Lesson Title	Iodination of Acetone
Length of Lesson	90 min
Created By	David Wilson
Subject	AP Chemistry
Grade Level	10-12
State Standards	4e
DOK Level	DOK 2
DOK Application	Describe
National Standards	K-12: Unifying Concepts and Processes / 9-12: B: Physical Science
Graduate Research Element	In my research I study the kinetics associated with the proteins with which I work. Determining the reaction orders and associated rates, which the students will do in this lab, of my proteins is what I do in my research.

Student Learning Goal:

State Standards: (Chemistry)

4) Analyze the relationship between microscopic and macroscopic models of matter.

e. Describe and identify factors affecting the solution process, rates of reaction, and equilibrium. (DOK 2)

National Science Standards: (9-12)

Unifying Concepts and Processes:

As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- Systems, order, and organization
- Evidence, models, and explanation
- Constancy, change, and measurement
- Evolution and equilibrium
- Form and function

B: Physical Science: Chemical Reactions

- Chemical reactions can take place in time periods ranging from the few femtoseconds (10^{-15} seconds) required for an atom to move a fraction of a chemical bond distance to geologic time scales of billions of years. Reaction rates depend on how often the reacting atoms and molecules encounter one another, on the temperature, and on the properties—including shape—of the reacting species.

Materials Needed (supplies, hand-outs, resources):
Be Careful and always read the Materials Safety Data Sheet (MSDS) written for chemicals you use. Federal Law requires the vendors of chemicals to provide MSDS sheets for all their chemicals

(All quantities specified here are for approximately one lab group.)

1) 50 mL 4.0 M Acetone. (99.9% Acetone solutions purchased from chemical vendors are 13.6 M Acetone.)
2) 50 mL distilled water (Plus a lot more distilled water to rinse glassware.)
3) 50 mL 0.005 M Iodine (This takes FOREVER to dissolve, and it must be stored in an amber bottle.)
4) 50 mL 1.0 M HCl (Concentrated HCl is 12.0 M HCl.)
5) Two large test tubes
6) One 100 mL beaker
7) Plastic transfer pipettes
8) Test tube rack
9) Graduated cylinder
10) Timer (to record the rate in seconds)

Lesson Performance Task/Assessment:
Students will

- Determine the rate of a reaction.
- Determine how the rate of a reaction changes by varying concentrations of the reactants in the reaction solution.
- Determine the orders of the reactants and the rate constant of a rate law of a reaction.

Lesson Relevance to Performance Task and Students:
This lab will reinforce the calculations that the students are learning in class. The concepts associated with this topic are very abstract and difficult to understand as a new student to chemistry. This lab is an opportunity for students to gain some perspective into what the concepts involved mean.

Anticipatory Set/Capture Interest:
The students have become familiar with the calculations involved in this lab already. However, the students will be given a pre-lab assignment (attached) to complete before the lab for homework to give them more directed experience in completing the calculations necessary in the lab. To further focus their minds, I will show them the reaction before they go into the lab. The reaction is a dramatic color-change reaction.

Guided Practice:
The pre-lab assignment qualifies as guided practice for the skills needed in the lab.

Independent Practice:
Completing the lab is the independent practice.

Remediation and/or Enrichment:
Remediation: Individual IEP.
Enrichment: The final section of the lab (Part B) is optional. The higher achieving students will complete that section.

Check(s) for Understanding:
Students should be able to complete all the calculations involved in the lab.

Closure:
I will ask the students to explain how temperature variance will affect the reaction rate.

Possible Alternate Subject Integrations:
None.

Teacher Notes:
References:

1) CHE-106 Lab Manual used at The University of Southern Mississippi; Woodruff, Frank and Howell, J. Emory. Chemical Principles in the Laboratory. The University of Southern Mississippi. 2000. {This particular lab was copyrighted in 1975.}

An Advanced Study Assignment, Lab Procedure, and Lab Background are attached.