

WHAT MAKES A ROCK?

Science Concept:

Sedimentary rocks are formed by weathering and erosion, deposition, compaction, and cementation.

Objectives:

The student will:

- describe how sedimentary rocks are formed;
- infer and make generalizations about forces in Earth; and
- create a T-chart or table with appropriate organization and labeling.

GLEs Addressed:

Science

- [7] SD1.1 The student demonstrates an understanding of geochemical cycles by describing the rock cycle and its relationship to igneous, metamorphic, and sedimentary rocks.
- [7] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

Writing

- [7] W3.2.4 The student writes for a variety of purposes and audiences by using diagrams, charts or illustrations with captions or labels in research projects or extended reports.

Vocabulary:

cementation - cementation is one of the processes that work together to turn sediment into sedimentary rock (lithification). Mineral-laden water percolates through sediment with open pore spaces. The spaces are gradually filled by minerals precipitating from the water, binding, or cementing, the grains together

compaction - occurs when the weight of overlying material compresses more deeply buried sediment. Along with cementation, this process converts sediments to solid rock

deposition - the accumulation of material dropped because of a slackening movement of the transporting medium, e.g., water or wind.

erosion - the process of removing material by water, wind, or ice. As soon as a rock particle (loosened by weathering) moves, by some flowing agent such as air, water or ice, it is erosion

pressure - the exertion of force upon a surface by an object, fluid, etc., in contact with it

rock - rocks are made of different kinds of minerals, or broken pieces of rocks. Some rocks are made of the shells of once-living animals, or of compressed pieces of plants. Rocks are divided into three basic types, igneous, sedimentary and metamorphic, depending upon how they were formed

weathering - (1) the physical disintegration or chemical decomposition of rock due to wind, rain, heat, freezing, thawing, etc. (2) The response of materials that were once in equilibrium within Earth's crust to new conditions at or near the surface in contact with water, air, or living matter. The breakdown of rock through a combination of chemical, physical, and biological processes. The ultimate outcome is the generation of soil

Materials:

- Hammer
- Towel
- Safety goggles

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INSTRUCTIONS Grade 7



- Sandstone, small piece
- Siltstone (optional)
- Ice cube trays (one per group)
- Trays or bowls (one per group)
- Plastic spoons (several per group)
- Sand (several cups per group)
- Water (1-2 cups per group)
- Water-soluble glue
- Science journal
- STUDENT WORKSHEET: "What Makes a Rock?"

Activity Procedure:

Please refer to the assessment task and scoring rubric located at the end of these instructions. Discuss the assessment descriptors with the class before teaching this lesson.

Gear up

Process Skills: predicting and inferring

1. Show students the sandstone. Ask them to record in their science journal what it is and how they think it is made.
2. Get out the hammer. Ask students what will happen if the rock is hit with the hammer. Wrap the rock in a towel and hit it with the hammer.
3. Ask what is happening to the rock and why. Ask students to record their answers in their journals. Discuss as a group.
4. Students may add to their responses in their journals based on the class discussion if they choose.

Explore

Process Skills: observing, describing, and predicting

5. Divide students into groups. Explain each group will design and test methods to simulate the formation of sandstone. Ask the class how they could make sandstone. Write student responses on the board. Review or introduce vocabulary words. Define the words as a class.
6. Distribute the materials to each group (ice cube trays, trays or bowls, plastic spoons, sand, water, and glue).
7. Guide students through the first test. (NOTE: This may be done as a demonstration, with students to follow, or all together as a class.) Pour several spoonfuls of sand into one division of the ice cube tray. Using your fingers, push on the sand as hard as possible. Predict what will happen after 24 hours. Record class predictions on the board. Ask students if this method will make a rock. Why or why not? What other methods might make a rock?
8. Distribute the STUDENT WORKSHEET: "What Makes a Rock?" and review the directions with the class. Remind students to make predictions before making their rocks and observe all lab safety rules. Allow groups time to manipulate materials and make several "rocks."
9. As groups work, move throughout the classroom monitoring student progress and asking guiding questions. (Examples of methods students might use include mixing sand and water with pressure, sand and water with no pressure, and sand and glue with pressure, etc.)
10. Provide a location for students to put their "rocks" overnight and allow the rocks to set overnight.

Teacher's Note: "Rocks" may require more than 24 hours to set up.

11. When rocks are set, ask students to reform into groups and examine the rocks they created. As they examine their rocks they should record their results on their worksheets.

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Generalize

Process Skills: inferring, describing, making generalizations, and communicating

12. Ask students the following questions and discuss as a group:
 - a. What did you do to make rocks?
 - b. What happened when you combined sand and water?
 - c. What happened when you combined sand and glue?
 - d. How did pressure change your results?
 - e. Why do you think this happened?
 - f. What was the difference?
 - g. What role did the glue have?
 - h. How does sandstone form in nature?
 - i. Where would this happen?
 - j. What do you think sandstone is useful for?
 - k. What uses would sandstone not be good for?

Apply

Process Skills: inferring, describing, and predicting

13. Ask students to do one of the following. In your science journal:
 - a. Describe how the rock you created fits in the rock cycle. Predict how your rock might become a different kind of rock.
 - b. Quartzite is a metamorphic rock formed as sandstone undergoes heat and pressure. How might quartzite and sandstone be similar? How might quartzite and sandstone be different?
 - c. Compare sandstone and siltstone. How do you think siltstone forms? (NOTE: This requires samples of both sandstone and siltstone available for students to examine.)

Extension Idea:

Compare and contrast quartzite and sandstone. Investigate the following questions: What would be some appropriate uses of sandstone? What would be some appropriate uses of quartzite?

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RUBRIC

Assessment Task:

Using your knowledge of sedimentary rocks, create a T-chart. In one column describe how sedimentary rock is formed. Include a definition and at least two details or examples. In a corresponding column, make at least one inference and at least one generalization about the sedimentary formation process that occurs in Earth. Be sure your T-chart is organized and labeled, as well as neat, colorful, and have correct spelling.

Rubric:

Objective	GLE	Below Proficient	Proficient	Above Proficient
The student describes how sedimentary rocks are formed.	[7] SD1.1	The student describes one way sedimentary rocks are formed.	The student describes how sedimentary rocks are formed and includes a definition and at least two details or examples (weathering/erosion, deposition, compaction, and cementation).	The student describes how sedimentary rocks are formed and includes a definition and three or more details or examples (weathering/erosion, deposition, compaction, and cementation).
The student infers and makes generalizations about forces in Earth.	[7] SA1.1	The student may make either an inference or a generalization about forces in Earth.	The student makes both an inference and a generalization about forces in Earth.	The student makes multiple inferences and generalizations about forces in the earth; his or her inferences and generalizations are supported by evidence.
The student creates a T-chart with appropriate organization and labeling.	[7] W3.2.4	The student creates a T-chart that is organized or labeled.	The student creates a T-chart that is organized and labeled.	The student creates a T-chart that is organized, neat and/or colorful, and has correct spelling.

NAME: _____

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Directions: Use the materials provided to try several methods that could create a rock. For each method, record the method, prediction, and results. The demo method is started for you.

Demo Method 1. Pour several spoonfuls of sand into one division of the ice cube tray. 2. Using your fingers push on the sand as hard as you can. 3. Allow to set for 24 hours	Prediction	Results
Method 2	Prediction	Results
Method 3	Prediction	Results
Method 4	Prediction	Results
Method 5	Prediction	Results