**Pre lab questions**

1. How do you expect a change in concentration or temperature of a reactant to affect the reaction rate?
2. Why is the volume in the beaker kept constant within each procedure?
3. Why is the concentration of hydrochloric acid kept constant?
4. How would you make 500 mL of a solution of 0.250 mol/L sodium thiosulfate?
5. How would you make 500 mL of a 2.0 mol/L solution of hydrochloric acid if you have 6.0 mol/L HCl in the storage cupboard?
6. If you begin an experiment with a 50.0 mL sample of 0.250 $mol \bullet L^{-1}$ sodium thiosulfate and you add 10.0 mL of hydrochloric acid, what is the concentration of sodium thiosulfate at the time you add the HCl?
7. How will the rate of this reaction depend on $[S_2O3^{2-}_{(aq)}]$ if m= 0?
8. If rate = $k_{obs}[S_2O3^{2-}_{(aq)}]^1$, sketch a graph of rate, on the y-axis, versus $[S_2O3^{2-}_{(aq)}]$, on the x-axis. There is no need to put any numerical values on this graph, or on those in question
9. a) If rate = $k_{obs}[S_2O3^{2-}_{(aq)}]^2$, sketch a graph of rate, on the y-axis, versus $[S_2O3^{2-}_{(aq)}]$, on the x-axis. b) If rate = $k_{obs}[S_2O3^{2-}_{(aq)}]^2$, sketch a graph of rate, on the y-axis, versus $[S_2O3^{2-}_{(aq)}]^2$, on the x-axis.

**Analysis**

1. Get a spreadsheet going. Enter data for $[S_2O3^{2-}_{(aq)}]$ and average reaction rate for each trial. Review your answers to the pre-lab questions before you begin the following.

2. If we assume that y = 1, a graph of reaction rate in mol/L •s on y-axis, versus $[S_2O3^{2-}_{(aq)}]^1$ (mol/L) on the x axis should be linear. Use a spreadsheet to plot this graph. Get a line of best fit (in Excel: right-click on any data point on the graph and choose "add trendline"). To find the $R^2$ value, also known as the correlation coefficient (right-click on the trendline, go to "options" and check box labeled $R^2$). Remember that an $R^2$ value of 1 indicates that the data fit exactly on a straight line.

3. If we assume that y = 2, a graph of reaction rate in mol/L •s on y-axis, versus $[S_2O3^{2-}_{(aq)}]$ (mol/L) will be a parabola. (Think about $y = x^2$.)
However, a plot of reaction rate versus $[S_2O3^{2-}_{(aq)}]^2$ axis should be *linear*. Use a spreadsheet to plot this graph. Get a line of best fit and find the $R^2$ (ie correlation coefficient) value as above.

Conclusion

4. Look at the $R^2$ values for the two graphs that you plotted. The $R^2$ value that is closer to 1 indicates the best value of the exponent y (see eq'n 2). Rewrite eq'n 2 with the appropriate value of y.

## 6.3 THEORIES OF REACTION RATES

### Collision Theory

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Q.

**Effect of [ ] on Reaction Rates:**

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- For a collision to be effective:
  1)

  2)

**ORIENTATION**:

### ACTIVATION ENERGY

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Called **Ea**-

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- Maxwell-Boltzman curve shows distribution of particles that have differing amounts of energy at a constant temp