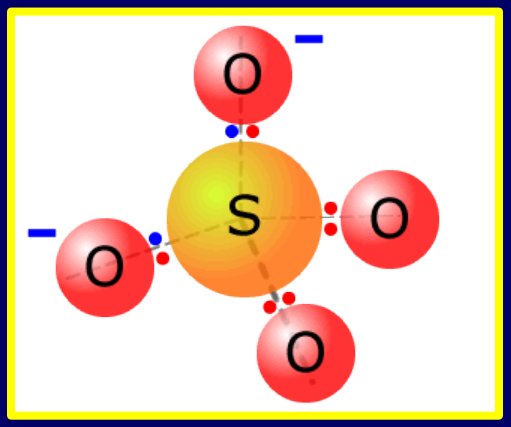
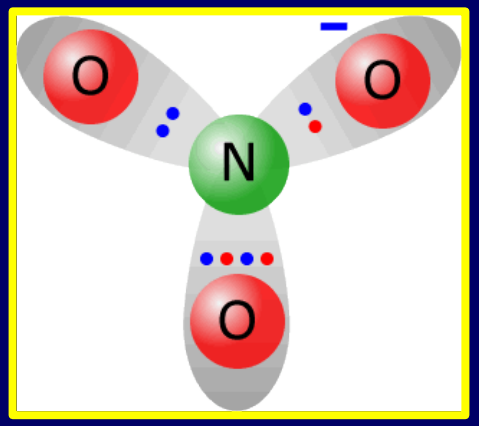
Polyatomic Ionic Compounds



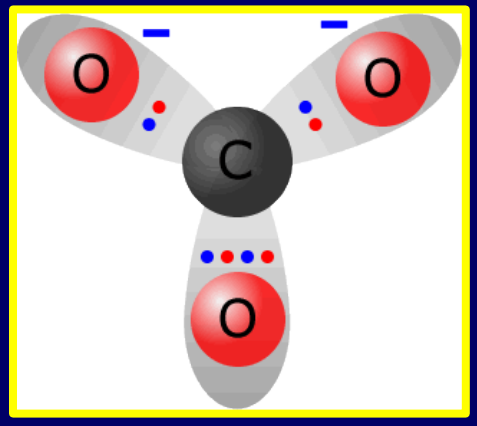
Sulfate

$(SO_4)^{-2}$



Nitrate

$(NO_3)^{-}$



Carbonate

$(CO_3)^{-2}$

Essential Standard 2.2

Understand chemical bonding and chemical interactions.

Learning Objective 2.2.2

Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions.

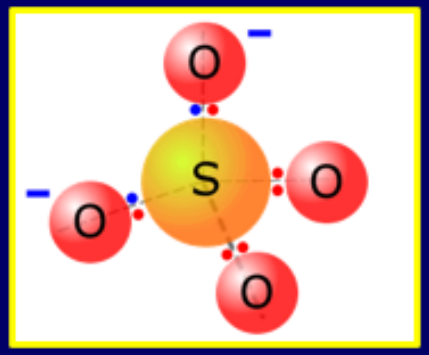
I Can Statements

At the end of this lesson, you should be able to say, with confidence:

- I can write chemical formulas for polyatomic ionic compounds
- I can name polyatomic ionic compounds given their chemical formulas

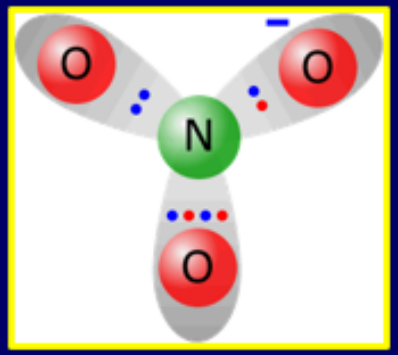
Polyatomic Ions

Polyatomic ions contain a group of positively or negatively charged atoms.



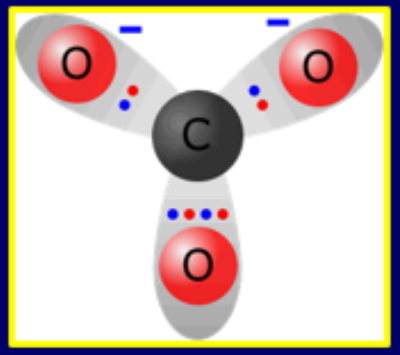
Sulfate

$(SO_4)^{-2}$



Nitrate

$(NO_3)^{-}$



Carbonate

$(CO_3)^{-2}$

The prefix poly means many, so polyatomic means many atoms.

