

Interactions of Matter

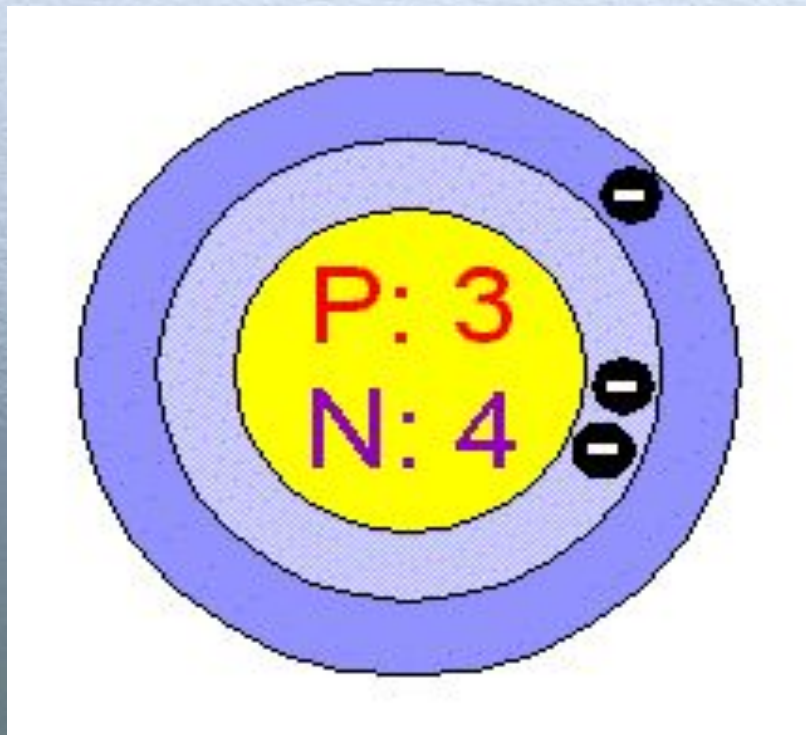
Chemical Bonding

Electrons

Most chemical bonding takes place using only valence electrons.

Use the diagrams/models found on the following slides to help you complete the missing information.

Chemical Bonding



1.

Name:

Protons:

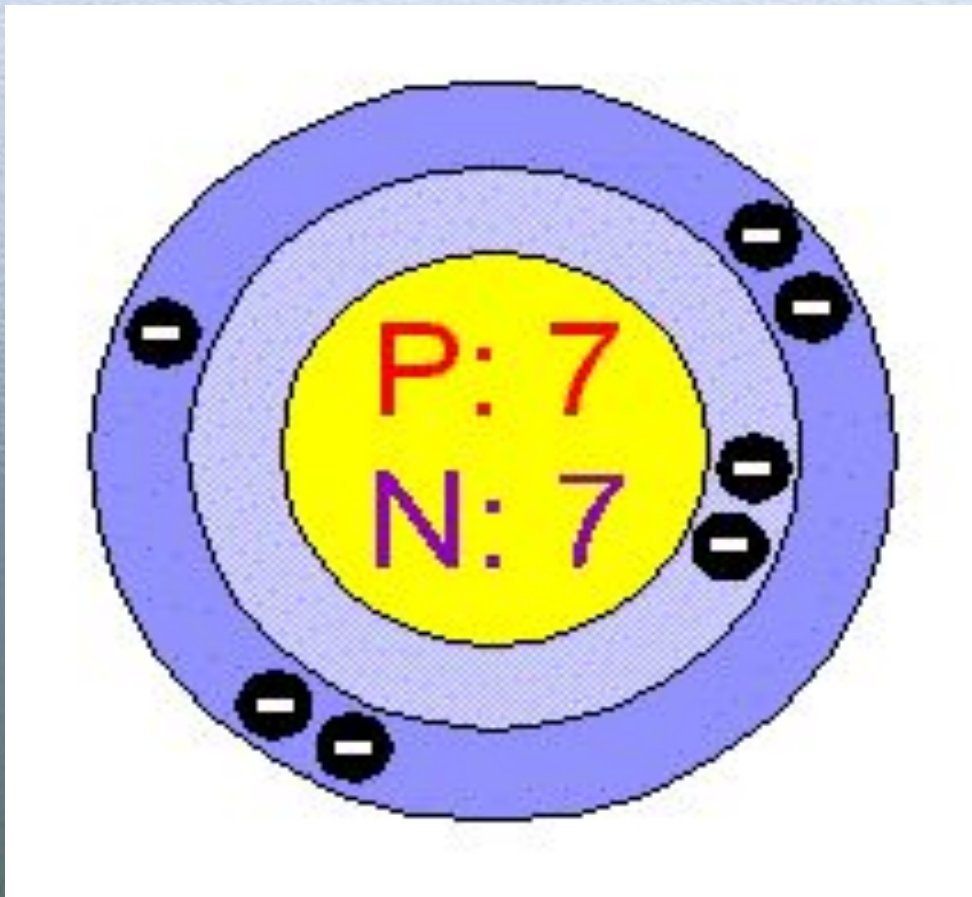
Neutrons:

Electrons:

Energy Levels:

Valence Electrons:

Chemical Bonding



2.

