**TEACHER NOTES**

**LAB ADV LQ 25**

From *Advanced Chemistry with Vernier,* Vernier Software & Technology, 2004

# INTRODUCTION

1. The light source for the reaction is either 430 nm or 470 nm. The nearly monochromatic blue light is absorbed by the solution.
2. When using a Spectrometer, we recommend choosing a wavelength very near 430 nm. However, other wavelengths from 420–480 nm can provide suitable results.
3. Prepare 100 mL of 0.020 M potassium iodide solution by dissolving 0.33 g of solid KI in sufficient distilled water to make 100 mL of solution.

1. Prepare 100 mL of 0.020 M iron (III) chloride solution by dissolving 0.54 g of solid FeCI3•6H2O in sufficient distilled water to make 100 mL of solution.

1. The cuvettes should be at least ¾ full to make precise absorbance measurements.

1. We recommend that each student lab team use a single cuvette to test their liquids in the Colorimeter or Spectrometer. This will eliminate errors introduced by slight variations in the absorbance of different plastic cuvettes.

1. If you wish your students to study the relationship between % transmittance and absorbance in the spectrophotometric analysis, you will need at least one set of data on a computer running the Logger Pro software. The measurements from the Colorimeter will be tabulated as both % transmittance and absorbance. At the end of the experiment, students can plot % transmittance *vs.* absorbance or % transmittance *vs.* concentration.

# HAZARD ALERTS

Iron (III) chloride solution (ferric chloride): May be a skin/tissue irritant. Hazard Code: D—Relatively non-hazardous.

Hydrochloric Acid : Causes severe skin and eye damage. Do not breathe mist, vapors or spray.

Potassium Iodide: Do not eat or drink when using this product. Harmful if swallowed.

The hazard information reference is: Flinn Scientific, Inc., *Chemical and Biological Catalog Reference Manual,* P.O. Box 219, Batavia, IL 60510.

# ANSWERS TO THE DATA ANALYSIS QUESTIONS

1. Answers will vary. Common explanations will emphasize the need to determined the moles of each substance and the total volume of the reaction mixture to calculate initial molarities of I- and Fe3+ ions. This also may be shown in an example calculation, as seen below.

 Trial 1: [I-] and [Fe3+] = {(0.02 M) (0.20 L)} ÷0.040 L = 0.010 M

1. The order of the reaction is first in KI or I-, and zero order in FeCl3, or Fe3+. By comparing Trials 1 and 2 along with Trials 1 and 4 in the sample results, it is evident that the concentration of I- affects the initial rate proportionally. While Trials 1 and 3 make a case for the reaction also being first order in Fe3+, the results of the other trials do not support it.

1. The rate law for the reaction between FeCl3 and KI at room temperature is:

 rate = *k*[I-].

1. It is not possible to calculate a rate constant, *k*, from the experimental data. The experiment, as conducted, allowed the student to collect just enough data to determined initial rates, but the reaction was not observed as it reached conclusion. In addition, the temperature of the reaction was not monitored, thus any determination of a rate constant is not reliable.

# SAMPLE DATA

|  |  |  |  |
| --- | --- | --- | --- |
| Trial  | [FeCI3] (M)  | [KI] (M)  | Initial rate (s-1)  |
|  1  |  0.010  |  0.010  |  0.0028  |
|  2  |  0.010  |  0.0050  |  0.0015  |
|  3  |  0.0050  |  0.010  |  0.0021  |
|  4   |  0.0075  |  0.0050  |  0.0015  |
|  5   |  0.0050  |  0.0075  |  0.0018  |

# SAMPLE GRAPH

