

Weathering Experiments

<http://ofcn.org/cyber.serv/academy/ace/sci/cecsci/cecsci210.html>

Focus on Inquiry

The student will collect and analyze data to understand mechanical and chemical weathering.

Lesson Overview

Students will simulate mechanical and chemical weathering in order to better understand how rocks change. In Part A, a piece of dry steel wool is moistened with water to show that “rust” (iron oxide) is formed due to chemical change. This simulates chemical weathering. In Part B, sugar cubes are broken into smaller pieces and the “shape” of the cube becomes rounded due to mechanical weathering. Rocks undergo both types of weathering and are examples of destructive forces.

Duration 60 minutes broken in to two class periods	Setting Classroom	Grouping Cooperative groups of 3-4	PTI Inquiry Subskills 3.7, 5.2, 5.3, 7.2, 7.3
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Lesson Components	Estimated Time	Inquiry Subskills Used	Technology Used	Level of Student Engagement	Brief Description
<i>Engage</i>	5 min	None	None	1	Students look at pictures of mountains and discuss how these mountains got their shape.
<i>Explore</i>	20 min 10 min	3.7, 5.2, 5.3	None	3	Students do two lab activities with steel wool (chemical weathering) and sugar cubes (physical weathering).
<i>Explain</i>	10 min 5 min	5.2, 7.2	None	3	Students explain weathering in light of their experimental results
<i>Expand</i>	10 min	3.7, 5.3	None	3	Students tour school grounds looking for evidence of chemical and physical weathering.
<i>Evaluate</i>	Varies	7.3	None	2	Teacher made rubric for laboratory worksheet.

Level of Student Engagement

1	Low	Listen to lecture, observe the teacher, individual reading, teacher demonstration, teacher-centered instruction
2	Moderate	Raise questions, lecture with discussion, record data, make predictions, technology interaction with assistance
3	High	Hands-on activity or inquiry; critique others, draw conclusions, make connections, problem-solve, student-centered

National Science Education Standards – Inquiry

Use appropriate tools and techniques to gather, analyze, and interpret data.
 Develop descriptions, explanations, predictions, and models using evidence.
 Think critically and logically to make the relationships between evidence and explanations.
 Communicate scientific procedures and explanations.



National Science Education Standards – Earth Science

Landforms are the result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, and deposition of sediment, while destructive forces include weathering and erosion.

Louisiana Grade Level Expectations – Inquiry

- Gr. 8, Inquiry GLE#7 – Record observations using methods that complement investigations (e.g., journals, tables, charts) (SI-M-A3)
- Gr. 8, Inquiry GLE#12 – Use data and information gathered to develop an explanation of experimental results (SI-M-A4)
- Gr. 8, Inquiry GLE#16 – Use evidence to make inferences and predict trends (SI-M-A5)
- Gr. 8, Inquiry GLE#19 – Communicate ideas in a variety of ways (e.g., symbols, illustrations, graphs, charts, spreadsheets, concept maps, oral and written reports, equations) (SI-M-A7)
- Gr. 8, Inquiry GLE#22 – Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)



Louisiana Grade Level Expectations Earth Science

Gr. 8, GLE#14 – Distinguish between chemical and mechanical (physical) weathering and identify the role of weathering agents (e.g., wind, water, ice, gravity) (ESS-M-A4)

Materials List (per group)

- 10 sugar cube
- jar with a lid
- 10 pieces of gravel
- 2 small pieces of steel wool and tongs
- 2 small plastic bags

Advance Preparation

1. Obtain materials on materials list.
2. Make enough student copies of **Blackline Master #1**.

Other Information

Objective

The learner will...

- observe the processes of mechanical and chemical weathering of "rocks."

Prior Knowledge Needed by the Students

- Students should have an introductory understanding that rocks go through changes.
- Students should understand the difference between physical and chemical changes.

Procedure

Engage

1. Teacher will provide pictures/transparencies of mountains (ex: Appalachian and Rocky Mountains) from various locations. Include some small rocks to show the students. Engage the students in a discussion on the formation of these small rocks. Allow the students to discuss their ideas.

Part A

Steel Wool Experiment: Chemical Weathering

Explore

1. Students should label one bag "dry" and put one small piece of steel wool in that bag.
2. Students should label the other bag "wet", wet the other piece of steel wool, and put it in the bag.
3. Both bags should be sealed and stored for 3-4 days.
4. Distribute Blackline Master #1.
5. Record your answer on your lab sheet.
 - a. In what ways are the bags the same?
 - b. In what way(s) do the bags differ?
 - c. What do you think will happen to the "dry" steel wool?
 - d. Explain **why you think** this will happen.
 - e. What do you think will happen to the "wet" steel wool?
 - f. Explain **why you think** this will happen.
6. Examine the wool from the "dry" bag. Record a description of its appearance.
7. While working over a piece of white paper, pull the wool apart with the tongs. Caution: Be careful with the steel wool. Do not let students handle it with their hands.
 - a. Describe what has fallen on the white paper.
 - b. Was this an example of mechanical/chemical weathering? Explain your answer.
 - c. Make a drawing of what you observe.
8. Repeat step 7 while examining the steel wool from the "wet" bag.
 - a. Describe its appearance.