Name:

Protons:

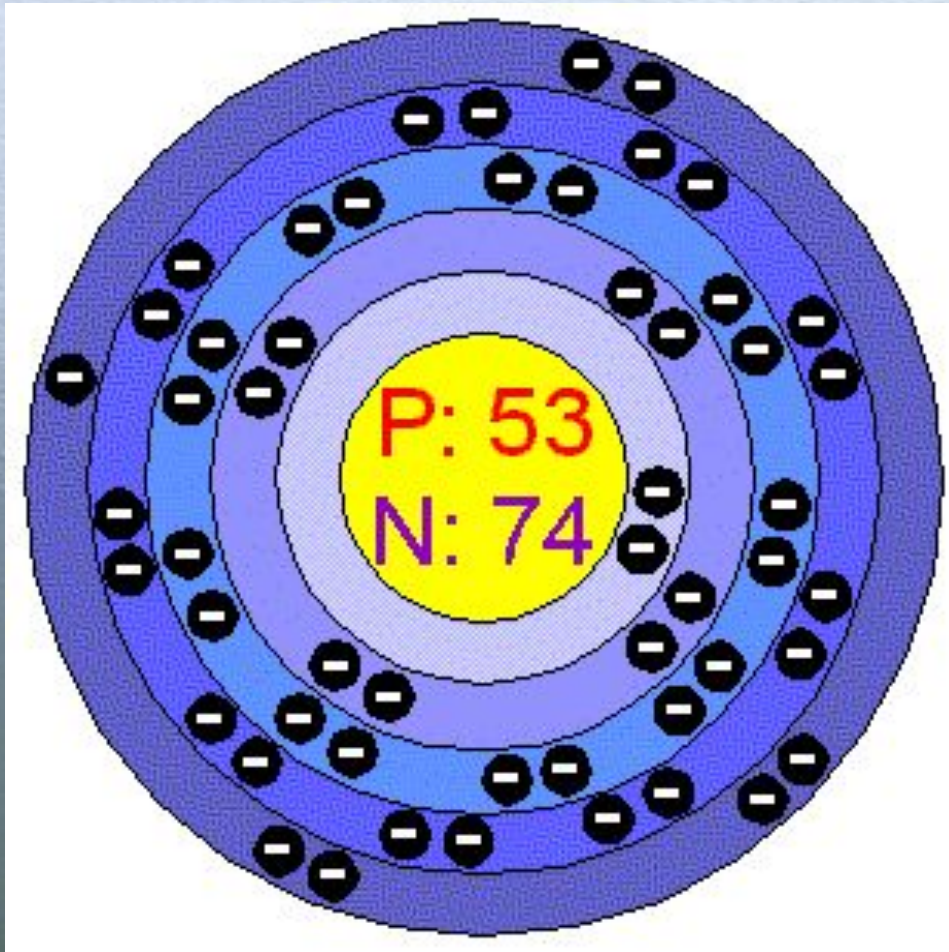
Neutrons:

Electrons:

Energy Levels:

Valence Electrons:

Chemical Bonding



3.

Name:

Protons:

Neutrons:

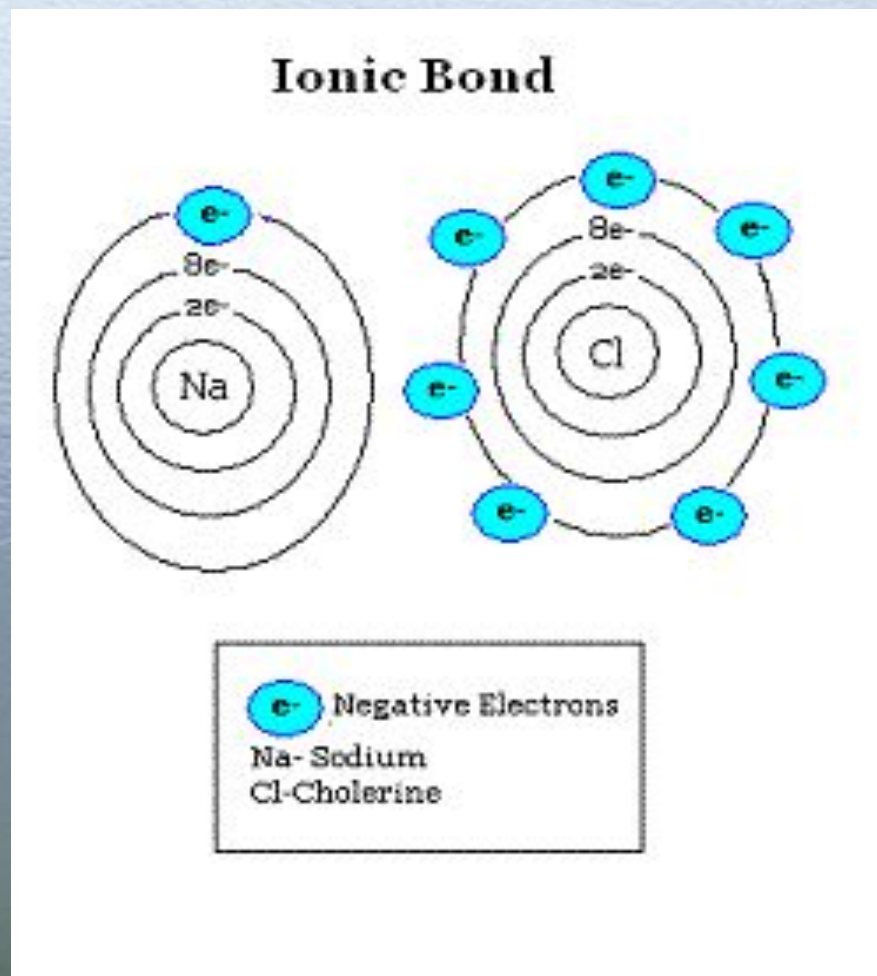
Electrons:

Energy Levels:

Valence Electrons:

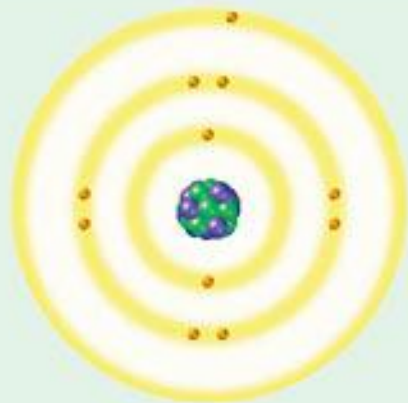
Forming Ions and Ionic Bonding

An **ionic bond** is a bond that forms when electrons are transferred from one atom to another atom. During ionic bonding, one or more valence electrons are transferred from one atom to another. Like all chemical bonds, ionic bonds form so that the outermost energy levels of the atoms in the bonds are filled.



