas is considered equal to the volume of the container. Most of the volume of a gas is empty space, which allows gases to be easily compressed.

4. Gas particles are in constant motion, moving rapidly in straight paths.

When gas particles collide, they rebound and travel in new directions. Every time they hit the walls of the container, they exert pressure. An increase in the number or force of collisions against the walls of the container causes an increase in the pressure of the gas.

5. The average kinetic energy of gas molecules is proportional to the Kelvin temperature.

Gas particles move faster as the temperature increases. At higher temperatures, gas particles hit the walls of the container more often and with more force, producing higher pressures.

Atmospheric Pressure	higher altitudes = less pressure
Units for Pressure (P)	atmosphere (atm)

Gas (cont)

	millimeters of mercury (mmHg)
	torr (Torr)
	pascal (Pa)
Units for Volume (V)	liters (L)
Units for Temperature (T)	kelvin (K)
	K= 273 + ° C
Units for amount of Gas (n)	gram (g)
	mole (n)
Measurement of Gas Pressure	P= force/area
1 atm = 760 mmHg = 760 Torr (exact)	1 atm = 29.9 inHg
1 mmHg = 1 Torr (exact)	1atm = 101,325 Pa = 101.325 kPa
1 atm = 14.7 lb/in^2 (psi)	
**Boy	

The Mole

Avogadros Number: 6.02 x 10^{23}	atoms or particles of that element
	number of moles will be a smaller number
The chemical formula subscripts specify the:	Atoms in 1 molecule
	Moles of each element in 1 mole

The Mole (cont)

How do you calculate the moles of an element in a compound?	*Step 1*: State the given and needed quantities
	Step 2: Write a plan to convert moles of a compound to moles of an element.
	Step 3: Write the equalities and conversion factors using subscripts.
	Step 4: Set up the problem to calculate the moles of an element.
Molar Mass: The quantity in grams that equals the atomic mass of that element	1 mole of C = 12.01g = 6.02x10^{23} atoms of C **obtained from the periodic table**
How do you find the molar mass of a compound?	Multiply the molar mass of each element by its subscript in the formula and add the results
Calculations using molar mass	Molar mass converts moles of a substance to grams, or grams to moles.

Limiting Reactants

Limiting Reactant	the reactant that is completely used up
	the reactant that does not completely react and is left over is called the *excess reactant*
How do you find out what is the limiting reactant and how many moles (or grams) of products can be produced?	*Step 1*: State the given and needed quantities (moles).
	Step 2: Use coefficients to write mole-mole factors
	Step 3: Calculate the quantity (moles) of product from each reactant, and **select the smaller quantity (moles) as the limiting reactant.**