

Ionic Compounds and Naming



Covalent bonds share electrons

Ionic bonds transfer electrons

Ionic Bonds



- Ionic compounds - made when two ions join.
- Are due to an **electrostatic attraction** between ions of opposite charge.
- Cations are positively charged ions (metals).
- Anions are negatively charged ions (non-metals).

Chemical Names, Symbols and Formulas.



We must have a uniform way to
represent all chemicals.

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Names are often based on a property or a discoverer.

- Sodium - Arabic word “suda” means headache.
- Hafnium - discovered in Copenhagen. (Latin = Hafnia)
- Lithium - Gk “lithos” means rock or stone
- Curium - for Marie Curie.

Symbols used in place of the name.

- O Oxygen
- N Nitrogen
- C Carbon
- H Hydrogen

*First letter is always capitalized
in a symbol - other letters are
always lower case*

- Co Cobalt
- CO Carbon Monoxide

*First letter is always capitalized
in a symbol - other letters are
always lower case*

- Sulfur S
- Selenium Se
- Strontium Sr
- Sodium Na

Formula - a combination of symbols showing composition.

- Subscript - a small number that tells *how many* atoms of the element are in the compound.
- H_2O means that **two atoms** of hydrogen are chemically bonded to one atom of oxygen.
- Subscript is written after the element it describes.
- Why isn't there anything written after the "O" for oxygen?
- If there is no number, "1" is implied.

Formula - a combination of symbols showing composition.

- Oxidation number of hydrogen is 1+ (+)
- Oxidation number of oxygen is 2- (-)
- +'s have to equal -'s
- have two (-)s therefore need two (+)'s



or

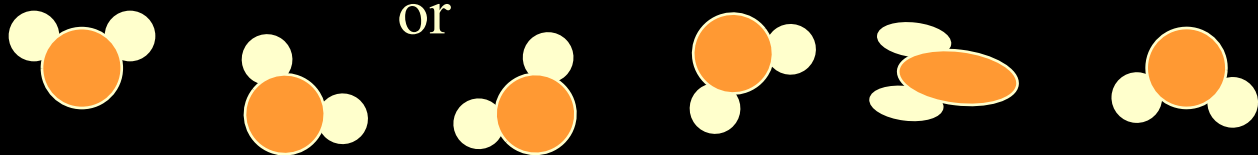


Formula - a combination of symbols showing composition.

- Coefficient - large number written in front of the formula.



- Coefficient tells how many formula units are present.



Binary Compounds

Two elements form a compound.



First name the cation normally, followed by the anion, changing the anion's suffix to “-ide”.

Aluminum Sulfur

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Aluminum Sulfide

Examples



- CaBr_2 - calcium bromide
- NaCl - sodium chloride
- H_2Se - hydrogen selenide

Formula writing

- Write the correct chemical formula that would form between
 - a) calcium and fluorine
 - b) Rubidium and oxygen
 - c) Magnesium and phosphorus

Practice problems pg.217 #'s 7-11. Write correct chemical formula and name

Part II - Naming Compounds



Positive ion (cation) is always named
and written first!

Polyatomic Ion Compounds



- Cation always goes first followed by anion.
- Do not change the polyatomic ion's name in any way. !

sodium sulfate

- Na_2SO_4 = sodium sulfate
- Na_2S = sodium sulfide
- What are the differences?

Polyatomic Ions

- If multiples of the same polyatomic ion are used, then use parenthesis to show the multiples.



Polyatomic Ions

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- Remember, OH^- is a single polyatomic unit.
- If you don't use the parenthesis it would mean 2 hydrogens but only one oxygen instead of two hydroxides.

Examples

- K_2SO_4 - potassium sulfate
- Li_3PO_4 - lithium phosphate
- BaCrO_4 - barium chromate
- $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ - ammonium dichromate

Stock Naming System

- Used with transition elements and those other which can have multiple oxidation numbers (Fe +2,+3)? Pg. 222
- Iron oxide could be
 - Fe_2O_3 or
 - FeO

Stock Naming System

- To clarify this, the oxidation number is stated immediately after the cation, then the anion is named as usual with its “-ide” ending in the case of binary compounds or the polyatomic name in the case of polyatomic ions.
- Because iron has an oxidation number of two in the formula FeO , its name is iron two oxide.
- But we use roman numerals to write it out. So. . . .
- FeO is iron(II) oxide.
- Remember the roman numeral refers to the oxidation number NOT the subscript!

Stock Naming System

- Fe_2O_3 would therefore be . . .
- Iron (III) oxide.
- What is the formula for manganese (III) fluoride?
- MnF_3
- What is the name of NiO_2 ?
- Nickel (IV) oxide.



Part III

Mercury is special!

Mercury



- Mercury II is written Hg^{+2}
- Mercury I is written Hg_2^{+2}
- Why?
- $\text{Hg}^+ + \text{Hg}^+ = \text{Hg}_2^{+2}$

Covalently Bonded Binary Molecules

- When naming things that bond covalently, (nonmetal to nonmetal), where oxidation numbers are not helpful we use a system which uses prefixes.
- Water, therefore could be called dihydrogen monooxide. Di indicating there are two hydrogens and mono indicating one oxygen. (Note the other binary rules still apply giving oxygen the “-ide” ending.
- What is the formula for trinitrogen pentoxide?
- N_3O_5