Exam 2 Study Guide

Here are the central topics for the second exam. If you understand this material well and understand the problems on the past several problem sets, you'll do well on the exam!

Chapter 7: Acids and Bases

Can you: identify the acid and/or the base in a chemical reaction? write the acid dissociation equilibrium constant expression? classify an acid as to strength based on $K_a$ values? calculate the equilibrium concentrations of a weak acid, its conjugate base, and $H^+$ in a solution? recognize when to make the approximation that the equilibrium acid concentration, $[HA]$, equals the analytic concentration, $[HA]_0$? relate a base hydrolysis constant, $K_b$, to its associated acid constant $K_a$? calculate the pH of a weak acid solution or a solution of a weak base? describe the species present at any pH in a polyprotic acid solution?

Chapter 8: Aqueous Equilibria

Can you: recognize a buffer solution? calculate its pH? its buffering capacity? use the Henderson-Hasselbalch equation? interpret a titration curve (initial pH, half-equivalence point, equivalence point, buffer region, post-equivalence point regions)? write a solid solubility reaction and its associated solubility product equilibrium constant expression, $K_{sp}$? calculate the solubility of a solid with limited solubility (a) in pure water? (b) in a solution containing an ion in common with the solid? (c) in a solution already containing an ion that reacts with one of the solid’s ions?

Chapter 9 (and sections 10.2 and 10.14): Energy, Work, Heat, and Enthalpy

Can you: calculate the work associated with a process conducted on an ideal gas and described by a path of the external pressure drawn on a $P$–$V$ diagram? recognize the implications of an isothermal process, an adiabatic process, and a reversible process? use $\Delta E = q + w$ to calculate energy changes? use $\Delta E = nC \Delta T$ to calculate the energy change of an ideal gas? use $H = E + PV$ to calculate enthalpy changes? use a general heat capacity to relate a temperature change to an energy change, as in a calorimeter? interpret a reaction enthalpy change (endothermic versus exothermic)? combine reactions and their enthalpy changes using Hess’s Law? understand and use enthalpies of formation?