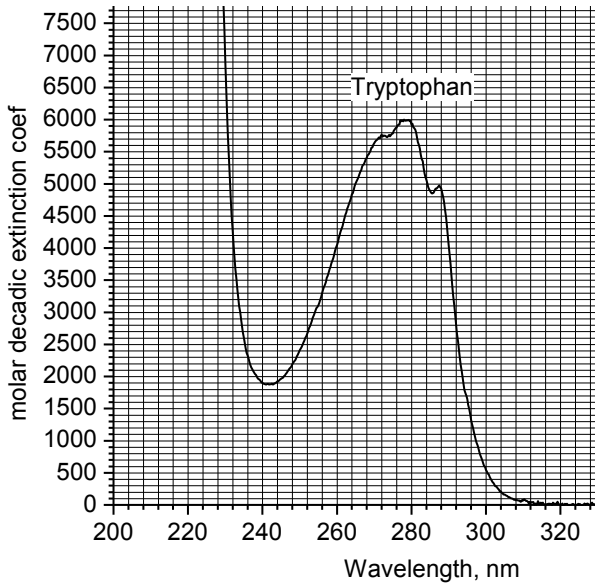
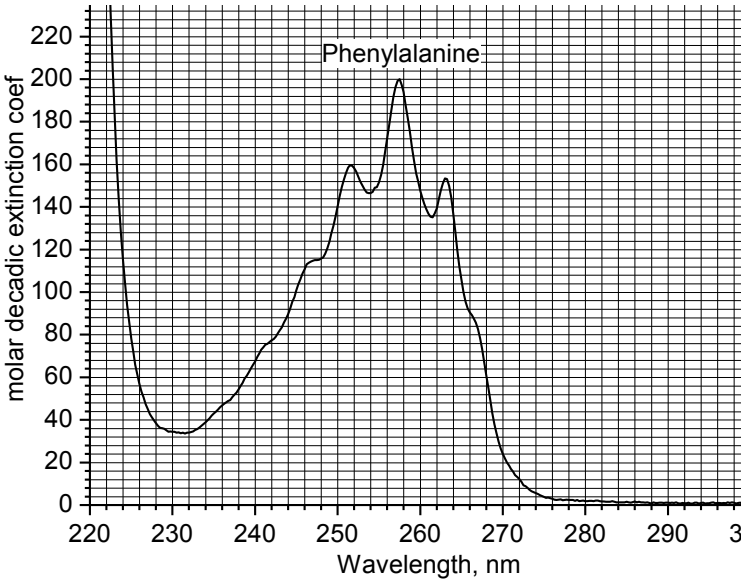
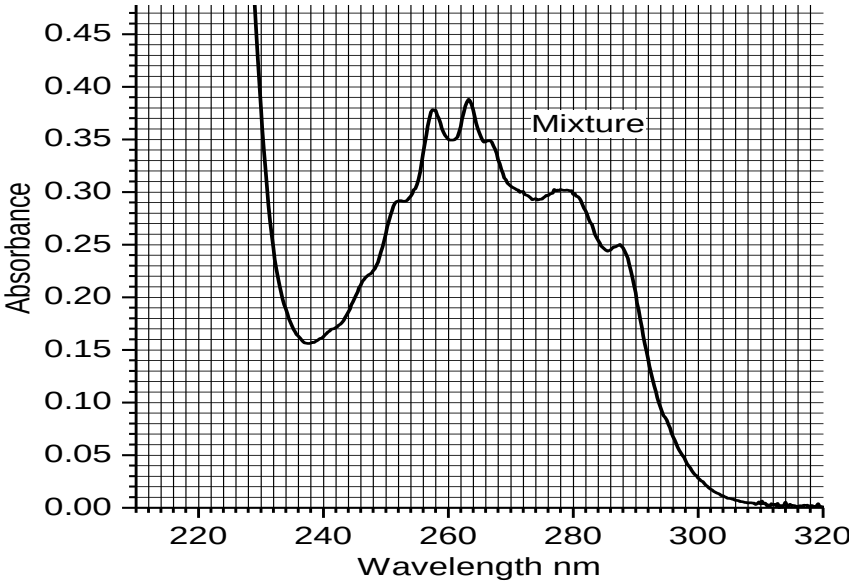
HOMEWORK #7

CHMY 361 **HANDOUT #11**
Nov. 21, 2017
Due Tue., Nov. 28 in class

1. Given the information on the upper two plots, find the molar concentrations of tryptophan (Trp) and phenylalanine (Phe) in the solution that gives the absorbance spectrum of the mixture. The path length is ***1.0 cm***.(Note: To have reasonable accuracy, use wavelengths with A = 0.1 or greater and extinction coefficient = 1000 or greater for Trp or = 40 or greater for Phe , if possible.) (Realize that the problem cannot be solved if you pick two wavelengths for which the ratio of extinction coefficients is nearly the same. That will give you two identical equations, but you need two independent equations to solve for 2 unknowns.) Therefore try to pick two wavelengths such that the ratio of extinction coefficients for Trp and Phe differs by a factor of 2 or greater.







2. Assuming that a second excited state of phenylalanine is beginning to absorb at 230 nm, make a drawing of the fluorescence spectrum that you expect if you excite a solution containing only phenylalanine with **225 nm** light.

3. (a) When a bond length vibrates, both masses move in opposite directions such that the center of mass stays constant. The correct mass to calculate the frequency from the "mass" and force constant is therefore what is called the ***reduced mass*** , which is given by $m_1m_2/(m_1+m_2)$. m1 and m2 are masses of the individual atoms that are bonded. Using the reduced mass, at what wavenumber (cm^{-1}) will the ^{17}C-^{2}H bond absorb IR light, given that the ^{16}O-^{1}H bond absorbs at 3600 cm^{-1}? You may use atomic mass units to do this problem.

(b) The force constant of bond stretching has nothing to do with isotopic mass. Why?

4. Given the shape depicted below shown in 3 views filled with water: draw curves that indicate the intensity of absorbed radio frequency energy during an MRI of this object when the magnetic field gradient is in the x, y, z directions. **NOTE: The figures on the <u>left</u> are only to show the orientation. Y is perpendicular to flat side.**