Introduction

Name: _____

AP Chemistry Lecture Outline

Video 103 (8:57)

<u>matter</u>: anything having mass and volume

<u>mass</u>: the amount of matter in an object

<u>weight</u>: the pull of gravity on an object

<u>volume</u>: the space an object occupies

        units: conversions:

<u>state of matter</u>: solid, liquid, or gas

    <u>atom</u>: a basic building block of matter

        --

<u>Elements</u> contain only one type of atom.

    (a) <u>monatomic</u> elements consist of "unbonded," identical atoms

      e.g.,

    (b) <u>polyatomic</u> elements consist of several identical atoms bonded together

      -- <u>diatomic</u> elements:

      -- others:

    (c) <u>allotropes</u>: different forms of the same element in the same state of matter

        <u>molecule</u>: a neutral group of bonded atoms

    Elements may consist of...

Chemical symbols for elements appear on the periodic table; only the first letter is capitalized.

Video 106 (6:40)

<u>Compounds</u> contain two or more different types of atoms.

    -- have properties that differ from those of their constituent elements

        e.g.,   Na (sodium):

               Cl_2 (chlorine):

All samples of a given compound have the same composition by mass.

EX.   A 550. g sample of chromium(III) oxide (Cr_2O_3) has 376 g Cr. How many grams of Cr and O are in a 212 g sample of Cr_2O_3?

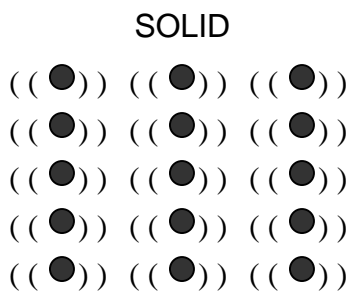<u>composition</u>: what the matter is made of
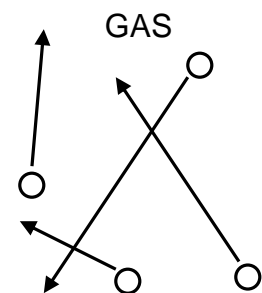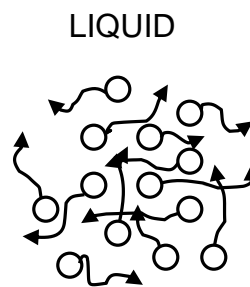
        copper:

        water:

<u>Properties</u> describe the matter.

   e.g., what it looks like, smells like, how it behaves

States of Matter

| Video 109 (6:33) | SOLID | LIQUID | GAS |

   <u>vapor</u>:

Changes in State

   Energy put into system:

   Energy removed from system:

Classifying Matter

Video 112 (6:28)

   (Pure) <u>Substances</u> have a fixed composition and fixed properties.

        --

           ELEMENTS   COMPOUNDS

             e.g.,   e.g.,

   <u>Mixtures</u> contain two or more substances mixed together.

      -- have varying composition and varying properties

      -- The substances are NOT chemically bonded; they retain their individual properties.

2

Two types of mixtures…	homogeneous: (or solution)	heterogeneous:
	sample has same	different composition
	composition and properties	and properties in the
	throughout; evenly mixed	same sample;
	at the particle level	unevenly mixed

e.g.,   e.g.,

alloy: a homogeneous mixture of metals   suspension: settles over time

      e.g.,   bronze (Cu + Sn)   e.g.,

                  pewter (Pb + Sn)

                  brass (Cu + Zn)

Video 115 (9:55)

Separating mixtures involves physical means, or physical changes.

    -- No chemical reactions are needed because...

        1. sorting: by color, shape, texture, etc.

        2. filtration: by particle size

        3. magnetism: one substance must contain iron

        4. chromatography: some substances dissolve more easily than others

        5. density: "sink vs. float"; perhaps use a centrifuge

           -- decant: to pour off the liquid

        6. distillation: different boiling points

             Volatile substances evaporate easily.

Video 118 (6:02)

      Properties of Matter

ONE OF THESE

CHEMICAL properties tell how a substance reacts with other substances.

PHYSICAL properties can be observed without chemically changing the substance.

AND

ONE OF THESE

EXTENSIVE properties depend on the amount of substance present.

INTENSIVE properties do NOT depend on the amount of substance.

   Examples: electrical conductivity   reactivity with water

                 ductile: can be drawn (pulled) into wire   brittleness

                 malleable: can be hammered into shape   magnetism

Density → how tightly packed the particles are

   ** Density of water =

The density of a liquid or solid is nearly *constant, no matter the sample's temperature.*

EX.   A student needs 15.0 g of ethanol, which has a density
        of 0.789 g/mL. What volume of ethanol is needed?

Significant Figures: *Is a digit significant?*   Video 124 (5:08)

Video 121 (3:44)   All non-zeroes are significant. Zeroes might or might not be.

Use the box-and-dot method to determine the sig figs in a
given quantity.

Prefix	Symbol	Meaning
giga-	G	10^9
mega-	M	10^6
kilo-	k	10^3
deci-	d	10^{-1}
centi-	c	10^{-2}
milli-	m	10^{-3}
micro-	μ	10^{-6}
nano-	n	10^{-9}
pico-	p	10^{-12}
femto-	f	10^{-15}

1. Identify the leftmost AND rightmost non-zeroes.

2. Draw a box around these AND everything in-between.

3. Everything in the box is significant.

4. Zeroes on the box's LEFT are NOT significant.

5. If there is a decimal point ANYWHERE, the zeroes on the
   box's RIGHT ARE significant. Otherwise, no.

In scientific notation, the exponent has no effect on the number of sig. figs.

Video 127 (7:07)   ***Rules: Significant Figures and Mathematical Operations***

   1. When multiplying or dividing, the answer must have the same number of sig. figs. as
      does the quantity with the fewest sig. figs.

EX.   1.52 C ÷ 3.431 s =

                        0.0251 N x 4.62 m ÷ 3.7 s =

   2. When adding or subtracting, the answer must be rounded to the place value of the
      least precise quantity.

EX.   2.53 s + 117.4 s =

                        2.11 m + 104.056 m + 0.1205 m =

   3. Because conversion factors are exact numbers, they do NOT affect the # of sig. figs.
      Your answer should have the same # of sig. figs. as does the quantity you start with.

Video 130 (3:01)   **Conversion Factors and Unit Cancellation**

EX.   For the rectangular solid: L = 14.2 cm W = 8.6 cm H = 21.5 cm
        Find volume.   Convert to mm^3.