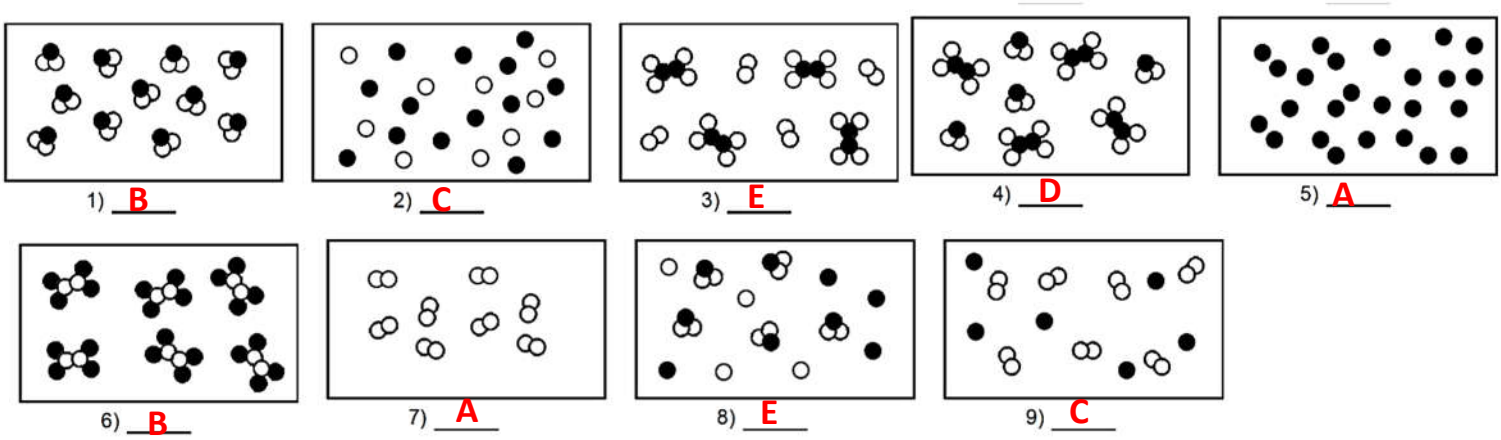
Unit 2 Test Review Name _____

Elements, Compounds, and Mixtures

Directions: Classify each of the pictures below by placing the correct label in the blanks below:

A= Element	D= Mixture of compounds
B= Compound	E= Mixture of elements and compounds
C= Mixture of elements	

Each circle represents an atom and each different color represents a different kind of atom. If two atoms are touching then they are bonded together.



1) B 2) C 3) E 4) D 5) A

6) B 7) A 8) E 9) C

Molar Mass & Percent Composition: SHOW WORK!

Chemical Formula	Molar Mass of the compound	% Composition of each element
PbO_2	Pb: 1 x 207.22 = 207.22 O: 2 x 16.00 = 32.00 **1 mole PbO_2 = 239.22 grams**	$\%Pb = \frac{207.22}{239.22} \times 100 = \mathbf{86.62\%}$ $\%O = \frac{32.00}{239.22} \times 100 = \mathbf{13.38\%}$
MnS	**86.998 grams**	**63.15% Mn** **36.85 % S**
$(NH_4)_2SO_4$	**132.16 grams**	**21.2% N** **6.11 % H** **24.26% S** **48.43% O**
XeF_4	**207.29 grams**	**63.34% Xe** **36.66% F**

Empirical & Molecular Formula

Chemical Compound	Molecular Formula	Empirical Formula
Hydrogen Peroxide	H_2O_2	**HO**
Glucose	$C_6H_{12}O_6$	**CH_2O**
Water	H_2O	**H_2O**
Acetic Acid	$C_2H_4O_2$	**CH_2O**

Find the mass of the empirical formula first. Then, divide the molar mass of the molecular formula by the mass of the empirical formula. This ratio will tell you how many times bigger the molecular formula is.

