

HOW TO FIND EMPIRICAL FORMULA (simplest ratio) from % COMPOSITION

ex) A compound has a % comp. of
40.0% Carbon, 6.71% Hydrogen, &
53.3% oxygen. What is the emp. form.

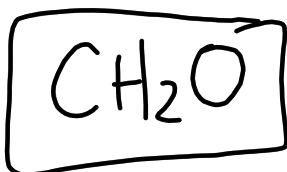
Assume 100 grams

$$40.0\% \text{ of } 100\text{g} = 40.0\text{g}$$

$$40.0\text{g C} \times \frac{1\text{mol}}{12.0\text{g}} = 3.33\text{ mol C} \quad \frac{3.33}{3.33} = 1$$

$$6.71\text{g H} \times \frac{1\text{mol}}{1.01\text{g}} = 6.64\text{ mol H} \quad \frac{6.64}{3.33} = 2$$

$$53.3\text{g O} \times \frac{1\text{mol}}{16.0\text{g}} = 3.33\text{ mol O} \quad \frac{3.33}{3.33} = 1$$



1) Assume 100 g

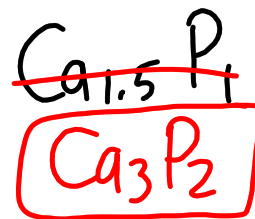
2) Convert g \rightarrow mol

3) \div by smallest # of moles

What is the emp. form. of a compd.
that is 66.6% Ca + 34.0% P?

$$66.6 \text{ g Ca} \times \frac{1 \text{ mol}}{40.1 \text{ g}} = 1.66 \text{ mol Ca} \quad \frac{1.66}{1.10} = \frac{1.5}{1} \times 2 = 3$$

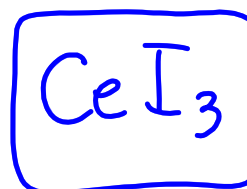
$$34.0 \text{ g P} \times \frac{1 \text{ mol}}{31.0 \text{ g}} = 1.10 \text{ mol P} \quad \frac{1.10}{1.10} = \frac{1}{1} \times 2 = 2$$



Calc. the emp. form. of a compd.
containing 1.67g Ce + 4.54g I.

$$1.67\text{g Ce} \times \frac{1\text{mol}}{140.1\text{g}} = .0119\text{mol Ce} \frac{.0119}{.0119} = 1$$

$$4.54\text{g I} \times \frac{1\text{mol}}{127.0\text{g}} = .0357\text{mol I} \frac{.0357}{.0119} = 3$$



Vit C. has a % comp of.

40.9% C 4.58% H 54.5% O

+ its molec. mass = 176.1 amu
molar mass

$$40.9 \text{ g C} \times \frac{1 \text{ mol}}{12.0 \text{ g}} = 3.41 \text{ mol C} \quad \frac{3.41}{3.41} = 1 \times 3 = \textcircled{3}$$

$$4.58 \text{ g H} \times \frac{1 \text{ mol}}{1.01 \text{ g}} = 4.53 \text{ mol H} \quad \frac{4.53}{3.41} = 1.33 = \frac{4}{3}$$

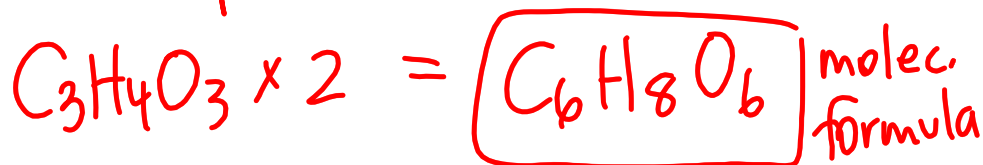
$\textcircled{4} \times 3$

$$54.5 \text{ g O} \times \frac{1 \text{ mol}}{16.0 \text{ g}} = 3.41 \text{ mol O} \quad \frac{3.41}{3.41} = 1 \times 3 = \textcircled{3}$$

emp. form. - $\text{C}_3\text{H}_4\text{O}_3$

$$\text{emp. mass} = 3(12.0) + 4(1.01) + 3(16.0) = 88.04$$

$$\frac{\text{molec mass}}{\text{emp. mass}} = \frac{176}{88} = 2$$



P. 362: 161, 162, 163a, 169, 173
346: 59, 61* BONUS
350: 62, 63