Ch. 14 concept map (Chemical Kinetics: The Rates of Chemical Reactions)

1. Understand the concept of reaction rate. Be able to calculate average and instantaneous rates from concentration vs. time data.
2. Calculate the rate of a reaction using stoichiometric coefficients and concentration vs. time data.
3. Describe the effects of concentration, pressure, surface area, temperature and catalysts on the rate of a reaction.
4. Use rate equations (differential rate laws) to determine the order of a reaction. Be able to predict the units of the rate constant (k) based on the order of the reaction.
5. Use the method of initial rates to determine the rate equation for a reaction and the value of the rate constant (k).
6. Understand how integrated rate laws are related to the differential rate laws. Use integrated rate laws to solve problems that involve concentration vs. time data.
7. Use concentration ([A]) vs. time, ln[A] vs. time and $[A]^{-1}$ vs time plots to determine the order of a reaction with respect to A.
8. Derive half-life expressions for reactions of zero, first and second order using integrated rate laws. Calculate the concentration of a reactant after a certain time (or the time it takes a reactant to reach certain concentration).
9. Understand the principles of collision theory. Relate activation energy (E_a) to the rate of a reaction.
10. Perform calculations using the Arrhenius equation.
11. Use lnk vs. T^{-1} data to calculate the activation energy of a reaction.
12. Use reaction coordinate diagrams to identify key information about the reaction (relative energy of reactants and products, activation energy, number of steps, intermediates, transition states…)
13. Determine the rate equation of a multistep reaction from elementary steps. Understand the concept and significance of the rate-determining step.
14. Understand the effect of a catalyst on the mechanism/activation energy of a reaction.