- b. Was this an example of mechanical/chemical weathering?
- c. Explain your answer.
- d. Make a drawing of what you observe.

Explain

1. In what ways are the contents of the bags the same?
2. In what way(s) do the bags differ?
3. Was it easy or hard to pull the wool apart from the “dry” bag?
4. How were the wet and dry steel wool different?
5. What caused the changes in the wet steel wool?
6. What kind of weathering is this? Mechanical or chemical?
7. Please explain how this kind of weathering could happen to a rock.

Part B

Sugar Cube Experiment: Chemical Weathering

Explore

1. Describe the appearance of the sugar cubes. Make a drawing of your sugar cubes.
2. Place the sugar cubes in the jar.
3. Describe what you think will happen to the sugar cubes when they are shaken 20 times.
4. Now shake your sugar cubes 20 times. Record your observation
5. Pour the contents of the jar onto a piece of paper separating the sugar cubes and the crumbs. (Don't eat any of it!!!)
 - a. Record any changes you notice in the sugar cubes.
 - b. Make a drawing of your observation.
 - c. Record if these changes are due to chemical or physical weathering?
 - d. Explain why?
6. Return the sugar cubes to the jar and shake another 20 times.
7. Again pour the contents onto a piece of paper separating the “crumbs” and the cubes. Make a drawing of your observation.
8. Observe any changes in the sugar cube. Observe any “parts” created by the shaking.

Explain

1. What changed did you notice in the sugar cubes?
2. Were these changes due to chemical or physical weathering
3. What reason(s) did you give for these changes?
4. How did the second shaking change the cubes appearance?
5. Is the amount of crumbs greater than, the same as or less than the first shaking?

Expand

1. Have students walk around the school to identify examples of mechanical weathering (broken concrete/sidewalk) and chemical weathering

Evaluate

1. Evaluation will come from the students recording their predictions, observations and drawings.
2. The teacher can conclude the activity by asking the students to explain what they learned about mechanical and chemical weathering.

Blackline Master

1. **Physical and Chemical Weathering Lab**

Supplementary Resources

Weathering by Pamela J. W. Gore, Georgia Perimeter College

<http://www.gpc.edu/~pgore/geology/geo101/weather.htm>

This site offers extensive background information on weathering.



Weathering Processes

<http://www.geol.binghamton.edu/class/geo211/Weathering.html>

Background information on weathering processes.

Ohio Geological Survey: Hands-On Earth Science

<http://www.dnr.state.oh.us/geosurvey/edu/hands12.htm>

"Do Rocks Last Forever?" article by Sherry Weisgarber.



Name: _____ Date _____ Class _____

Physical and Chemical Weathering Lab

Part A: Steel Wool Experiment

1. In what way(s) are the bags the same?
2. In what way(s) do the bags differ?
3. What do you think will happen to the “dry” steel wool?
4. Explain why you think this will happen.
5. What do you think will happen to the “wet” steel wool?
6. Explain why you think this will happen.
7. Record a description of the wool from the “dry bag.
- 8a. Describe what has fallen on the white paper.
- 8b. Was this an example of mechanical or chemical weathering? Explain your answer.
- 8c. Make a drawing of what you observe.

Part B: Sugar Cube Experiment

- 1a. Describe the appearance of the sugar cubes.
- 1b. Make a drawing of what you observe.
2. Describe what you think will happen to the sugar cubes when they are shaken 20 times.
3. After pouring the content onto a piece of paper, describe any changes you notice in the sugar cubes.



4. Make a drawing of your observation.

5. Are these changes due to chemical or physical weathering? Explain your answer.

6. What changes do you observe in your sugar cubes?

7. Describe the parts created by the shaking.

8. What changes did you notice in the sugar cubes?

9. Were these changes due to chemical or physical weathering?

10. What reason(s) did you give for these changes?

11. How did the second shaking change the cubes appearance?

12. Is the amount of crumbs greater than, the same as or less than the first shaking?

13. What did you learn about mechanical and chemical weathering?

14. How are these destructive forces changing the Earth?

15. Can you see evidence of destructive forces where you live? Give examples.