

Atomic Structure Review: Isotopes and Average Atomic Mass

Atoms of the **same element** always have the **same number of protons**.

Atoms of the **same element** will always have the **same atomic number**.

Atoms of the same element may have a **different number of neutrons**.

If atoms of the **same element** have different numbers of neutrons they will have **different masses**.

Isotopes are atoms of the same element that have a different number of neutrons.

The atomic masses reported on the periodic table are the **average atomic masses**.

The **average atomic mass** for an element is the weighted average of the masses for all of the different isotopes of that element.

Average atomic mass is calculated using the following formula:

$$\text{average atomic mass} = (\text{mass } I_1) * \text{relative abundance } I_1 + (\text{mass } I_2) * R.A. I_2 + .$$

Relative abundance is the percent abundance in **decimal** form.

A percent abundance of 75% would be a relative abundance of 0.75.

Problems:

1. Isotopes of an element differ in_____.
2. One of the tin isotopes has 50 protons and 63 neutrons. Another isotope of tin might have _____.
3. What is the mass number of an isotope of hydrogen consisting of 1 proton, 1 electron, and 2 neutrons?
4. In what way are magnesium–24 and magnesium–25 different?
5. A hypothetical element **X** has three isotopes: ^{40}X , ^{41}X , and ^{42}X . Their abundances are 72.0%, 9.00%, and 19.0% respectively. What is the atomic mass of **X**?
6. The atomic masses of most elements are not whole numbers mainly because_____.