

The Atomic Mass of Candium Activity

Problem: In nature most elements occur as a mixture of two or more isotopes. Each isotope of an element has a fixed mass with a natural percent abundance. The mass of the element needs to reflect the masses of these isotopes in their respective abundances. Given the masses and abundances, how is the Average Atomic Mass determined?

Purpose: To determine the average atomic mass of Candium

Materials: Triple Beam Balance Candium sample weigh boat

Procedure:

1. Obtain a sample of Candium from your teacher.
2. Separate the three isotopes (m&m's, skittle's, and peanut m&m's) and measure the mass of each isotope. Record in Data Table 1-1.
3. Count the number of m&m's, skittle's and peanut m&m's. Record in Data Table 1-1.

Data Table 1-1: Average Mass, Percent Abundance, Relative Abundance, and Relative Mass of Candium.

	M&M's	Skittle's	Peanut M&M's	Totals
Total Mass (grams)				
Number				
Average Mass (grams)				
Percent Abundance				
Relative Abundance				
Relative Mass (grams)				

Mass of weigh boat: _____

Data Analysis: (Show all work on a separate sheet of paper.)

1. Calculate the average mass of each isotope.

$$\text{average mass} = \frac{\text{Total mass of isotope}}{\text{Number of particles of isotope}}$$

2. Calculate the percent abundance of each isotope.

$$\% \text{ abundance} = \frac{\text{number of particles of isotope}}{\text{total number of particles}} \times 100$$

3. Calculate the relative abundance of each isotope.

$$\text{relative abundance} = \frac{\text{percent abundance of each isotope}}{100}$$

4. Calculate the relative mass of each isotope.

$$\text{relative mass} = \text{relative abundance of isotope} \times \text{average mass of isotope}$$

5. Calculate the average atomic mass of all Candium particles.

$$\text{average atomic mass of Candium} = \text{relative mass} + \text{relative mass} + \text{relative mass}$$

Conclusion:

1. Explain the difference between the percent abundance and relative abundance. What is the result when you total the individual percent abundances? The individual relative abundances?
2. The percent abundance of each kind of candy tells you how many of each kind of candy there are in every 100 particles. What does the relative abundance tell you?
3. Compare the total values for rows 3 and 6 in the table. Why can't the atomic mass in row 6 be calculated the way the total for row 3 is calculated?
4. Explain any differences between the atomic mass of your Candium sample and that of your neighbor. Explain why the differences would be smaller if larger samples were used.
5. The four isotopes of lead and its abundances are: Pb-204, 1.37%; Pb-206, 26.26%; Pb-207, 20.82%; and Pb-208, 51.55%. Calculate lead's approximate atomic mass to five significant figures.