Empirical Formula	Molar Mass (g/mol) of M.F	Molecular Formula
CH_2	84.18 g/mol	**C_6H_{12}**
$CaCl_2$	110.98 g/mol	**$CaCl_2$**
CF_3	138.02 g/mol	**C_2F_6**

Determine the Empirical and Molecular Formula for the following problems:

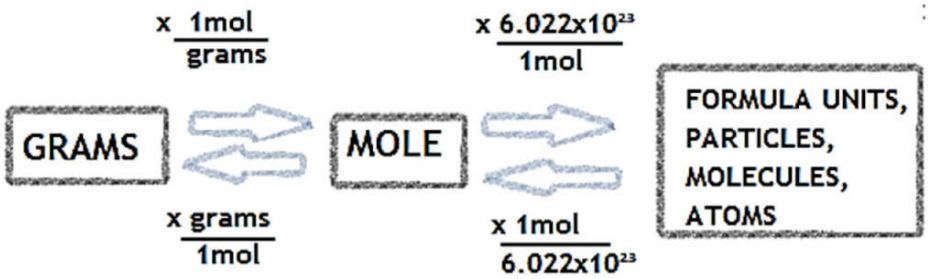
1. Succinic acid is a substance produced by lichens. Chemical analysis of succinic acid indicates that it is composed of 40.68% carbon, 5.08% hydrogen, and 54.24% oxygen and has a molecular weight of 118.1 g/mol. Determine the empirical and molecular formulas for succinic acid.

Empirical Formula _____**$C_2H_3O_2$**_____ Molecular Formula _____**$C_4H_6O_4$**_____

2. Salicylic acid is the active ingredient of Aspirin®. Salicylic acid is composed of 60.87 % carbon, 4.38% hydrogen, and 34.76% oxygen and has a molecular weight of 138.12 g/mol. Determine the empirical and molecular formulas for salicylic acid.

Empirical Formula _____**$C_7H_6O_3$**_____ Molecular Formula _____**$C_7H_6O_3$**_____

Molar Conversions: SHOW WORK!



1. How many grams are in 5.66 moles of calcium carbonate ($CaCO_3$)?

   566.5 grams

2. What is the number of moles in 368 grams of H_2SO_4?

   3.75 moles

3. How many molecules are in 32.4 moles of KF?

   1.95×10^{25} molecules

4. How many grams are there in 4.99×10^{22} atoms of sodium?

   1.91 grams

5. A sample of Na_2SO_4 has a mass of 14.5 g. Calculate the number of Na_2SO_4 molecules present in the sample.

   6.15×10^{22} molecules

Solutions (Molarity): SHOW WORK!

$$\text{molarity} = \frac{\text{moles of solute}}{\text{liter of solution}}$$

1. What is the molarity of a solution in which 116 g of NaCl are dissolved in 1.5 L of solution?

1.32 M

2. What is the molarity of a solution in which 15.0 g of $AgNO_3$ is dissolved in 250. mL of solution?

0.35 M

3. How many grams of $NaNO_3$ should be used to prepare 2.50 L of a 0.500 M solution?

106.25 grams

4. 15.0 g of LiCl is dissolved to prepare a 0.75 M solution. What is the volume of the solution?

0.47 L

Dilutions: SHOW WORK!

$$M_1V_1 = M_2V_2$$

1. How much concentrated 18 M sulfuric acid is needed to prepare 250 mL of a 6.0 M solution?

   83.3 mL

2. How much concentrated 12 M hydrochloric acid is needed to prepare 100. mL of a 2.0 M solution?

   16.6 mL

3. To what volume should 25 mL of 15 M nitric acid be diluted to prepare a 3.0 M solution?

   125 mL

4. 50. mL of 12 M hydrochloric acid is needed to produce 4.0 M solution? What is the final volume of the solution? How much water does the 50 mL of HCl need to be added to?

