

Chemical Bonding

What is it? **Union of 2 or more atoms through the transfer or sharing of electrons.**

2 types of binary compounds

<u>Ionic</u> bonds	Covalent bonds
metal donates e ⁻ to a non-metal.	NM shares its e ⁻ with another NM
Form ions	No ions

How to determine whether an ionic or covalent bond is being shown?

1st element = metal = ionic bond
 1st " = NM = Covalent bond

Valence: The number of bonds an element can make. Same number as ion, but remove the + and - sign. 1 2 3 4 3 2 1 0

Octet rule (stable octet): Molecules bonded correctly and having the correct number of electrons on its orbits.

Going from name to molecular formula

a) Ionic bonds: Metal is the first element in the bond!!

	^{VE} Lewis structure	^{valence} x-over rule	molecular formula
M potassium chloride	$^{+1}K \rightarrow : \overset{-1}{Cl} :$	$K_1 Cl_1$	KCl
M magnesium oxide	$^{+2}Mg \rightarrow : \overset{-2}{O} :$	$Mg_2 O_2$	MgO
M calcium chloride	$^{+2}Ca \rightarrow : \overset{-1}{Cl} : \leftarrow : \overset{-1}{Cl} :$	$Ca_2 Cl_2$	$CaCl_2$
lithium sulfide	$^{+1}Li \rightarrow : \overset{-2}{S} : \leftarrow : Li^{+1}$	$Li_2 S_2$	$Li_2 S$
aluminum oxide	$^{+3}Al \rightarrow : \overset{-2}{O} : \leftarrow : \overset{-2}{O} : \leftarrow : Al^{+3}$	$Al_3 O_2$	$Al_2 O_3$

Question: If potassium chloride forms a 1:1 ratio and its molecular formula is KCl, will sodium fluoride being in the respective groups also form a 1:1 ratio?

yes

What about calcium chloride producing $CaCl_2$, what will magnesium bromide become?



b) covalent bond

Prefixes

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

- x-over rule does not need to be done because it was **already done**, the number of atoms is in the name.

- Hydrogen forms a covalent bond.
- Boron forms a covalent bond.

	ve Lewis diagram	molecular structure
C_4Cl_4 CCl_4 carbon tetrachloride		CCl_4
S_2Cl_2 SCl_2 sulfur dichloride		SCl_2
H_2S_2 H_2S dihydrogen sulfide		H_2S
phosphorus trichloride		PCl_3

7 diatomic gases

Form covalent bonds and always found as a **pair** of atoms bonded with themselves.

not

I Have No BRight Or CLever Friends

F_2, Cl_2, Br_2, I_2	O_2	N_2	H_2

Wrong, this has too many electrons!

Wrong, no octet

Correct. Double bond obeys the octet rule.



Going from molecular structure to name

a) Ionic rule: Metal is the first element

- 1- Write name of 1st element
 - 2- Write name of second element
 - 3- End second element with suffix 'ide'
- * prefixes are never used

Na_3P	Al_2O_3	Li_2S	NaCl	CaCl_2
Sodium phosphide	aluminum oxide	Lithium sulfide	Sodium chloride	calcium chloride

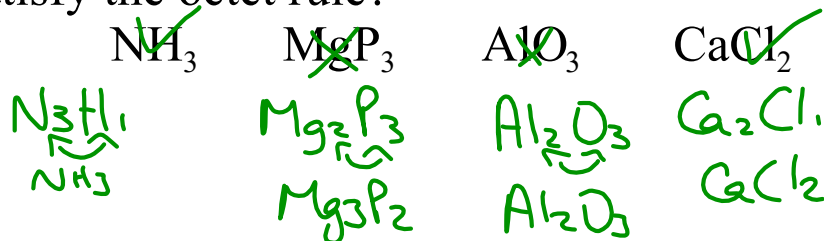
b) Covalent rule: non-metal is the first element!!

- 1- 1st element use prefix if more than one atom
- 2- 2nd element use prefix if more than one atom. Use 'mono' if the atom is oxygen and there is only one atom.
- 3- Always end second element with suffix 'ide'

P_2S_3	HCl	H_2O	H_2S	SF_2	CCl_4
diphosphorus trisulfide	Hydrogen chloride	dihydrogen monoxide	dihydrogen sulfide	sulfur difluoride	carbon tetrachloride

Past Exam Questions

1. Four existing common compounds are listed below: Which of the above compounds does not satisfy the octet rule?



2. What is the molecular formula of sodium nitride?

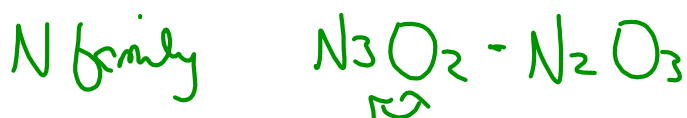
- A) S₃N **B) Na₃N** C) NaN D) NaN₃



3. Which group of substances consists only of substances formed by covalent bonds?

- A) ~~K₂O~~, PCl₃, H₂S C) CH₄, ~~C₂S~~, NCl₃
B) ~~NaCl~~, MgO, AlF₃ **D) NH₃, O₂, P₂O₃**

4. Element X combines with oxygen to form the compound X₂O₃. To which family in the periodic table could element X belong?



5. An element from group 2 is bonded with a halogen. Which compound correctly shows this bond?

- A) MgCl₂** B) Mg₂Cl C) MgCl D) Mg₂Cl₇

Attachments

Chemical Party.mp4

Ionic and covalent bonding animation.mp4