

Name:

Date:

Hour:

CALVIN

Chemistry Ch.10 Empirical Quiz

1) How many of each element:

a)  $\text{Na}_2\text{CO}_3$       Na ~ 2      C ~ 1      O ~ 3

b) 4  $\text{CO}_2$       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

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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.

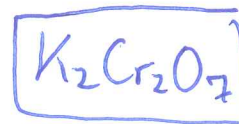
$$\text{CH} \quad \begin{array}{r} 12.01 \\ + 1.01 \\ \hline 13.02 \end{array} \quad \frac{78.11}{13.02} \approx 6 \quad \text{So, } \boxed{\text{C}_6\text{H}_6}$$

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

$$\frac{26.6\text{gK}}{39.10\text{gK}} \times \frac{1\text{ mol K}}{1} = \frac{0.680\text{mol}}{0.680} \approx 1 \rightarrow 2$$

$$\frac{35.4\text{gCr}}{52.00\text{gCr}} \times \frac{1\text{ mol Cr}}{1} = \frac{0.681\text{mol}}{0.680} \approx 1 \rightarrow 2$$

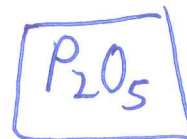
$$\frac{38.0\text{gO}}{16.00\text{gO}} \times \frac{1\text{ mol O}}{1} = \frac{2.38\text{mol}}{0.680} \approx 3.5 \rightarrow 7$$



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?

$$\frac{4.43\text{gP}}{30.97\text{gP}} \times \frac{1\text{ mol P}}{1} = \frac{0.143\text{mol}}{0.143} \approx 1 \rightarrow 2$$

$$\frac{5.72\text{gO}}{16.00\text{gO}} \times \frac{1\text{ mol O}}{1} = \frac{0.358\text{mol}}{0.143} \approx 2.5 \rightarrow 5$$



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<sub>2</sub>O

b) M C<sub>6</sub>H<sub>6</sub> → CH

c) M P<sub>4</sub>O<sub>10</sub> → P<sub>2</sub>O<sub>5</sub>

d) E Li<sub>2</sub>SO<sub>4</sub>

e) M C<sub>12</sub>H<sub>24</sub>O<sub>6</sub> → C<sub>2</sub>H<sub>4</sub>O

**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!**

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

Go Vikings!!

$\boxed{\text{Not speeding! 😊}}$