TABLE 4 Atomic Masses and Abundances of Several Naturally Occurring Isotopes

Isotope	Mass number	Percentage natural abundance	Atomic mass (amu)	Average atomic mass of element (amu)
Hydrogen-1	1	99.9885	1.007 825	1.007 94
Hydrogen-2	2	0.0115	2.014 102	
Carbon-12	12	98.93	12 (by definition)	
Carbon-13	13	1.07	13.003 355	12.0107
Oxygen-16	16	99.757	15.994 915	
Oxygen-17	17	0.038	16.999 132	15.9994
Oxygen-18	18	0.205	17.999 160	
Copper-63	63	69.15	62.929 601	63.546
Copper-65	65	30.85	64.927 794	
Cesium-133	133	100	132.905 447	132.905
Uranium-234	234	0.0054	234.040 945	
Uranium-235	235	0.7204	235.043 922	238.029
Uranium-238	238	99.2742	238.050 784	

Calculating Average Atomic Mass

The average atomic mass of an element depends on both the mass and the relative abundance of each of the element's isotopes. For example, naturally occurring copper consists of 69.15% copper-63, which has an atomic mass of 62.929 601 amu, and 30.85% copper-65, which has an atomic mass of 64.927 794 amu. The average atomic mass of copper can be calculated by multiplying the atomic mass of each isotope by its relative abundance (expressed in decimal form) and adding the results.

$$0.6915 \times 62.929\,601 \text{ amu} + 0.3085 \times 64.927\,794 \text{ amu} = 63.55 \text{ amu}$$

The calculated average atomic mass of naturally occurring copper is 63.55 amu.

The average atomic mass is included for the elements listed in **Table 4.** As illustrated in the table, most atomic masses are known to four or more significant figures. *In this book, an element's atomic mass is usually rounded to two decimal places before it is used in a calculation.*

Relating Mass to Numbers of Atoms

The relative atomic mass scale makes it possible to know how many atoms of an element are present in a sample of the element with a measurable mass. Three very important concepts—the mole, Avogadro's number, and molar mass—provide the basis for relating masses in grams to numbers of atoms.