Review for First Exam:

Chapter 13

Definition of solution; solvent, solute; kinds of solutions
Ways of representing solubility: mass solute per mass solvent; molar solubility
Soluble and insoluble; miscible and immiscible
Thermodynamics of solution formation
Entropy (S) and disorder; how entropy favors solution formation
Enthalpy of solution (ΔH_{soln}); how this depends on interparticle attractive forces
Origin of the observation "like dissolves like"
Unsaturated solution, saturated solution, supersaturated solution
Effect of temperature on the solubility of a solid in a liquid
Concentration units - molarity, molality, mole fraction, mass percent, ppm by mass and so forth
Calculation of concentration in different units; converting from one unit to another unit
Solubility of gases in liquids; Henry's law ($[B] = k\ p_B$) and its use
Dependence of gas solubility on temperature
Solutions of volatile liquids; Raoult's law ($p_A = X_A\ p_A^\circ$) and its use in calculations
Raoult's law and ideal solution behavior; ideal behavior as $X_A \rightarrow 1$ for all solvents
Vapor pressure vs mole fraction plots for ideal and nonideal solutions; finding vapor pressure for pure liquids from the plot of vapor pressure vs mole fraction
Colligative properties; general characteristics
Vapor pressure lowering ($\Delta p_A = X_B\ p_A^\circ$)
Boiling point elevation ($\Delta T_b = T_b - T_b^\circ = K_b\ m_B$)
Freezing point depression ($\Delta T_f = T_f^\circ - T_f = K_f\ m_B$)
Osmotic pressure ($\Pi = M_B RT$); semipermeable membranes
van't Hoff factor; definition, relationship to ionization or dissociation of a solute
Calculations using colligative properties
Molecular mass by colligative properties
Reverse osmosis; osmosis and cell shape
Colloids; definition and simple examples

Chapter 14

Review of thermodynamics - work, heat, internal energy, enthalpy ($H = U + pV$)
Sign conventions; state functions
First law of thermodynamics ($\Delta U = q + w$)
Spontaneous processes; the need for a second law for thermodynamics
Entropy (S), properties and interpretation of entropy
ΔS_{syst}, ΔS_{surr}, ΔS_{univ}
The second law of thermodynamics ($\Delta S_{univ} \geq 0$) and its meaning
Spontaneous processes; equilibrium
Finding ΔS_{syst}, ΔS_{surr}, ΔS_{univ} for chemical reactions
Entropy for solids, liquids, and gases
Qualitative prediction of ΔS_{syst} for chemical reactions
Trends in entropy based on size of molecules, dissolving substances in solvents
The third law of thermodynamics
Free energy (G); definition of free energy ($G = H - TS$)
Relationship between ΔG and spontaneous processes (for T, p constant)
Method for calculating ΔG_{rxn}
Find T_{eq} for processes; finding the range of temperatures for which processes are spontaneous