

ISOTOPES

All atoms of any given element have the same numbers of protons in their nucleus. However, atoms of the same element may have different numbers of neutrons and thus different weights. Atoms are said to be isotopes if they are of the same element but they have different weights due to different numbers of neutrons. Let's look at some examples.

C-12 and C-14 are isotopes. Since both are carbon atoms they have the same number of protons... 6. (The atomic number of carbon is 6.)

Atoms of C-12, like any carbon atoms must have 6 protons. In order for these atoms to have a mass number of 12 they must also contain 6 neutrons. Atoms of C-14 must also have 6 protons (all carbon atoms do). However, in order for these atoms to have a mass of 14 they must contain 8 neutrons.

We should point out that isotopes of an element behave identically in terms of how they react with other chemicals. The only difference is in their weights. A good example of an element with different isotopes is hydrogen.

NORMAL HYDROGEN H-1

Most hydrogen atoms consist of just a single proton and an electron... no neutrons; thus they have a mass of 1. About 99.98% of all hydrogen atoms are normal hydrogen; (sometimes called protium).

HEAVY HYDROGEN H-2

Sometimes called deuterium. These atoms are twice as heavy as "normal" hydrogen atoms because they contain a neutron in addition to the proton in normal H.

TRITIUM H-3

These atoms contain a proton and two neutrons.

STUDENT PRACTICE

1. Explain how atoms of U-235 and U-238 are similar and how they differ.

2. Give the number of protons and neutrons in each of the following pairs of isotopes...

O-16 P = n =

O-18 P = n =

Ba-137 P = n =

Ba-139 p = n =

Ne-20 p = n =

Ne-21 p = n =