Accelerated Chemistry: Average Atomic Mass Worksheet

Calculate the average atomic mass for each element based on the natural abundance of its isotopes.

1. Find the average atomic mass for Li if 7.5% of Li atoms are $^6\text{Li}$ with a mass of 6.0151223 amu and 92.5% are $^7\text{Li}$ with a mass of 7.0160041 amu.

\[
(0.075 \times 6.0151223 \text{ amu}) + (0.925 \times 7.0160041 \text{ amu}) = 6.9 \text{ amu}
\]

2. Find the average atomic mass for B if 19.9% of B atoms are $^{10}\text{B}$ with a mass of 10.0129371 amu and 80.1% are $^{11}\text{B}$ with a mass of 11.0093055 amu.

\[
(0.199 \times 10.0129371 \text{ amu}) + (0.801 \times 11.0093055 \text{ amu}) = 10.8 \text{ amu}
\]

3. Find the average atomic mass for Cl if 75.78% of Cl atoms are $^{35}\text{Cl}$ with a mass of 34.96885271 amu and 24.22% are $^{37}\text{Cl}$ with a mass of 36.96590260 amu.

\[
(0.7578 \times 34.96885271 \text{ amu}) + (0.2422 \times 36.96590260 \text{ amu}) = 35.45 \text{ amu}
\]

4. Find the average atomic mass for Mg if 78.99% of Mg atoms are $^{24}\text{Mg}$ with a mass of 23.9850419 amu, 10.00% are $^{25}\text{Mg}$ with a mass of 24.9858370 amu, and 11.01% are $^{26}\text{Mg}$ with a mass of 25.9825930 amu.

\[
(0.7899 \times 23.9850419 \text{ amu}) + (0.1000 \times 24.9858370 \text{ amu}) + (0.1101 \times 25.9825930 \text{ amu}) = 24.31 \text{ amu}
\]

5. There are 2 isotopes of copper that occur naturally; $^{63}\text{Cu}$ and $^{65}\text{Cu}$. The $^{63}\text{Cu}$ atoms have a mass of 62.926601 amu and the $^{65}\text{Cu}$ atoms have a mass of 64.927794 amu. What is the percent natural abundance for each isotope? $^{63}\text{Cu} = 69.15\%$ and $^{65}\text{Cu} = 30.85\%$.

The two isotope abundances must equal all of the copper so let $^{63}\text{Cu} = x$ and $^{65}\text{Cu} = 1-x$. Now isolate and solve for x,

\[
\begin{align*}
63.546 \text{ amu} &= \left(62.926601 \text{ amu}\right)x + \left(64.927794 \text{ amu}\right)(1-x) \\
63.546 \text{ amu} &= \left(62.926601 \text{ amu}\right)x + \left(64.927794 \text{ amu}\right) - \left(64.927794 \text{ amu}\right)x \\
63.546 \text{ amu} - 64.927794 \text{ amu} &= \left(62.926601 \text{ amu}\right)x - \left(64.927794 \text{ amu}\right)x \\
x &= \frac{-1.382}{-1.998193} \\
&= 0.6915 \quad ^{63}\text{Cu} \\
^{65}\text{Cu} &= 1 - 0.6915 = 0.3085
\end{align*}
\]