Review Guide: Exam 3, Chemistry 115

**Chapter 12: Gases**

* Know the properties of gases.
* Know definitions: vacuum, gas pressure, atmospheric pressure, compressibility
* Recognize that atmospheric pressure decreases with altitude.
* Be able to convert between units of pressure: 1 atm =760 torr =760 mmHg = 14.7 psi=101.325 kPa
* Know how changes in volume, temperature, and number of particles affect gas pressure.
* Use **ideal gas law** (**PV=nRT)** to solve for P, V, n, or T (in Kelvins).

$$R=\frac{0.0821 L\*atm}{mol\*K}$$

* Given 2 sets of conditions, solve problems using

$\frac{P\_{1}V\_{1 }}{T\_{1}}= \frac{P\_{2}V\_{2 }}{T\_{2}}$, including canceling variables that stay the same to simplify. Recognize the temperatures (T’s) must be in Kelvins.

* **Solve for stoichiometry problems involving gases**
* Recognize that STP is standard temperature and pressure, defined at 0°C and 1 atm.
* **Dalton’s Law of Partial Pressure:**
* Use Dalton’s Law (Ptotal = P1 + P2 + P3 + …) to solve for total pressure or the partial pressure of one gas in a mixture
* **Kinetic Theory of an Ideal Gas**
* Know the kinetic theory of gases regarding particle volume, particle motion, attraction, collisions, and the average kinetic energy of each particle being proportional to the temperature.
* **Diffusion**: gradual mixing of molecules gas molecules by virtue of their kinetic motion
* **Effusion**: process of a gas under pressure escaping from a container via small opening
	+ Be able to identify the order that several gases escape out of a container by using their molar masses
* **Real (Non-ideal) Gases**
* Recognize the conditions (low pressure, high temperature, large container volume) for gases to behave ideally and why.

**Chapter 13: Liquids**

**“Like dissolves like” rule**

* Polar substances will mix and dissolve in one another, and nonpolar substances will mix and dissolve in one another.
* Polar substances will NOT mix and dissolve in nonpolar substances and vice versa.
* Use the polarity of substances to determine which liquids will mix with one another or which solids will dissolve in water and other polar solvents.

**Intermolecular Forces (IMF’s):** attraction between 2 different molecules in a liquid or solid

* Identify the type(s) of intermolecular force for a molecule as
* **London/dispersion forces**
* **Dipole-dipole forces**
* **Hydrogen bonding**.
* Recognize that polar molecules experience both London/dispersion forces as well as dipole-dipole or hydrogen bonding.
* Know that hydrogen bonds are the strongest type of intermolecular force, dipole-dipole forces are the next strongest, and London forces are generally the weakest.
* Recognize that London forces increase with more electrons—use size to determine relative number of electrons for different molecules.
* Know the terms: evaporation, boiling point, and vapor pressure.
* Recognize how IMF’s influence vapor pressure and boiling point.
* Given different substances, determine which has the highest melting or boiling point based on IMF’s and/or chemical bonds.
* Know ionic and covalent bonds are stronger than all types of intermolecular forces, even hydrogen bonds.
* Know the regions and features of a **Heating/Cooling Curve**

**Chapter 14: Solutions**

**Solution**: uniform mixture of two or more substances as atoms, ions, or molecules (a **solute** dissolved in **solvent)**

* **solute:** component present in smaller amount
* **solvent:** component present in greater amount

Know how temperature affects the solubility of gases and solids in solution.

Know Henry’s Law that Solubility α Pressure (S= k\*P)

$$\frac{S\_{1}}{P\_{1}} = \frac{S\_{2}}{P\_{2}}$$

* Recognize what occurs at the molecular level when a solute dissolves in water.
* Recognize what can be done to increase the rate of dissolving: heating solution, stirring solution, grinding solute into smaller particles
* Know the definitions for unsaturated, saturated, and supersaturated
* Use **“Like dissolves like”** Rule and the **Solubility Rules** to predict what substances are **soluble/insoluble** in or **miscible/** **immiscible** with water or other solvent

$$Mass percent = \frac{mass of solute}{mass of solution} x 100$$

$$ppm = \frac{mass of solute}{mass of solution} x 10^{6}$$

$$mole Fraction of A= \frac{moles of A}{total moles} $$

$$mole Fraction of A= \frac{moles of solute}{Liters of solution} $$

**Dilution Equation: M1 V1 = M2 V2**

**Molarity, Mass Percent Concentration, and Solution Stoichiometry Calculations**

* Solve for amount of solute, solvent, or solution given mass percent concentration, molarity, etc.
* Use molarity and volume to solve for moles