

42 CHAPTER 2 ATOMS, MOLECULES, AND IONS



For simplest formulas, assume that $c = f = 1$. Thus:



Compound I = XY_2 : If X has relative mass of 1.00, $\frac{1.00}{1.00 + 2y} = 0.3043$, $y = 1.14$.

Compound II = X_2Y : If X has relative mass of 1.00, $\frac{2.00}{2.00 + y} = 0.6364$, $y = 1.14$.

The relative mass of Y is 1.14 times that of X. Thus, if X has an atomic mass of 100, then Y will have an atomic mass of 114.

117. Most of the mass of the atom is due to the protons and the neutrons in the nucleus, and protons and neutrons have about the same mass (1.67×10^{-24} g). The ratio of the mass of the molecule to the mass of a nuclear particle will give a good approximation of the number of nuclear particles (protons and neutrons) present.

$$\frac{7.31 \times 10^{-23} \text{ g}}{1.67 \times 10^{-24} \text{ g}} = 43.8 \approx 44 \text{ nuclear particles}$$

Thus there are 44 protons and neutrons present. If the number of protons equals the number of neutrons, we have 22 protons in the molecule. One possibility would be the molecule CO_2 [$6 + 2(8) = 22$ protons].

118. For each experiment, divide the larger number by the smaller. In doing so, we get:

experiment 1	X = 1.0	Y = 10.5
experiment 2	Y = 1.4	Z = 1.0
experiment 3	X = 1.0	Y = 3.5

Our assumption about formulas dictates the rest of the solution. For example, if we assume that the formula of the compound in experiment 1 is XY and that of experiment 2 is YZ, we get relative masses of:

$$X = 2.0; \quad Y = 21; \quad Z = 15 \quad (= 21/1.4)$$

and a formula of X_3Y for experiment 3 [three times as much X must be present in experiment 3 as compared to experiment 1 ($10.5/3.5 = 3$)].

However, if we assume the formula for experiment 2 is YZ and that of experiment 3 is XZ, then we get:

$$X = 2.0; \quad Y = 7.0; \quad Z = 5.0 \quad (= 7.0/1.4)$$

and a formula of XY_3 for experiment 1. Any answer that is consistent with your initial assumptions is correct.

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