

Lab: Factors that Affect Reaction Rates

Name: _____

Block: _____

| For Students: | For Teacher: |
|----------------|---|
| Lab performed: | Pre-lab completion: <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Lab due: | Lab Submitted: <input type="checkbox"/> On Time <input type="checkbox"/> Late |

Introduction:

The rate of a reaction is always expressed as the change in _____ per unit of _____.

Objectives

- 1.
- 2.
- 3.
- 4.

Answer the following questions:

- a) In a reaction, it takes 9.05 minutes for a 2.22 kg rock to completely dissolve. Calculate the reaction rate in g/s. *Show all work including proper units.*
- b) A reaction with a production rate of 0.045g/s takes place over 7.2 seconds. Calculate the mass of product formed. *Show all work including proper units.*
- c) A reactant is consumed at a rate of 6.43mL/min. If 2.49mL of the reactant is used up, calculate the reaction time. State your answer in seconds. *Show all work including proper units.*

Procedure:

Part I: Effect of Concentration on Reaction Rate

| | | | |
|------------------------------------|---------------------------------|------------------------------------|--|
| Mass of 100. cm of Mg: 1.7 g | | Mass of 1.00cm of Mg: | |
| <u>Concentration of HCl</u> | <u>Reaction Time (s)</u> | <u>Reaction Rate: (g/s)</u> | |
| 1.0M | | | |
| 3.0M | | | |
| 6.0M | | | |

Part II: Effect of Temperature on Reaction Rate

| | | | |
|------------------------------------|---------------------------------|------------------------------------|--|
| Mass of 100. cm of Mg: 1.7 g | | Mass of 1.00cm of Mg: | |
| <u>(Approx) Temperature</u> | <u>Reaction Time (s)</u> | <u>Reaction Rate: (g/s)</u> | |
| Boiling = _____ °C | | | |
| Hot Water = _____ °C | | | |
| Room Temp. = _____ °C | | | |
| Ice Water = _____ °C | | | |

Part III: Effect of Surface Area on Reaction Rate

| <u>Reactant</u> | <u>Mass CaCO₃ Reacted</u> | <u>Reaction Time (s)</u> | <u>Reaction Rate (g/s)</u> |
|--------------------------|---|---------------------------------|-----------------------------------|
| CaCO ₃ chip | | | |
| CaCO ₃ powder | | | |

Part IV: Effect of a Catalyst on Reaction Rate

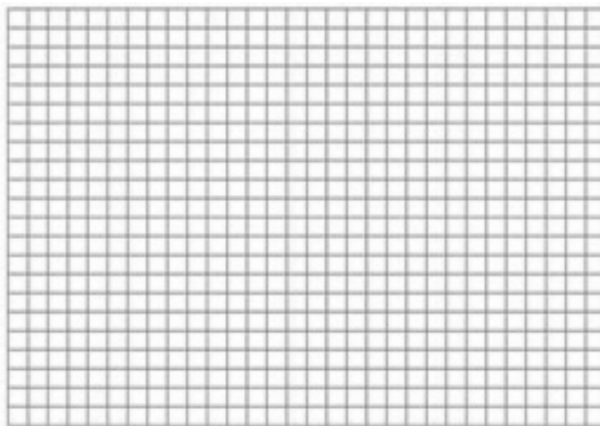
| <u>Reaction</u> | <u>Reaction Time (s)</u> |
|-----------------------------------|---------------------------------|
| With Mn ²⁺ catalyst | |
| Without Mn ²⁺ catalyst | |

Analysis of Results:

Part I:

1. Look at your results from Part I. What happens to the reaction rate as the concentration of the acid is increased? Explain your answer in terms of collision theory.

2. Draw a line graph of the reaction rate vs. concentration of HCl results from Part I.

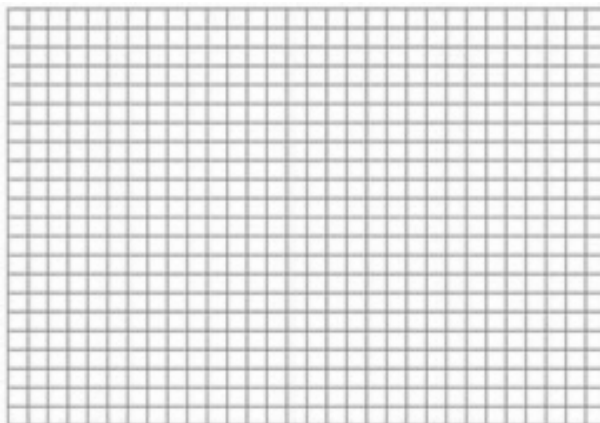


3. Use your graph to predict the reaction rate and then calculate the reaction time for a 1.00cm Mg strip in 4.5M HCl solution under the same conditions.

Part II:

1. Which reaction's rate was the fastest? Explain your answer in terms of collision theory.

2. Draw a line graph of the reaction rate vs. temperature from Part II.



3. Use your graph to predict the reaction rate and then calculate the reaction time for a 1.00cm Mg strip in 1.0M HCl solution at a temperature of 75°C.

Part III:

1. Look at your results from Part III. Which reaction had the slowest rate? Explain why using collision theory.

Part IV:

1. By what factor (how many more times) did the rate increase when a catalyst was used?

Conclusion:

State the results of Objectives 1, 2, 3, and 4.

1.

2.

3.

4.