

## Mechanical vs. Chemical Weathering Demo



### **Objective:**

To compare and contrast mechanical and chemical weathering of different rocks.

### **Materials:**

1. Safety Goggles (not safety glasses)
2. Two or three small rock samples of granite, limestone, sandstone, marble and basalt
3. Rock hammer
4. Club Soda- a form of carbonic acid
5. Tap water
6. 24 Baby food jars with lids and labels
7. A balance
8. A strainer or fine sieve
9. Paper towels
10. Paper and pencil to record your observations

### **Procedure:**

1. **A.** Measure and record the mass of a sample of granite, limestone, marble and basalt (you may also measure the size or volume of each sample)
2. Place one sample of granite, limestone, marble and basalt in baby food jars filled only with air. Label each jar
3. Place the cover on each jar. Put your safety goggles over your eyes
4. Shake the jar and record any changes in the rock.
5. Observe the sample after 20 minutes and again after 24 hours. Record your data
6. Put your safety goggles
7. Use a rock hammer to crush part of each rock sample into smaller pieces
8. Separate the each crushed sample into two piles
9. **B.** Measure and record the mass of small pieces of crushed pieces of each samples ( you may also measure the size of the pieces or their combined volume)
10. Place these pieces into separate baby food jars Label each jar.
11. Draw and describe the whole and crushed samples. Remember to label your diagrams
12. Add club soda to cover the crushed rock in each jar. Put the lid on tightly
13. Put on your safety goggles
14. Holding the top of the jar securely shake the jars.
15. Check the sample after 20 minutes and record your observations
16. Observe and record any changes after 24 hours
17. **C.** Place the larger piece of each rock sample in a jar and. add tap water
18. Put on your safety goggles
19. Close the lid tightly and shake each jar.
20. Draw and describe these jars. Observe after 20 minutes and again the next day.

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21. Shake and observe the contents of each of the jars each day for a month.
22. Record any changes in the samples in group A, B and C
23. Remove the lids from the jars and strain out the solid content from the samples with the club soda and the tap water. Reserve and record your observations of the solid pieces and the liquid
24. Air dry the samples
25. Measure and record the mass of each of the samples in Parts A, B and C. Use only the large solid sample in jars from A
26. Place the samples back into their jars and add new club soda or tap water to the jars from part B and C
27. Continue the process of shaking, straining, massing and adding new club soda throughout the school year until you observe and measure a change.

### **Follow-up:**

Use stronger acids like a 10% solution of Hydrochloric Acid (**stir** carefully do not shake) and just look to see if you observe any changes in your samples

### **Observation Questions:**

1. Organize your information into a chart

Samples	Air	Carbonated Water	Tap Water	Date	Time
Limestone					
Marble					
Granite					
Sandstone					
Basalt					

2. Compare the effect of shaking the jar with air with the carbonated water on the rock samples.
3. Compare the effect of carbonated water with the effect of the tap water on each rock sample.
4. Which rock samples showed change during the experiment?

### **Analysis Questions:**

1. Which rock type was affected by the carbonic acid? Support your answer with examples from your data .**Rocks containing calcium carbonate like limestone and marble should be decomposed faster. Students should look to their observations.**
2. Which samples showed signs of mechanical weathering? **Samples with the greatest surface area exposed should be broken down faster and disintegrate more. Samples like shale or mudstone should break a part first. Limestone and marble and even basalt will leave dust in the containers. Again students should consult their observations.** Give examples
3. Which samples showed signs of chemical weathering? **The samples containing calcium carbonate and clay minerals should chemically weather first. Also the first formed igneous rocks like olivine and basalt should chemically weather before rocks that take longer to crystallize and contain higher concentrations of**

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- quartz. Again students should consult their measurements and observations Give examples
4. How did time relate to the rate of weathering? Longer time should result in greater weathering of all kinds You may replace the carbonic acid and continue to shake the jars until the end of the year and save a sample to show next years class. Put them out and let the students guess what happened to the rocks Give examples
  5. Which rock type was least effected by the carbonic acid? The granite should be least affected or any rock with a high quartz content. Support with an example.
  6. How does weathering relate to the Bowen's Reaction Series for igneous rock? The igneous rocks that are the first to crystallize are the first to show signs of weathering. The magma melts at a high temperature and their minerals cool at a higher temperature. Fro example Basalt will weather long before granite. You may ask the students to find examples of weathered mountains and relate them to this information.