

Name: Emily Zimmer
 Date:
 Hour:

AP Chem Empirical Quiz

- 1) How many of each element:
- a) Na_2CO_3 Na ~ 2 C ~ 1 O ~ 3
 - b) 4 CO_2 C ~ 4 O ~ 8
 - c) 2 $\text{C}_6\text{H}_{12}\text{O}_6$ C ~ 12 H ~ 24 O ~ 12
 - d) 2 $(\text{NH}_4)_2\text{S}$ N ~ 4 H ~ 16 S ~ 2
 - e) 5 $\text{Al}(\text{OH})_3$ Al ~ 5 O ~ 15 H ~ 15
 - f) 6 $\text{Ni}(\text{NO}_3)_2$ Ni ~ 6 N ~ 12 O ~ 36

+++++

Circle the best answer:

- 2) (Empirical, molecular) formula shows the subscripts in the smallest whole number ratio.
- 3) (Empirical, molecular) formula shows the actual types and numbers of atoms in a compound.
- 4) Empirical and molecular formulas (can, cannot) be identical.
- 5) A mole ratio ending in ".5" must be multiplied by (2, 3, 4) to make it a whole number)
- 6) A mole ratio ending in ".33" must multiplied by (2, 3, 4) to make it a whole number)
- 7) A mole ratio ending in ".25" must multiplied by (2, 3, 4) to make it a whole number)
- 8) When finding the empirical formula, in order to convert % of an element into grams you assume you have a (0 g, 100 g, radioactive) sample.

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- 9) Find the *molecular* formula for a compound with an empirical formula of CH and a formula mass of 78.11 amu.

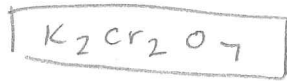
$$\begin{array}{l}
 \text{C} = 12.01 \text{ g} \\
 \text{H} = 1.01 \text{ g} \\
 \hline
 13.01
 \end{array}
 \qquad
 \begin{array}{r}
 78.11 \\
 \hline
 13.01
 \end{array}
 \qquad
 \boxed{\text{C}_6\text{H}_6}$$

10) Suppose a sample consists of 26.6% K, 35.4% Cr, and 38.0% O. Find the *empirical formula*.

$$\frac{26.6 \text{ g}}{39.1 \text{ g}} \frac{1 \text{ mol}}{1} = \frac{.6803 \text{ mol}}{.6803} \approx 1 \times 2$$

$$\frac{35.4 \text{ g}}{52 \text{ g}} \frac{1 \text{ mol}}{1} = \frac{.6808 \text{ mol}}{.6803} \approx 1 \times 2$$

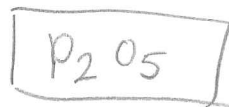
$$\frac{38.0 \text{ g}}{16 \text{ g}} \frac{1 \text{ mol}}{1} = \frac{2.4375 \text{ mol}}{.6803} \approx 3.5 \times 2$$



11) Analysis of a 10.15 g sample of a compound known to contain only Phosphorus and Oxygen indicates a Phosphorus content of 4.43 g. What is the empirical formula of this compound?

$$\frac{5.72 \text{ g O}}{16 \text{ g}} \frac{1 \text{ mol}}{1} \approx .3575 \approx 2.5 \times 2$$

$$\frac{4.43 \text{ g P}}{30.97 \text{ g}} \frac{1 \text{ mol}}{1} \approx .14304 \approx 1 \times 2$$



12) Classify each as empirical (E) or molecular (M) formulas. If molecular, draw an arrow (→) and write the empirical formula to the RIGHT.

a) BOTH H_2O

b) M C_6H_6 → CH

c) M P_4O_{10} → P_2O_5

d) E Li_2SO_4

e) M $C_{12}H_{24}O_6$ → C_2H_4O

BONUS

Use factor-label (i.e. *follow the units*) to check whether you are speeding if it takes you 52 seconds to drive between consecutive mile markers on the highway with a posted speed of 70 miles per hour. **SHOW WORK!**

No you're not.

1 mile	60 sec	60 min	=	$\frac{69.2 \text{ miles}}{h}$
52 s	1 min	1 hr		

Go Vikings!!

Br₂ I₂ N₂ Cl₂ H₂ O₂ F₂

Name: EMILY ZIMMER

Date:

Hour:

AP Chem Conversions Quiz

1) Molar mass

Find the molar mass of each item:

a) Calcium 40.08 g/mol

b) Iron (III) Carbonate

^{Fe₂(CO₃)₃}
c) Aluminum Hydroxide 291.73 g/mol

^{Al(OH)₃}
d) Carbon dioxide 78.01 g/mol

- Make the following conversions... Use factor-label method!
- Units are your guide ~ put in the #'s last! SIG DIGS! BOX in your answer! UNITS!

2) Moles to grams

a) 1.00 moles of Potassium Chloride → g

b) 5.25 moles of Nickel (II) Cyanide → g

$$\frac{5.25 \text{ mol} \text{ Ni(CN)}_2}{1 \text{ mol}} \times \frac{110.75 \text{ g Ni(CN)}_2}{1 \text{ mol}} = \boxed{581 \text{ g Ni(CN)}_2}$$

c) 3.00 moles of water → g

3) Grams to moles

a) 12.01 g of Carbon → moles

b) 36.04 g of CaCl₂ → moles

c) 225 g of Lithium Phosphate → moles

$$\frac{225 \text{ g Li}_3\text{PO}_4}{115.79 \text{ g}} \times \frac{1 \text{ mol}}{1} = \boxed{1.94 \text{ mol Li}_3\text{PO}_4}$$

4) Atoms to grams/grams to atoms

a) 1.23×10^{28} atoms of Boron \rightarrow g

b) 6.02×10^{23} atoms of Lithium Sulfate \rightarrow g

c) 42.0 g of Sodium Chloride \rightarrow atoms

$$\frac{42.0 \text{ g}}{58.44 \text{ g/mol}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 4.33 \times 10^{23} \text{ atoms NaCl}$$

5) Find the % composition of Potassium Sulfate

K_2SO_4

$K = 2 \times 39.1 = 78.2$	$78.2 / 174.3 =$	44.9%
$S = 1 \times 32.1 = 32.1$	$32.1 / 174.3 =$	18.4%
$O = 4 \times 16 = 64$	$64 / 174.3 =$	36.7%
<hr/>		
174.3		

6) Find the % composition of Ammonium Sulfide

GO VIKINGS!