Checklist for Exam 1

Chapter 12. Solutions

- ☐ I know how to use the principle of "like-dissolves-like" to predict solubility using Lewis dot structures and molecular shape.
- ☐ I know the formulas for molarity, molality, mole fraction, and mass percent because these formulas will not be given on the exam.
- ☐ I can interconvert molality, mole fraction, mass percent, Conc(ppm) and Conc(ppb). I know that making the little table like we did in class is very helpful. It never involves anything more than converting mass to moles or visa versa.
- ☐ I know how molarity differs from the other types of concentration measurements such as molality, mole fraction and mass percent.
- ☐ I can convert molarity to molality, mole fraction and mass percent and can convert molality, mole fraction or mass percent to molarity. I know I must use the density and usually have to use $\text{mass}_{\text{solution}} = \text{mass}_{\text{solute}} + \text{mass}_{\text{solvent}}$. Again, I know that using the table is very useful.
- ☐ I know the formula for vapor pressure of a solution of a non-volatile, non-electrolyte: $P_{\text{sol'l}} = X_{\text{solvent}} \times P^{o}_{\text{solvent}}$, and how to use it.
- ☐ I know how to calculate the vapor pressure of a solution of an ionic solute, because then $P_{\text{sol'l}} = P^{o}_{\text{solvent}} \times n_{\text{solvent}}/(n_{\text{solvent}} + n_{\text{solute}} \times i)$.
- ☐ I know how to calculate the vapor pressure of a solution of two liquids with vapor pressures (solute and solvent or, if preferred, Liquid A and Liquid B) using $P_{\text{sol'l}} = X_A \times P^{o}_A + X_B \times P^{o}_B$.
- ☐ I know the formulas for freezing point lowering as they will not be given on the test, although K_f will be given. I can use these formulas to solve for ΔT_f, molality, or i, given the other two values and K_f. I also know that I may have to predict i from the formula if it is not specifically given. I can also determine the freezing point of a solution given the freezing point of the pure solvent and the ΔT_f value that I calculated.
- ☐ I can do the same sort of things described above for boiling point elevation.
- ☐ I know the formula for osmotic pressure, $\Pi = MRTi$, including i and how to use it. I know that I will be given the value for R, the gas constant.
- ☐ Given the mass of an unknown and colligative property information such as freezing point lowering, boiling point elevation, vapor pressure lowering or osmotic pressure, I can figure out the molar mass of the unknown. I know that I usually will use the colligative property information to solve for the solution concentration (molality, mole fraction or molarity) and then use the amount of solvent/solution to determine moles of unknown. That with the mass of the unknown allows me to calculate molar mass of the unknown.

Chapter 13. Kinetics (Sections 13.1 – 13.8)

- ☐ I know that I will be given the table of kinetic formulas that were distributed in class.
- ☐ I know the meaning of vocabulary words such as order, rate and rate constant.
- ☐ I know that the rate changes with changes in concentration of reactant for first and second order reactions, but the rate constant does not change unless the temperature has been changed.

- ☐ I know how to use initial concentration and initial rate data in order to generate a rate law (rate expression). In addition, I can use the data table in order to determine the rate constant with proper units.
- ☐ I know how to use data from a time-concentration study in order to determine the rate law. In addition, I know how to use the data and time-concentration expression in order to determine the rate constant with proper units.
- ☐ Once I know the rate law and the rate constant, I can use the appropriate time-concentration expression to determine the concentration of reactant at any point in time for a zero, first or second order reaction. I can also use the appropriate time-concentration expression to calculate the time it takes to get to a certain concentration from a starting concentration, again for a zero, first or second order reaction.
- ☐ I can express rates in terms of $-\Delta[A]/\Delta t$ for a reactant or $+\Delta[P]/\Delta t$ for a product. I can determine the rate from the data as described above as well as getting it from the slope of a graph.
- ☐ Given a balanced chemical equation, I can convert the rate in terms of $-\Delta[A]/\Delta t$ to the rate in terms of another reactant or product, $\Delta[P]/\Delta t$.
- ☐ I can use the rate law (expression), the rate constant and the concentration of the various reactants that appear in the rate expression in order to determine the rate for the reaction.
- ☐ I can do half-life calculations.
- ☐ I know how to sketch a reaction profile that diagrams the reaction from reactants to products. If ΔH is also provided, I can include that in my drawing. I can label the reactants, intermediates, transition states, the various E_{act} (one for each step), and the overall ΔH.
- ☐ I understand the role of temperature in the changing the rate constant (and thereby the rate) for all reactions.
- ☐ I know how to read population vs. energy graphs and I know how they change as the temperature changes. I know what it means to sketch E_{act} on these graphs.
- ☐ I know what exactly it means when one, two or three (!) things appear as reactants in a mechanism's step.
- ☐ I know how to inspect a reaction mechanism and determine the overall reaction. I can also identify catalysts and intermediates, if any are present.
- ☐ I know how to write a rate law for the slow step in any mechanism. I know that for mechanisms in which the second step is slow, I must substitute out any intermediates that show up in the rate law (because we can't measure their concentrations in lab, so we would have difficulty "proving" the rate law.) To do this, I know how to use an equilibrium expression from the fast step(s).
- ☐ I know how to sketch a reaction profile that diagrams the mechanism. If ΔH is also provided, I can include that in my drawing. I can label the reactants, intermediates, transition states, the various E_{act} (one for each step), and the overall ΔH.
- ☐ I understand the role of temperature in the changing the rate constant (and thereby the rate) for all reactions.
- ☐ I know how to read Boltzmann distributions (population vs. energy) graphs and I know how they change as the temperature changes. I know what it means to sketch E_{act} on these graphs.