

Chapter 5 The Periodic Table

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?

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.

- 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?
- 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?

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.