

Atom Notes

Element- pure substance that cannot be separated into simpler substances by physical or chemical means. Represented by a chemical symbol

Atom – Smallest particle into which an element can be divided and still be the same substance.

Accepted scientific theory of atoms:

- ▶ 1. All substances are made of atoms.
- ▶ 2. Atoms are small particles that cannot be created or destroyed.
- ▶ 3. Atoms of the same element are exactly alike.
- ▶ 4. Atoms join with other atoms to make new substances

AMU stands for Atomic Mass Unit, the unit used to measure the mass of protons and neutrons.

Atoms are composed of three primary subatomic particles:

1. Protons
 - ▶ **positively** charged particles
 - ▶ found in the **nucleus**
 - ▶ mass is 1 AMU

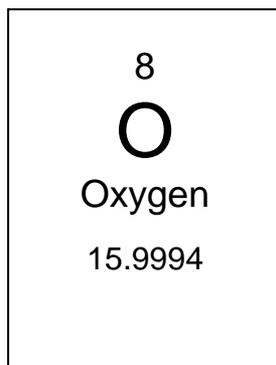
2. Neutrons
 - ▶ **no charge (neutral)**
 - ▶ found in the **nucleus**
 - ▶ mass is 1 AMU
 - ▶ “glue” that holds the protons together in the nucleus.

3. Electrons
 - ▶ **Negatively** charged
 - ▶ Found **around the nucleus** in energy levels within the electron cloud.
 - ▶ **Mass** is very small, **almost zero**

Atoms are neutral because the number of protons equals the number of electrons.

All of the **mass** of an atom is found in the nucleus.
Almost all of the **volume** of an atom is empty space.

How to determine the number of protons, electrons and neutrons in an atom:



The top number is the **atomic number**.

The atomic number is the number of **protons**. In a neutral atom, the atomic number is also equal to the number of electrons.

The bottom number is the **atomic mass**. The atomic mass is equal to the number of protons AND neutrons. Round the atomic mass to the nearest whole number and it is called **mass number**.

Use the PEN method (slide, slide, round the bottom and subtract) to determine the number of protons, neutrons and electrons.

P = 8 atomic number

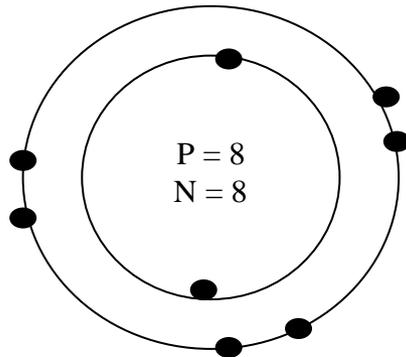
E = 8 atomic number

N = 8 (atomic mass of 15.994 is rounded to 16 (mass number), then the atomic number, 8, is subtracted, leaving 8 neutrons)

Use PEN to create a **Bohr model** of an atom. Protons and neutrons are located in the nucleus of an atom. Electrons are placed in specific energy levels in the electron cloud. Electrons fill the energy levels from the inside (closest to the nucleus) to the outside (farthest from the nucleus).

- **Two** electrons fill the first energy level.
- **Eight** electrons fill the second energy level.
- **Eight** electrons fill the third energy level (up to atomic number 18).

Example of a Bohr model of oxygen:



Electrons on the outermost energy level are called valence electrons and determine how the atom will react with other atoms. In the example above, oxygen has 6 valence electrons.