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**Weathering Tums Lab**

**Introduction:**

Every day, rocks on the surface of the Earth are subjected to weathering by chemical and mechanical elements like wind, acid rain, heat, and ice. Calcium carbonate, the substance that makes up calcite and limestone (not to mention antacids for when you have an upset stomach) reacts with any type of acid (like hydrochloric acid- HCl) upon contact. This reaction is:

CaCO3 + 2HCl => H2O + CaCl2 + CO2.

In this reaction, the acid combines with the calcium carbonate to make water, calcium chloride, and carbon dioxide.

Today you will be working with calcium carbonate (Tums) and looking at the affects of chemical weathering and measure its affects.

**Problem:**

What variables affect the rate of chemical weathering?

**Hypothesis:** How do you think acidity, surface area, and temperature affect the rate (speed) of weathering of Tums? Answer each question as a hypothesis. Write your hypothesis with an “If… then… because” statement for each question.

*Acidity*: What happens to Tums in water compared to acid (vinegar)?

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*Surface area*: How will the size of the Tums affect the rate of weathering?

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*Heat*: How will the reaction rate of the Tums be affected if the acid (vinegar) is heated?

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**Materials:**

water, vinegar (an acid), Two (2) beakers, Six (6) Tums tablets, kettle, timer.

*Experiment A: How will weathering be affected by water or acid (vinegar)?*

**Procedure:**

1. Fill a beaker with 50ml of water.

2. Fill a second beaker with 50ml of white vinegar.

3. Take two Tums and at the same time, place the two separate Tums into each beaker.

4. Observe each beaker for five minutes and record your observations on the data table on the back of this page.

5. Pour the water and vinegar down the drain and throw away the Tums. Rinse each beaker.

In this experiment what was the …

Independent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Control? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Experiment B: How will the size of the Tums affect the rate of weathering?*

**Procedure:**

1. Fill two beakers with 50ml of white vinegar.

3. Take two Tums. Break ONE tablet into pieces; leave the second tablet intact.

4. At the same time, place the two separate Tums into each beaker.

5. Observe each beaker for five minutes and record your observations on the data table on the back of this page.

6. Pour the water and vinegar down the drain and throw away the Tums. Rinse each beaker.

In this experiment what was the …

Independent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Control? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Experiment C: What will happen to the rate of weathering if you heat the acid?*

**Procedure:**

1. Go to the kettle heating station with your supplies and run experiment at the kettle station. Bring kettle to boil.

2. Fill a beaker with 50 ml of room temperature white vinegar.

3. Carefully fill a second beaker with 50ml of hot white vinegar.

3. Take two Tums. At the same time, place two separate Tums into each beaker.

4. Observe each beaker for five minutes and record your observations on the data table on the back of this page.

5. Carefully pour the water and vinegar down the drain and throw away the Tums. Rinse each beaker.

In this experiment what was the …

Independent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Control? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Data Table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| TEST | Amount of Reaction  (bubbles being created) | | | Observations |
|  | None | Some | More than the other beaker |  |
| A: ACID TEST |  |  |  |  |
| Tums in Water |  |  |  |  |
| Tums in Vinegar |  |  |  |  |
| B: SURFACE AREA TEST |  |  |  |  |
| Whole Tums |  |  |  |  |
| Broken Tums |  |  |  |  |
| C: TEMPERATURE TEST |  |  |  |  |
| Room Temperature |  |  |  |  |
| Heated Vinegar |  |  |  |  |

**Analysis Questions:**

1. What type of weathering did this lab model?

2. When the Tums were placed in an acid, bubbles were released. What were the bubbles being created? Why did this occur?

3. Infer from your data obtained in the surface area experiment. Why would the amount of surface area make a difference in the rate of chemical weathering?

4. Based on your data, how does heat affect the rate of chemical weathering?

5. What does this imply about weathering in the tropics compared to weathering in the polar regions of the world?

6. Based on your observations in this lab, describe the conditions that would cause the MOST chemical weathering to occur.