lab lecture #3 (9/29/15)
- covalent compounds / mixture
- Expt A2: naming compounds
  - inorganic compounds
    - ionic inorganic compound
      - binary ionic
    - compounds with polyatomic ions
    - hydrates
  - acids
  - inorganic covalent compounds
    - binary covalent
  - organic compounds
- break
- Expt A1
  - notes
  - sample calculation
  - explain lab report due on thurs
  - make up data / learn how to graph.

- crucible
- test tube
Covalent compounds:
- Atoms share electrons
- Usually between non-metal + non-metal

Ex.
H₂
H••H → H₂+H₂

H₂O

Hydrogen chloride

Mixture vs. Compound?
Mixture: mix of substance
→ No bonds formed between them (ionic or covalent)
→ Can be separated.

Ionic compounds are not molecules.

Molecule is basic unit that you can separate with physical boundary

Formula unit.
Compounds also classified as:

- Organic compounds (carbon)
  - H₂O, N, S, P
  - Mostly covalent compounds.

- Inorganic compounds (chemicals w/o C)
  - Ionic compound
  - Mostly A₂
  - Covalent compound

Inorganic compounds:

1. Ionic
   - Binary ionic compound
     - Made from 2 elements.
       - NaCl → Sodium chloride.

- Name cation 1st, write out full name.
- Name anion 2nd.
  - Change the last letter of elements name to "ide!"
ex. Nitrogen – nitride
Oxygen – oxide
Sulfur – sulfide
Selenium – selenide
Fluorine – fluoride
Chlorine – chloride
Bromine – bromide
Iodine – iodide
Astatine – astatide

NaCl Sodium chloride
CaF₂ Calcium fluoride

→ ionic compound — don't include #

FeCl₃ Iron (III) chloride
PbO₂ Lead (IV) oxide

2) Ionic compounds with polyatomic ion.

Covalent molecule that carries a net +/− charge.

\[ \text{Na}_2\text{CO}_3 \]
\[ \text{Na} \leftrightarrow \text{CO}_3^{2−} \]

1) Common polyatomic cation.

ammonium \( (\text{NH}_4^+) \)
Mercury (I) \( (\text{Hg}_2^{2+}) \)
(5) Common polyatomic anions.

1. Not oxoanion (does not have O).
   - CN⁻ cyanide
   - SCN⁻ thioncyanate

2. Oxoanions (with oxygen).
   - Oxoanion that only has 1 member in its family.
     - Example: NOₓ

   \[ \text{# of O} \uparrow \text{ate} \downarrow \text{ite} \] \[ \text{NO}_3^⁻ \text{ nitrate} \]
   \[ \text{SO}_3^²⁻ \text{ sulfite} \]
   \[ \text{SO}_4^²⁻ \text{ sulfate} \]
   \[ \text{PO}_4^³⁻ \text{ phosphate} \]
   \[ \text{PO}_3^³⁻ \text{ phosphite} \]

3. Oxoanion that has 4 members in its family.
   - Chlorine oxoanion:
     - Prefix: per
     - Suffix: chlorate

   \[ \text{# of} \] \[ \text{ClO}_4^⁻ \text{ perchlorate} \]
   \[ \text{ClO}_3^⁻ \text{ chlorate} \]
   \[ \text{ClO}_2^⁻ \text{ chlorite} \]
   \[ \text{ClO}⁻ \text{ hypochlorite} \]
③ Misfits.

④ H Containing oxoanion.

\[ \text{SO}_4^{2-}, \text{CO}_3^{2-}, \text{PO}_4^{3-}, \text{HSO}_4^-, \text{HCO}_3^-, \text{HPO}_4^{2-}, \text{H}_2\text{PO}_4^-, \text{OH}^- \]

hydrate
- ionic compound incorporates water molecules in each formula unit.

ex \( \text{MgCl}_2 \cdot 2\text{H}_2\text{O} \)

magnesium chloride + di

\( \text{MgSO}_4 \cdot 7\text{H}_2\text{O} \)
magnesium sulfate heptahydrate.

\( \text{Cu SO}_4 \cdot 5\text{H}_2\text{O} \)
copper(II) sulfate pentahydrate
Acid.

Hydrogen containing compounds typically used as an aqueous solution in homogenous mixture in water.

1. Binary acid (made of elements).

   HCl  HBr  HF

   hydro + ic acid
   prefix  non-metal root

   hydrochloric acid
   hydrobromic acid
   hydrofluoric acid.

2. Oxoacid (thing with oxygen, polyatomic ion).
   - same as polyatomic ion,
     'ate' → 'ic'
     'ite' → 'ous' + acid.

   H$_2$CO$_3$  H$_2$SO$_4$  H$_2$SO$_3$
   Carbonic acid  Sulfuric acid  Sulfurous acid.

   CO$_3^{2-}$  SO$_4^{2-}$  SO$_3^{2-}$
   Carbonate  Sulfate  Sulfite.
HClO₄
perchloric acid

HClO⁻
hypochlorous acid.

Covalent compound: O (organic)/organic).

→ NO, NO₂, N₂O, N₂O₄.

→ # matters in the name.

- binary covalent compound (2 elements).
  1. element w/ lower group # on periodic table.
     → Same group #, name higher
     period # goes 1st.

  2. 2nd element’s name ends w/ ‘ide’

→ insert # prefix prior to each element’s name.

N₂S₅
dinitrogen pentasulfide

BF₃
boron trifluoride
- oxygen.
  
  10: monoxide
  
  20: dioxide
  
  30: trioxide
  
  40: tetroxide
  
  50: pentoxide
  
  60: hexoxide
  
  70: heptoxide
  
  8: octoxide
  
  9: nonoxide
  
  10: deoxide

H₂O

carbon monoxide
  
  dihydrogen

② organic
  
  - CH - single bond - alkanes.
  
  CH₄ methane  C₂H₆ ethane.

  "ane"
How to read a burette

3.5.