SCIENCE 10  
9.L: Investigating Reaction Rate

**The Lab**:

We have so far studied chemical reactions of all kinds. In this lab, we will be investigating how chemical reactions can be made to speed up or slow down, i.e. reaction rate!

We will investigate the reaction of hydrochloric acid with chalk, also known as calcium carbonate. First we will see how they react together on their own, then we will change two different variables and observe their effects on reaction rate.

Materials:

* chalk
* 0.1 M HCl
* 1.0 M HCl
* mortar and pestle
* balance
* timer
* beaker
* graduated cylinder (10mL)

**Safety**:

* Put on your lab coat and safety goggles before starting!
* Be very careful around any acids you use! They are corrosive and will burn you.

**Report**:

When you are finished, write up your findings into a neatly typed or written lab report with the following sections as headings:

* Name, Date, & Block
* Title (Investigating Reaction Rate)
* Purpose (Why? What did you do and what did you hope to learn from it?)
* Methods (Write: “See lab procedures.”)
* Results (Table A)
* Discussion (Answer the questions below.)
  1. What is the reaction equation between hydrochloric acid and calcium carbonate? Write out the equation, predict the products, name the reaction type, and balance it.
  2. Which two variables did you test?
  3. How did each variable affect reaction rate?
  4. Explain why you believe each variable had the effect it did. Relate your responses to Kinetic Molecular Theory and Collision Theory.
  5. Do your own research and write down one way in which reaction rate is increased in an industrial-scale reaction (e.g. with a catalyst or heat).

**Procedure**:

1. Copy down Table A into your notebook:

Table A

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Control** | **Variable 1** | **Variable 2** |
| **Variable Changed** | n/a |  |  |
| **Mass of Chalk** |  |  |  |
| **Time to Dissolve** |  |  |  |
| **Reaction Rate** |  |  |  |

2. Break one full-size piece of chalk into three roughly equal size pieces. You will use one piece as a control, the second piece as a way to test the effect of one variable on reaction rate, and the third as a way to test the effect of a second variable on reaction rate.

3. Take each of the pieces of chalk to a balance and weigh it. Record their masses in Table A.

4. Add no more than 10 mL of 0.1 M HCl to a beaker. Get a timer ready.

5. Place the “Control” piece of chalk into the acid. Time how long it takes for the chalk to dissolve (i.e. for the reaction to complete) and record that time in Table A.

6. Calculate the reaction rate using the mass of the chalk and the time it took to dissolve.

7. Decide which variable you will test for the “Variable 1” piece of chalk. Change that variable using the equipment available, then test reaction rate using no more than 10 mL of acid.

8. Decide which variable you will test for the “Variable 2” piece of chalk and repeat.

9. Clean up your station and put all your equipment back where you found it. Nice work!

**Marking Checklist**:

|  |  |
| --- | --- |
| Content  (20 points) | Title, Purpose, Methods, Results, and Discussion sections present (2)  Each above section contains all required information (3) Table A is present, labelled, and filled in completely (5)  Discussion questions answered thoughtfully in complete sentences (10) |
| Presentation  (10 points) | Report is typed or written neatly in pen (3) Formatting clearly separates sections [i.e. Title, Purpose, etc.] (2) Table A is neat and data easily readable (3) Report is (mostly) free of grammatical errors (2) |

Total: 30 points