Chem 116, Fall 2006
Prof. Sevian
Study guide for Exam 2

The exam will consist of two sections: short answer and problems. The short answer questions could be multiple-choice, fill-in-the-blank, brief response, or short calculations. There will be two problems, which will involve showing your work on calculations and/or demonstrating complete and clear logical reasoning in an explanation. When doing calculations, if the answer you provide is off by more than one significant digit, one point will be deducted.

Exam 2 will cover material from homework assignments #5 and 6, the part of #4 that comes from chapter 13, and the part of #7 that comes from chapter 21. Relevant sections from text book chapters 13, 14 and 21 will be covered on the exam. Please see the course syllabus for a list of which sections in chapters 13 and 14 are being covered. In chapter 21, the exam covers sections 21.1, 2, 3 and 4.

You will be provided with the following information on the exam:

Equations

Arrhenius equation: $k = Ae^{-E_a/RT}$

$t_{half} = \frac{0.693}{k}$ for a first-order reaction

Constants of nature

$R = 8.314 \ \frac{J}{mol \bullet K} = 0.08206 \frac{L \bullet atm}{mol \bullet K}$

More Equations

Differential rate laws:

0. rate of change of [A] = k [A]^0
1. rate of change of [A] = k [A]^1
2. rate of change of [A] = k [A]^2

Integrated rate laws:

0. $[A] = [A]_o + k\,t$
1. $\ln[A] = \ln[A]_o - k\,t$
2. $\frac{1}{[A]} = \frac{1}{[A]_o} + k\,t$

Short Answer and/or Problems

Things that you should know or be able to do (though there won't necessarily be a question on every single one of these items because that would make the exam too long):

1. Compare aqueous solutions of various concentrations and/or solutes and determine which solution would differ most in its physical properties from pure water.
2. Given information about the concentration of a solution in one set of units (molarity, molality, mole fraction, or weight percent) calculate a different set of units
3. Determine the freezing or boiling point of a given solution, or the vapor pressure of the solvent over the solution, or the osmotic pressure exerted
4. Use a solubility curve to determine whether a solution of given concentration is below saturation, saturated, or supersaturated
5. Determine the molar mass of an unknown chemical from measurement of a colligative property (*e.g.*, boiling point elevation, freezing point depression) when that chemical is dissolved in a known solvent
6. Determine the van't Hoff factor for a particular ionic compound if given information about how a solution containing it behaves
7. Given a particular reaction and a graph of concentration vs. time for one of the reactants, call it X, you should be able to:

    a. Sketch a graph of concentration vs. time for one of the products, call it Y
    b. Show your calculations to estimate the initial rate of change of concentration of X
    c. Calculate the initial rate of change of concentration for Y
    d. Given graphs of various configurations of X vs. time, determine the order of the reaction with respect to X and justify your answer
    e. Write the rate law
    f. Calculate the rate constant and/or half-life (if it is first-order)
    g. Calculate the concentration of X at a time later than what is shown on the graph
8. Given a particular reaction and a set of experiments with varying initial concentrations of all the reactants and the resulting initial rate, determine the form of the rate law and the value and units for the rate constant, *k*
9. Given a particular first-order process (such as a radioactive decay process), the initial concentration of the reactant species, and the rate constant or half-life, determine the concentration of that species at some later time
10. Predict the effect on the rate of reaction (increase, decrease, stay the same) when various experimental conditions change, and link these effects to various terms within the rate law
11. Use the Arrhenius equation to calculate the activation energy of a process, given *k* vs. T data
12. Given a particular reaction and its experimentally determined rate law, and several possible reaction mechanisms, determine which mechanism is plausible
13. Sketch an energy vs. reaction progress graph given information about the enthalpy change and activation energy, or from a graph determine this information
14. Predict missing information in an equation representing a nuclear process (e.g., radioactive decay, nuclear transmutation)
15. Identify common radioactive particles in nuclear process equations: alpha, beta, positron, neutron, proton

Problems

1. A problem similar to one of the group problems
2. A mathematically-based problem involving one of the items in the list above

Additional Information About Exams

Exam 2 will take place during regular class time, 2:30-3:45 p.m., on Thursday, October 26. You will have the entire class period to complete the exam, but you will need to work efficiently to complete it. All exams must be turned in by 3:50. If you arrive late to the exam, you will not be given extra time. If you arrive after the first exam has been turned in, you will not be allowed to take the exam. I urge you to leave home earlier than usual to allow for surprise commuting problems.

More information about exams in general can be found in the syllabus and in the “Additional Information” section at the end of the Exam 1 study guide.

Also, Practice Exam 2 and its answer key have been posted on the course website. Please be aware that some of the questions on Practice Exam 1 are also relevant to this exam.