

Isotopic Abundance

Problem 2-41

The two naturally occurring isotopes of silver have the following abundances: ^{107}Ag , 51.84%; ^{109}Ag , 48.16%. The mass of ^{107}Ag is 106.905092 u. What is the mass of ^{109}Ag ?

Solution:

Recall the calculation for weighted-average atomic mass, WAAM:

$$\text{WAAM} = \text{abundance}_1 \times AM_1 + \text{abundance}_2 \times AM_2 + \dots$$

All periodic table masses are measured from the naturally occurring elements so they are necessarily weight-average atomic masses. Looking up the atomic mass of Ag on the periodic table gives 107.868 u.

Now, just fill in the blanks...

$$107.868 \text{ u} = 0.5184 \times 106.905092 \text{ u} + 0.4816 \times AM_{^{109}\text{Ag}}$$

$$0.4816 \times AM_{^{109}\text{Ag}} = 52.44840 \text{ u}$$

$$AM_{^{109}\text{Ag}} = 108.9045 \text{ u}$$

If you're worrying about significant figures in this problem:

$$AM_{^{109}\text{Ag}} = 108.90 \text{ u or } 108.9 \text{ u}$$