# Calculating Average Atomic Mass

Carbon has two stable isotopes. Carbon-12 has an assigned atomic mass of 12.0000 and a percentage in nature of 98.93%. The atomic mass of carbon-13 is 13.0034 and its percentage in nature is 1.070%. What is the average atomic mass for carbon?

**Math Skill: Percents and Decimals**

You may want to read more about this **Math Skill** in the **Skills and Reference Handbook** at the end of your textbook.

**1. Read and Understand**

*What information are you given?*

carbon-12: atomic mass = 12.0000, % in nature = 98.93
carbon-13: atomic mass = 13.0034, % in nature = 1.070

**2. Plan and Solve**

*What unknown are you trying to calculate?*

Average atomic mass for carbon = ?

*What equation can you use?*

(atomic mass C-12) (% C-12) + (atomic mass C-13) (% C-13) = average atomic mass of C

*Convert the percentages to decimals and multiply the atomic mass of each isotope by the decimal representing its percentage in nature.*

(12.0000) (0.9893) = 11.8716 rounded to 11.87
(13.0034) (0.01070) = 0.1391364 rounded to 0.1391

*Add the products of the two multiplications to find the average atomic mass for carbon.*

11.87 + 0.1391 = 12.0091 rounded to 12.01

**3. Look Back and Check**

*Is your answer reasonable?*

Because almost all the carbon atoms in nature are carbon-12 atoms, the average atomic mass of carbon (12.01) is close to the atomic mass of carbon-12 (12.0000).

## Math Practice

*On a separate sheet of paper, solve the following problems.*

1. The element boron has two stable isotopes. Boron-10 has an atomic mass of 10.0129 and a percentage in nature of 19.78% The atomic mass of boron-11 is 11.0093 and its percentage in nature is 80.22% What is the average atomic mass for boron?

   **$(0.1978 \times 10.0129) + (0.8022 \times 11.0093) = 1.981 + 8.832 = 10.813$**

2. Nitrogen has two stable isotopes, nitrogen-14 and nitrogen-15. Nitrogen-14 has an atomic mass of 14.0031. Its percentage in nature is 99.63%. What is the percentage in nature of nitrogen-15?

   **100.00% − 99.63% = 0.37%**