CHAPTER OVERVIEW

3: Molecular Luminescence

Learning Objectives

After completing this unit the student will be able to:

- Describe the difference between a singlet and triplet state.
- Draw an energy level diagram and identify the transitions that correspond to absorption, fluorescence, internal conversion, radiationless decay, intersystem crossing and phosphorescence.
- Explain why phosphorescence emission is weak in most substances.
- Draw a diagram that shows the layout of the components of a fluorescence spectrophotometer.
- Describe the difference between a fluorescence excitation and emission spectrum.
- Draw representative examples of fluorescence excitation and emission spectra.
- Describe a procedure for measuring phosphorescence free of any interference from fluorescence.
- Justify why fluorescence measurements are often more sensitive than absorption measurements.
- Describe the meaning and consequences of self-absorption.
- Identify variables including the effect of pH that can influence the intensity of fluorescence.
- Identify the features that occur in organic molecules that are likely to have high fluorescent quantum yields.
- Compare two molecules and determine which one will undergo more collisional deactivation.

Luminescent methods refer to a family of techniques in which excited state species emit electromagnetic radiation. Among luminescent methods are various sub-categories that include the processes of fluorescence, phosphorescence, chemiluminescence, bioluminescence and triboluminescence. Among these different sub-categories, fluorescence spectroscopy is by far the most common technique used for analysis purposes. You are no doubt familiar with fluorescent lights. This unit will allow you to understand how such a light works.

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