Chemical Compounds

What is a compound?

How are they formed?

Finding the ionic charge of an element?

Classifying compounds

Compounds:

-made of 2 or more elements chemically combined through a chemical reaction

-when atoms join, they do so in specific amounts or proportions to form a **molecule** (smallest part of a compound.)

example: a water molecule always consists of 2 atoms of hydrogen joined to an atom of oxygen.

Compounds have properties that are not like their component elements.

example: oxygen and hydrogen are both gases at room temperature, but chemically combine to make a liquid at room temperature.

All compounds of chemical names.

water=dihydrogen oxide

Salt=sodium chloride

The Chemical Formula contains the symbol for each element in the compound and shows the number of each atom.

carbon dioxide= 1 atom of carbon joined to 2 atoms of oxygen.=CO_2

How are chemical compounds formed?

Chemical compounds are the result of the **chemical bonding** of atoms.

chemical bond:

-the forces that attract atoms to each other in compounds.

-elements combine or bond together because of their valence electrons (remember, valence electrons are in the outer shell of an atom.)

-**Octet Rule:** every atom of every element wants to have 8 electrons in its outer shell.

Finding the Ionic Charge:

Ionic Charge of a Metal:

-A metal LOSES electrons.

-This means a metal has a positive ionic charge.

-The ionic charge is the number of electrons the atom wants to give away.

example: K (Potassium)

K has 1 valence-shell electron.

K gives away this single electron.

The ionic charge of potassium is +1.

We write this as: K^{+1}

Ionic Charge of a Non-Metal:

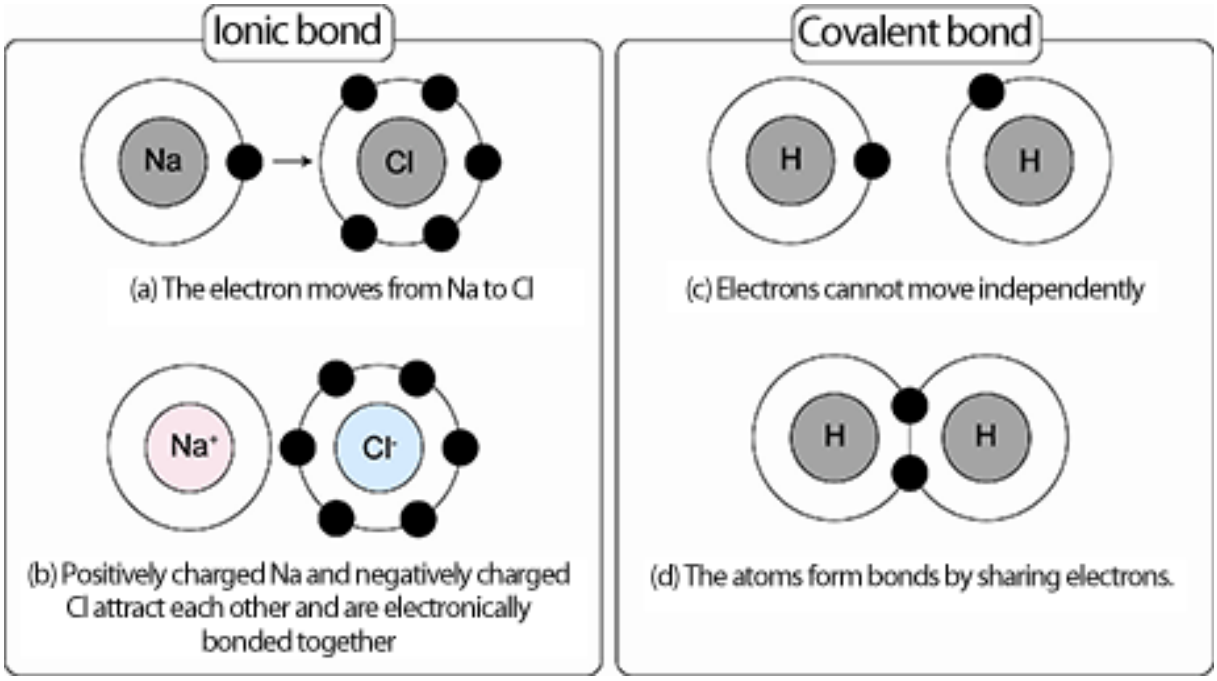
Look at the number of electrons in the outer shell. Calculate how many more electrons that atom needs to have 8. That number is the ionic charge with a minus charge.

example: Oxygen has 6 valence electrons.

Oxygen needs 2 more to have 8. Therefore oxygen wants to borrow/gain these 2 electrons.

The ionic charge of Oxygen is -2.

We write this as O^{2-}



Ionic Compounds: formed with ionic bonds (donation of electrons)

Made of metal elements and non-metal elements.

-can have a positive charge: **cation** (loses valence e-)

-can have a negative charge: **anion** (gains valence e-)

-attraction is strong between opposite charged particles.

Covalent Compounds: formed with covalent bonds (sharing of e-)

Made of only non-metal elements.

-can have a positive charge: **cation** (loses valence e-)

-can have a negative charge: **anion** (gains valence e-)

-attraction between molecules is weak

Please complete the Ionic vs Covalent booklet before continuing through the notes.

Naming Ionic Compounds

The Metal is always named first.

The second part of the name is the non-metal with the ending changed to "ide"

Example:

Chemical Formula	Metal Name	Nonmetal Name	Compound Name
NaCl	sodium	chlorine	sodium chloride
MgO	magnesium	oxygen	magnesium oxide
LiBr	lithium	bromine	lithium bromide

Writing Chemical Formulas of Ionic Compounds

1. Identify the ions involved, writing the cation (+) first and the anion (-) second.

2. Determine the ratio by which the elements will bond to show a net charge of zero.

3. Use subscripts to indicate the number of atoms of each element present.

* Another way: crisscross superscripts and subscripts.

Compound Name	Cation Charge	Anion Charge	Chemical Formula
Aluminum Iodide	Al^{3+}	I^{1-}	AlI_3
Lithium Bromide	Li^{1+}	Br^{1-}	LiBr
Sodium Oxide	Na^{1+}	O^{2-}	Na_2O

Multivalent Metals

can move electrons in and out of their valence shell.

For this reason, they are written with roman numerals to show how many valence electrons are in the valence shell.

Iron(ii) = Fe^{2+}

Iron (iii)= Fe^{3+}

Polyatomic Compounds

a group of atoms that stay together and have an overall charge

nitrate= $[NO_3]^{-1}$ the ion is NO3 and the overall charge is -1

carbonate= CO_3^{2-} the ion is CO3 and the overall charge is -2

Naming Covalent Compounds

When naming covalent bonds, we must use prefixes to indicate how much of each atom are present.

Just like ionic compounds, the second element name ends with "ide"

Prefix:	Number:
mono	1
di	2
tri	3
tetra	4
penta	5
hexa	6
hepta	7
octa	8

Chemical Formula	Element 1 Name	Element 2 Name	Compound Name
SO2	sulfur	oxygen	sulfur dioxide
N2O4	Nitrogen	oxygen	dinitrogen tetraoxide
SF6	Sulfur	flourine	Sulfur hexaflouride

Writing Chemical Formulas of Covalent Compounds

The prefixes tell us how many of each atom there are.

Compound Name	Element 1	Element 2	Chemical Formula
Sulfur diflouride	S	F	SF2
dinitrogen pentaoxide	N	O	N2O5
Hexaboron Silicide	B	Si	B6S