Period:

# Ionic Compounds

## Ion Charges Add

An ion is an atom with a positive or negative charge because it has gained or lost electrons. With multiple ions, their charges add together.

# Oxidation Numbers $Na^{1+} + Na^{1+} = 2 + charge$ So $Na_2^{1+} = 2 + charge$

Each Sodium atom gives up 1 electron, so 2 Sodium atoms (Na2) will give up 2 electrons and have a charge of 2+.

# Opposite Ions Attract

Just as with protons and electrons: oppositely charged atoms attract. Positive ions (metals) attract negative ions (nonmetals), forming ionic compounds.

# Positive ions attract Negative ions

Positive ion of 2+ 
$$Mg^{2+}$$
 attracts  $F^{1-}$  Negative ion of 1-

#### Electron Arrows

Electron arrows are an easy way to visualize electrons being given or accepted by atoms.

# The Symbols

Losing 1 electron Gaining 1 electron An ionic bond

The number of electron arrows comes from the oxidation numbers. Positives give electrons; negatives receive,

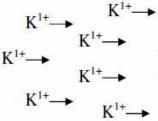
$$Mg^{2+}$$
  $\longrightarrow$   $F^{1-}$ 

Magnesium's oxidation number is +2, so it will lose 2 electrons. Sulfur's oxidation number is -1, so it will gain I electron.

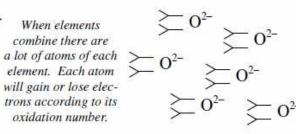
## Ionic Compounds

How do elements combine to form compounds? Elements rarely occur naturally as individual atoms. Instead. each sample of an element contains a huge number of atoms! When placed together most elements will begin to lose electrons (becoming a positive ion) or gain electrons (becoming a negative ion). The positive ions are attracted to negative ions and combine into ionic compounds.

Ionic compounds always combine in a particular ratio (same number of each atom) so that they are balanced, The net charge must equal zero!



will gain or lose electrons according to its oxidation number.



Each potassium loses 1 electron.

Each oxygen gains 2 electrons.

$$K^{1+} \longrightarrow D^{2-}$$

Oxygen is not full, so it will attract another K.

$$K^{1+} \longrightarrow C^{2-}$$

Oxygen is now full and the compound is balanced,

Each oxygen will attract two potassiums, so potassium and oxygen will always combine as K2O.

## Limiting Reactant

As atoms combine into compounds, eventually one element will run out first. This is the limiting reactant, the reactant that is limited in amount. When one element is gone, the reaction will stop.



When the wood is all burned, the fire will stop. Wood is the limiting reactant because there is still oxygen.

Magnesium and fluorine combine in a 1 to 2 ratio: MgF2. In this simplified example, the 8 fluorine atoms could combine with 4 magnesium atoms. Since there are only 3 magnesium atoms, the magnesium will run out first, making magnesium the limiting reactant. In the real world there are billions of atoms when they form compounds. Chemists are able to know how many atoms there are by the weight of the samples.

<ol> <li>Oxidation #s</li> <li>Zero</li> <li>Negative ion</li> <li>Positive ion</li> <li>Balanced</li> </ol>	<ul> <li>A. Attracted by a positive ion.</li> <li>B. Tells you how many electrons will be gained or lost by an element.</li> <li>C. Net charge of a balanced ionic compound.</li> <li>D. When the number of electrons given equals the number taken.</li> <li>E. Attracted by a negative ion.</li> </ul>	6. Use the following symbols to answer the following.  A. An electron being lost:  B. An ionic bond:  C. An electron being gained:  D. Used for a metal:  E. Used for a nonmetal:
7. Give abbreviate Calcium Ca <sup>2+</sup> Oxygen Sodium	Nitrogen Fluorine Aluminum	8. Give number of electrons gained or lost  Ca <sup>2+</sup> 2 lost

For the following six examples, combine the two given atoms using electron arrows, then give the balanced ionic compound formula.

Combine Sodium and Oxygen	Give the balanced ionic formula for Sodium Oxide.	Combine Beryllium and Fluorine	Give the balanced ionic formula for Beryllium Fluoride.
Combine Magnesium and Sulfur	Give the balanced ionic formula for Magnesium Sulfide	Combine Lithium and Phosphorus	Give the balanced ionic formula:
			Compound name:
Combine Calcium and Nitrogen	Give the balanced ionic formula:	Combine Aluminum and Oxygen	Give the balanced ionic formula for
	Compound name:		Compound name:
Write the balanced ionic comp	Na <sup>1+</sup> and S <sup>2-</sup> :	Write the balanced ionic formulas for the following:  Lithium and Oxygen:  Magnesium and Iodine:	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		Calcium and Sulfur:  Aluminum and Oxygen:	