

ATOMIC THEORY - WHAT ATOMS ARE MADE OF

SCH3U_2012-2013

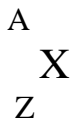
ATOM The smallest unit of an element
Made of many particles - the most important are **protons, neutrons** and **electrons**.
(Protons and neutrons are in the central **nucleus**. Electrons are in the outer regions).
They have no net charge. (ie. # protons = # electrons)

ATOMIC NUMBER The **number of protons** in the nucleus of an atom. (Since atoms are uncharged, the atomic number will also tell you how many electrons are present in the atom).
Is **characteristic of an element**. (i.e. Each element can be identified by its own atomic number).

ELECTRON Very small particle(s) located in the outer regions of the atom.
Each electron has a charge of -1.
Each electron has a mass about 2000 times smaller than that of a proton or a neutron.
It is the **loss or gain of electrons** which makes uncharged atoms into charged **ions**.

ION Atom which has either lost or gained electrons and therefore has either a net positive or a net negative charge. (i.e. Loss of electrons produces positively charged ions and a gain of electrons produces negatively charged ions).

ISOTOPE Although different atoms of the same element will always have the same number of protons (the same atomic number), they may have slightly different numbers of neutrons (making their mass numbers different).
Such atoms are known as isotopes.
They are often represented in the following manner:



where X represents the chemical symbol for the element, A is the mass number and Z is the atomic number.

Isotopes are often simply listed with identifying mass numbers. (their atomic numbers are all the same). Example: three common isotopes of lead are lead-206, lead-207 and lead-208: ^{206}Pb , ^{207}Pb , ^{208}Pb .

Most elements found in nature are really a mixture of two or more isotopes.

Therefore, the atomic masses stated on the periodic table are really the average atomic masses of all of the isotopes of each element. This is why the atomic mass numbers on the periodic table are decimal numbers.

MASS NUMBER

The **total number of protons** (i.e. the atomic number) **and neutrons** in the nucleus.

Can vary with different isotopes of the same element.

NEUTRON

Uncharged particle(s) located in the nucleus of the atom.

Has about the same mass as a proton.

Atoms of the same element may have different numbers of neutrons (such atoms are said to be isotopes).

NUCLEUS

Central, massive, positively charged core of the atom; contains the neutrons and protons of the atom.

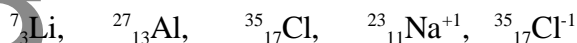
PROTON

Each proton has a charge of +1 and a mass about equal to a neutron.

Located in the nucleus of the atom.

PRACTICE PROBLEMS

1. For each of the following, state the atomic mass, atomic number, number of protons, number of electrons, number of neutrons:



2. A neutral atom of a particular element has an atomic number of 32 and a mass number of 73. Identify this element and state how many electrons, protons and neutrons it contains.

3. The nucleus of an atom of bromine contains 35 protons and 45 neutrons. What is the atomic number and the mass number of the atom?

4. a. Two common isotopes of copper are copper-63 and copper-65. How many protons, neutrons and electrons does each of these isotopes possess?

b) Determine the atomic number, the mass number and the numbers of protons, electrons and neutrons in a Cu^{+2} ion made from an atom of copper-63.

Now do Assignment on Isotopes and Relative Atomic Mass