

Pre-AP Chemistry
Unit #4—Periodicity

Isotopes

Isotopes are atoms of the same element which differ in the number of neutrons they contain. For example, helium-3 has two protons and one neutron in each nucleus. Helium-4 has two protons and two neutrons. These are two different isotopes of helium. Nearly all elements found in nature are mixtures of several different isotopes. Although the chemical properties of isotopes of the same element are the same, the physical properties differ. The natural proportions of the isotopes are expressed in the form of an abundance ratio.

There are four ways to write an isotope:

1. Helium-4
2. ${}^4_2\text{He}$
3. He-4
4. ${}^4\text{He}$

An equation can be used to determine the mass number of an isotope:

$$\text{mass number} = \# \text{ protons} + \# \text{ neutrons}$$

To find the number of neutrons, the equation can be manipulated to solve for neutrons:

$$\# \text{ neutrons} = \text{mass number} - \# \text{ protons}$$

To find the number of protons and determine the element from the Periodic Table of Elements, the equation can be manipulated to solve for the protons:

$$\# \text{ protons} = \text{mass number} - \# \text{ neutrons}$$

Protons	2	2
Electrons	2	2
Neutrons	2	1
Z Number	2	2
Mass Number (A)	4	3
Element	Helium	Helium
Symbol	He	He
Isotope Form #1	Helium-4	Helium-3
Isotope Form #2	He-4	He-3
Isotope Form #3	${}^4\text{He}$	${}^3\text{He}$
Isotope Form #4	${}^4_2\text{He}$	${}^3_2\text{He}$