

Sediments and Solution Caves: Part 1

Student Copy



SEDIMENTS AND SOLUTION CAVES: PART 1

Sediments may consist of soil, salt, sand, seashells, plant and/or animal remains. Along with the differences in the sediments themselves, there are 3 main factors that determine how they settle: wind, water, and gravity. As a result, sediments settle at different rates and accumulate in different locations. *Sedimentary rocks* form as sediments accumulate and build up into thick layers, and the presence of layers in rocks is referred to as “*stratification*”. The sediments themselves are “glued” together with a mixture of dead and decaying organisms and minerals from groundwater. These materials form a cement-like bond around the sediments and bind them into solid rock.

The boundary between sedimentary rock layers is naturally weak and can be easily broken. Fluids can flow through cracks formed between the rock layers and wear away the rock in a process called *erosion*. If acidic water flows along and adjacent to joints (fractures), faults, and layers in the rock, it can further erode them and lead to the formation of caves. These types of caves are called *solution caves*.

Acidic water can be produced when water and carbon dioxide mix to form *carbonic acid*. Another cave-forming acid is *sulfuric acid*. Many geologists believe that fresh rainwater mixed with deeper salty water to produce the sulfuric acid that dissolved the caves of Carlsbad Cavern National Park. The act or process of dissolving substances of any kind, including rocks, is called “*dissolution*”.

Questions:

1. What are the 3 main factors that influence the settling of sediments?
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2. What binds sediments together to form a solid sedimentary rock?
3. What is “stratification”?
4. Where are sedimentary rocks naturally weak and easily broken?
5. What are 2 types of acids that can dissolve rocks and form caves?
6. What is “dissolution”?

Sedimentation Activity Materials:

- Various coarse and fine-grained sediments: sand, silt, mud, gravel/pebbles (using different colored sediments make differentiating between the sediments easier).
- Two-liter plastic soda bottle
- Cement solution: 1 cup water with ½ cup Epsom salt
- Plastic funnel
- Organic matter: various shells, sticks (optional: mini plastic animals and insects)

Sedimentation Activity Procedure:

1. Students should get into small groups of up to 4 students per group.
2. Using the funnel, add one layer of each sediment type into the plastic bottle. Each layer should be about 1 cm deep.
3. Add several seashells, plant remains, and any other organic matter.
4. Add enough cement solution to completely cover the sediments with about 1 inch extra on top of the sediments.
5. Screw the cap on the bottle cap tightly and shake for 2- 3 minutes.
6. Place the bottle on a flat surface and watch the sediments settle in the bottle.
7. After about 5 minutes, carefully observe the various sediments as they settle out of the water.
8. Record the order in which the sediments settled.
 - Use the bottle diagram on page 4 to draw the sediments as they settled out in your bottle, including any organic matter.
 - Be sure to label each sediment layer and any organic matter found in each layer.
9. Answer the following questions in the **Observations** section.
10. Leave your bottle to harden overnight.
11. Use the rest of the class time to complete the Caves and Fossils worksheet.

Observations:

1. Which sediments settle out first?
2. Why do you think these sediments settled out first?
3. Which sediments settle out last?
4. Why do you think these sediments settled out last?

