SPECTRUM OF A PARTICLE IN A BOX

(Last Revision: January 31, 1997)

- ABSTRACT:

  Electrons in a conjugated system resemble the simple particle in a box problem in quantum mechanics. Many dyes have this conjugated system and their spectrum can be interpreted in terms of the simple energy expression derived from the particle in a box problem.

- TEXT REFERENCE:

  Sime, Rodney J., "Physical Chemistry - Methods, Techniques and Experiments," Saunders Pub., Philadelphia, PA, 1990. p. 687-693.

- OTHER REFERENCES:
- GENERAL DESCRIPTION AND THEORY:

  The electrons in the extended pi bond in molecule with a conjugated system can be regarded as particles in a box. Thus the energy expression from the particle in a box problem can be used to predict the electronic spectrum of these molecules. In this experiment the spectrum is used to predict the length of the pi bond.

- EQUIPMENT:

  Recording spectrometer, pipets, volumetric flasks, cells.

- CHEMICALS:

  Methanol, stock solutions of related cyanine dyes.

- LABORATORY PROCEDURE:

  Measure the absorption for a series of dyes for at least a 100 nm range about the maximum. Adjust the concentration to obtain a percent transmission about 10 for the maximum.

- CALCULATIONS:

  The calculations are those described by Sime.

- LITERATURE VALUES:

  Kuhn, H., J. Chem. Phys. 17:1198-1212, 1949.