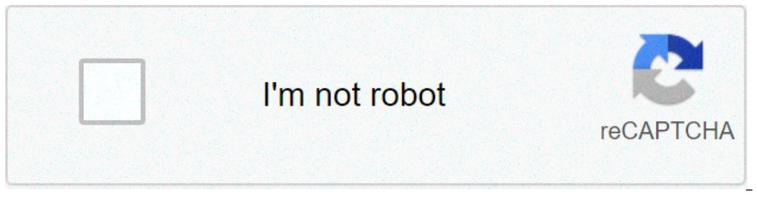

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Kinetics of iodine clock reaction lab report

Overview Investigations of the rate at which a chemical reaction occurs is of great importance to chemists and engineers, because studies of rate data can help elucidate the elementary steps--the mechanism--by which a chemical reaction takes place. In this experiment you will study two aspects of reaction rate: how the overall rate of reaction depends on the concentration of the reactants, and how the rate varies with temperature. Qualitatively, we would expect an increase in the concentration of the reactants to lead to a faster rate for a chemical reaction: a reaction takes place when molecules collide physically with one another, and if there are more molecules present, they will collide more often. We also would expect an increase in temperature to lead to a faster rate for a chemical reaction. Temperature is a measurement of the average kinetic energy of the molecules in a sample. If the temperature is raised, the average kinetic energy is raised, and more molecules will collide with enough energy to react with each other. Data These concentrations were marked on the front of the containers from which you obtained them. The concentrations used below for the sample calculations may not be the concentrations available when you performed the experiment. [stock HSO3] 0.0164 M [stock IO3] 0.0247 M Mixture Trial 1 Trial 2 Average Time 1 21 sec 23 sec 22 sec 2 27 sec 29 sec 28 sec 3 37 sec 35 sec 36 sec 4 55 sec 55 sec 55 sec 5 108 sec 112 sec 110 sec Calculations Page 169, Part II Remember that square brackets [ ] are an abbreviation for the concentration, in moles/L--the molarity--of the indicated substance. When Mixture 3 was prepared (according the instructions on Page 132) it should have contained 5.00 mL of NaHSO3 solution, 30 mL of KIO3 solution, and 20 mL of water. Effectively, we are diluting 30.0 mL of 0.0247 M KIO3 to a total volume of (30.0 + 20.0 + 5.0) = 55.0 mL. So the concentration of KIO3 is then You are going to be making a graph of -log(time) versus log[IO3-] to determine the order of the reaction with respect to the concentration of iodate ion. The logarithms to be calculated are the base 10 logarithms (log, log10, etc.). This table prepares you for making the graph by converting your time and concentration data into the form needed for the graph. Remember that the number before the decimal point in a logarithm represents the power of ten of the number being written (and is not really a "significant" figure). When calculating the logarithm of a number, the logarithm should have as many figures after the decimal point as the original number had significant figures. Since we have already determined the concentration of iodate ion, [IO3-] for Mixture 3, we will use that Mixture to illustrate the calculations: For Mixture 3, [IO3-] = 0.0135 M log [IO3-] = log [0.0135] = -1.870 (three significant figures after decimal point) The average time for Mixture 3 to react was 36 sec -log (time) = -log (36 sec) = -1.56 (two significant figures after decimal point) The table is then completed for the other reaction mixtures. You will also have to calculate the [IO3-] for the other four reaction Mixtures. See Part IIA, above. Mixture -log (time) [IO3-] log [IO3-] 1 -1.34 0.0225 M -1.648 2 -1.45 0.0180 M -1.745 3 -1.56 (see above) 0.0135 M -1.870 (see above) 4 -1.74 0.00898 M -2.047 5 -2.04 0.00449 M -2.348 When you make your graph, remember that the graph should be plotted so that the data can be read to the number of significant figures in the measurements, and should almost fill the page. Since none of the points are near the origin (0,0) there is no need to show the origin. For my data above, the scale of the -log (time) axis only has to run from -1.30 to -2.10, and the log [IO3-] axis only has to run from -1.600 to -2.400. According to the derivation on Pages 133-134, the slope of your plot of "-log (time) versus log [IO3-]" gives the experimental order of the reaction with respect to the concentration of iodate ion. See the appendix on graphing. In calculating the slope, choose two far-apart points on the "best" line you have drawn (rather than using any of your individual data points). Realize that the answer to this should be the actual slope calculated (in Part IVA2, you will round off) As this experiment was designed, the order of the reaction for iodate ion should come out to be a small whole number. Round off your slope in Part IVA1 to the nearest whole number here. Questions: 1. What would a wet beaker do to the concentration of the two reagents taken? 2. According to the general rate law on Page 131, Rate = k[HSO3-]x[IO3-]y where y is the order of reaction with respect to the concentration of iodate ion, which you determined in your experiment as the slope of your graph. If the concentration of iodate is doubled, this interjects a factor of 2 raised to the y power into rate. So what happens to the time required for the reaction? 3. Your graph of -log(time) versus log[IO3-] should have been a straight line. The straight line can more or less be used like the calibration curve you made in Experiment 15 for the colored dye: the straight line in this experiment shows a relationship between time and concentration. Note, however, that the relationship is not a direct one. kinetics of iodine clock reaction lab report chegg. chemical kinetics of the iodine clock reaction lab report. chemical kinetics of the iodine clock reaction lab report tamu

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