Chapter 1

1. What is a science- difficult to define. Science is an accumulation of knowledge about our physical world based on observations. Scientific observation must be reproducible.

   a. Hypothesis.- a guess that explains observable data that can be tested.
   b. Scientific Laws- are universal descriptions of observable data that are true everywhere in the universe under the stated conditions.
   c. Scientific theory- the best detailed explanation that can predict observable outcomes. Are tentative and open to revisions.
   d. Scientific models- tangible items or pictures to represent invisible processes.

Science is limited by the number of variables in the system. (overhead)

Critical thinking applied to science-
   a. Falsifiability- evidence can be applied to prove the theory false.

   b. Logic- any argument offered as evidence in support of any claim must be sound. An argument is sound if its conclusion follows inevitably from its premises and if its premises are true.

   c. Replicability- evidence must be replicable in subsequent experiments or trials.

   d. Sufficiency-
      1. burden of proof is on the claimant.
      2. extraordinary claims demand extraordinary evidence.
      3. evidence based on authority and/or testimony is never adequate.
2. Chemistry is the study of the changes in matter and the transfer of energy.
   Matter is anything that occupies space.
   a. Applied research- making something that can be used. Drugs, testing of the water.
   b. Basic research- search for knowledge.

3. Physical and chemical changes -
   a. Properties-
   b. physical- physical characteristics, color, smell, density.
   c. physical change- a change that does not alter the in the chemical composition, no bonds are broken or formed.

   Chemical properties- reactivity.
   Chemical change- bonds are broken or formed.
   Signs of a chemical change-
   a. Heat
   b. Precipitation.
   c. Color change
   d. Bubbles.

EX. 1. Water evaporates. P
     2. Dull saw is sharpened. P
     c. Rust. C
     d. Burning. C
     e. Wood is made into saw dust. P

5. Matter-
a. Solid- rigid, maintains shape, non-compressible.
b. Liquid- occupies a specific volume but assumes the shape of the container.
c. Gas- occupies the volume of the container, is compressible, molecules do not touch.

6. Substances, Mixtures-

A. Substance- has a definite composition that does not vary. Can not be separated.

Elements- a primary substance that cannot be separated into any simpler substances. Have symbols.

Compound- composed of two or more elements. Look at capital letters.

Atom- smallest part of an element that retains the characteristics of that element.

Molecule- is a group of atoms bound together.

B. Mixture- composition is variable. EX. Alloys vary on the composition of metal.

Units of measurement. SI= metric system, based of powers of ten. Go over prefixes.

a. Mass- gram(g)

b. Length- meter (m)

c. Volume- liter(L), 1 cubic centimeter = 1 mL

d. Temperature- Kelvin (K) absolute zero, Celsius.

7. Density-

Density = mass/volume

less dense substances will float on more dense if they are in-miscible.

EX. Calculate mass of 1.00 L of gasoline if its density is 0.660 g/mL.
\[
\frac{1000 \text{ mL}}{0.660 \text{ g}} = 660 \text{ g}
\]

EX. What volume is occupied by 223 g of mercury? D of Hg = 13.6 g/mL

\[
\frac{223 \text{ g}}{13.6 \text{ g/mL}} = 16.4 \text{ mL}
\]

8. Energy- ability to change matter.

Two forms-

a. Kinetic energy- energy of motion.

b. Potential- energy due to position or arrangement.

Ex.

1. A ball ready to roll down a hill. PE
2. Fuel PE
3. A failing leaf KE
4. A candy bar PE

Temperature and Heat

1. Temperature- is a measure of how hot an object is. Is related to the kinetic energy of an object. (show thermometer)

Get burned because of little balls hitting you.

2. Heat- is the energy that flows from a hotter object to a cooler one.

   The units are joules (J) 1 cal = 4.184 J
   Cal = 1g of water to rise 1 °C

There are three major temperature scales.

1. Kelvin (SI)- absolute zero. No negative signs.

   \[ K = °C + 273 \]

2. Fahrenheit-
3. Celsius is equal to 1 Kelvin.
   Show over heads