

Rocking Changes

Category: Earth Science/Geology

Type: Class Experiment (30 min)

Materials:

1	Plastic container with lid
1	Box of sugar cubes
1	Plastic tray
1	Handful of small stones
1	Box of Crayons
1	Small round foil tray
1	Wooden Stick
1	Plastic cup
1	Hot plate
1	Pot or pan
1	Piece of foil
	Water



You Tube: <http://youtu.be/-hxFBjulX1w>

How To:



Experiment 1, Sugar Rocks: Place four sugar cubes into the plastic container and screw the lid on tightly.

Shake the container for 60 seconds.



Shake the contents of the container out onto one side of the tray. Examine the sugar cubes.



Also, examine the sugar sediments. Rub them between your fingers.



Take a handful of small stones and place into the container with four new sugar cubes. Shake for 60 seconds.



Pour the contents onto the other side of the tray. Examine the sugar cubes and sediment. Compare them to the cubes shaken without stones



Experiment 2, Rock Models. A – Igneous: Heat a pan of water.



Pick two crayons of any color.



Remove the wrappers from the crayons.



Break the crayons into small pieces.



If you are having trouble breaking the crayon, use a craftstick to cut into the crayon and then break it.



Place the crayons in the foil tray and bend it slightly in half.



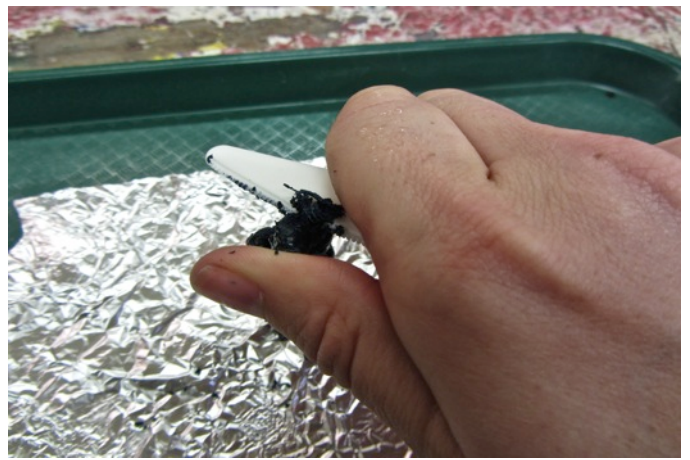
Place the foil tray in to the pan of hot water.



Let the crayons fully melt.



Carefully remove the tray from the pan. Quickly pour the melted crayons into the water to make your new lava rock. When it is solid, fish it out of the water and have a look.



B – Sedimentary: Using a plastic knife, shave pieces of crayon on to a piece of foil.



Gather all the crayon shavings in the foil and close it.



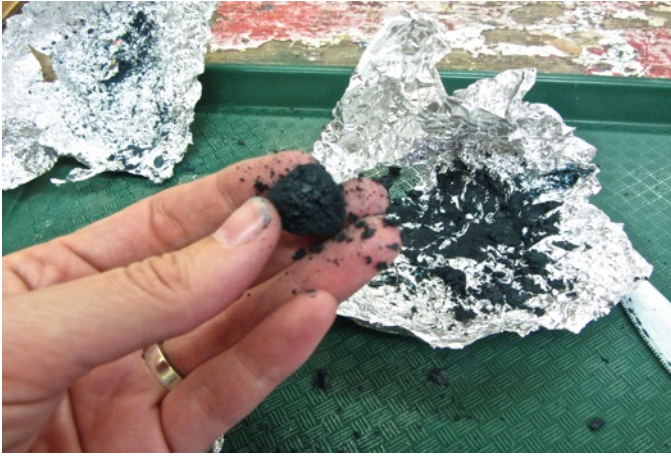
Stand on the foil packet to compress the crayon pieces together.



Open the foil to see the sedimentary rock that was made.



C – Metamorphic: Close the sedimentary rock back up in the foil. Place it hot water for about 30 seconds to a minute.



The rock should now be soft and you can change its shape (carry out metamorphosis) by standing on the foil again or using your hands.

To transport the rocks, place them in the foil tray, fold in half and tape it closed. Write your name on the tape.

Fine Points:

- If doing the sugar rock experiment with a class, divide them into groups of three and let each student shake the container for 20 seconds.
- To recycle the small stones, separate from the sugar using a sieve.
- A sharpener can be used to erode the crayons into tiny shavings.
- Folding the foil tray in half allows a larger number to be placed in the pan at once. This is important when working with a class.
- Remove the foil tray from the pan by gripping it at the edges, or use tweezers.
- During a class an adult should supervise the pan to ensure the students don't knock the pan over, and to pass them their trays.
- The newly formed lava rocks can be re-melted again.

