**Rates of Chemical Reactions: Iodination of Acetone**

## Teacher Notes

**Lab Time**: 80 minutes

**Preparation**:

**Time**: 30 minutes

Acetone Solution: Weigh out 232 grams of acetone. Add to a one-liter volumetric flask and dilute to the mark.

HCl Solution: Add 83.8 mL of concentrated HCl to enough water to

make 1 liter of solution.

Iodine solution: Add 1.27 grams of iodine to about 500 mL of alcohol

in a 1L volumetric flask. Dilute to the mark with water.

**T**: Make a set of equipment and materials available to each lab group.

**V**: The van can provide equipment and materials as requested.

The reaction is first order in acetone, first order in hydrogen ion, and zero order in iodine concentration. The students will notice that when the volume of iodine is increased, the reaction actually takes longer. This reaction is not as “flashy” as many clock reactions but gives consistent results. The students can use various combinations of acetone, iodine, and HCl, but calculations are easier if they double each reactant in turn. The last trial gives them an opportunity to predict a rate once they determine the order and rate constant.

**Answers to Questions**:

1. Why is the concentration of iodine so much lower than the other reactants?

It is assumed that all of the iodine will be consumed during the course of the reaction. The rate of the reaction can be monitored by the rate at which the iodine is used up.

2. How are time and rate related? How are 1/time and rate related?

*Time and rate are inversely related. 1/time and rate are directly related.*

3. What does it mean when someone says a reaction is “first order”?

When the concentration of a reactant is doubled, the rate also doubles. The time for the reaction is cut in half.

4. In a reaction A + B → C, it is found that the reaction is first order in terms of A

and B. What happens to the rate if the concentrations of A and B are doubled?

*The reaction rate is four times as fast.*