

Chapter 3: Chemical Compounds

Sept 12, 2022

Chemistry Department, Cypress College

Lecture and Lab Weekly Agenda

Lab Section

- Lab Safety Quiz
- Begin Exp 2 - Nomenclature

Lecture Section

- Go over homework assignment; present your work for 1pt EC
- Review Ch 3+8 - Chemical Compounds and Types of Bonding
- Finish up Ch 3 lect and worksheet
- Homework and quiz 3 released Fri, Sept 16 at 3pm
- Homework due Fri, Sept 23 at 11:59pm
- Quiz 3 due Mon, Sept 19 at 11:59pm

Review: Electronegativity of Ionic and Molecular Compounds

Naming Molecular Compounds

Acids and Bases

Introduction to Bonding

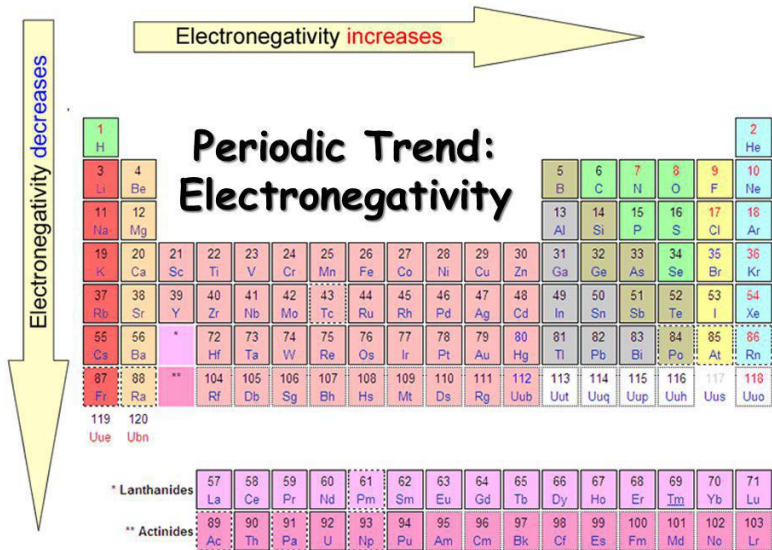
Ionic Bonding

- Electrons transferred from metal to nonmetal
- Ionized atoms and electrostatic interactions

Covalent Bonding (CB)

- Sharing of electrons between atoms (usually look at as pairs)
- Generally occurs between nonmetals in molecular elements, molecular compounds, and polyatomic ions

Consideration of Electronegativity



Practice: Ionic or Molecular compounds?

Determine whether the following compounds are ionic or molecular.

- Cl_2CO
- MnO
- NCl_3
- CoBr_2
- K_2S
- CO
- CaF_2
- HI
- CaO
- IBr
- CO_2
- $\text{C}_6\text{H}_{12}\text{O}_6$ (sugar)

Practice: Polarity

Which of the following is the most polar bond?

C–C; C–H; N–H; O–H; F–H; Se–H

Monoatomic and Polyatomic Ions

Period	IA (1)												IIIA (13)					VIIIA (18)				
	IIA (2)																					
1																						
2	Li ⁺	Be ²⁺													N ³⁻	O ²⁻	F ⁻					
3	Na ⁺	Mg ²⁺	IIIB (3)	IVB (4)	VB (5)	VIB (6)	VIIB (7)	VIII (8) (9) (10)			IB (11)	IIB (12)	Al ³⁺		P ³⁻	S ²⁻	Cl ⁻					
4	K ⁺	Ca ²⁺										Zn ²⁺				Se ²⁻	Br ⁻					
5	Rb ⁺	Sr ²⁺									Ag ⁺	Cd ²⁺				Te ²⁻	I ⁻					
6	Cs ⁺	Ba ²⁺																				
7																						

Transition metals typically form ions with variable charges.

Monoatomic and Polyatomic Ions

B BO_3^{3-} borate	C CO_3^{2-} carbonate	N NO_3^- nitrate NO_2^- nitrite N^{3-} nitride	O O_2^{2-} peroxide O^{2-} oxide	F No oxoanions F^- fluoride
	Si SiO_4^{4-} silicate	P PO_4^{3-} phosphate P^{3-} phosphide	S SO_4^{2-} sulfate SO_3^{2-} sulfite S^{2-} sulfide	Cl ClO_4^- perchlorate ClO_3^- chlorate ClO_2^- chlorite ClO^- hypochlorite Cl^- chloride
		As AsO_4^{3-} arsenate AsO_3^{3-} arsenite As^{3-} arsenide	Se SeO_4^{2-} selenate SeO_3^{2-} selenite Se^{2-} selenide	Br BrO_4^- perbromate BrO_3^- bromate BrO_2^- bromite BrO^- hypobromite Br^- bromide
			Te TeO_4^{2-} tellurate TeO_3^{2-} tellurite Te^{2-} telluride	I IO_4^- periodate IO_3^- iodate IO_2^- iodite IO^- hypoiodite I^- iodide

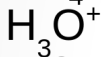
Additional Polyatomic Ions



thiocyanate



ammonium



hydronium



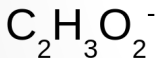
peroxide



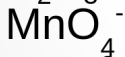
hydroxide



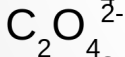
cyanide



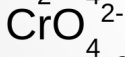
acetate



permanganate



oxalate



chromate



dichromate

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Naming Molecular Compounds

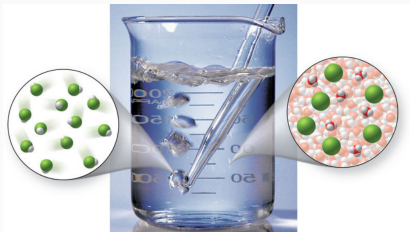
Prefix	Number	Prefix	Number	Prefix	Number
mono-	1	penta-	5	octa-	8
di-	2	hexa-	6	nona-	9
tri-	3	hepta-	7	deca-	10
tetra-	4				

1. Use numerical prefix for the element (usually ignore the first when using “mono”)
2. Add “-ide” to the second element

Naming Binary Molecular Compounds

- H_2O
- N_2O_4
- CO
- CH_4

Naming Acids and Bases



1. If anion ends in “-ide,” add “hydro” before the root of the anion name followed by “-ic acid”
2. If anion ends in “-ate,” use the root of the anion name followed by “-ic acid”
3. If anion ends in “-ite,” use the root of the anion name followed by “-ous acid”

Practice: Naming the Acid

- HCl
- HNO_3
- H_2CO_3
- H_2SO_3

Definition(s) of an Acid

Arrhenius Acid - dissociation of acid in water to yield the ions

e.g. $\text{HCl(aq)} \rightarrow \text{H}^+(\text{aq}) + \text{Cl}^-(\text{aq})$

Brønsted Acid - any species that can donate a proton H^+

Lewis Acid - donation of a pair of electrons