

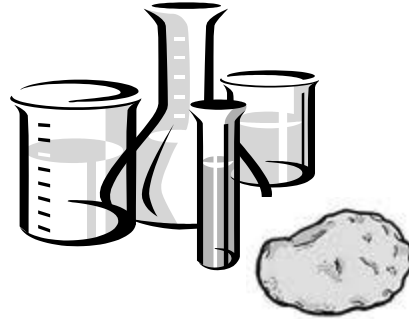
Lesson 5 – Disappearing Rocks

Lesson Overview: Students will examine limestone rock and perform a “Bubble Test”.

Objectives:

Students will be able to:

1. Describe the characteristics of limestone rock.
2. Explain how limestone rock forms.
3. Model the effects of acids on a carbonate rock such as limestone.



Standards Addressed:

National Science Education Standards: 5th-8th grade

- Content Standard A: Science as Inquiry
- Content Standard B: Physical Science
- Content Standard D: Earth and Space Science

Duration of Lesson/Time Requirement: 40 minutes

Materials Required:

Pictures and/or specimens of limestone containing fossils

Hand lenses (if available)

Pictures and examples of seashells both whole and broken

Clear plastic cup filled with room-temperature water

Small amount of sugar (approximately 1 Tablespoon)

Safety goggles for each student

Disappearing Rocks Student Worksheet (1 per student)

For every group of 2-3 students:

- White table vinegar
- Jar or beaker
- Dropper or pipette
- Rock samples, one being limestone (A, B & C)
- Seashells/pieces of seashells
- Paper towels

Safety:

This lesson should take place in a well ventilated area. Students should wear properly fitting safety goggles during the activity and wash hands afterwards. Read and follow all safety warnings on material labels.

At the conclusion of the lesson have students pour their used solutions in a common waste container. Dispose of all liquid waste down the drain or according to local regulations.

Classroom Technology:

Computer with Internet connection and projection capabilities and/or SMART Board (optional)

Set-Up:

Gather the necessary materials. Pour small amounts of white table vinegar into a jar/beaker for each group of 2-3 students. If multiple rock samples cannot be obtained the experiment will be successful as long as one rock sample is limestone and the other rock sample is a non-carbonate rock.

Procedure:

Introduction

Review with the students that the majority of the world's caves are found in areas of sedimentary rock. Ask them to name several examples of sedimentary rock (e.g. conglomerate, sandstone, and limestone). Explain to the students that the majority of the world's caves are found in areas of limestone rock.

Project/show pictures of limestone for the students to view. Pass out pictures and/or specimens of limestone containing fossils for the students to look at closely. If hand lenses are available allow the students to use them to examine the limestone specimens. Ask the students to describe the limestone. What do they notice about the limestone? Does the limestone have anything embedded in it? (fossils)

Explain to the students that because limestone is a sedimentary rock it is one of the best preservers of fossils. Tell the students that fossils are the preserved remains or traces of animals, plants, and other organisms from the past. Ask the students how they think the fossils of shelled animals and other sea life could end up in limestone.

Activity #1

Ask the students to raise their hands if they have ever collected seashells on a beach. Ask the students where the shells came from? (Animals in the water) Project/show pictures of seashells for the students to view. Pass out pictures and/or specimens of seashells for the students to look at closely. Ask the students if they know what the seashells are made up of. Explain to the students that seashells are made up of calcium carbonate. Calcium carbonate is a chemical compound with the formula CaCO_3 . Tell the students that calcium carbonate is a common substance found in rocks in all parts of the world and that it is the main component of shells of marine organisms, snails, pearls, and eggshells. If a piece of classroom chalk is available, hold up the chalk and tell the students that some teachers use calcium carbonate every day in their classrooms when writing on the chalkboard.

Tell the students that long ago the surface of what is now the United States looked very different than it does today. Explain to them that shallow seas once covered many parts of what is now the United States. Tell the students that just like we find shelled animals in oceans today, shelled animals also lived in these ancient seas.