Objectives:

During this activity students will:

1. Understand processes involved in the erosion of rocks.
2. Understand changes that can happen to rocks in the rock cycle.

Concepts Involved:

- Components of the rock cycle
- How rocks can change over time under the influence of weathering, erosion, pressure and heat.

Focus Questions:

1. How big can rocks be and what are some examples of big rocks in nature?
2. What type of environmental force will you be mimicking when you shake the jar?
3. How do you think the shape and color of the rocks will change in the crayon experiment?

Elaboration:

If we look in nature we see that rocks exist in different sizes, from mountains and boulders to gravel and grains of sand. Rocks are broken down into smaller pieces through a process known as weathering. There are three types of weathering: mechanical, chemical and biological.

In mechanical weathering (also known as physical weathering), rocks are broken down without any change in the chemical nature of the rocks. The rocks are torn apart by physical force rather than by chemical breakdown. There are a number of different forces that do this; the most common comes from the freezing and thawing of water. Water can enter the many holes and cracks in rocks, and when it freezes it expands. The result is that the holes and cracks in rocks are deepened and pieces of rock are pushed outward.

In the first experiment the type of mechanical weathering examined is abrasion. Abrasion occurs when water and wind and gravity expose rocks to friction and abrasion from other rocks, big and small, causing them to break apart. A number of factors influence the intensity of the abrasion, such as the hardness of the rocks involved and the speed and size of the moving particles. Imagine a rock falling from a mountain. It hits other rocks on the way down and some pieces of it get knocked off. As it continues to fall, it gets swept up into a stream. It moves along the stream, and more pieces are broken apart as it bangs into other rocks. Even just the force of the moving stream water can break more pieces off the rock.

Chemical weathering changes the mineral composition of rocks through chemical processes and breaks down the bonds holding the rocks together, causing them to fall apart. Examples of chemical weathering include acid rain changing the appearance of a statue, and salty ocean water wearing away cliffs. Examples of biological weathering are when plants break up rocks with their growing roots or plant acids dissolve rocks.

Rocks are classified as sedimentary, metamorphic and igneous. The second experiment can be used as a model to study the rock cycle and the formation of igneous, sedimentary and metamorphic rocks. Igneous rock forms when rocks of any type are melted at a high temperature in the Earth's upper mantle (temperatures range from 932°F-7,230°F), and then cooled underground or on the surface after a volcanic eruption. Examples of igneous rocks are granite, obsidian and basalt.

In the first experiment we one way in which sedimentary rocks are made. Metamorphic rocks come from the transformation of existing rock types (sedimentary, igneous and other metamorphic rocks) by heat and pressure. Examples of metamorphic rocks are quartzite, which is made from sandstone, and marble, which is made from limestone.

Links to k-12 CA Content Standards:

Grades k-8 Standard Set Investigation and Experimentation:

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other strands, students should develop their own questions and perform investigations.

Grades k-12 Mathematical Reasoning:

1.0 Students make decisions about how to approach problems:

- 1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.
 - 1.2 Determine when and how to break a problem into simpler parts.
- 2.0 Students use strategies, skills, and concepts in finding solutions:
- 1.1 Use estimation to verify the reasonableness of calculated results.
 - 1.2 2.2 Apply strategies and results from simpler problems to more complex problems.
 - 1.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
 - 2.5 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- 3.0 Students move beyond a particular problem by generalizing to other situations:
- 3.1 Evaluate the reasonableness of the solution in the context of the original situation.
 - 3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
 - 3.3 Develop generalizations of the results obtained and apply them in other circumstances.

Grade 2 Standard Set 3. Earth Sciences.

Earth is made of materials that have distinct properties and provide resources for human activities. As a basis for understanding this concept:

- 3.a. Students know how to compare the physical properties of different kinds of rocks and know that rock is composed of different combinations of minerals.
- 3.b. *Students know* smaller rocks come from the breakage and weathering of larger rocks.
- 3.c. Students know that soil is made partly from weathered rock and partly from organic materials and that soils differ in their color, texture, capacity to retain water, and ability to support the growth of many kinds of plants.

Grade 4 Standard Set 4. Earth Sciences

The properties of rocks and minerals reflect the processes that formed them. As a basis for understanding this concept:

- 4.a. Students know how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to their properties and methods of formation (the rock cycle).