

NAME:

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## Why Atoms Combine Notes v2

### Why do atoms form substances? Why not just stay as lone atoms?

Most atoms, when alone are chemically unstable. Atoms are attracted to one another because they can become chemically stable by chemically bonding together.

**chemically stable** - when an atom's outer energy level is full of electrons it is chemically stable

**energy level** – a part of the electron cloud where specific electrons fly around.

- the first energy level can hold 2 electrons
- the second energy level holds 8 electrons
- every energy level after the 2<sup>nd</sup> "acts" like it holds 8 electrons

Atoms give away, take, or share electrons with other atoms so they can fill up or totally empty out their outer level and become chemically stable.

When they do this they form chemical bonds.

**chemical bond** - a force that holds two or more atoms together.

Once atoms are bonded to other atoms, they form molecules of the elements and compounds in the world around us.

Example: Hydrogen atoms and oxygen atoms are not stable when they are "alone." If hydrogen atoms and oxygen atoms come in contact with each other they can form chemical bonds to make H<sub>2</sub>O and become chemically stable. The hydrogen and oxygen atoms will then be chemically bonded together because they have made an exchange of electrons.

### Dot Diagrams

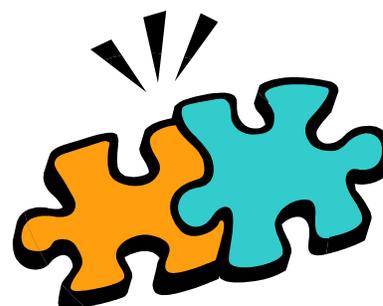
A dot diagram is a picture that shows how many electrons are available for an atom to give, take, or share.

A dot diagram can tell you:

- if that atom is chemically stable
- what an atom will want to do with its electrons
- what other atoms it will want to bond with
- how different atoms will bond together

#### To make a dot diagram:

1. Write the atom's chemical symbol.
2. Use the atom's column number to figure out how many outer level electrons it has:
  - atoms in groups 1 and 2 have 1 or 2 outer level electrons
  - atoms in groups 13, 14, 15, 16, 17, and 18 have 3, 4, 5, 6, 7, and 8 outer level electrons (take their group number and subtract 10)
  - Helium breaks these rules and has 2 outer level electrons even though it is in group 18.



3. Put one dot for each outer level electron around the chemical symbol following the pattern below:

<b>X</b> .	<b>X</b> :	. <b>X</b> :	. <b>X</b> :
<b>Step One</b>	<b>Step Two</b>	<b>Step Three</b>	<b>Step Four</b>
. <b>X</b> :	. <b>X</b> :	. <b>X</b> :	. <b>X</b> :
<b>Step Five</b>	<b>Step Six</b>	<b>Step Seven</b>	<b>Step Eight</b>

### How do I use “Dot Diagrams?”

Atoms will seek out other atoms who can fill or empty their outer energy level. You can use the dot diagrams to show how these atoms would bond together.

Example: Potassium is in group (row) 1. Therefore it wants to give one electron away. Its dot diagram would look like this:



I wish I could get rid of this one electron.

Chlorine is in group (row) 17. So it wants to take in one electron. Its dot diagram looks like this:



One more electron could go here

These two elements would chemically combine to become a compound with each other and then their dot diagrams would combine like this:



Potassium's electron fills in the missing space for Chlorine.

This makes Potassium stable since it got rid of its extra electron, and Chlorine stable since it has a full outer level.