Introduction to Chemical Equilibrium

1. List the properties of a system at equilibrium (observable properties, open vs closed system)
2. Define equilibrium
3. Types of equilibrium (phase equilibrium, chemical reaction equilibrium, solubility equilibrium) pg. 424 -430
4. Describe changes in rates of reaction of products and reactants as equilibrium is approached (concentration vs. time graph)
5. Equilibrium Law (a.k.a. law of mass action) pg. 439
6. Define equilibrium constant and write mass action expressions for equilibrium equations
7. Distinguish between homogeneous and heterogeneous systems
8. State Le Chateliers Principle
9. Apply Le Chateliers Principle in the lab.
10. Predict the effect of temperature, pressure, addition of reactant or product, addition of inert substance, catalyst on equilibrium
11. Explain applications of equilibrium (Haber process, photochromatic lenses, stalagmites)
12. Relate these effects on equilibrium to the collision theory
13. Explain the relationship between equilibrium, free energy, enthalpy and entropy
14. Predict whether a reaction will favour formation of products or reactants given the magnitude of the equilibrium constant.
15. Explain how temperature effects the magnitude of K_c for endothermic & exothermic reactions
16. Calculate K_c for a reaction given the initial conditions and the amount by which one of the components of the reaction has changed (Type 1, 2 and 3).
17. Calculate the equilibrium concentrations given the initial concentrations and the equilibrium constant (Type 4, 5 and 6)
18. Determine if a system is at equilibrium given the concentrations of the components of the reaction.
19. Define Solubility product constant K_{sp} and write K_{sp} Expressions for salts that have dissociated into their respective ions.
20. Calculate molar solubility of a substance given K_{sp}
21. Calculate K_{sp} given molar solubility
22. Experimentally determine K_{sp} of a substance.