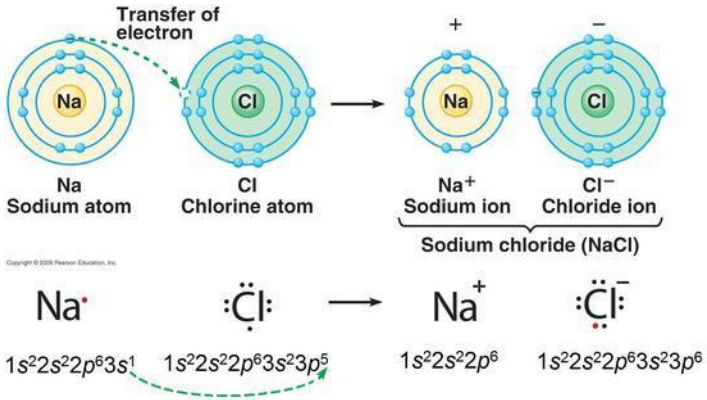
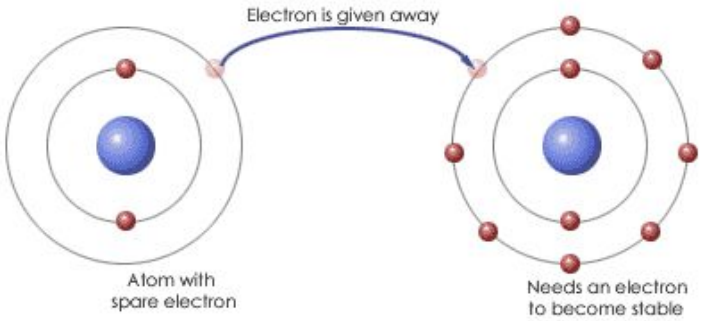
NOTES on Chapter 5 Atoms and Bonding

5.2 Ionic Bonds

Atoms with 5,6, or 7 valence electrons usually become more stable with 8.
Atoms with 1,2, or 3 valence electrons can lose electrons and become more stable.

When these two types of atoms combine, both atoms become more stable.





When this kind of combining occurs, it creates atoms with an electric charge – an ion.

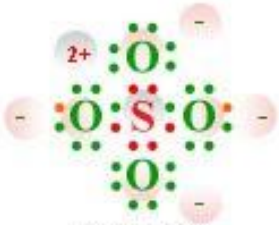
When Na loses an electron it becomes a positive ion. When Cl gains an electron, it becomes a negative ion.

8.49 Ions and Their Charges

Ions and Their Charges

Name	Charge	Symbol or Formula
Lithium	1+	Li^+
Sodium	1+	Na^+
Potassium	1+	K^+
Ammonium	1+	NH_4^+
Calcium	2+	Ca^{2+}
Magnesium	2+	Mg^{2+}
Aluminum	3+	Al^{3+}
Fluoride	1–	F^-
Chloride	1–	Cl^-
Iodide	1–	I^-
Bicarbonate	1–	HCO_3^-
Nitrate	1–	NO_3^-
Oxide	2–	O^{2-}
Sulfide	2–	S^{2-}
Carbonate	2–	CO_3^{2-}
Sulfate	2–	SO_4^{2-}
Phosphate	3–	PO_4^{3-}

Ions that are made of more than one atom are called polyatomic ions. ("many")



sulfate ion

ammonium ion

Ionic bonds form as a result of the attraction between positive and negative ions.

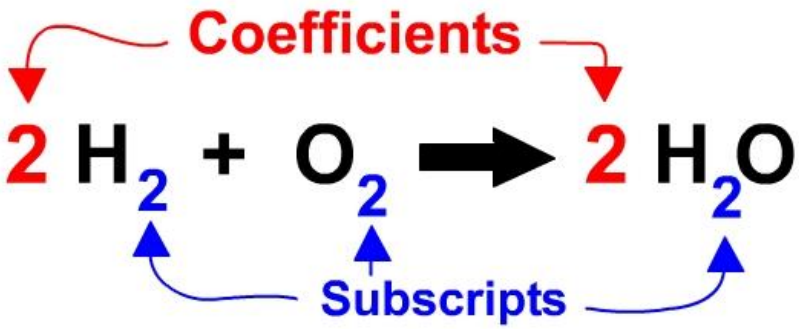
A compound that consists of a positive and a negative ion (like NaCl) is called an ionic compound.

A chemical formula is a combination of symbols that shows the ratio of elements in a compound.

$MgCl_2$ What does this chemical formula tell you?

When ionic compounds form, the ions come together in a way that balances out the charges on the ions. The chemical formula for the compound reflects this balance.

A subscript tells you the ratio of elements in the compound.



For an ionic compound, the name of the positive ion comes first, followed by the name of the negative ion.

The name of the positive ion is usually the name of a metal.

If the negative ion is a single element, such as sodium chloride, the end of its name changes to –ide.

MgO is named magnesium oxide.

If the negative ion is polyatomic, its name usually ends in –ate or –ite. Ammonium nitrate, NH_4NO_3.

Turn to page 161 in your book for the Skills Activity.

Ionic compounds are hard, brittle crystals that have high melting points. When dissolved in water or melted, they conduct electricity.

Crystals are an orderly, three-dimensional arrangement.

They will usually have sharp edges, corners, flat surfaces, and a cubic shape.

Halite, table salt, sodium chloride

In an ionic compound, every ion is attracted to ions of opposite charge that surround it. The pattern remains the same no matter what the size of the crystal.

Because of this strong ionic bonding and attractions among the ions, many crystals are hard and brittle

When you heat an ionic compound, its energy increases. Once it has enough energy to overcome the attractive force between them, they break away from each other. In other words, they melt. This takes a lot of energy. Table salt must be heated to 801°C before the crystal melts.

Table Salt (Sodium Chloride)

When the ion compounds are in their solid state, their bonds are so strong that they can't move. If they can't move, they cannot conduct electric current.

However, when the ionic crystals are melted or dissolved in water, they are free to move about, permitting the solution to conduct electricity.