Chemistry B: Course Map

Unit 1: The Mole (app. 3 weeks)

Phenomenon: how many popcorn kernels are in the jar?, Mole Challenge, Molecular Formula of MgO

Standards: HS-PS1-7: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

Learning Targets:

I can…

- ☐ Define and use the Mole
- ☐ Describe and calculate molar mass of elements and compounds
- ☐ Use Molar Mass and the Mole in calculations to find grams, moles, and molar mass
- ☐ Convert to volume of a gas at STP
- ☐ Calculate empirical and molecular formula
- ☐ Calculate percent composition

- *Assess and apply the various ways chemists express quantities of substances.*
- *Use mole concept to calculate the number of particles, moles, mass, and volume in a chemical equation*
- *Perform percent composition calculations*
- *Determine empirical and molecular formulas*

Unit 2: Stoichiometry (app. 2.5 weeks)

Phenomenon: iron & copper (II) sulfate lab, pink & blue (excess & limiting reactant) lab, baking soda lab

Standards: HS-PS1-7: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

Learning Targets:

- Assess and apply the various ways chemists express quantities of substances.
- Identify and solve different types of stoichiometry problems
- Percent Yield
- Limiting Reagents

Success Criteria :

Mole to Mole Stoichiometry

- ☐ I can balance chemical equations
- ☐ I can perform mole to mole stoichiometry
- ☐ I can create a BCA table for a chemical reaction

Mass Stoichiometry

- ☐ I can perform stoichiometry involving mass conversions

Volume Stoichiometry

- ☐ I can perform stoichiometry involving volume conversions of gases at STP

Mixed Stoichiometry

- ☐ I can perform stoichiometry involving any combination of mole, mass, and volume stoichiometry.

Limiting Reactants

- ☐ I can determine the limiting and excess reactants (reagents) in a chemical reaction.
- ☐ I can perform stoichiometry involving a limiting reactant.
- ☐ I can draw and interpret particle models of limiting reactant stoichiometry.

Percent Yield

- ☐ I can calculate the percent yield from a chemical reaction in a lab.
- ☐ I can explain the difference between actual and theoretical yield and how they relate to error.

Unit 3: Gas Laws and Kinetic Molecular Theory (app. 4 weeks)

Phenomenon: perfume demo, hot vs cold demo, tanker car implosion, crushing can, deflated tires in winter, phet simulation on gas laws, boyle's law lab, Ideal Gas Law Lab

Standards: HS-PS3-5

Learning Targets:

- Apply and use gas laws: relationships between pressure, volume, temperature, and number of moles of a gas , so that we can predict and model real world gas phenomena.
- Describe the nature of gasses and the kinetic molecular theory so that we can explain real world phenomena.
- Use mathematical relationships so that we can develop quantitative evidence for our phenomenon
- Use the Ideal Gas Law in calculations so that we can apply the gas laws to more real world phenomena
- Apply Graham's Law to effusion of gasses so that we can predict and model real world gas phenomena.

Success Criteria :

Kinetic Molecular Theory , Pressure and Temperature

- ☐ I can convert pressure values between units of atm, mmHg, kPa,.
- ☐ I can convert temperature values between units of ℃ and kelvin
- ☐ I can define temperature and pressure in terms of the motion of particles
- ☐ I can explain absolute zero

Charles's law

- ☐ I can explain the mathematical relationship between absolute temperature and volume
- ☐ I can perform calculations using Charles's Law
- ☐ I can draw particle diagrams of gasses with changing temperature and volume

Boyle's Law

☐ I can explain the mathematical relationship between volume and pressure
☐ I can perform calculations using Boyle's Law
☐ I can identify a graph of Boyle's Law
☐ I can draw particle diagrams of gasses with changing pressure and volume.

Gay Lussac's Law

☐ I can explain the mathematical relationship between absolute temperature and pressure
☐ I can perform calculations using Gay Lussac's Law
☐ I can draw particle diagrams of gasses with changing temperature and pressure

Combined Gas Law

☐ I can explain relationships among pressure, temperature, volume, and the amount of a gas
☐ I can apply the combined gas law to perform calculations involving 2 changing variables.

Ideal Gas Law

☐ I can use the ideal gas law to calculate pressure, temperature, volume, or the number of moles of a gas when 3 variables are known.

Dalton's Law of Partial Pressure

☐ I can use Dalton's law of partial pressure to calculate the pressure of a mixture of gasses with known pressures.
☐ I can apply Dalton's law of partial pressure to calculate the dry volume of a gas sample that's collected over water.

Graham's Law

☐ I can use Graham's law to qualitatively compare the effusion rate of two gasses.

Unit 4: Thermochemistry (app. 4 weeks)

Phenomenon: hot/cold packs, ice cube in the hand, brass vs water heating

Standards: HS - PS1 - 4

Learning Targets:

- Exo vs Endothermic
- Heat calculations
- Enthalpy and Hess's Law
- Calorimetry

Unit 5: Solutions and Acid/Base Chemistry (app. 3.5 weeks)

Phenomenon: acidity of juices

Standards: Analyze and explain relationships that exist between solute and solvent in solutions and apply acid/base chemistry

Learning Targets:

- Calculate the concentration (molarity) of a solution
- Prepare a solution of a given concentration
- Describe Arrhenius, Bronsted-Lowry, and Lewis acid/base theory
- Naming acids
- Use pH to describe strength of acids/bases
- Perform an acid/base titration

Success Criteria

Solutions and Concentration

- ☐ I can define and differentiate between the terms: solution, solute, solvent, soluble
- ☐ I can calculate the concentration (molarity) of a solution when given mass of solute and volume of solvent.
- ☐ I can convert between moles and volume using molarity.
- ☐ I can write a procedure for preparing a concentration of a solution with known molarity
- ☐ I can draw particle diagrams of solutions of different concentration

Dilutions

- ☐ I can define dilution in terms of molarity
- ☐ I can calculate the volume of stock solution needed to dilute a solution.
- ☐ I can write a procedure for preparing a dilution from a stock solution.

Naming Acids

- ☐ I can write the chemical formula for an acid when given its name
- ☐ I can write the name of an acid when given its formula

Properties of Acids and Bases

- ☐ I can explain the difference in the chemical makeup of an acid and base
- ☐ I can recall difference is taste, touch, reactivity, and conductivity of acids and bases
- ☐ I can identify if an acid or base is strong or weak.
- ☐ I can draw a comparative particle diagram of a weak and strong acid

PH and POH and Neutralization Reactions

- ☐ I can identify a solution as acidic or basic by its PH
- ☐ I can convert between PH and POH
- ☐ I can calculate between hydrogen ion concentration and PH
- ☐ I can calculate between hydroxide ion concentration and POH
- ☐ I can predict the products of a neutralization reaction.

Titrations

- ☐ I can perform and acid/base titration in the laboratory
- ☐ I can calculate the concentration of an unknown solution using description of a titration
- ☐ I can identify the equivalence point from a titration graph.