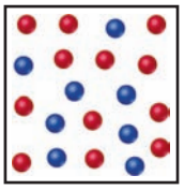
Exercise 2.2

The following diagram is a representation of 20 atoms of a fictitious element, which we will call nevadium (Nv). The red spheres are ^{293}Nv, and the blue spheres are ^{295}Nv. (**a**) Assuming that this sample is a statistically representative sample of the element, calculate the percent abundance of each element. (**b**) If the mass of ^{293}Nv is 293.15 amu and that of ^{295}Nv is 295.15 amu, what is the atomic weight of Nv? [Section 2.4]



Solution

(**a**) There are 12 red balls, and there are 8 blue balls.

$$\text{Percent Abundance of } ^{293}\text{Nv:} \quad \frac{12}{20} \times 100\% = 60\%$$

$$\text{Percent Abundance of } ^{295}\text{Nv:} \quad \frac{8}{20} \times 100\% = 40\%$$

(**b**) The atomic weight is calculated by multiplying the fractional abundance with the respective mass of each isotope and adding them together.

$$\begin{aligned}\text{Atomic Weight} &= \sum(\text{fractional abundance})(\text{mass}) \\ &= \left(\frac{12}{20}\right)(293.15 \text{ amu}) + \left(\frac{8}{20}\right)(295.15 \text{ amu}) \\ &= 175.89 \text{ amu} + 118.06 \text{ amu} \\ &= 293.95 \text{ amu}\end{aligned}$$