

IODINE CLOCK REACTION

Purpose: to determine the reaction rate for the reaction between iodate and hydrogen sulphite ions.

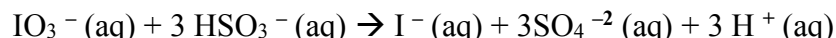
Theory:

The iodine clock reaction consists of mixing the two solutions below:

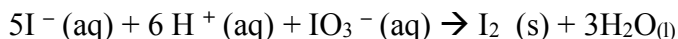
SOLUTION A is a 0.020 M solution of KIO_3 (aq)

SOLUTION B is a 0.0020 M solution of HSO_3^- (aq) with some starch as an indicator.

Initial Step:



When all of the bisulphite is used up, the I^- (aq) ions react with the remaining iodate ions to produce iodine, I_2 (s):



The molecular iodine forms a blue-black substance with the starch present in the solution, indicating to us that the reaction has proceeded to this point.

Procedure PART ONE: Effect of change in concentration of IO_3^- (aq)

1. Prepare a series of test tubes containing 10.0 ml, 8.0 ml, 6.0 ml, 4.0 ml, and 2.0 ml of iodate ion solution (SOLUTION A). **Add water as needed to bring the total volume to 10.0 ml in each tube.**
2. Prepare 5 test tubes containing 10.0 ml of the bisulphite ion solution (SOLUTION B).
3. ***Quickly*** pour solution A into solution B, and then back and forth 3 times to obtain uniform mixing. Start the stopwatch as soon as the solutions come into contact. Note the time *at the first sign of a reaction*.
4. Repeat for each pair of test tubes.

Procedure PART TWO: Effect of change in concentration of HSO_3^- (aq)

1. Prepare a series of test tubes containing 10.0 ml, 8.0 ml, 6.0 ml, 4.0 ml, and 2.0 ml of Bisulphite ion solution (SOLUTION B). **Add water as needed to bring the total volume to 10.0 ml in each tube.**
2. Prepare 5 test tubes containing 10.0 ml of the iodate ion solution (SOLUTION A).
3. ***Quickly*** pour solution B into solution A, and then back and forth 3 times to obtain uniform mixing. Start the stopwatch as soon as the solutions come into contact. Note the time *at the first sign of a reaction*.
4. Repeat for each pair of test tubes.

RESULTS / ANALYSIS:

DATA TABLES: One data table for each part, showing the volume used for each solution, the volume of water used for dilution, if necessary, and the reaction time.

GROUP DISCUSSION with your PARTNERS (not for marks)

DATA TABLES

Data for varying $[\text{IO}_3^-]$ Procedure PART ONE

Volume 0.020 M IO_3^- (mL \pm _____ mL)	Volume H_2O (mL \pm _____ mL)	Volume 0.0020 M HSO_3^- (mL \pm _____ mL)	Reaction Time (s \pm _____ s)
10.0 ml	0.0 ml	10.0 ml	
8.0 ml	2.0 ml	10.0 ml	
6.0 ml	4.0 ml	10.0 ml	
4.0 ml	6.0 ml	10.0 ml	
2.0 ml	8.0 ml	10.0 ml	

Data for varying $[\text{HSO}_3^-]$ Procedure PART TWO

Volume 0.0020 M HSO_3^- (mL \pm _____ mL)	Volume H_2O (mL \pm _____ mL)	Volume 0.020 M IO_3^- (mL \pm _____ mL)	Reaction Time (s \pm _____ s)
10.0 ml	0.0 ml	10.0 ml	
8.0 ml	2.0 ml	10.0 ml	
6.0 ml	4.0 ml	10.0 ml	
4.0 ml	6.0 ml	10.0 ml	
2.0 ml	8.0 ml	10.0 ml	

DISCUSSION IN YOUR LAB GROUPS

In order to prepare for the Unit 1 Test, work with your partners, **using REACTION KINETICS LANGUAGE (Chem 12 terminology)** to demonstrate complete understanding of the big ideas.

1. Use Reaction Kinetics Theory to explain the relationship between the varying concentration and the time of reaction. Be overt and thorough in your answer.
Discuss how this lab procedure demonstrates the relationship between concentration **of each reactant** and time.
2. Which of the 6 factors that affect a rate of reaction, could affect the rate of this lab? Consider each factor and explain how it played a role (or didn't) in the effective collisions of the molecules in this reaction. Be sure to discuss specifically how each factor was directly or *perhaps inadvertently* involved in changing the rate.

TEMPERATURE

NATURE of REACTANTS

CATALYST

SURFACE AREA

AGITATION

CONCENTRATION of REACTANTS (you have already discussed this factor thoroughly in Question 1)
3. Outline some of the Sources of Error that could lead you to erroneous results in terms of your conclusions. Discuss the procedural inadequacies and experimenter inexperience that may cause erroneous data to be collected. Refer to Mrs. Toombs' **Senior Lab Report Format Outline** (posted on the blog, under FORMS AND DOCS) if you need support in with how to write Sources of Error (and Relevant Theory).