

Chapter 2 – Atoms

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August 25 & August 27, 2020

- Dalton's Atomic Theory:
 1. Elements are made of atoms
 2. All atoms of the same element are the same
 3. Different atoms from different elements are different
 4. Certain atoms can combine
 5. No creation or destructing of atoms (conservation of mass)
- Constant Composition – All compounds have the same composition (Water is always H_2O)
- Multiple Proportions – Compounds come together in whole numbers (Always H_2O , never $H_{.5}O$)
- JJ Thompson – Used cathode ray to determine that atoms have tiny negative particles, but, because atoms are neutral, there must be positive charges to counter the negative
- Ernst Rutherford – The gold foil experiment shot alpha particles at source of atoms
 1. Most went through the atoms
 2. A few large deflections

He concluded...

 3. Atoms are mostly open space
 4. Center has positive charge
- Modern concept of atom – Protons and neutrons in nucleus. Electrons on outside
- Different chemical properties are from the number and arrangement of the electrons
- Periodic Table:

1. Columns up and down, rows left to right
 2. Column 1 – Alkali Metals
 3. Column 2 – Alkaline Earth Metals
 4. Middle – Transition Metals
 5. Column 7 – Halogens
 6. Column 8 – Noble Gases
- Properties of Metals
 1. Conduct
 2. Malleable
 3. Ductile
 4. Lustrous
 - Atomic Number – Number of protons, usually displayed at the top
 - Mass Number – Protons plus neutrons is the atomic mass
 - Isotopes – Different number of neutrons
 - Ions – Different number of electrons
 1. Cations – Positive
 2. Anions – Negative
 - Polyatomics – Charged Groups
 - Ionic Compounds (Examples):
 1. $Mg^{+2} \& Cl^{-} \Rightarrow MgCl_2$
 2. $Ca^{+2} \& PO_4 \Rightarrow Ca_3(PO_4)_2$
 3. $Cr^{+3} \& OH^{-} \Rightarrow Cr(OH)_3$
 - Common Charges:
 1. Aluminum $\Rightarrow Al^{+3}$
 2. Zinc $\Rightarrow Zn^{+2}$
 3. Silver $\Rightarrow Ag^{+1}$

What is the individual charge?

1. $CaBr_2 \rightarrow Ca^{+2} \& Br^{-1}$
2. $FeCl_3 \rightarrow Fe^{+3} \& Cl^{-1}$

3. $Pb_2O_3 \rightarrow Pb^{+3} \& O^{-2}$
4. $Co_2(SO_4)_3 \rightarrow Co^{+3} \& SO_4^{-2}$

- Naming Rules:

1. Metal with Nonmetal of known charge

- (a) Cation first
- (b) “-ide” ending on the anion

Examples

- (c) $NaCl \rightarrow$ Sodium Chloride
- (d) $MgS \rightarrow$ Magnesium Sulfide

2. Metal with Nonmetal of unknown charge

- (a) Cation followed by roman numeral that equals the charge

Examples

- (b) $FeCl_2 \rightarrow$ Iron (II) Chloride
- (c) $CuN \rightarrow$ Copper (III) Nitride

3. Polyatomic

- (a) Use the name

Examples

- (b) $NaOH \rightarrow$ Sodium Hydroxide
- (c) $CuSO_4 \rightarrow$ Copper Sulfate

4. Nonmetal and Nonmetal

- (a) Use prefixes to denote number of atoms:

Number	Prefix
1	Mono-
2	Di-
3	Tri-
4	Tetra-
5	Penta-
Examples	

- (b) $BF_3 \rightarrow$ Boron Trifluoride
- (c) $NO \rightarrow$ Nitrogen Monoxide (When there is one, sometimes mono is dropped, so this could be nitrogen oxide)
- (d) $N_2O_5 \rightarrow$ Dinitrogen Pentoxide

5. Hydrogen, Nitrogen, Oxygen, and all of the halogens

- (a) All appear as H_2 , N_2 , O_2 , etc.

- Hydrates

1. $CaCl_2 \cdot 6H_2O$
2. $MgCO_3 \cdot 5H_2O$

- Strong Acids

1. Hydrochloric – HCl
2. Sulfuric – H_2SO_4
3. Nitric – HNO_3

Practice

- $Ni(SO_4)_2 \rightarrow$ Nickel (IV) Sulfate
- $BaS \rightarrow$ Barium Sulfide
- $Cr_2CrO_4 \rightarrow$ Chromium (I) Chromate
- $ZnO \rightarrow$ Zinc Oxide
- Iron (III) Sulfate $\rightarrow Fe_2(SO_4)_3$
- Tetraboron Difluoride $\rightarrow B_4F_2$
- Potassium Phosphate $\rightarrow K_3PO_4$
- Aluminum Nitrate $\rightarrow Al(NO_3)_3$