   150 mL solutions; 100 mL water

Beer's Law

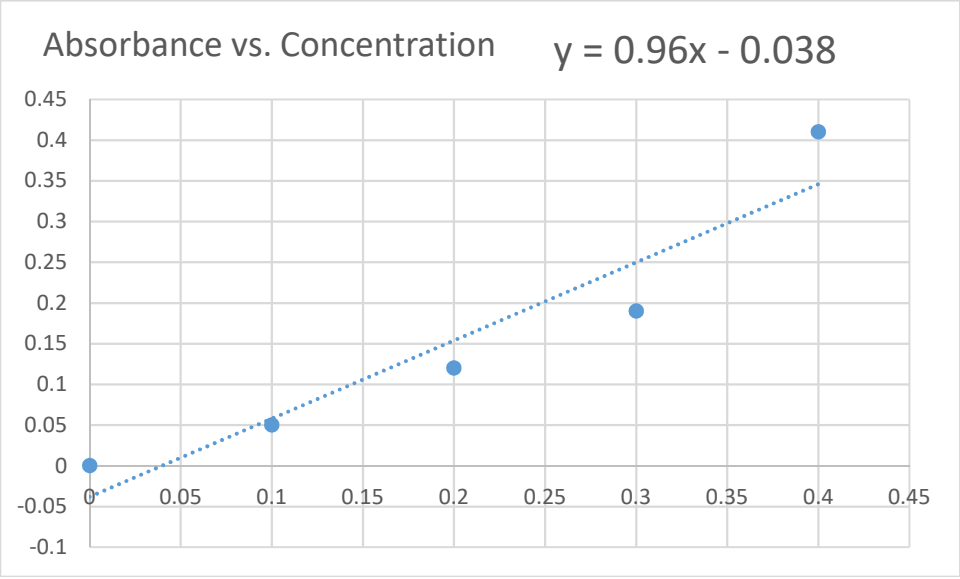
Reference table:

Color of Solution	Color Being Absorbed	Wavelength of color being absorbed
Green	Red	700 nm
Blue-green	Orange-red	600 nm
Violet	Yellow	550 nm
Red-violet	Yellow-green	530 nm
Red	Green	500 nm
Orange	Blue	450 nm
Yellow	Violet	400 nm

1. There are four wavelengths on the colorimeter (430 nm, 470 nm, 565 nm, and 635 nm). Which of the four wavelengths would you choose to measure the absorbance of Potassium Permanganate, a violet colored solution? Justify your answer.

565 nm. Closest to 550 nm

2. Known concentrations were made and the absorbance for each concentration were recorded in the data table below. The concentrations and absorbance were graphed and the line that best fits was determined.



If an unknown solution has an absorbance of 0.183, what is the concentration of the unknown solution? EXPLAIN how to find it and then SHOW WORK.

0.23 M

Separation Techniques

1. Determine the property which differs between the following pairs of substances:

Substances	Homo-/Hetero-geneous	Separation Method
Ice & lemonade	**Het**	**Filtration, decant**
Salt & oil	**Het**	**Filtration,**
Mud & water	**Het**	**Filter, decant**
Water & rubbing alcohol	**Hom**	**Evaporation, distillation**

2. Determine the physical properties that each separation technique takes advantage of in order to separate the different components of a mixture

Separation Technique	Physical Properties	Type of Mixture (heterogeneous and/or homogeneous)
Distillation	**Boiling point**	**Both**
Decanting	**State of matter, density**	**Het**
Filtration	**Size, solubility, state of matter**	**Het**
Evaporation	**Boiling point**	**Both**
Centrifuge	**Density**	**Het**
Paper Chromatography	**Polarity**	**Hom**
Column Chromatography	**polarity**	**Hom**

Physical/Chemical, Extensive/Intensive Properties

3. Circle the correct term that correctly completes the sentence for the next few problems

1. (**Physical or Chemical**) properties describe matter.
2. (**Physical** or Chemical) properties of a substance can be easily observed.
3. One can use their five senses to determine the (**Physical** or Chemical) properties of a substance.
4. (Physical or **Chemical**) properties usually describe how a substance reacts.
5. (Physical or **Chemical**) properties are not as easy to observe.
6. (**Physical or Chemical**) properties can be used to identify substances.

4. Classify each property as being a physical (P) or chemical (C) property. Also indicate whether it is an intensive (I) or extensive (E) property in each box.

1) Mass **P, E**	2) Density **P, I**	3) Length **P, E**
4) Color **P, I**	5) Reactivity **C, I**	6) Volume **P, E**
7) Malleability **P, I**	8) Luster **P, I**	9) Copper conducts electricity. **P, I**
10) The pH of an acid is below 7.0. **C, I**	11) Iron can be oxidized. **C, I**	12) The density of water is 1.0g/mL. **P, I**
13) Oxygen is a gas. **P, I**	14) A flag pole is 25 ft. tall. **P, E**	15) A ruby is red. **P, I**