Ch 2 Matter (Unit 2 Matter & Atomic Structure)

Matter- has mass and occupies space.

Phase- any part of a system with uniform composition and properties.

Pure substances- form of matter that has definite composition and distinct properties.
Composed of **Atoms**- smallest particle of an element which retains the chemical nature of the element.

Physical properties- qualities which can be measured or observed without changing the composition of a substance; includes color, solubility, odor, hardness, melting / boiling / freezing points, density, and physical state.

Extensive Property- depends on the system size or the amount of material in the system, e.g. mass, volume, energy, electrical resistance, texture.

Intensive Property- does not depend on the system size or the amount of material in the system, e.g. density, melting/freezing/boiling points, viscosity, flammability.

Physical change - change in state or appearance, but the same chemical composition. Boil, freeze, melt, condense, split, crack, grind, cut, crush, and bend are all physical changes.

Three States of Matter

Solid- definite shape and fixed volume (cannot compress).

Liquid- fixed volume and takes the shape of its container; expand when heated but does not compress well.

Gas- neither fixed shape nor volume (expands to fill container); easily compressed.

Mixture- physical blend in which components retain their chemical identity (parts are unchanged).

Mixtures may always be separated by physical means, e.g. evaporation and standing, which do not involve a change in the ratio of atoms.

Mixtures may be **homogeneous** (same composition throughout, e.g. solution) or **heterogeneous** (components remain separate; often "settle out").

Element- simplest form of matter that consists of only one kind of atom.

Molecule- identifiable units of matter consisting of two or more atoms combined in a definite ratio; if the atoms are the same, it is an element, but if they are different, it is a **compound** which may only be separated by chemical means.

Atomic number = number of protons or electrons in an element

Atomic mass (in AMU)= combined mass of electron (e^-), proton (p^+) and neutron (n^0)

Chemical Symbology

$^{A}_{2}X^{0}$ where A is the mass, 2 is the atomic number, 0 is the charge

Tin has 69 n^0 $^{119}_{50}Sn$ mass=119; 119-69=50 (atomic number)

Pt=195 amu 195-78=117 neutrons

if Cu has 34 n^0, then 34+29=63 amu

if atomic # of Ni=28 and mass =59, then 59-28=31 n^0

All **matter** may be classified as an **element, compound,** or **mixture.**

A pure substance may be an element or compound.

A mixture may be homogenous (metal alloys, air) or heterogenous (concrete, soup).

Chemical symbol- representation of elements in one or two letters (second letter must be lower case).

Chemical properties- those exhibited due to a change in atom arrangements or atom ratios (chemical reaction), e.g. H_2O_2 and peroxidase; combustion; corrosion

Reactants- starting substance.
Products- substance formed.

How can you tell if a chemical reaction has occurred?
Energy is absorbed or released producing changes in light, heat, or gas production.

Law of Conservation of Mass- in any physical change or chemical reaction, mass is neither created nor destroyed but converted from one form into another, i.e. it is conserved.

Kelvin vs Celsius

$$K = {}^{o}C + 273 \qquad {}^{o}C = K - 273$$