

Ionic Bonds

Objectives

- **Explain** how ionic bonds form.
- **Describe** how positive ions form.
- **Describe** how negative ions form.
- **Explain** why ionic compounds are neutral.

I. Forming Ionic Bonds

A. What Is an Ionic Bond? An ionic bond is a bond that forms when electrons are transferred from one atom to another atom.

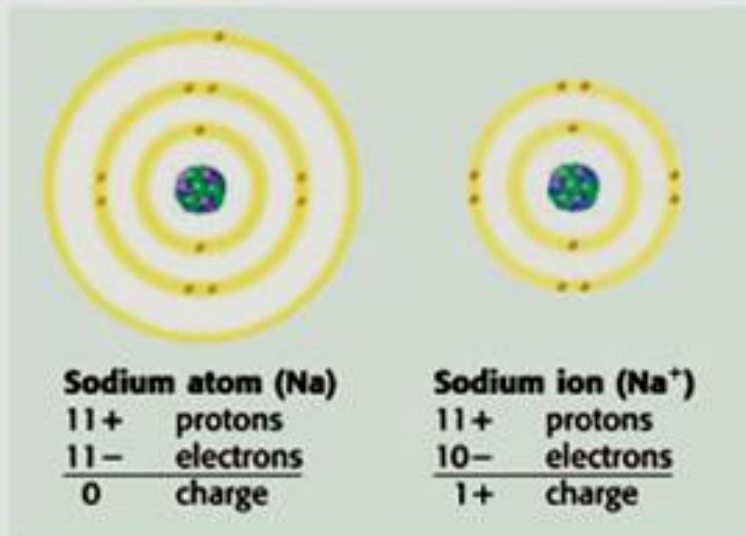
B. Charged Particles Ions are charged particles that form when atoms gain or lose electrons.

II. Forming Positive Ions

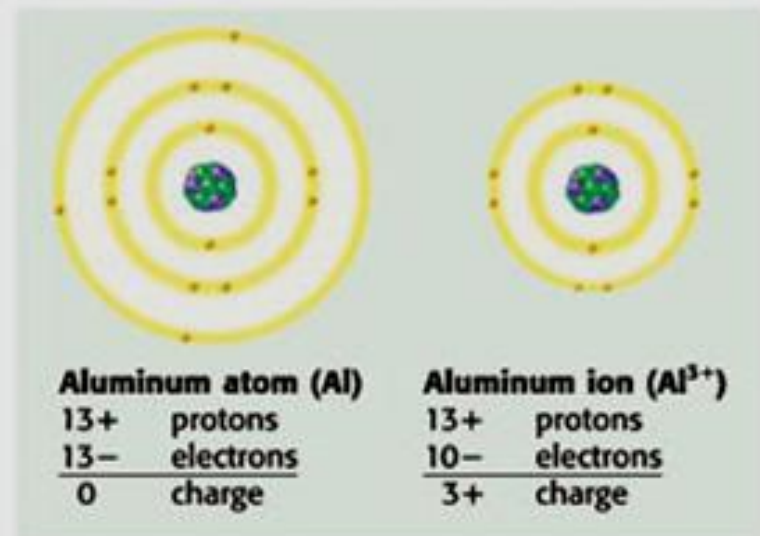
A. Metal Atoms and the Loss of Electrons Atoms of most metals have few valence electrons. Metal atoms tend to lose these valence electrons and form positive ions.

B. The Energy Needed to Lose Electrons Energy is needed to pull electrons away from atoms. Only a small amount of energy is needed to take electrons from metal atoms.

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.



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.



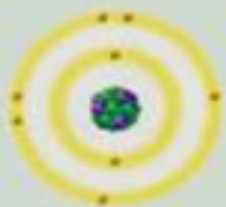
III. Forming Negative Ions

A. Nonmetal Atoms Gain Electrons The outermost energy level of nonmetal atoms is almost full. Only a few electrons are needed to fill the outer level of nonmetal atom. So, atoms of nonmetals tend to gain electrons from other atoms.

B. The Energy of Gaining Electrons Energy is given off by most nonmetal atoms when they gain electrons. The more easily an atom gains an electron, the more energy the atom releases.

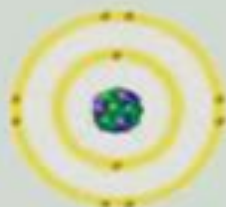
Here's How It Works: During chemical changes, an oxygen atom gains 2 electrons in the second energy level from another atom. An oxide ion that has 8 valence electrons is formed. Thus, its outermost energy level is filled.

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.



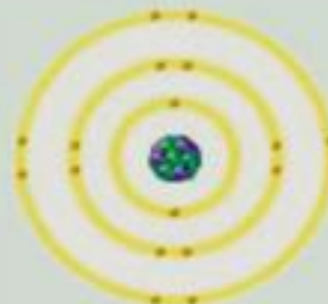
Oxygen atom (O)
8+ protons
8- electrons

0 charge



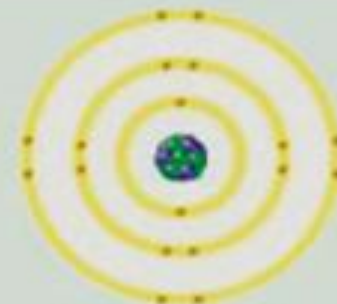
Oxide ion (O²⁻)
8+ protons
10- electrons

2- charge



Chlorine atom (Cl)
17+ protons
17- electrons

0 charge

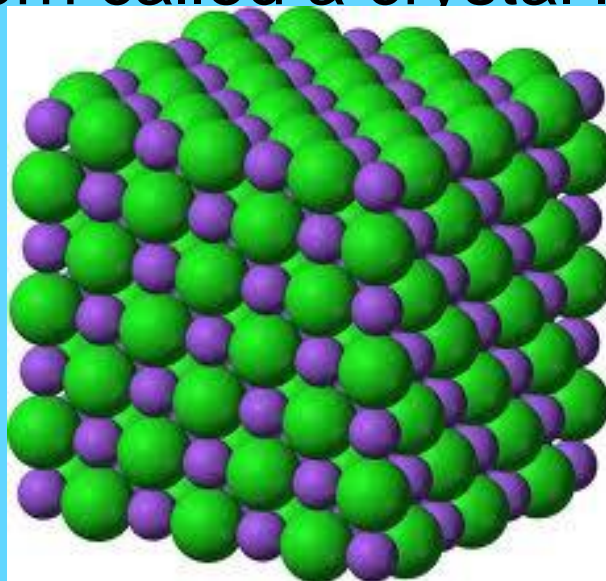


Chloride ion (Cl⁻)
17+ protons
18- electrons

1- charge

IV. Ionic Compounds

A. Crystal Lattices When ionic bonds form, the number of electrons lost by the metal atoms equals the number gained by the nonmetal atoms. The ions that bond are charged, but the compound formed is neutral because the charges of the ions cancel each other. When ions bond, they form a repeating three-dimensional pattern called a crystal lattice.



Sodium Chloride

Science Journal Entry #4

Draw electron shell diagrams for the following atoms. Then tell if the two atoms in each set will form ionic bonds with each other. Honors students must also identify the charge on each atom. The periodic table is on pg.338 in your book.

1. Potassium and Iodine
2. Magnesium and Bromine
3. Calcium and Chlorine
4. Lithium and Fluorine
5. Boron and Chlorine
6. Barium and Iodine