**Chem 12 – Lab 1A: Measuring the rate of a limestone/HCl reaction**

**Pre-lab thinking:**

This experiment looks at the reaction between limestone rock (CaCO3) and hydrochloric acid:  
 **CaCO3 (s) + 2HCl (aq) 🡪 CaCl2 (aq) + H2O (l)  + CO2 (g)**

The rate of reaction measures the change in reactants or products over time. Make a list of all the ways you might measure/report the rate of this reaction:

Which method should we use in our lab? Why did you choose this one?

Predict: What do you think the change will look like over time? (as a graph)

**CREATE A FORMAL LAB REPORT FOR THE EXPERIMENT BELOW, USING THE OUTLINE**

**Questions:  
  *What is the rate of this chemical reaction? What happens to the reaction rate over time?***

**Procedure:**  
 You will use a 250mL Erlenmeyer flask, 3 limestone rocks, and 50.0mL of 3.00M HCl.  
 Design a procedure that will allow you to measure the reaction rate. Consider:  
 - Which data will you need to collect to calculate the reaction rate? (Question 1)  
 - When/how will you record this data?  
 - How will you gather data about the rate over time? (Question 2).   
 - How often will you record this data, and what will you record?  
 - What is the most effective way to organize your data?

***Tip: observe your reaction for a total of 15 minutes***

**Data analysis:**  
 Calculate the overall/average reaction rate (for the full 15 minutes).  
 Show your work, and include units in your answer.

Do you see any changes in the rate over time? Explain the general patterns that you see.

Go deeper: plot a graph of products or reactants over time, for this reaction.   
 \*\* use the lab format sheet to help you build a complete graph!

Listen to your teacher’s explanation of average vs. instantaneous rate, then use your   
 graph to find the instantaneous rate of reaction at 5 minutes and at 10 minutes.   
 Show your work. How do these rates compare?

**Conclusion:**  
*Since there are two questions in this lab, the conclusion will be split.*

Make a **claim:** what is the overall rate of reaction?  
 Your work in the analysis section above will be your **evidence.**  
 You don’t need to repeat it here  
Sources of error:  
 Identify any factors that might have affected your calculated rate.  
 Explain whether each of these factors has lowered or inflated your answer.

Make a **claim:** how does the reaction rate change over time?  
Give **evidence** that supports your claim.  
 Use actual data (average and/or instantaneous rate) to explain why you made this claim.  
Explain your **reasoning.** Connect your claim to theory. Why does this claim make sense?  
 What’s the science behind what you’re seeing?  
 You’re welcome to do some research here. Key word: collision theory