

## Percent composition and empirical formula calculations sheet

1. Calculate the percent composition of silicon dioxide.

$$SiO_2$$

$$Si : 28.09 \frac{\%}{mol} \rightarrow \frac{28.09 \frac{\%}{mol}}{60.09 \frac{\%}{mol}} \cdot 100 = 46.75\% Si$$

$$O : 32.00 \frac{\%}{mol} \rightarrow \frac{32.00 \frac{\%}{mol}}{60.09 \frac{\%}{mol}} \cdot 100 = 53.25\% O$$

$$T = 60.09 \frac{\%}{mol}$$

2. You have determined the empirical formula of a compound to be  $C_3H_7O$ . If the molar mass of the compound is 177.30 g/mol, what is the molecular formula of the compound?

$$C_3H_7O = 59.10 \frac{\%}{mol} \quad \frac{177.30 \frac{\%}{mol}}{59.10 \frac{\%}{mol}} = 3 \quad \rightarrow \quad \text{molecular formula} = C_9H_{21}O_3$$

3. The percent composition of a substance was found to be 32.00% C, 42.66% O, 18.67% N, and 6.67% H. What is the empirical formula of this substance?

$$C : 32.00\% \rightarrow 32.00g \left( \frac{1mol}{12.01g} \right) = 2.66445mol \rightarrow \frac{2.66445mol}{1.33262mol} = 2$$

$$O : 42.66\% \rightarrow 42.66g \left( \frac{1mol}{16.00g} \right) = 2.66625mol \rightarrow \frac{2.66625mol}{1.33262mol} = 2 \quad \rightarrow \quad C_2O_2NH_5$$

$$N : 18.67\% \rightarrow 18.67g \left( \frac{1mol}{14.01g} \right) = 1.33262mol \rightarrow \frac{1.33262mol}{1.33262mol} = 1$$

$$H : 6.67\% \rightarrow 6.67g \left( \frac{1mol}{1.01g} \right) = 6.60396mol \rightarrow \frac{6.60396mol}{1.33262mol} = 5$$

4. You mass 50.0 g of an unknown sugar and then decompose it by heating. This reaction produces 20.0 g of carbon and 30.0 g of water.

- What is the percent of carbon in your sugar?

$$\frac{20.0gC}{50.0gT} \cdot 100 = 40.0\%C$$

- What is the percent of hydrogen in your sugar? (You need to determine the mass of hydrogen from the percent composition of water to solve this.)

$$\frac{30.0gW}{50.0gT} \cdot 100 = 60.0\%W$$

$$0.60W \cdot \frac{2.02gH}{18.02gW} \cdot 100 = 6.73\%H$$