Rate and Order Lab Feedback Rubric

Category	General	Pts	Specific	Self Assessment
Lab Title, Topic	Topic is not the same as the title of the chapter!	**1**	Rate and Order, Spectroscopy, Kinetics	
Purpose/Question/ Problem/Goal /Hypothesis	Relevant, thoughtful	**1**	To determine the order of the reaction in KI and $FeCl_3$ and determine the rate law expression for the reaction through spectroscopy	
Key vocab terms and equations	Just the terms, nothing else	**2**	• Spectroscopy, Concentration, absorbance, Kinetics (reaction rate), Rate Law, rate constant, Order(s), • Rate = $k[A]^x[B]^y$, wavelength max, $M_1V_1 = M_2V_2$	
Key concept explained	All relevant concepts explained in a detailed and scientific way that demonstrates the connection to the material taught in the chapter.	**3**	• As this reaction proceeds, it undergoes a color change that can be precisely measured by a Spectrometer. By carefully varying the concentrations of the reactants, you will determine the effect each reactant has on the rate of the reaction, and consequently the order of the reaction. From this information, you will write a rate law expression for the reaction	
Lab equipment, setup, named lab techniques	All important items included, labeled, explained	**2**	NA – Points automatically given unless you wrote something that did not apply. Don't make up nonsense just to fill a box!	
Sig figs related to the equipment		**1**	• Spectrometer gave 2-4 sig figs depending on the absorbance reading • 1.0 mL on graduated cylinder, 0.2 mL on pipettes	
Experimental results	Reported in a succinct and direct way.	**2**	Needed rate law with no rate constant value or stated orders of BOTH reactants	
Accepted values/results	Relevant accepted values/results reported	**2**	Accepted values for each Order were told to you in class and need to be stated here. You needed to say what your determined orders were for each.	
% Error Calculation	Done correctly, work shown, answer reported	**2**	Needed to see the calculation for %error, work shown and answers provided	
Sample calculations	Sample calculation shown for each type of calculation, work shown, numbers and units included, done correctly, answers reported.	**4**	<u>One calculation of each type must be included</u> • Calculation of $[FeCl_3]$, [KI], • Calculation of Orders for Fe^{3+} and I^- • Units	

Possible Lab errors	Relevant lab errors reported. No mention of "human error" or "calculation mistakes" etc	**3**	• Finger prints left on cuvettes (incorrect absorbance = incorrect [ ]) • Cuvette not completely cleaned between trials (contaminated) • Incorrect solution(s) made for reaction • Inconsistent time between mixing and putting Rxn into spec • Cuvette not completely dried between trials (dilute next trial) • Detailed	
Mathematical impact of lab errors	Identifies if errors result in higher or lower final results, explaining mathematical reasoning	**3**	• Will vary depending on error. • Must include how error effect result(s) with explanation(s) • Detailed	
Example test question on topic	Thoughtful, relevant possible test question on this topic	**2**	Question needs to be detailed, complex enough to show thought/processing of the scientific concepts being taught during the chapter – not just a simple "what color flame does calcium make" type question. See HERE for Costa's Levels of Questioning. Question should be level 2 or 3 – did not hold you accountable this time	
Solved Example test question	Work shown, done correctly, explanation given if not a mathematical problem.	**2**	Answer needs to be detailed and correct. If Math, must show all work to prove answer	
Data Tables	Professional, large, rows/columns labeled, data legible	**12**	• Data tables were already made: must include descriptive title along with the full reaction (reactants and products). This was to see if you recorded your data in a detailed way. • No Full Rxn – 3 pt deduction • No Title – 5 pt deduction	
Discussion questions	One or more questions will be evaluated for completion and/or accuracy.	**10**	• See Below this table – Highlighted • Detailed, thoughtful, relevant, complete	
Professionalism	Neat, legible, demonstrates deep level of thought/detail/effort.	**7**	Points deducted if the legibility detracted from my ability to grade the assignment. Points also deducted for a blatant disregard for the level of thought and detail required of an AP level course. This category is also used for strange/unique issues that do not fit nicely into another category.	

Discussion Questions – The highlighted ones were graded.

- ☐ All were graded for completion, detail, thought AND accuracy
  - Only question #4 for accuracy
- ☐ All were graded for completion, detail, and thought

1. **Answers will vary**. Common explanations will emphasize the need to determine the moles of each substance and the total volume of the reaction mixture to calculate initial molarities of the I^- and Fe^{3+} ions. This also may be shown in an example calculation, as seen below.

   Trial 1: $[I^-]$ and $[Fe^{3+}]$ = {(0.02 M) (0.020 L)} ÷ 0.040 L = 0.010 M

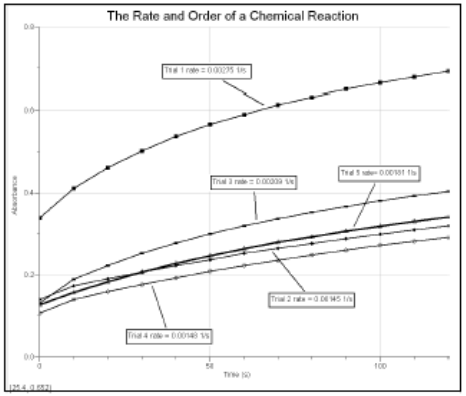
2. The order of the reaction is first in KI, or I^-, and zero order in $FeCl_3$, or Fe^{3+}. By comparing Trials 1 and 2 along with Trials 1 and 4 in the sample results, it is evident that the concentration of I^- affects the initial rate proportionally. While Trials 1 and 3 make a case for the reaction also being first order in Fe3+, the results of the other trials do not support it.

3. The rate law for the reaction between $FeCl_3$ and KI at room temperature is: Rate = k$[I^-]$.

4. 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 determine 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	$[FeCl_3]$ (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



For Schnell:

NA – Points automatically given unless you wrote something that did not apply. You should know this box was not applicable to the lab being done. Don't make up nonsense just to fill a box!