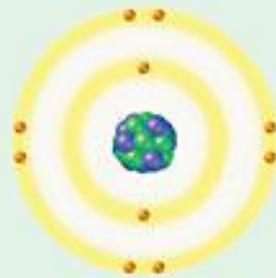
Forming Positive Ions

Here's How It Works: During chemical changes, a sodium atom can lose its 1 electron in the third energy level to another atom. The filled second level becomes the outermost level, so the resulting sodium ion has 8 valence electrons.



Sodium atom (Na)

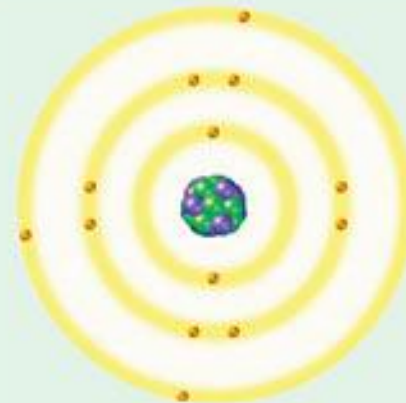
11+	protons
11-	electrons
<hr/>	
0	charge



Sodium ion (Na⁺)

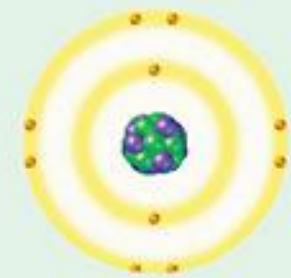
11+	protons
10-	electrons
<hr/>	
1+	charge

Here's How It Works: During chemical changes, an aluminum atom can lose its 3 electrons in the third energy level to another atom. The filled second level becomes the outermost level, so the resulting aluminum ion has 8 valence electrons.



Aluminum atom (Al)

13+	protons
13-	electrons
<hr/>	
0	charge



Aluminum ion (Al³⁺)

13+	protons
10-	electrons
<hr/>	
3+	charge

Forming Positive Ions

Use the diagram to help you form a positive ion.

4.

Atom:

_____ Protons

_____ Electrons

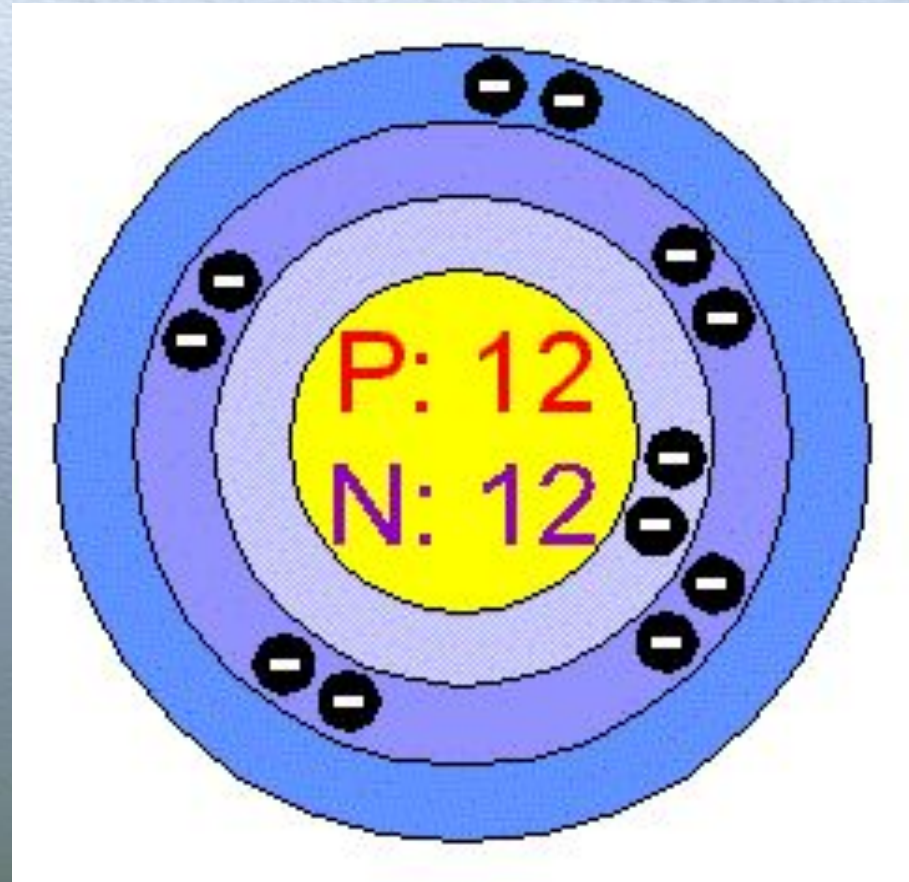
_____ Charge

Ion:

_____ Protons

_____ Electrons

_____ Charge



Forming Positive Ions

Use the diagram to help you form a positive ion.

5.

Atom:

_____ Protons

_____ Electrons

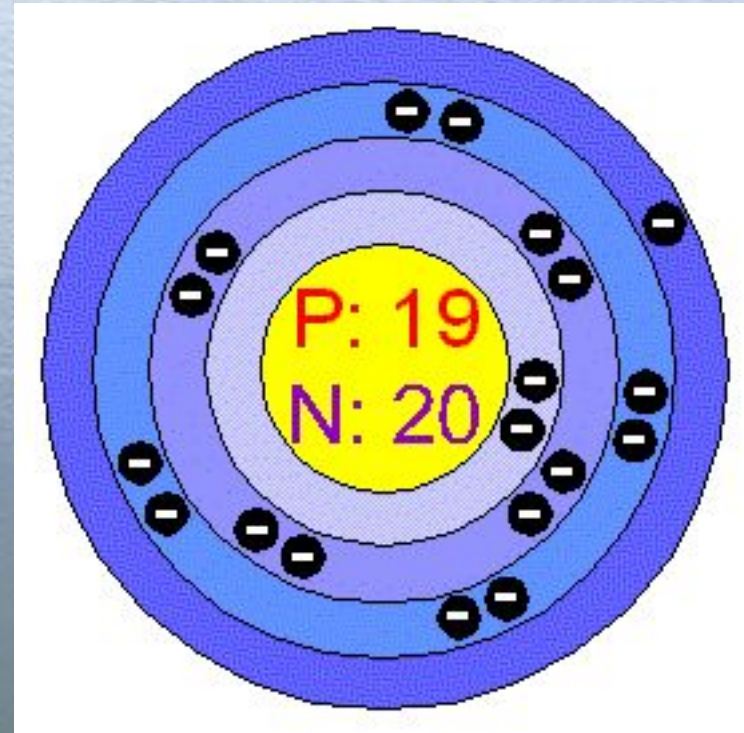
_____ Charge

Ion:

