SOLID OXYGEN! DON'T TOUCH!

Quizzes back at the end of the period	The Test is Thursday	Tuesday? ~~Today~~: We will burn candy by dropping it into "Solid Oxygen" at 11:25.

Purpose:

Figure out the empirical formula of a compound.

WARMUP :

COPY THIS

Molecular Formula	Empirical Formula
$C_3H_9O_3$	$C_1H_3O_1$
$C_2H_4O_2$	$C_1H_2O_1$
C_6H_6	C_1H_1
C_2H_2	C_1H_1
$C_{24}H_{24}$	C_1H_1
$C_4H_8O_4$	$C_1H_2O_1$

Molecular formula definition: The exact number of each element's atoms in one molecule

Empirical formula definition: Just a smallest whole-integer ratio of the elements in a substance

How we found empirical formula

1. we converted grams of each element into moles
2. we wrote a crude empirical formula (non-integer)
3. divide each subscript by the smallest subscript
4. TRIAL AND ERROR: multiply + divide until all coefficients are integer

Name
Period 5 IRS

1. What is the molecular mass of C_4H_8?

Carbon: $4 \times (12.01) = 48.04$ g/mole
hydrogen: $8 \times (1.01) = 8.08$ g/mole
56.12 g/mole

2. Of all the letters in this square, what percent are X's?

O	O	H	X	X	
O	O	O	X	O	X
H	O	H			

$\frac{4 \times 5}{14 \text{ letters}} \times 100 = 28.6 \approx 29\%$

Useful information about dried garbanzos:	Each garbanzo weighs 0.6362 grams	A box contains 24 bags of beans
	Each bag of garbanzos contains 1062 beans	Each bean is 73 protein by mass.

3. How many beans will there be in 3 bags of garbanzos?

$3 \text{ bags} \times \left(\frac{1062 \text{ beans}}{1 \text{ bags}}\right) = 3186 \text{ beans}$

4. What would be the mass of 2.1×10^{-15} moles of garbanzos?

$2.1 \times 10^{-15} \text{ moles} \times \left(\frac{6.02 \times 10^{23} \text{ bean}}{1 \text{ mole}}\right) \times \left(\frac{0.6362 \text{ grams}}{1 \text{ bean}}\right) = 8.0 \times 10^{8} \text{ grams}$

5. What will be the mass of 13 boxes?

$13 \text{ box} \times \left(\frac{24 \text{ bag}}{1 \text{ box}}\right) \times \left(\frac{1062 \text{ bean}}{1 \text{ bag}}\right) \times \left(\frac{0.6362 \text{ g}}{1 \text{ bean}}\right) = 2.108 \times 10^{5} \text{ grams}$

6. How many moles are in 650000000000000000000000000 garbanzo beans?

$6.5 \times 10^{26} \text{ beans} \times \left(\frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ beans}}\right) = 1.1 \times 10^{3} \text{ moles}$

7. A strong wind has blown a bunch of conversion factors away from Problem #4! Worse still they have lost their numbers! Fill in top and bottom numbers on each. You are only allowed to write in the following numbers: "1", "6.02×10^{23}", and anything from the periodic table.

$\left(\frac{1 \text{ moles Sulfur}}{6.02\times10^{23} \text{ atoms Sulfur}}\right)$ $\left(\frac{6.02\times10^{23} \text{ atoms Sulfur}}{1 \text{ moles Sulfur}}\right)$ $\left(\frac{1 \text{ moles Sulfur}}{32.065 \text{ grams Sulfur}}\right)$ $\left(\frac{32.065 \text{ grams Sulfur}}{1 \text{ moles Sulfur}}\right)$

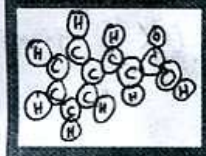
8. Now, use the conversion factors you created above to solve the following problems below.

a. $\left(\begin{matrix}2.80\times10^{24} \text{ atoms} \\ \text{of sulfur}\end{matrix}\right) \times \left(\frac{1 \text{ mole}}{6.02\times10^{23} \text{ atoms}}\right) = 4.65$ moles of sulfur

b. $\left(\begin{matrix}0.360 \text{ moles} \\ \text{of sulfur}\end{matrix}\right) \times \left(\frac{6.02\times10^{23} \text{ atoms}}{1 \text{ mole}}\right) = 2.17\times10^{23}$ atoms of sulfur

c. $\left(\begin{matrix}2.80\times10^{24} \text{ atoms} \\ \text{of sulfur}\end{matrix}\right) \times \left(\frac{1 \text{ mole}}{6.02\times10^{23} \text{ atoms}}\right) \times \left(\frac{32.065 \text{ grams}}{1 \text{ mole}}\right) = 149$ grams of sulfur

9. If you like the flavor cinnamon, you may be interested to know that its formula is $C_9H_8O_2$ …



According to the periodic table, what is the mass of a mole of this molecule?

carbon : $9\times(12.01) = 108.09$
hydrogen : $8\times(1.01) = 8.08$
oxygen : $2\times(16.00) = 32.00$
148.17 g/mole

A single piece of Trident® gum has about 7.902×10^{18} cinnamon molecules. What would be the mass of that many molecules of this substance?.

$7.902\times10^{18} \text{ molecules} \times \left(\frac{1 \text{ mole}}{6.02\times10^{23} \text{ molecules}}\right) \times \left(\frac{148.17 \text{ gram}}{1 \text{ mole}}\right) = 1.94\times10^{-3}$ grams

10. What would be the mass of 4.77×10^{14} atoms of helium ?

$4.77\times10^{14} \text{ atoms He} \times \left(\frac{1 \text{ mole He}}{6.02\times10^{23} \text{ atoms He}}\right) \times \left(\frac{4.00 \text{ grams He}}{1 \text{ mole He}}\right) = 3.17\times10^{-9}$ grams

11. Of all the letters in this square, what percent are H's?

O O H X X
O O O X O X
H O H

$\frac{3 \text{ H's}}{14 \text{ letters}} \times 100 = 21\%$