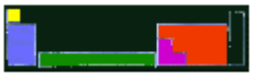
Revised August 2007



AP LAB 15b: Rates of Reaction (Concentration)

Aim To determine the effect of concentration on the rate of a chemical reaction

Apparatus Graduated cylinders (various sizes), 100 mL beakers, stopwatch

Chemicals 3.00 M HCl, distilled water, Magnesium ribbon

Method

1. By performing the appropriate calculations, complete lines **B** and **C** in the table on page 2.

2. By using a pipet and the appropriate graduated cylinders, measure the required volumes of water and 3.00 M HCl. In six separate beakers, combine the HCl and water in order to make up the desired solutions.

3. Measure and weigh a 30.0 cm length of magnesium ribbon. Record the mass on page 2.

4. Cut the 30.0 cm length of magnesium ribbon into six equal length pieces, i.e. six pieces measuring 5.00 cm each.

5. Drop one piece of magnesium ribbon into the first beaker and simultaneously start the stopwatch. With gentle swirling, continue to observe the magnesium ribbon until it disappears, stopping the stopwatch at the point you can no longer see any magnesium ribbon. Record the time taken in line **D** the table on page 2.

6. Repeat step #5 for the remaining beakers.

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Results

	1	2	3	4	5	6
A: Desired Solution	20.0 mL of 3.00 M HCl	20.0 mL of 2.00 M HCl	20.0 mL of 1.50 M HCl	20.0 mL of 1.00 M HCl	20.0 mL of 0.50 M HCl	20.0 mL of 0.25 M HCl
B: Volume of 3.0 M HCl required to make desired solution	20.0 mL					
C: Volume of distilled water required to make desired solution	0.00 mL					
D: Time in seconds taken for Mg to disappear						
E: Rate of Reaction in g/s						

Mass of 30.0 cm length of Magnesium ribbon =

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Conclusion/Calculation

1. Determine the rate of reaction in each experiment in terms of mass of reactants used per second. Record your results on line **E** on the table.

2. Plot a graph of rate (y axis) and [HCl] (x axis) in order to determine the order of the reaction with respect HCl.

3. Given the order you have determined from the graph in #2 above, sketch the graph you would expect to obtain if you plotted a different graph of [HCl] (y axis) and time (x axis).

4. What plot would yield a straight line graph, and how could the graph be used to determine a value for the rate constant in this reaction?

5. Write the net ionic equation for the reaction.

6. What would be an alternative method of assessing the rate of this reaction?

7. The reaction is known to be exothermic. Sketch a reaction pathway profile for the reaction showing the reaction the pathway of the reaction both with AND without a catalyst. Fully label the sketch.

8. If the reaction were carried out using Magnesium powder as opposed to magnesium ribbon, what would happen to the time taken for the reaction to be completed? Explain your answer.