

Preparation for the exam 2:

Chem112L, Spring 2008

Exam dates: Monday June 9, 4-7 and ???

This exam focuses on mass spectrometry, protein crystallography, and enzyme kinetics. I expect that you know the basic material from the three previous experiments as well. I intend to have a mix of problem-solving, and multiple-choice questions. Knowledge of the following helps you in preparing for the exam:

1. Physical principles behind each of the following at molecular/atomistic level
 - a. Protein ionization and its relevance to mass spectrometry
 - b. Protein crystallization
 - c. Enzyme catalysis and inhibition

2. Physical principles behind each of the observation/study methods
 - a. Separation of molecules based on m/z values; protein identification
 - b. X-ray diffractometry
 - c. Measurement of reaction rates by UV-Vis spectrophotometry

3. Theoretical description of biochemical reactions
 - a. Transition state stabilization concept in enzyme catalysis
 - b. Description of reactions via intersecting potential energy surfaces
 - c. The energy levels and wave functions of quantum harmonic oscillator
 - d. Kinetic isotope effect
 - e. Tunneling

4. Practical aspects of each of the experiments
 - a. Why such detection parameters (wavelengths, acquisition time etc)
 - b. Why such concentrations of solutes, buffers etc.
 - c. Why such sample handling, e.g. hanging drop in crystallography

5. Data analysis
 - a. Understand the meaning of all the data observed
 - b. Understand methods of plotting enzyme kinetics data
 - c. Analysis of protein and peptide mass spectra
 - d. Derivation of equations for enzyme kinetics in equilibrium and steady-state cases
 - e. Derivation of equations for enzyme kinetics when an inhibitor is present

6. Miscellaneous
 - a. How to apply techniques, such as kinetics and crystallography to other problems in biochemistry
 - b. How to carry our calculations that are commonly used in biophysical and bioanalytical chemistry