Polyatomic Ions

All the polyatomic ion groups you will work with in this class, are on this chart.

Polyatomic Ions	
NH_4^+ $(NH_4)^+$	Ammonium
$C_2H_3O_2^-$ $(C_2H_3O_2)^-$	Acetate
ClO_3^- $(ClO_3)^-$	Chlorate
NO_3^- $(NO_3)^-$	Nitrate
OH^- $(OH)^-$	Hydroxide
CO_3^{2-} $(CO_3)^{-2}$	Carbonate
SO_4^{2-} $(SO_4)^{-2}$	Sulfate
PO_4^{3-} $(PO_4)^{-3}$	Phosphate

Polyatomic Ions

Even though the group contains a charge and can form an ionic bond, the atoms within the group are joined together by covalent bonds.

$(NH_4)^+$ $(ClO_3)^-$ $(SO_4)^{2-}$

Notice that all the elements involved are non-metals.

Polyatomic Compounds

When writing formulas, keep the polyatomic ion group in parenthesis and treat it as one binary compound.

Calcium Phosphate

Calcium Ca^{+2}

Phosphate $(PO_4)^{3-}$

$Ca_3(PO_4)_2$

Polyatomic Compounds

Any subscript within the parentheses cannot be changed.

Calcium Phosphate

Calcium Ca^{+2}

Phosphate $(PO_4)^{3-}$

$Ca_3(PO_4)_2$

Formula Writing Rules

1. **Write the symbol and positive oxidation numbered element or group first**

Ammonium Sulfate

$(NH_4)^{+1}$

* In this case, ammonium is one of the polyatomic ion groups, so just write the group with the oxidation number as a superscript.

Formula Writing Rules

2. Write the symbol of the element or group that has the negative oxidation number or charge

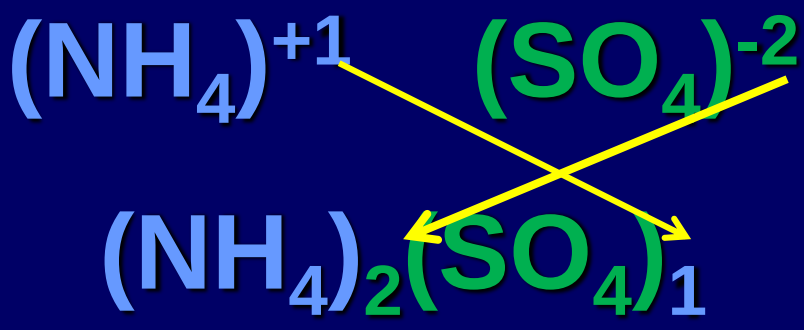
Ammonium Sulfate

$(SO_4)^{-2}$

Formula Writing Rules

3. Write oxidation numbers of each element or group, minus the charge, as the subscript for the other element. **(Criss Cross)**

Ammonium Sulfate



Formula Writing Rules

Remember that we don't write 1's as subscripts and if there is only one of that polyatomic group, the parentheses are often dropped.

Ammonium Sulfate

$(NH_4)^{+1}$ $(SO_4)^{-2}$

$(NH_4)_2SO_4$

Formula Writing Rules

When the subscripts are equal, that means there is still a 1:1 ratio, so the subscripts are often dropped.

Magnesium Carbonate

Mg^{+2} $(CO_3)^{-2}$

$MgCO_3$

Naming Polyatomic Ions

1. Write the name of the positive ion or polyatomic group

K_2SO_4

Potassium

2. Write the name of the negative ion or polyatomic group

K_2SO_4

Sulfate

Naming Polyatomic Ions

3. Place the names together

K_2SO_4

Potassium Sulfate

Just use the chart for the names each time.

Polyatomic Ions	
NH_4^+ $(NH_4)^+$	Ammonium
$C_2H_3O_2^-$ $(C_2H_3O_2)^-$	Acetate
ClO_3^- $(ClO_3)^-$	Chlorate
NO_3^- $(NO_3)^-$	Nitrate
OH^- $(OH)^-$	Hydroxide
CO_3^{2-} $(CO_3)^{-2}$	Carbonate
SO_4^{2-} $(SO_4)^{-2}$	Sulfate
PO_4^{3-} $(PO_4)^{-3}$	Phosphate

The End