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| **Iodination of Acetone** | Name: |  |
| Hand-In, Chem 210L | Partner: |  |

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See the rubric below for more detailed information about grading.

1. (1 pt) Record the times for your initial room temperature reactions (part II C and D).

{Insert time values, calculations and explanation here}

1. (2 points) Determine the initial concentrations of iodine, acetone and acid in a reaction containing 2.00 mL iodine, 4.00 mL acetone and 2.00 mL acid (H+). Use the stock reagent concentrations you recorded.

Remember, you must show the steps in each calculation and explain, where necessary, units must be clear and correct.

{Insert calculations and explanations here}

1. (2 pts) For the one of the reactions with components listed as in #2, it required 1.73 minutes for the yellow color to completely disappear. Calculate the reaction rate for this reaction given in M/sec.

{Insert calculations and explanations here}

1. **(3 points)** Include the excel table showing all of your initial volumes and concentrations for each reactant in each unique run performed. Make sure the table has a number and a title and include all headings with units where applicable. Show a sample calculation of initial concentration for each of the reactants.

**{Insert table here.}**

1. (9 pts) The overall goal of this question is to determine the correct rate law expression for this reaction.

(a. 3 pts) Based on the class average data for your lab section, determine the rates of all the reactions studied in . Include a table showing all of these rates here.



**{Type answer here including the table, sample calculations and explanatory}**

(b. 3 pts) Based on your answers to part a. calculate the exact values for the order of the reaction with respect to each of the reactants. You will need to use logarithms to solve for the exact values and you need to show a sample calculation. Include the fully labeled rate law using the calculated orders.

**{Type answer here including sample calculations and explanatory text as appropriate.}**

**{Type the fully labeled rate law with exact orders from your calculation}  
  
 {Type the fully labeled rate law with rounded orders}**

(c. 3 pts) Based on the class average data for your lab section determine the rate constants for each of the reactions studied (four room temperature runs, one cool and one ice). When using the orders from part b. round them off to the nearest whole number. Explain the steps in the process and show one sample calculation. Also **report** an average rate constant for the four room temperature runs, for the cool experiments and for the cold experiments. For the room temperature reactions include the numeric error   
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**{Type answer here including sample calculations and explanatory text as appropriate.}**

1. **(Ignore this question)** Based on the amount that you had to round off the orders to get to a whole number in going from part 2b to part 2c above, what does this tell you about the error in the experiment? What are some likely sources of error in this experiment?

**{Insert discussion here.}**

1. (4 points) Based on your data, how does the rate constant change with temperature? Why does it change in this way?

**{Insert discussion here.}**

1. (4 points) Using class data from the room temperature and variable temperature experiments calculate the value of the activation energy for this reaction using either the two-point form of the Arrhenius equation or the linear Arrhenius equation/graphical approach. Show a sample calculation using the two point method if relevant and include your graph used to determine activation energy using the graphical approach.

**{Insert fully labeled graph, sample calculations and answers here}**

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|  | **Unsatisfactory** | **Borderline** | **Satisfactory** | **Excellent** | **Score** |
| **Q #1** | Not using Microsoft Equation or similar equation editor but stringing out calculations in lines of text and numbers.  **0 points** |  |  | Correctly identified two trials within 10% of each other. (0.5 pt)  Calculations are correct showing the two times are within 10% of each other (0.5 pt)  **1 point** | 1 pts. |
| **Q #2** | Not using Microsoft Equation or similar equation editor.  **0 points** | Major calculation errors and/or consistently incorrect use of units and significant figures.  **0.5-1 points** | Minor calculation errors and/or incorrect use of units and significant figures.  **1.5 points** | Correct calculation of iodine concentration,  (0.5 pt)  Correct calculation of acetone concentration  (0.5 pt)  Correct calculation of acid concentration (0.5 pt)  All calculations are labeled correctly  Answers are rounded to the correct number of significant figures (0.5 pt)  **2 points** | 2 pts |
| **Q #3** |  |  | Minor calculation errors and/or incorrect use of units and significant figures. | Correctly showed calculation of rate including correct units and labeling (1.5 pt)  Correctly converted M/min to M/sec (0.5 pt) | 2 pts |

See the rubric below for more detailed information about grading.

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|  | **Unsatisfactory** | **Borderline** | **Satisfactory** | **Excellent** | **Score** |
| **Q #4**  **[Init.]** | No sample calculations or Microsoft Equation not used.  **0 points** | Mistakes in calculations and table  **1 point** | Incorrect or no use of units.  **2 points** | Clear, correct calculations with proper use of units. Full table **(1 pt)** Sample calculations for each reactant **(2 pts)** | **3 pts.** |
| **Q #5a**  **Rates** | No sample calculations or Microsoft Equation not used.  **0 points** | Mistakes in calculations and table  **1 point** | Everything correct but explanation missing.  **2 points** | Clear, correct calculations with proper use of units. Table included **(1 pt)** Fully labeled and correct sample calculation **(1 pt)** Explanation of each step of the calculation **(1 pt)** | **3 pts.** |
| **Q #5b**  **Orders** | No sample calculations or Microsoft Equation not used.  **0 points** | Mistakes in calculations and/or lacking rate laws.  **1 point** | Incorrect or no use of units and/or rate laws are not included  **2 points** | Clear, correct calculations with proper use of units to show orders with respect to each reactant **(2 pts)**  Rate law with exact orders included **(0.5 pt)** Rate law with rounded orders included **(0.5 pt)** | **3 pts**. |
| **Q #5c**  **Rate**  **Const.** | No sample calculations or Microsoft Equation not used.  **0 points** | Mistakes in calculations.  **1 point** | Incorrect or no use of units or no calculation of error.  **2 points** | Clear, correct calculations with proper use of units and determination of error for rate constant. Sample calculation **(1 pt)** Rate constants reported  **(1 pt)** Error calculated and included **(1 pt)** | **3 pts**. |
| **Q #6**  **Error** | Poor discussion of error.  **0 points** | Not clear about how to judge error or possible sources of error.  **1 point** |  | Clear idea of error based on necessary rounding  identify possible errors  **(1 pt)** and plausible discussion of sources of error **(1 pt).** | **2 pts**. |
| **Q #7**  ***k* vs. T** | Incorrect analysis and explanation.  **0 points** | Analysis or explanation is not clear.  **1 point** |  | Correct analysis of how and why *k* changes with T. Statement of relationship **(1 pt)** Explanation **(1 pt)**  **2 points** | **2 pts.** |
| **Q #8**  **Ea** | No sample calculations or Microsoft Equation not used.  **0 points** | Mistakes in calculations.  **1-2 points** | Incorrect or no use of units or no calculation of error.  **3 points** | Clear, correct calculations with proper use of units and determination of error for Ea. Sample 2 point calculation **(1 pt)** Fully labeled graph included **(1 pt)** Report four Ea’s **(1 pt)**  Average  **(1 pt)** | **4 pts.** |
|  | | |  |  | 25 pts |