_____ Protons

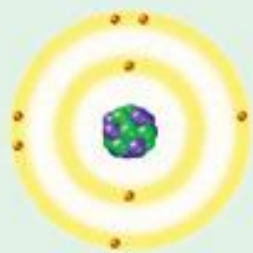
_____ Electrons

_____ Charge



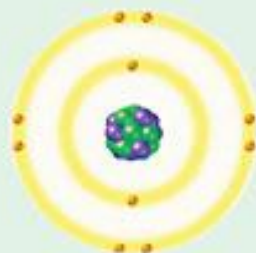
Forming Negative Ions

Here's How It Works: During chemical changes, an oxygen atom gains 2 electrons in the second energy level from another atom. An oxide ion that has 8 valence electrons is formed. Thus, its outermost energy level is filled.



Oxygen atom (O)
8+ protons
8- electrons

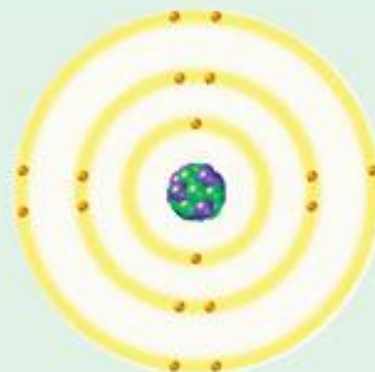
0 charge



Oxide ion (O²⁻)
8+ protons
10- electrons

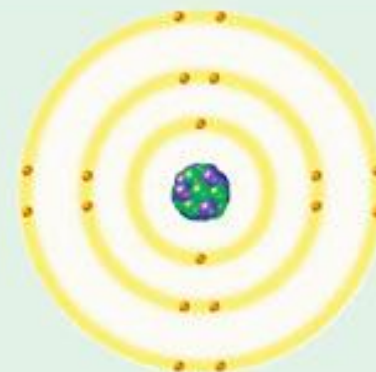
2- charge

Here's How It Works: During chemical changes, a chlorine atom gains 1 electron in the third energy level from another atom. A chloride ion that has 8 valence electrons is formed. Thus, its outermost energy level is filled.



Chlorine atom (Cl)
17+ protons
17- electrons

0 charge



Chloride ion (Cl⁻)
17+ protons
18- electrons

1- charge

Forming Negative Ions

Use the diagram to help you form a negative ion.

6.

Atom:

_____ Protons

_____ Electrons

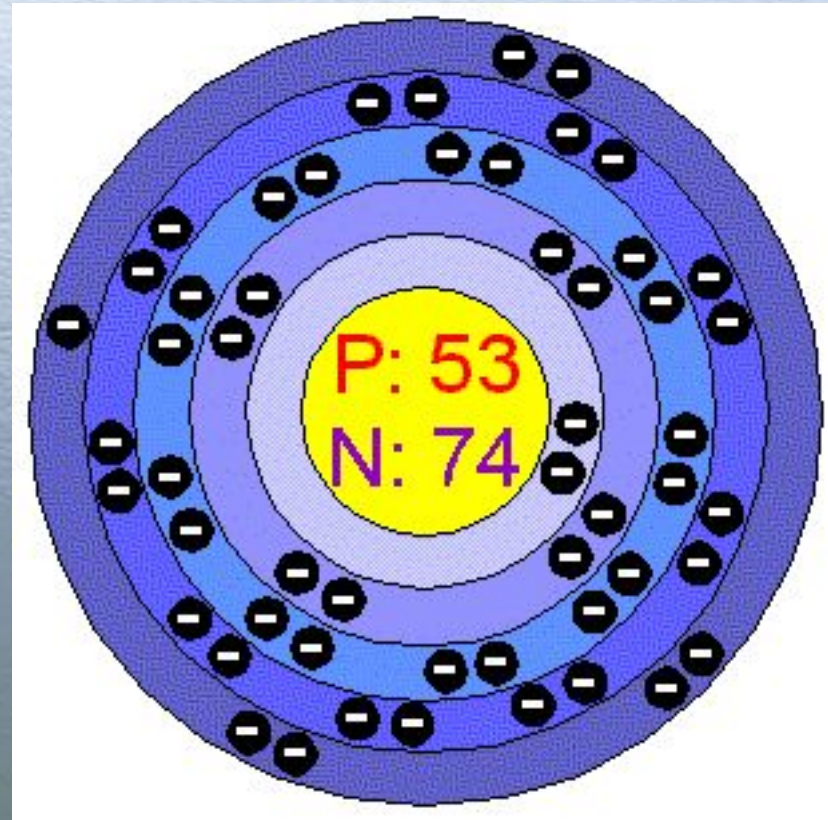
_____ Charge

Ion:

_____ Protons

_____ Electrons

_____ Charge



Forming Negative Ions

Use the diagram to help you form a negative ion.

7.

