

Name: _____

Date: _____



Dot Diagrams



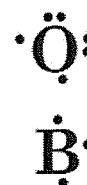
You have learned that atoms are composed of protons, neutrons, and electrons. The electrons occupy energy levels that surround the nucleus in the form of an “electron cloud.” The electrons that are involved in forming chemical bonds are called **valence electrons**. Atoms can have up to eight valence electrons. These electrons exist in the outermost region of the electron cloud often called the “valence shell.”

The most stable atoms have eight valence electrons. When an atom has eight valence electrons, it is said to have a complete octet. Atoms will gain or lose electrons in order to complete their octet. In the process of gaining or losing electrons, atoms will form chemical bonds with other atoms. The method we use to visually represent an atom's valence state is called a *dot diagram*, and you will practice drawing these in the following exercise.

What is a dot diagram?

Dot diagrams are composed of two parts—the chemical symbol for the element and dots surrounding the chemical symbol. Each dot represents one valence electron.

- If an element, such as oxygen (O), has six valence electrons, then six dots will surround the chemical symbol as shown to the right.
- Boron (B) has three valence electrons, so three dots surround the chemical symbol for boron as shown to the right.



There can be up to eight dots around a symbol, depending on the number of valence electrons the atom has. The first four dots are single, and then as more dots are added, they fill in as pairs.

PRACTICE 1

Using a periodic table, complete the following chart. With this information, draw a dot diagram for each element in the chart. Remember, only the valence electrons are represented in the diagram, not the total number of electrons.

Element	Chemical symbol	Total number of electrons	Number of valence electrons	Dot diagram
Potassium	K			
Nitrogen	N			
Carbon	C			
Beryllium	Be			
Neon	Ne			
Sulfur	S			