

Physical Weathering - Abrasion Lab # _____

Introduction –

When rocks are exposed to air and water at the Earth's surface, they are changed by a process called weathering. Weathering is the breakdown of rocks both chemically and physically. In physical weathering rocks are broken into smaller fragments without a change in composition. When rocks are chemically weathered, new minerals form with different properties and characteristics. The materials that are produced by weathering are called sediments. Sediments are classified by the size of the particles. The stream velocity graph on page 6 of the Earth Science Reference Tables can be used to determine the different size ranges of sediments.

There are many different types of chemical and physical weathering that happen on our planet. One important type of physical weathering is called abrasion. Abrasion is a process that happens to sediments as they are being carried by an agent of erosion. Wind and running water are the primary agents that cause abrasion of sediments. As a particle is moved, it collides with other particles and has the rough edges of the particle chipped off. The farther a particle is transported the more it becomes abraded. In this investigation you will be modeling the process of abrasion using sugar cubes. It is important to understand what happens to both the size and shape of sediments as they are transformed by the process of abrasion,

Materials

Triple beam or digital balance, 10 sugar cubes, plastic container, lab sheets, filter paper, paper towel, stopwatch

Procedure

This lab will allow you to observe the change in the size and shape of sugar cubes as they are abraded.

Part One – Conduct Experiment

1. Record the mass of the filter paper on your data sheet.
2. Place the 10 sugar cubes on the filter paper and record the total mass on your data sheet.
3. Place the sugar sample into your plastic container and secure the top. Shake the sugar cubes vigorously for 3 minutes. (Use the stopwatch to time this event)
4. Pour the contents of the container onto the paper towel. Place the larger pieces of sugar back on the filter paper. All sugar powder and individual grains of sugar should be left on the paper towel. Find the mass of the large sugar particles using the balance and record this answer on your data sheet.
5. Draw or photograph what your sugar particle look like after this shaking.
6. Repeat steps 3 through 5 until you have shaken your sugar samples for 15 minutes.
7. Dispose of all sugar, filter paper, and paper towels in the garbage. (DO NOT EAT ANY OF THE SAMPLES!)

Part Two – Data Analysis

1. Calculate the percentage of sugar that was lost during each 3 minute shaking period. Use the formula:

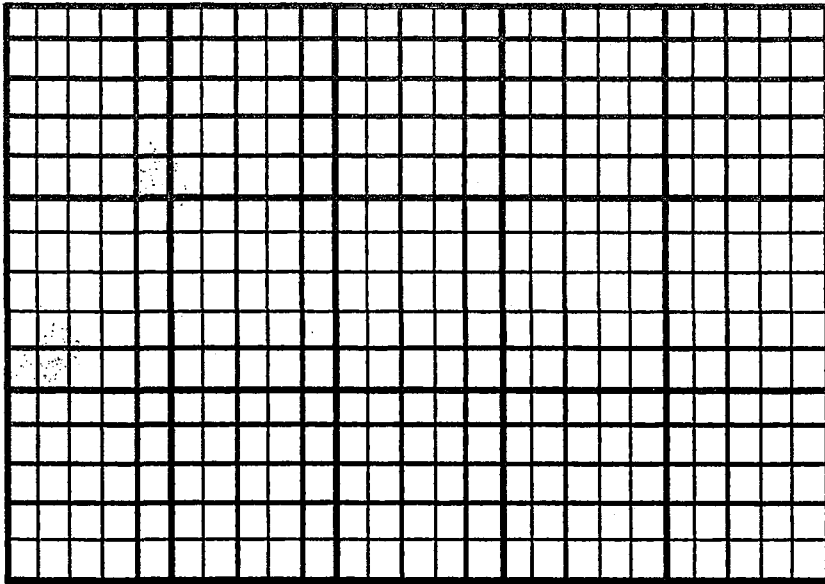
$$\% \text{ Mass Lost} = \frac{\text{Change in Mass for the 3 minute interval}}{\text{Starting Mass}} \times 100$$

2. Create a line graph of the shaking time and remaining mass on graph #1.
3. Create a line graph of the shaking time and % mass lost on graph #2.

Questions

1. How did the size and the shape of the cubes change during the experiment?
2. What happened to the rate of percentage of mass lost during the experiment? What caused this change in rate?
3. How would your results have changed if you used rock material instead of sugar during the experiment?
4. If sugar spheres were used instead of sugar cubes, how would the results of the experiment have differed? Make sure you discuss how the percentage of mass lost, size, and shape would have been altered.
5. If you conducted this experiment with 200 ml of water in the container, how do you think your results would have changed? What property of the sugar would be responsible for the changes you predict?
6. What physical properties of a mineral sample would determine the rate at which a sample becomes abraded?

