IONIC BONDING
Octet Rule:
All elements gain or lose electrons so they wind up with the same electron configuration as the nearest noble gas.

Ion:
But when an atom gains or loses electrons, it becomes a charged particle called an ion.

Ionic Bond:
An ionic bond is a bond that forms when electrons are transferred from one atom to another atom.
Ionic Bond

- Forms when valence electrons are transferred (gained or lost) from one atom to another to complete each other's outer energy levels.
- Forms between metals “+” ions and nonmetals “-” ions
- When formed, the # of electrons lost equals the # of electrons gained.
Ionic Compounds

- Compounds are NEUTRAL!
- The charged cancel each other out!
- Some of the properties of ionic compounds include, Strong bond, high melting point and boiling points.
Forming Positive “+” Ions

Occurs when an atom loses valence electrons. An atom now has more protons than negative electrons. (unbalanced + and -)

Protons > Electrons (more positives than negatives in the atom)

Hydrogen and Metals form + ions because they have few valence electrons

Only takes a small amount of energy to lose their few valence electrons.

Example – G1 and G2

Ion is called a Cation
5. How are positive ions formed?

By losing electrons

What happens to the balance?
Forming Negative “-” Ions

An ion with a negative charge, formed when an atom gains valence electrons in a reaction. Electrons > Protons (more negatives than positives in the atom)

Non-metals tend to form “-” ions. Their atoms have 5, 6, or 7 electrons in their valence shell and it is easier for them to gain electrons to acquire a stable shell than to lose at least 5.

Ending of name changes…-ide
Ex G17 – Fluorine → Fluoride

Ion is called a Anion
7. How are negative ions formed?

By gaining electrons

What happens to the balance?
Oxidation

Oxidation in a chemical reaction occurs when one of the following occurs

1. An element or compound gains oxygen
2. A compound loses hydrogen
3. An atom or ion loses electrons
4. The substance/compound/atom is then considered to be oxidized and its oxidation state has increased
Oxidation Number

- A number that shows the oxidation state of an element in a compound.
  - written in Roman numerals
  - placed in brackets after the name of the element.
  - It is only included in the name of a compound when the element has more than one oxidation state.
Oxidation Number Examples

- Iron (III) chloride
  - oxidation # = 3
  - oxidation state = 3+

- Lead (IV) oxide
  - oxidation # = 4
  - oxidation state = 4+
Reduction

- In a chemical reaction when one of the following occurs
  - A compound loses oxygen
  - A compound or element gains hydrogen
  - An atom or ion gains electrons
  - A substance that undergoes reduction is said to be reduced, and its oxidation state is decreased. (It is the opposite of Oxidation)
Writing Ionic Formulas

Always write + ion or metal first
Write – ion or nonmetal second

Polyatomic Ion – an ion that is made up of more than one ion

• When written name remains the same
• Use parentheses

Roman Numerals show oxidation number

An oxidation number is the number of valence electrons an atom gains or loses to become stable.

Make sure the compounds are neutral.
Forming Positive and Negative Ions

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
0 charge

Sodium ion (Na⁺)
11+ protons
10− electrons
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
0 charge

Aluminum ion (Al³⁺)
13+ protons
10− electrons
3+ 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