Ask the students to raise their hand if they have ever found broken seashells while walking along a beach. Ask the students what might cause seashells to break. Discuss the force of waves in the ocean. Show the students several examples of broken shells. Explain to the students that some seashells even crushed into a fine powder over time. Ask the students what they think happens to the shells or shell pieces over time. Where will they go? (They settle to the ocean floor)

Explain to the students that over long periods of time, perhaps hundreds, thousands or millions of years, the shells and shell pieces at the bottom of the ocean will pile up into thick layers. Some of these layers can be hundreds and even thousands of feet thick. Ask them how they think it would feel to be a shell at the bottom of the pile. How heavy would the shells above be? Reference the “hand pile” they made in lesson #4 and also discuss football players and how the person on the bottom of a pile-up feels. Explain to the students that the weight of the shells causes the shells to cement together over time. The resulting rock is limestone, composed of calcium carbonate.

Activity #2

Tell the students that the largest and greatest number of caves are found in areas of extensive deposits of limestone. Explain that limestone and other carbonate rocks are somewhat unique because their mineral grains can be dissolved in nature. Ask the students why they think this would be important in the process of forming a cave.

Explain to the students that a geologist can often tell what kinds of minerals are found in rocks by the physical properties of the rock. Geologists look at the appearance of the rock and characteristics such as its grain size, hardness, color, texture, and whether it can be dissolved.

Ask the students if they know what it means to dissolve something. Show the students a clear plastic cup filled with room-temperature water and a small amount of sugar. Ask the students what they think will happen when the sugar, a solid, is added to the water, a liquid. Add the sugar to the water and stir. Allow the students to observe the results. Ask the students to explain what happened to the sugar. Is the sugar still present even though they cannot see it?

Explain to the students that the main mineral that makes up limestone is called calcite. Tell the students that calcite will dissolve in most forms of acid. Show the students several rock samples. Tell the students that one of the samples of rock is limestone. Ask the students if they can suggest a way to determine which rock is the limestone. Explain to the students that the rock samples can be tested for calcite by checking to see which ones dissolve when they come into contact with acid.

Activity #3

Explain to the students that they will participate in a Bubble Test (also known as an Acid Test). Tell the students that each pair or small group of students will receive one sample of each rock type (A, B & C). Following classroom safety procedures they will use a dropper to place a couple of drops of white table vinegar on each rock sample. The rock samples with calcite (the limestone) will bubble and those without calcite will not.

Suggested Procedure:

1. Explain safety procedures to be followed in the classroom. Tell the students that they are to keep their safety goggles on at all times. Make sure the students know what to do if their skin comes into contact with the white table vinegar.
2. Handout a copy of the *Disappearing Rocks Student Worksheet* to each student and make sure that each student has a pencil to record their observations.
3. Distribute rock samples, seashells and other materials to each pair or small group of students.
4. Review the procedure with the students.
 - a. Place one rock sample at a time in the jar or beaker. Make sure the rock sample is labeled properly (A, B or C).
 - b. Use the dropper to place several drops of white table vinegar on the rock sample.
 - c. Observe what happens and record observations in the proper column on the *Disappearing Rocks Student Worksheet* (acid reaction or no reaction).
 - d. Wipe white table vinegar droplets off of rock sample using paper towel.
 - e. Repeat steps a-d for other rock samples.
 - f. Test a seashell/piece of a seashell with the white table vinegar. Observe and record observations.
 - g. Write down conclusions on the *Disappearing Rocks Student Worksheet*.

Wrap-Up/Conclusion

Upon completion of the experiment and clean up of the students' work stations ask the students if they were able to determine which rock sample was the limestone. How could they tell?

Review with the students that limestone is a sedimentary rock that is composed of calcium carbonate. The main mineral found in limestone is calcite and it can be easily dissolved by acid.

Explain to the students that they used white table vinegar, which is a mild acid, to dissolve limestone in the classroom. Ask the students if they think that geologists create caves by pouring acid onto limestone. Ask the students to think about where caves are found. Are caves natural or manmade? Explain to the students that in order for caves to be created the limestone must be dissolved away by an acid that is naturally formed in nature. Ask the students to think about where they can find acid in nature. Explain to the students that they will investigate acids further in the next lesson.