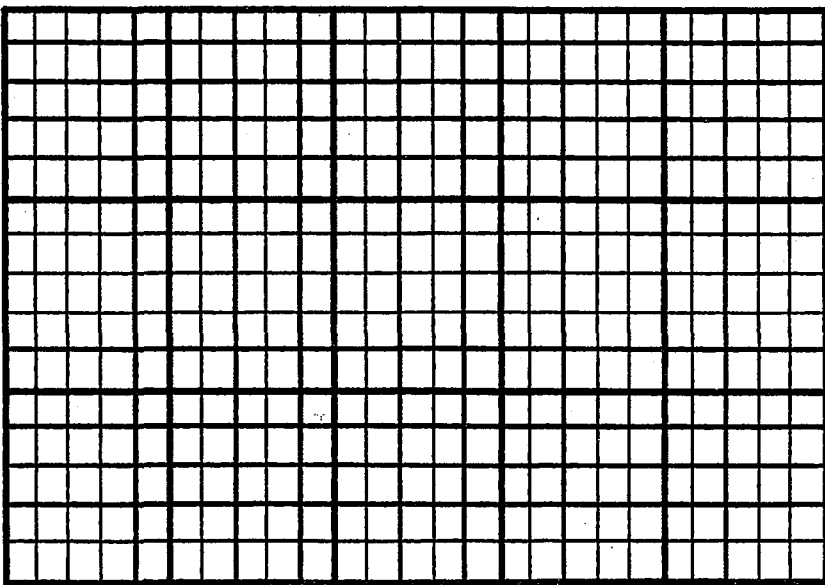
Remaining mass of sugar (grams)



Shaking Time (min)

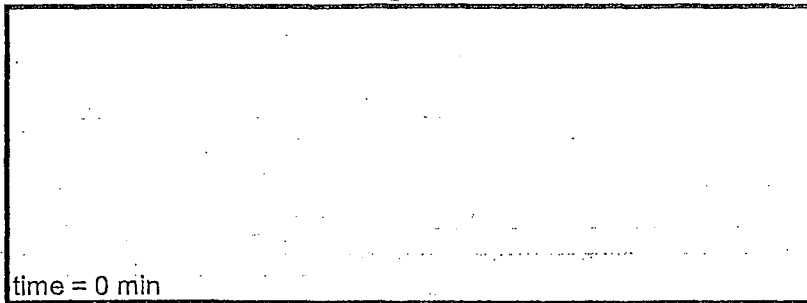
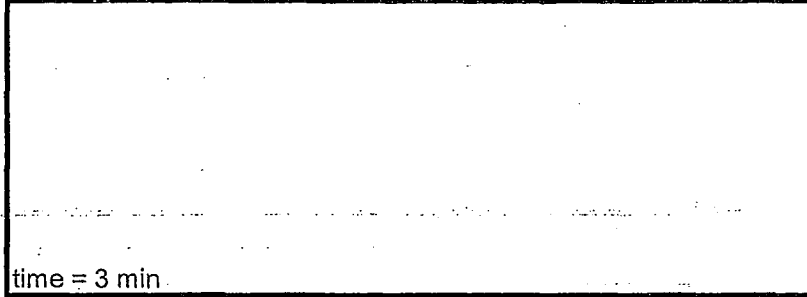
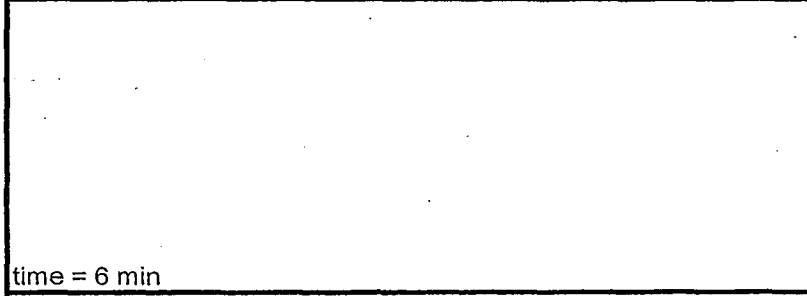
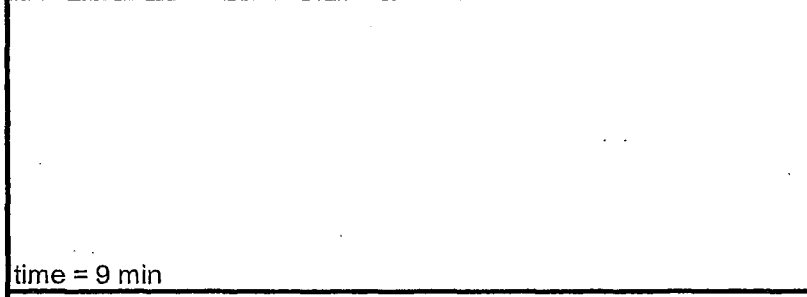
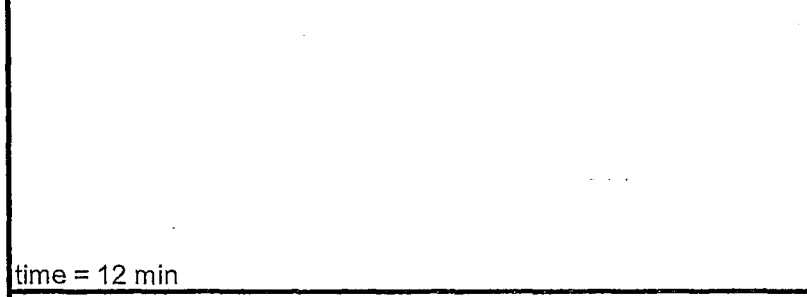

| Shaking Time (min) | Mass of Sugar Sample (g) | % of Mass Lost |
|--------------------|--------------------------|----------------|
| 0 | | |
| 3 | | |
| 6 | | |
| 9 | | |
| 12 | | |
| 15 | | |

Percentage of mass lost



Shaking Time (min)

Drawing of Sugar Cube Samples

| |
|--|
|  |
| time = 0 min |
|  |
| time = 3 min |
|  |
| time = 6 min |
|  |
| time = 9 min |
|  |
| time = 12 min |
|  |
| time = 15 min |