Atom:

_____ Protons

_____ Electrons

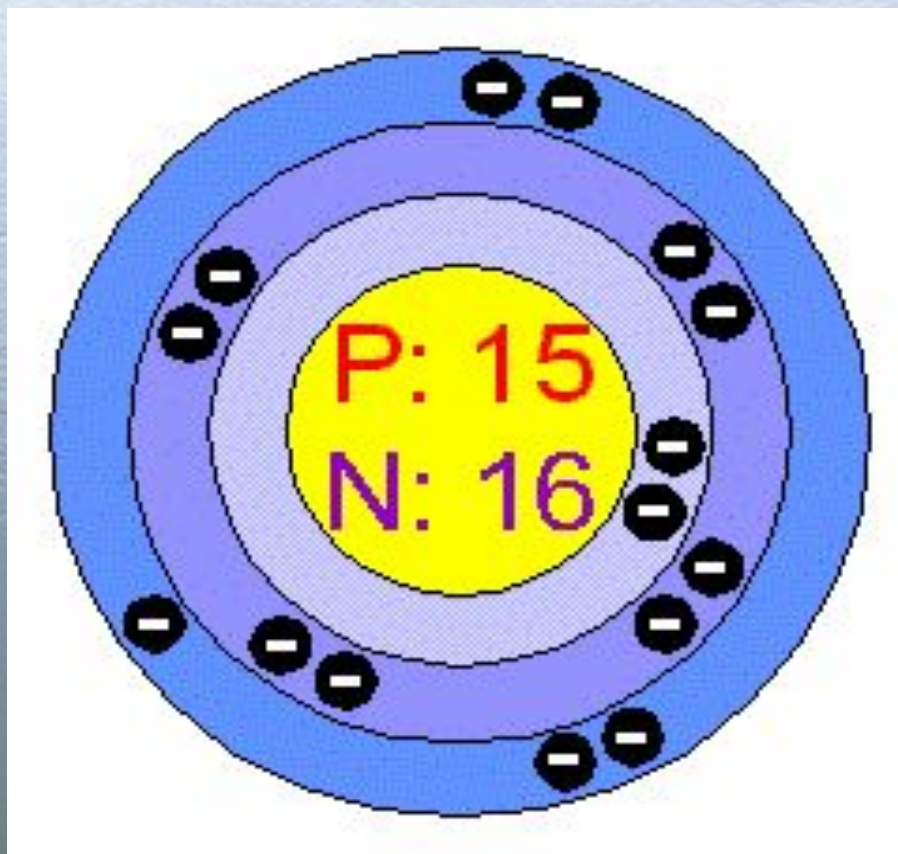
_____ Charge

Ion:

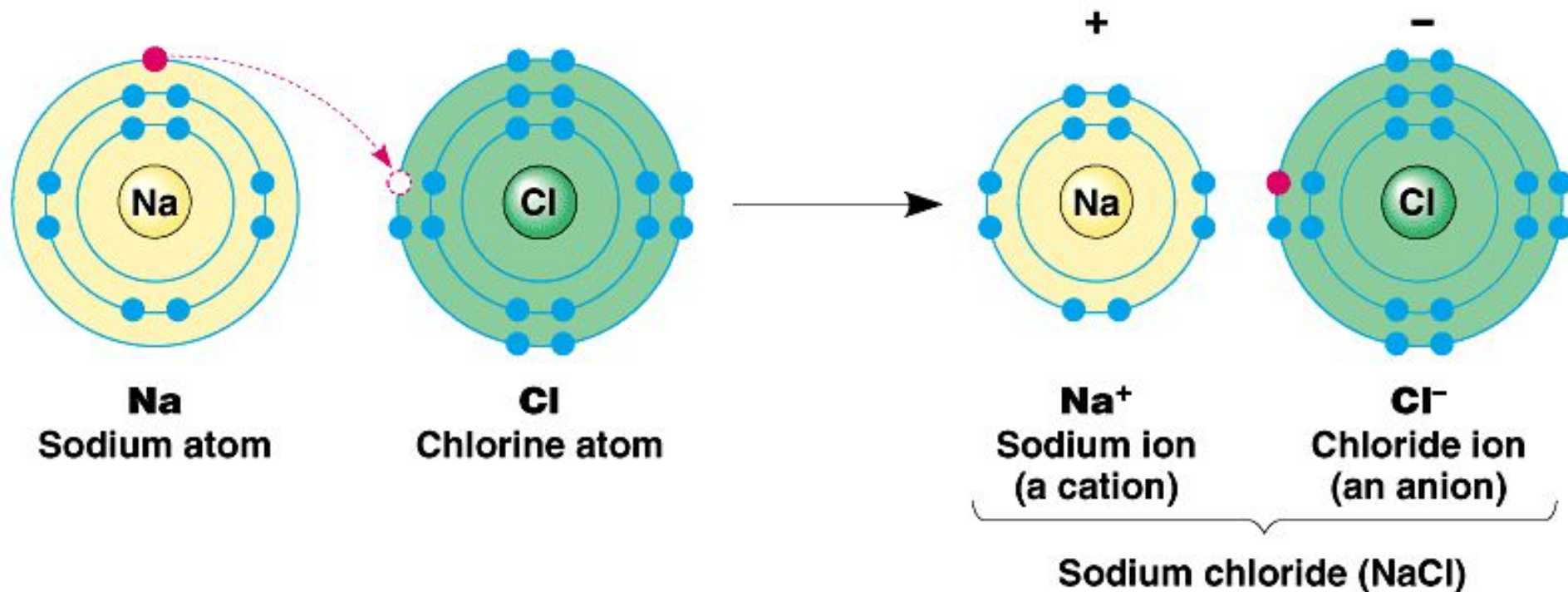
_____ Protons

_____ Electrons

_____ Charge



Ionic Compounds



Ionic Compounds

Use the example from the previous slide to help you diagram the ionic bonding between following elements.

