**Exam 4 Study Guide CHEM 141**

**Chapter 11*(Intermolecular Forces)***

* Predict the type of intermolecular forces present in a substance based on its chemical structure. *(intermolecular force is a core topic)* Give an example of each type of intermolecular force*(i.e. ion-dipole/ dipole-dipole/London dispersion/hydrogen bonding)*
* Discuss the relative strengths of intermolecular forces *( This includes understanding how the strength of dipole-dipole and dispersion forces are affected by polarity, polarizability, molecular weight and the shape of the molecule,*
* Give an example of a substance that is polarizable and one that is not polarizable.
* Predict the effect of temperature on viscosity and surface tension.
* Explain what causes capillary action.
* Determine the correct order for a set of compounds based on increasing b.p./vapor pressure
* Use the Clausius-Clapeyron equation to detm. the vapor pressure of a solvent at a specific temperature or its b.p. when given the slope for the equation.
* Identify the six phase transitions on a heating curve.
* Calculate the enthalpy change necessary to convert a solid to gas. *(This includes an understanding of the heat of fusion and the heat of vaporization,*
* Identify the physical state of a substance using a phase diagram
* Identify the triple point and critical point for a substance on a phase diagram *( This includes knowing the definition of a triple point/critical point)*
* Explain the difference between critical temperature, critical pressure, and critical point.
* Recognize examples of the types of crystalline solids and the forces between particles.

**Chapter 12 *(Properties of Solutions)***

* Explain the role of specific intermolecular forces in the solution process *. ( e.g. Why is salt insoluble in gasoline? Why will water not mix with oil?)*
* Differentiate among the following terms by recognizing an example for each: crystallization, solubility, saturated sol’n, unsaturated sol’n, supersaturated sol’n , miscible, and immiscible
* Discuss the role of entropy in the solution process for an endothermic process*.*
* Predict the solubility of a substance based on its polarity.
* Use Henry’s law to calculate the solubility or molar concentration of a gas.
* Calculate the molarity, molality, mass percent, and osmotic pressure of a solution
* Give an example for each of the four types of colligative properties *( e.g.... adding salt to water raises the boiling point)*
* Determine the molar mass of a compound using freezing- point or osmotic pressure
* Calculate the boiling point or freezing point of a solution using the van’t Hoff factor for the solute.
* Determine if a red blood cell will undergo crenation, be unaffected, or undergo hemolysis when exposed to solutions that are either hypotonic, hypertonic, or isotonic.
* Use Raoult’s law to calculate the vapor pressure of a solution
* Discuss the conditions when a real solution would mimic an ideal solution.
* In terms of intermolecular forces, explain why many solutions do not obey Raoult’s law.

**Chapter 14 *(Chemical Equilibrium)***

* State the definition of a chemical equilibrium**.**
* Define the term law of mass action and show how it relates totheequilibrium-constant (Kc).
* Calculate the equilibrium-constant (Kc) for a reaction. ( This includes being able to write the correct equilibrium-constant expression)
* Calculate the equilibrium-constant (Kp) for a gas phase reaction.
* Convert Kc into Kp using the appropriate equation.
* Evaluate the size of K and determine the position of equilibrium. *(e.g if K = 0.0004, what does the value of K here mean for the products at equilibrium?)*
* Write an equilibrium-constant expression for heterogeneous equilibria.
* Determine the equilibrium concentrations of reactions when given initial concentrations of reactants and/or products.
* Know how to solve equilibrium expression by the following methods
	+ Assumption
	+ Perfect square
	+ Quadratic formula
	+ Multiple iteration
* Predict the direction of a reaction by calculating the reaction quotient (Qc) and comparing it to Kc
* Determine the direction equilibrium will shift when a change is made in a reaction condition as predicted by Le Chatelier’s principle.
* Characteristics of the Equilibrium Expression
* For reverse reaction, equilibrium expression is reciprocal of that for forward reaction
* Multiplying coefficients by factor, n, raises equilibrium constant to nth power
* Multiple Equilibria
	+ When a reaction can be expressed as a sum of two or more reactions, the equilibrium constant for the overall reaction is simply the product of the equilibrium constants for the individual reactions.
	+ Be able to manipulate a series of reactions to determine the equilibrium constant for an overall reaction