EQUILIBRIUM I AND II

PART I. TITRATION OF AN AMINO ACID USING A pH METER
PART II. SPECTROPHOTOMETRIC STUDY OF AN INDICATOR

GOAL/PURPOSE: -to monitor pH during an acid/base titration using a pH meter
- to determine the molecular weight of an unknown amino acid
- to use a spreadsheet program (Quattro Pro) to graph the titration curve
- to explore the relationship between pH and acid/base indicator color using
a UV/vis spectrophotometer (diode array)

NEEDED PRIOR CONCEPTS: -acid/base equilibria
-titration
-acid/base indicators
-pH/pKₐ and relative acid strength
-visible spectroscopy
-using titration to determine equivalent weight, and
molecular weight of an unknown acid
-amino acids and functional groups
-Zwitter ions

** the lab could be simplified/made qualitative by eliminating the "unknown" acid aspect
of determining the molecular weight of the amino acid. This reduces the need for discussion of
pKₐ. Alternatively, this could be done after a preliminary experiment in which a student
determines, for example, the Kₐ for acetic acid using indicators (methyl red and bromocresol green
work fairly well).

LABORATORY SKILLS: -analytical balance
-pH meter
-titration/use of a buret
-micropipettors
-UV-Visible diode array spectrophotometer
-use of spreadsheet programs

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PRE/POST-LAB ACTIVITIES:
- Use of Spectronic 20 spectrophotometer, comparison with diode array spectrophotometer
- Relate amino acids to protein synthesis
- Pre-lab: simple titration of acid/base using an indicator
- Intro: usefulness in identification of amino acids; relate to problems in metabolism of phenylalanine
- Post-lab extension: red wine, rose petals, red cabbage investigation of spectra at different pH's, compare to indicator used in lab: one molecule or more present?

SAFETY:
- Stirrer used as stirrer only, not hot plate
- Care of pH electrode
- Stool for use as needed in reading of buret during titration
- Care and handling of cuvettes for spectrophotometer
- Micropipettors: take care not to invert; label pipettes for use with specific solutions

PROCEDURES:

Part I
1. Video: analytical balance
2. Caution not to turn on hot plate
3. Video: Apparatus set up and operation
4. Video: Operation of pH meter; standardization
5. Caution on speed of addition of liquid from buret: dropwise

Part II
1. Video: micropipettor use
2. Check off solutions as they are added in order not to omit one in error.
3. Video: UV/Vis spectrophotometer
4. Care of cuvettes