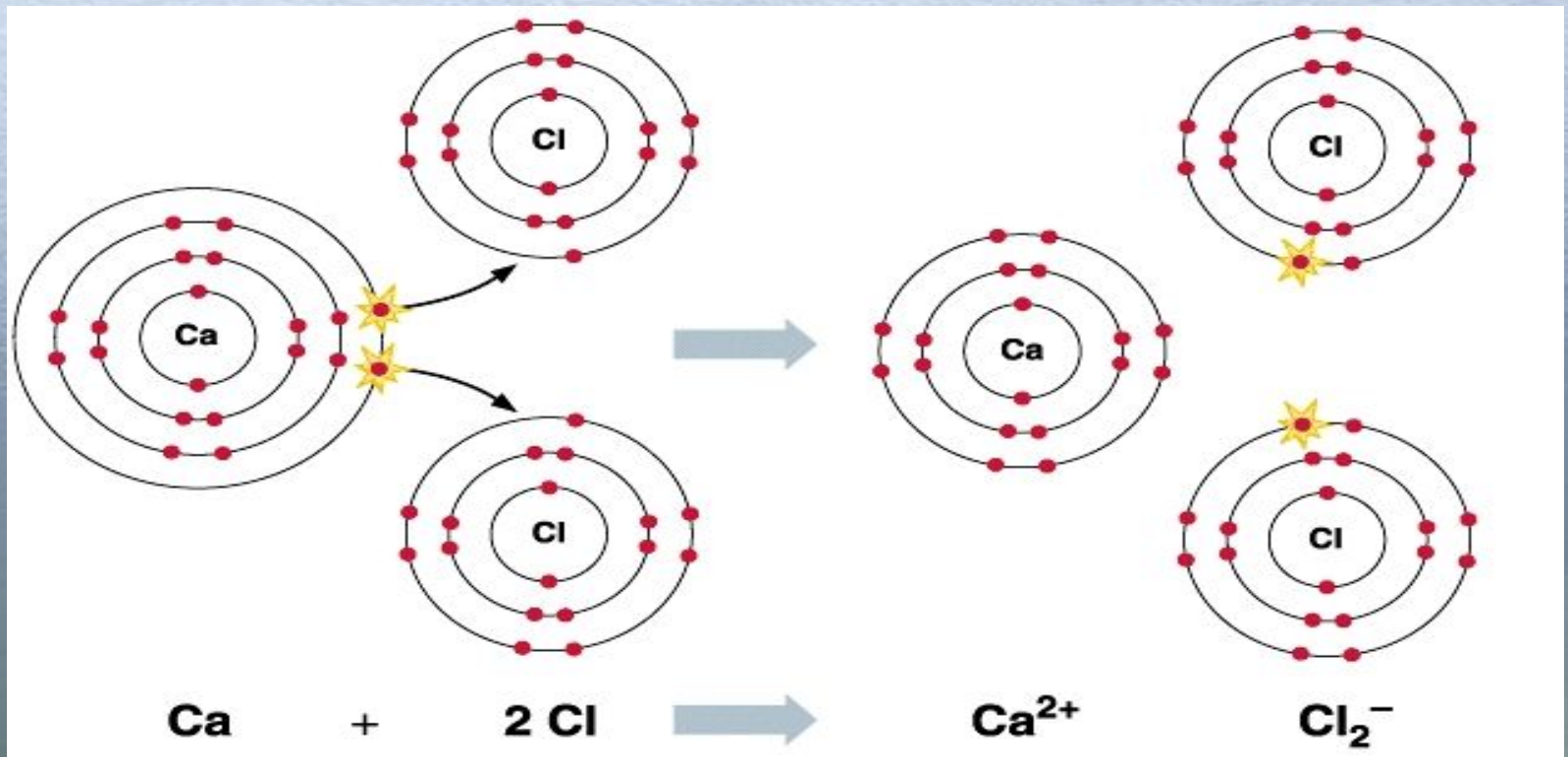
8. Lithium and Chlorine

9. Magnesium and Oxygen

10. Boron and Phosphorus

Ionic Compounds

Not all atoms ionically bond in a one to one ratio. The example below shows a two to one ratio of chlorine to calcium.



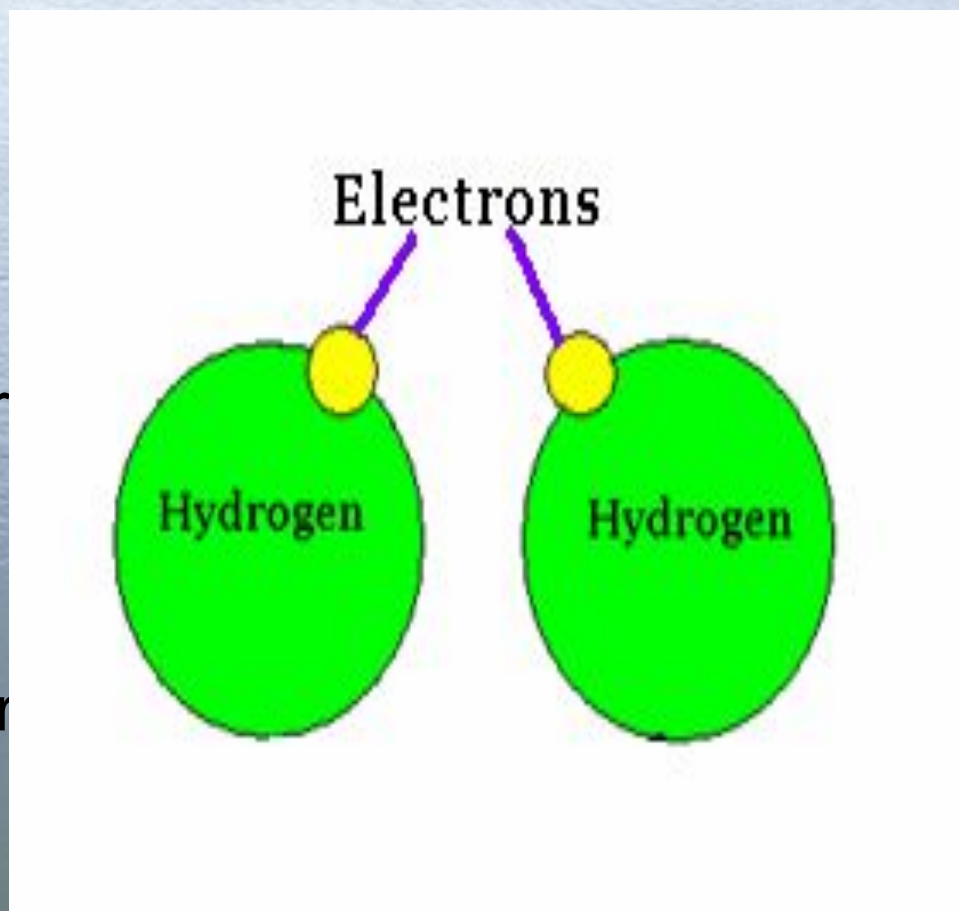
Ionic Compounds

Use the example from the previous slide to help you diagram the ionic bonding between following elements.

