Chemistry Lab

Regina Zibuck, Ph.D.
rzibuck@wayne.edu

Description

- One or more tasks/experiments
- Answer questions involving the science processes of chemistry
- Acids & Bases
- Aqueous Solutions (new)

Routine Information

- Interpretation of experimental data (tabular and/or graphic)
- Observation of an experiment set up and running
- Computer or calculator sensors/probes
- Stoichiometry : mole conversions and percentage yield

Routine Information

Nomenclature and formula writing - symbols and charges for the polyatomic ions by memory: nitrate, carbonate, phosphate, acetate, sulfate, ammonium, bicarbonate, and hydroxide (“ite” forms of “ates” listed)

Safety

- Students must wear:
  - Closed-toe shoes with socks
  - Loose fitting pants or skirts that come to the ankles
  - Lab coat or lab apron
    - Long-Sleeved Shirt (if wearing a lab apron)
  - Indirect vent or unvented chemical splash proof goggles. Eye protection C.
  - Long hair must be tied back
  - Gloves are optional

What Students Should Bring

- Safety gear
- Something to write with
- ONE 8.5 X 11 sheet of paper (double sided, sheet protectors are allowed) per student
- ONE stand alone calculator of any type (per student)

What the Supervisor Provides

- Everything the student will need
  - This may include:
    - Glassware
    - Reagents
    - Balances
    - Hot plates
    - Thermometers
    - Probes
    - Stirrers
    - A periodic table and any constants

Changes for 2020

- 1 new topic & 1 old topic:
  - Acids & Bases
  - Aqueous Solutions

How to prepare participants

- Make sure students read the directions and pay particular attention to the description of the event (The Competition)
- Have them do many experiments together
- Have them determine their individual strengths
- Divide (and conquer) tasks during competition
- Check each other's work

How to Prepare

- Use a college level General (Freshman) Chemistry textbook
  - *Chemistry* by Zumdahl and Zumdahl
- Start with a Prep-Gen Chem book if lower level background material needed
  - *Introductory Chemistry* by Zumdahl

How to Prepare

- Use lab textbooks and search the given topics
  - Acids and Bases
  - Aqueous Solutions

How to Prepare

- Acids and Bases
  - Properties and Uses
  - Reactions
  - Titrations

Acids and Bases

- Know common acids
  - HCl, HNO_3, H_2SO_4, H_3PO_4, H_2CO_3, acetic acid, and ascorbic acid
- Know common bases
  - NaOH, KOH, $Ca(OH)_2$, $Mg(OH)_2$, and NH_4OH
- Acid-Base Indicators

Acid-Base Chemistry

- Reactions
  - Metals
  - Carbonates
  - Bicarbonates
  - Sulfites
  - Bisulfites
  - Oxides
  - Neutralization

Acid-Base Activities

- Titration
  - Percent composition
  - Molarity
  - Molar mass

Acid-Base Calculations

- K_a
- K_b
- pH
- pOH
- dilution

Aqueous Solutions

- Principals, properties, terms and definitions
- Calculate solution concentration given quantities of solute and solvent
- Amount of material needed to achieve a specific concentration
- Molarity, molality, mass percentage, ppm

Aqueous Solutions

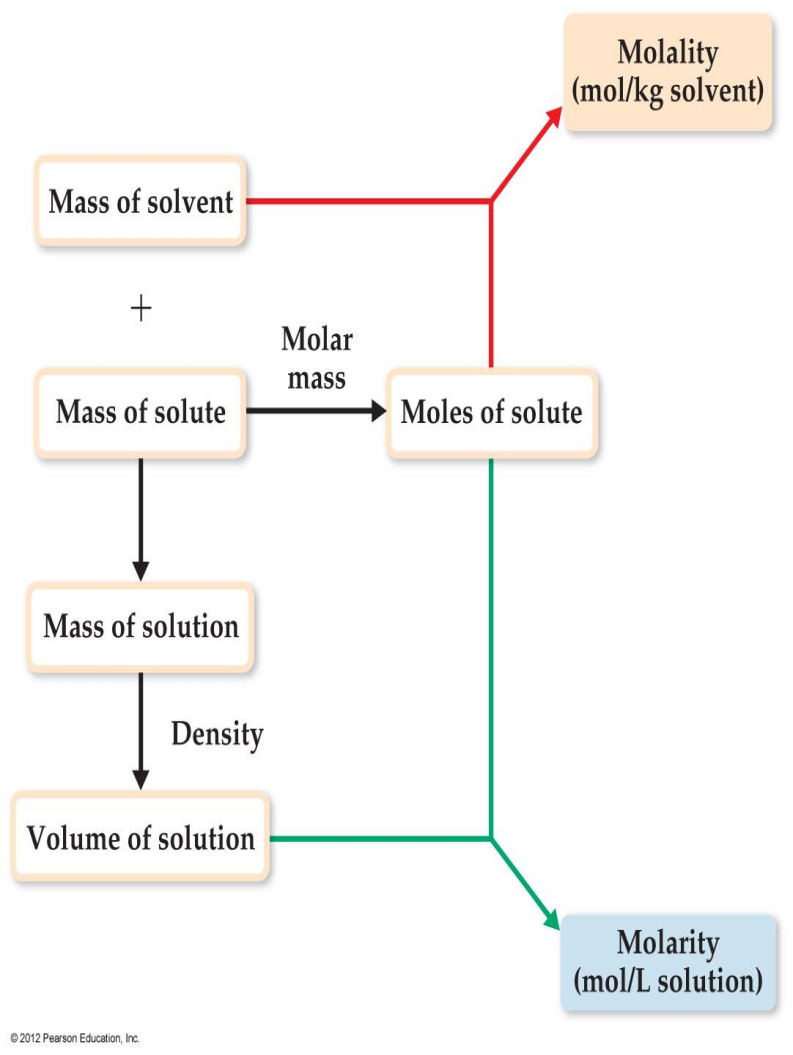
- Use freezing point depression to determine the molar mass of a solute
- Identify and explain factors that affect solution formation
- Determine whether a solution is saturated, unsaturated or supersaturated
- Any reaction that deals with water or hydrates

Aqueous Solutions

- Writing Equations for Aqueous Ionic Reactions
- Predicting Whether a Precipitation Reaction Occurs; Writing Ionic Equations

Some Ways to Calculate Solution Concentration

- **Molarity: moles of solute/liters of solution, M = mol/L**
- **Molality: moles of solute/kilograms of solvent, m = mol/kg**



Colligative Properties

- Changes in colligative properties depend only on the *number* of solute particles present, not on the *identity* of the solute particles.
- Among colligative properties are:
  - Vapor-pressure lowering
  - Boiling-point elevation
  - Freezing-point depression
  - Osmotic pressure

Scoring

- 50% Acids and Bases
- 50% Aqueous Solutions

BONUS

- See Chem Lab presentation at
- https://drive.google.com/drive/folders/1DaWeB0dZbtWvsSONAgS5fWQBJ5axtYZp