

Introduction to the Rock Cycle

Lesson Concept	Weathering and erosion are processes of the rock cycle.
Link	In the previous lesson students learned that moving air, water or ice causes erosion via rain, waves, rivers, glaciers and wind. In this lesson, students learn that rocks are transformed through the rock cycle. In the next lesson, students will learn that rocks can be identified by their properties.
Time	70 minutes
Materials	<u>Whole class</u> 1 sheet of foil 1 heavy-duty gallon sized re-sealable bag (e.g., Ziplock© Freezer Bag) 1 wide rimmed beaker 3 beakers 1 Hot Plate 1 oven mitt 2 beaker's worth of Water A Tea Party for Rock Cycle Fact Heavy, hard covered book <u>Individual</u> Multicolored used Crayons Plastic Knife Paper Plate Student Inquiry Journal Copy of the "Formative Assessment #1: Rock Cycle Demo Questions"
Advance preparation	<ol style="list-style-type: none">1. Collect old crayons in many colors that can easily be discarded.2. Heat water in a wide rimmed beaker.3. Fill one beaker with cool water.4. Cut "Tea Party for Rock Cycle Fact Strips."

Adapted from Celina Cerny and Peggy Lubcheco

4.4 Introduction to the Rock Cycle

*SCIENCE MATTERS

Teacher Note: You may want to ask a Kindergarten or preschool teacher if there are any old, chunky crayons that they would not mind donating to your class. The fat crayons work best as they do not break when the kids scrape them. These crayons will not be completely destroyed and can be saved and reused for this lesson in subsequent years.

Procedure:

Engage (2 minutes) *Just as rocks are deconstructed over time, so are they constructed.*

1. Remind students that in the previous lesson, we learned about the agents (causes) of weathering. In essence, this is how rocks are broken down or deconstructed.
2. Ask students to think about the opposite of breaking down or deconstruction. [Expected Student Response (ESR): construction or building up].
3. Explain to students that today they will learn about how rocks are constructed or formed.

Explore (8 minutes) *Weathering breaks rocks into sediments that are cemented and compacted into rocks called sedimentary rock.*

4. Tell students that they will be given a crayon that represents a rock. Show them the crayon. Explain to students that just as a crayon represents the **rock**, a knife represents the agents of weathering: water, wind, ice, etc.
5. Model scraping the crayon with the knife, slowly making sure that all of the small pieces fall into a paper plate. Each time the knife slides across the crayon, name a different type of weathering, e.g., water, wind, and ice, in a rhythmic pattern.
6. Distribute crayons, plastic knives, and paper plates. Have students scrape the crayons with the jagged edge of the knife while stating the type of weathering that the scraping represents, e.g., water, wind, ice.

Explain (5 minutes) *Weathering breaks rocks into sediments that are cemented and compacted into rocks called sedimentary rock.*

7. As students work, ask, “What does the crayon represent?” [(ESR): The crayon represents a rock.] “What does the knife represent?” [(ESR): The movement of the knife models a natural process, the weathering the rock.] “What do the crayon shavings represent?” [(ESR): The crayon shavings represent sediments.]

Explore/Explain (3 minutes) *Weathering breaks rocks into sediments that are cemented and compacted into rocks called sedimentary rock.*

8. Gather as many of the shavings into a corner of the sealable bag as possible. Have students imagine that the sediments from the rock begin to settle.

9. Seal the bag and place a book on top of it. Say, "Imagine what happens over time. More sediments land on top of these sediments or the sediments get moved during erosion. Boulders roll down hills and wind up on top. Earthquakes shift land on top of sediments. All of these substances put pressure on top of the sediments."
10. With as much pressure as possible, press the sealed corner full of sediments down until you have a fragile piece of solid sediments. Say, "Sediments plus pressure will form a specific type of rock."

*Teacher Note: Weathering occurs **in situ**, or "with no movement", and thus should not be confused with **erosion**, which involves the movement of rocks and minerals by agents such as water, ice, snow, wind and gravity. This part of the lesson is a teacher demonstration. The pressed sediments may still be crumbly, try to be gentle with them.*

11. Ask: "What kind of rock do you think is created when sediments get pressed together over millions of years?" [(ESR): Sedimentary Rock].

Explore (5 minutes) Heat and pressure are the processes that make metamorphic rock.

12. For 2-3 seconds at a time, quickly dip the sealed baggie with sediments inside into the prepared wide rimmed beaker filled with hot water. Remove it quickly, as you do not want it to melt completely. Ask students to think about what the hot water is doing to the crayon shavings. [(ESR): You are adding heat to the crayon just as the earth adds heat to rock.]
13. Press the sealed bag with shavings between a heavy book and a desk. Ask, "What else am I adding?" [(ESR): Adding more pressure- again.] Explain that over millions and millions of years, the rocks get heated and squeezed and sometimes other substances get added, too. Repeatedly dip the baggie, press the baggie between the heavy book and desk, making it obvious that this is occurring over millions of years. Repeat until brown or black sediments freckle the shaving and the sediments hold together somewhat. Dip the baggie in the cold water if necessary.

Explain (2 minutes) Heat and pressure are the processes that make metamorphic rock.

14. Reach into the bag and hold up the new rock formed in the bag, explain how the sediments continue to stick together a bit more strongly than earlier. Ask, "What does this model represent?" [(ESR): This represents metamorphic rock, rock formed from heat and pressure.]

Teacher Note: This piece of model “rock” should be warm but not melted. Specs of the crayon shavings still should still maintain their original color, but you will also see brown or black, melted pieces.