11. Sodium and Oxygen
12. Magnesium and Fluorine
13. Beryllium and Nitrogen
14. Aluminum and Oxygen

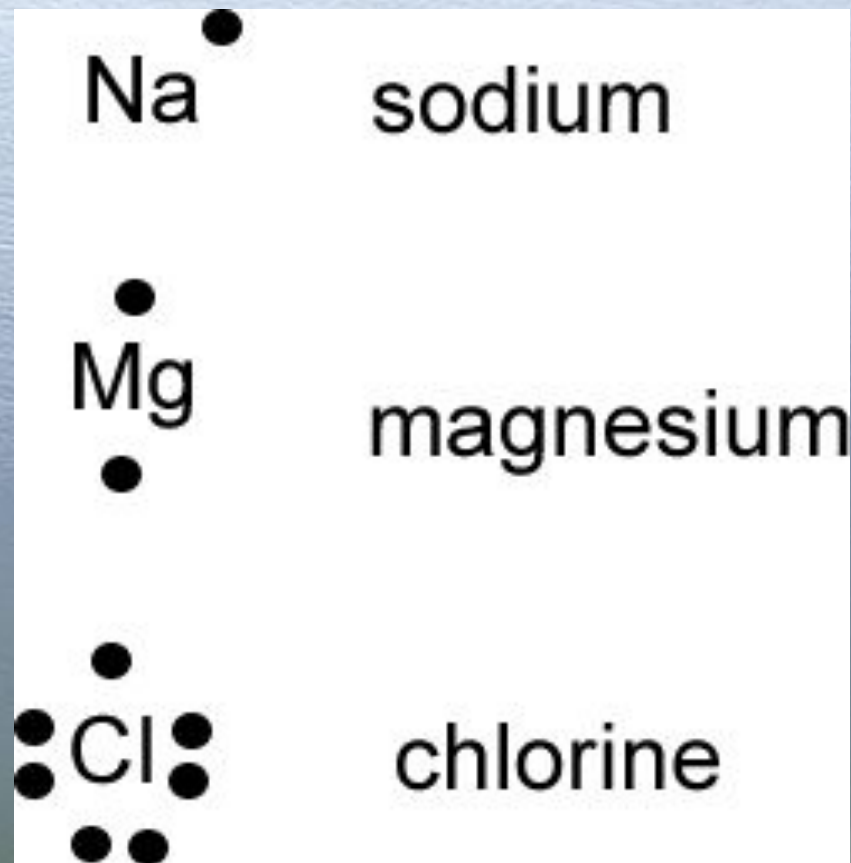
Covalent Bonding

A covalent bond forms when atoms share one or more pairs of electrons. When two atoms of nonmetals bond, a large amount of energy is needed for either atom to lose an electron. So, two nonmetals don't transfer electrons to fill the outermost energy levels of their atoms. Instead, two nonmetal atoms bond by sharing electrons with each another.



Covalent Bonds and Electron-Dot Diagrams

One way to represent atoms and molecules is to use electron-dot diagrams. An electron-dot diagram is a model that shows only the valence electrons in an atom. Electron-dot diagrams can help you predict how atoms might bond. To draw an electron-dot diagram, write the symbol of the element and place one dot around the symbol for every valence electron in the atom.

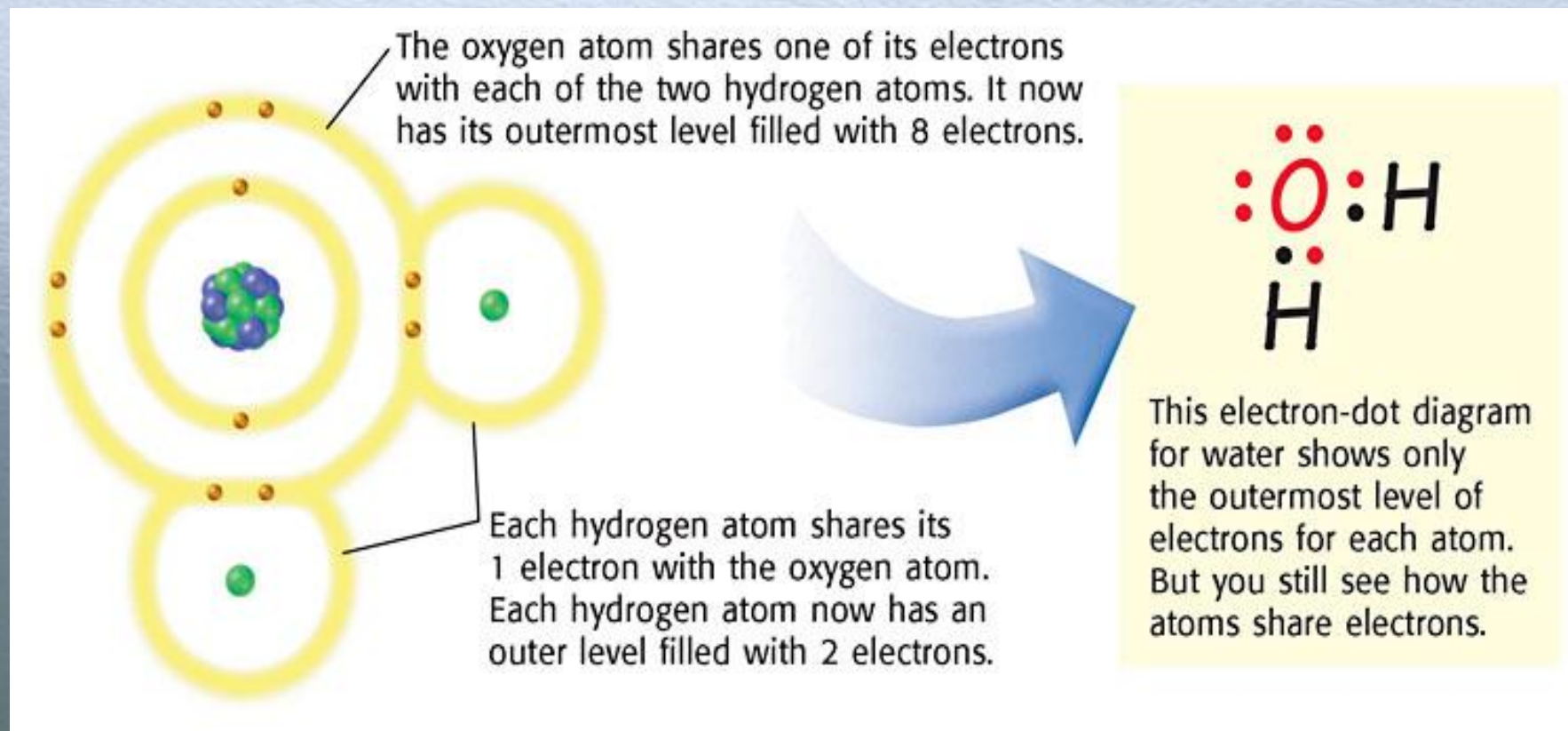


Covalent Bonds and Electron-Dot Diagrams

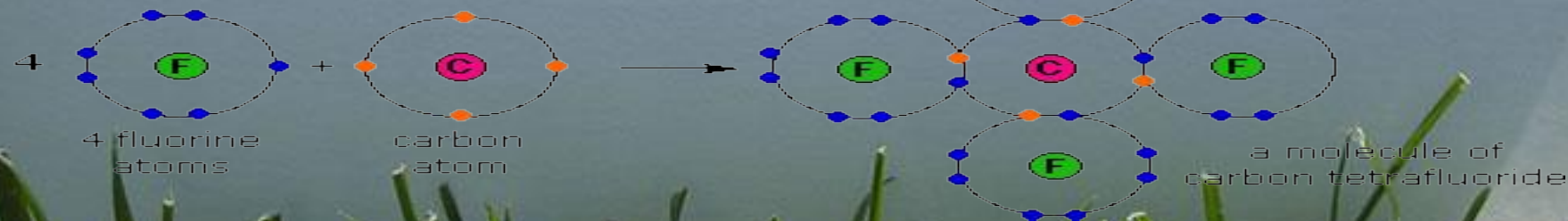
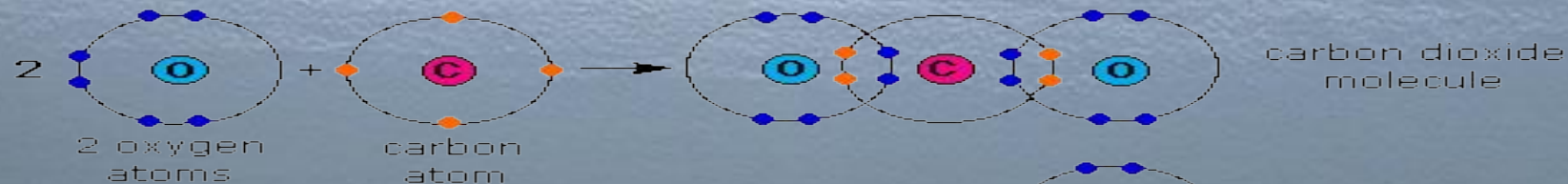
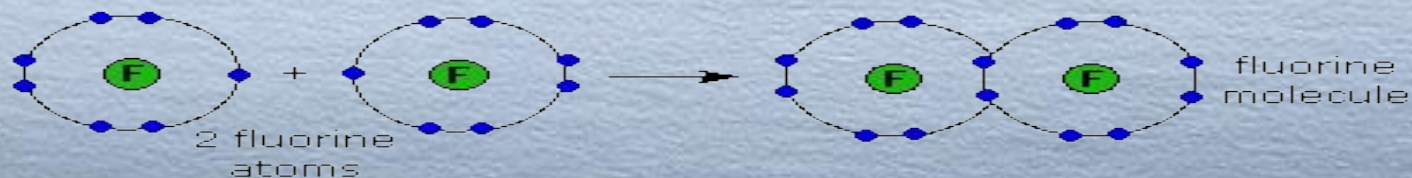
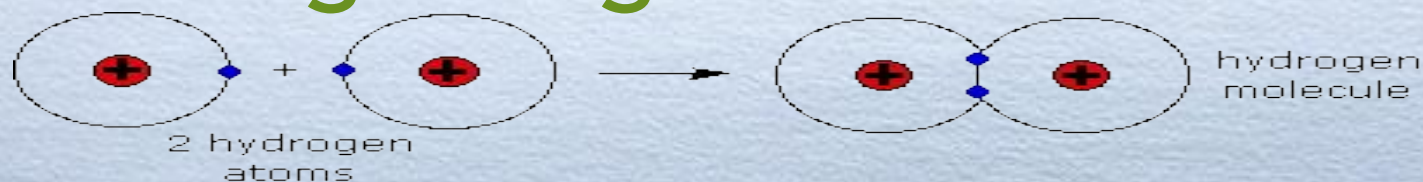
Numbers 15-50:

Use the examples from the previous slide to help you complete electron-dot diagrams for the first 36 elements on the periodic table.

Demonstrating Covalent Bonding using Electron-Dot Diagrams



Additional Examples of Covalent Bonding using Electron-Dot Diagrams



Covalent Molecules

Use the example from the previous slide to help you diagram the covalent bonding between following elements.

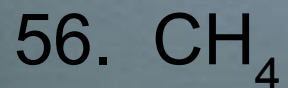
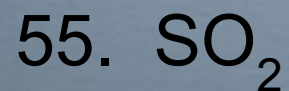
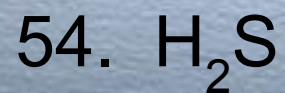
51. Hydrogen and Fluorine

52. Oxygen and Sulfur

53. Nitrogen and Nitrogen

Covalent Molecules

Use the chemical formulas below to help you diagram the covalent bonds.



Chemical Bonding

Congratulations!

You have completed the Chemical Bonding Chapter and are ready for the Chapter 1 assessment.

Good Luck!