Explore **(10 minutes) High heat is one process that makes metamorphic rock.**

15. Place the “metamorphic rock” clump into an empty beaker and heat it at a low temperature using an oven mitt or a utensil to protect yourself from being burned. Show caution when melting by picking up the beaker and swirling the contents. The shavings will melt slowly at first but when it hits the melting temperature, it will melt very quickly.
16. This represents the melting of rock into magma. Ask, “Could we have melted the sediments before we made them into metamorphic rock? [(ESR): Yes]
17. Pour the melted crayons into the beaker of cool or room temperature water. This represents the formation of igneous rock.

Explain **(10 minutes) Weathering and erosion are processes of the rock cycle.**

18. Distribute the Juncture Assessment: “Rock Cycle Demo Questions.” Have students complete the assessment.
19. Have a discussion about how this exploration relates to the rock cycle. Ask, “Does the rock cycle move in one cycle? [(ESR): There is not one path.]

Teacher Note: Prior to this discussion, go to www.Showme.com, you will find a way to visually display the Rock Cycle for your students. Do not show the “Show Me” to students. It is intended as background information to help you, the teacher further explain the rock cycle to your students.

Evaluate **(15 minutes) Weathering and erosion are processes of the rock cycle.**

20. Have students glue the questions with their written responses into their science notebooks journals.

Extend **(10 minutes) Each of the different types of rocks has something special that makes it a particular type.**

21. Distribute the “Tea Party Rock Cycle Fact Strips” to each student.
22. Ask students to walk around the room and when you clap your hands twice, they need to find the person closest to them to be their partner.

23. Ask them to greet their partner and read them their fact. Each person must listen and take a turn. Call on a student to state their partner's fact. Repeat the process several times.

Formative Assessment #1: Rock Cycle Demo Questions

1. How many types of rocks are there and what are their names?
2. Describe the processes that make sedimentary rock.
3. Describe the processes that make igneous rock.
4. Describe the processes that make metamorphic rock.
5. What do each of the models represent in our investigations?

Model

Represents

Crayon

Crayon shavings

Melted crayon shavings

Formative Assessment #1 Rock Cycle Demo Questions (Answer Key)

1. How many types of rocks are there and what are their names?

There are 3 types of rocks in the rock cycle:

Sedimentary Rock

Igneous Rock

Metamorphic Rock

2. Describe the processes that make sedimentary rock.

The processes that make sedimentary rock are: cementation and compaction

3. Describe the processes that make igneous rock.

Heat forms igneous rocks.

4. Describe the processes by which make metamorphic rock.

Heat and pressure form metamorphic rock.

5. What do each of the models represent in our investigations?

<u>Model</u>	<u>Represents</u>
Crayon	rock
Crayon shavings	sediments
Melted crayon shavings	lava

Tea Party Rock Cycle Fact Strips.

Metamorphic Rock: Metamorphic rocks begin to form at 12-16 kilometers beneath the earth's surface. They begin changing at temperatures of 100 degrees Celsius to 800 degrees Celsius. If you squeeze and heat a rock for a few million years, it can turn into a new kind of rock.



HEAT in the Earth: Where does the heat come from? The heat comes from magma.



PRESSURE in the Earth: Where does the pressure come from? The pressure comes from layers of rock piled on top of layers and layers of rock. The layers on the bottom get squeezed. The thicker the layers, the more pressure there is.

Fascinating Fact

The oldest known rock lies in Canada. The acasta gneiss, a metamorphic rock, is 3.96 billion years old.

Igneous Rock: The oldest type of all rocks is the igneous rock. The word "igneous" comes from a Greek word for fire. Deep inside the earth, the temperature is very high and the minerals there are in liquid form called magma. As the magma pushes towards the earth's surface, it starts to cool and turns into solid igneous rock.



Magma is called lava when it reaches the earth's surface. Lava cools quickly and forms rocks with small crystals. They are called extrusive igneous rocks.

Most rocks are made of minerals. However, all rocks are not the same. That is why rock collecting is so interesting and fun. Every rock has its own story.

Rocks can be put into three basic rock types: igneous, sedimentary, and metamorphic. How a rock is formed determines which group it is placed in.

Fascinating Fact: Seventy percent of all the rocks on earth are sedimentary rocks. Weathering agents are wind, water, and ice.

Sediments: Rocks are broken up into smaller pieces by weathering agents such as wind, water, and ice. These small pieces of rock turn into pebbles, gravel, sand, and clay. They tumble down rivers and streams. These pieces settle in a new place and begin to pile up.



Sedimentary Rock : Sediments can harden into sedimentary rock in two ways.
1. Pressure and 2.Cementation.

Cementing-Some sediments are glued together by minerals dissolved in water.

Sedimentary rocks are often rich in fossils.

The Rock Cycle: “It was many eons ago, When I awakened in a chamber low, An extremely hot, burning mound, Of melted rock beneath the ground. I’d no idea of the millennia ahead, The walk on Earth that I would tread; A bath by other rocks well-worn, For into the rock cycle I was born.”

Gems are not rocks.

Cooled lava is igneous rock

Basalt is an igneous rock that is full of iron, magnesium, and is dense to the core.

The black sand found on the beaches of the Hawaiian Islands was once igneous rock! Once the rock is considered sand, it is called sediments.

Sedimentary rock can use calcite, dissolved in the sea, minerals from shells of animals that were once alive and even human bone that were turned into limestone.

If sedimentary rock goes under heat and pressure, it will turn into metamorphic rock. So, mud can turn into shale, schist will turn into gneiss.

The sedimentary rock, sandstone, under heat and pressure will turn into the metamorphic rock quartzite.

Slate under heat and pressure will turn into the metamorphic rock schist.

The sedimentary rock, limestone, under heat and pressure will turn into the metamorphic rock marble, then it is often used in bathrooms and kitchens.