

Franklin Mountains Middle School Lesson

Rock Cycle Review Student Activity or Teacher Demonstration

Objectives

- Students will be able to identify natural forces that cause erosion and weathering.
- Students will describe how sedimentary, metamorphic and igneous rocks may be formed in nature.

Materials

Crayons (4 to 6 per color per student), pencil sharpeners or several old vegetable graters, newspaper, hammer, four 6 inch 2X4 wood pieces, two "C" clamps, one hot plate or pancake griddle, two pie plates, heavy duty aluminum foil, tongs, ice, tray, safety goggles.

Introduction

Ask the students to describe rocks and or rock formations that they have observed in their neighborhood, at the beach or on a mountain. **Show** the students pictures of the Franklin Mountains located under the *Rock, Sediment and Rock tab*. **Ask** the following questions:

- Have you ever wondered about how rocks form?
- Are new rocks forming at this moment?
- Are rocks all the same size?
- Why do rocks break into small pieces?
- Why are some rocks and mountains layered? Different colors?
- Why do you think the Franklin Mountains are layered?

Explain that we will answer some of these questions today as we review the rock cycle.

Part A: Weathering

Cover all lab tables or desks with newspaper. The students may work in small groups. **Give** each student 4 - 6 crayons that are the same color. Students in the same group should be given different colored crayons. **Give** each group a couple of vegetable graters and/or pencil sharpeners. The crayons represent rock material, and the vegetable graters/pencil sharpeners represent mechanical weathering agents. Students should carefully shave each of the crayons with a pencil sharpener or vegetable grater keeping all of the fragments in a small pile. As the students are "weathering" their crayons, call attention to the size and shape of the crayon shavings. The crayon shavings represent "rock" fragments. **CAUTION** the students to be careful using the vegetable graters.

Ask the following questions:

- Are the crayon shavings the same size?
- Are rock fragments the same size in nature?

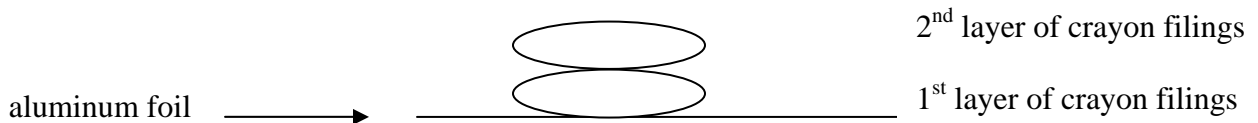
- Name some weathering forces?

The weathering process is complete when each student has collected about 1 inch of crayon shavings. The shavings will be shared with classmates to form a multi-colored, layered "rock."

Part B: Erosion and Sedimentation

Explain that once rock fragments have been created (erosion) they are moved and deposited by natural weathering forces. The rocks that you see in the western Franklin Mountains, along the ridge crest at the south end of the range and overlying the old dark-colored rocks of the east part of the range were formed as sediments were deposited in an ancient ocean. Everyplace you see a change from one layer of sedimentary rock to another layer means that the conditions of deposition of the original sediments changed. You may see thin layers, or you may see layers that are several feet thick.

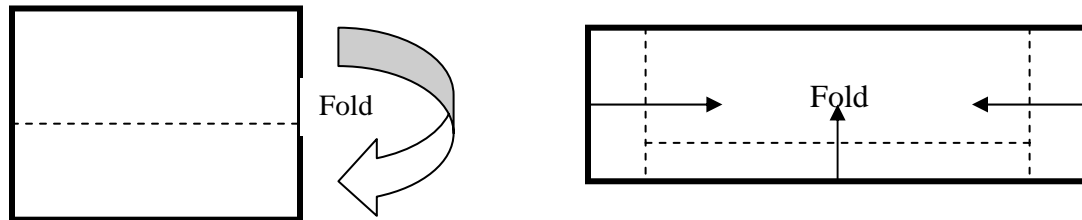
Give each student one 12 inch X 12 inch piece of aluminum foil. **Instruct** the students to fold their aluminum foil in half. The students should now transfer one color of their "rock" fragments (crayon filings) to the center of the aluminum foil. They should spread the "rock" fragments so that they form about a 1 - 2 cm layer on the foil. The students should then form another rock layer by using "rock" fragments of a different color. This process is followed until they have three to four layers of "rock" fragments.



As the students are layering their "rock" fragments **ask**:

- What forces in nature allow this process to happen?
- Where could you find layered rock fragments?

Fold the aluminum foil. Fold the edges in so that all of the "rock" fragments are inside the foil.



PART C: Sediments/Sedimentary rock simulation (SAFETY GOGGLES REQUIRED)

Close the aluminum foil packets and proceed to the hammer station. Students should place their "rock" fragments between two pieces of wood and then hit the wood gently with the hammer. The students may stand on the wood pieces as an alternative to using the hammer. As "light" pressure is applied to the "rock" fragments they compress. Spaces

between the fragments are reduced in size and in nature they fill with cementing agents. Once the "rock" fragments have been gently compressed, remove the wooden blocks. Students should carefully open their aluminum foil packages and observe the new product. **Call** attention to the center of the "rock". The crayon shavings should be tightly compressed. **Ask** the students to break their "rock" in half. **Encourage** the students to look at the broken edges and describe the layers.

Ask the following questions:

- How have the layers changed?
- What happened to the spaces between the fragments?
- What type of "rock" is represented?

Put the "rocks" back in the aluminum foil packets.

Part D: Metamorphic rock simulation

Place the aluminum foil packets between two pieces of wood and use "C" clamps to press the wood blocks together. **Encourage** the students to add as much pressure as possible. This part of the lab demonstrates how additional pressure can change rocks. In reality, as the pressure within the earth increases, temperatures increase as well. A temperature change is probably occurring in this activity but the change cannot be measured - chemical activity associated with the formation of metamorphic rock is not a part of this activity.

After the students release the "C" clamp, ask them to open their aluminum foil packets and examine the newly formed "metamorphic rock." **Encourage** the students to describe changes in the thickness, fragment shape, and surface of the rock.

Part E: Igneous rock simulation (MUST BE COMPLETED BY TEACHER, LAB ASSISTANT OR PARENT VOLUNTEER)

Igneous rocks form deep within the earth. The mostly dark colored rocks that you see on the lower slopes of the eastern Franklin Mountains and all along Trans-Mountain Road are Precambrian-age rocks. They are mostly volcanic rocks (rocks associated with volcanoes), granites (igneous rock with coarse crystals of quartz and feldspar), and sedimentary rocks, which are most commonly rocks deposited as sediments in water. These rocks have been so deeply buried that the heat and pressure of the deep Earth have changed them. They have been "metamorphosed." A well-layered, metamorphosed limestone (see light-colored rocks below) is now a marble.

Before you turn it on, protect the hot plate or pancake griddle by covering it with a layer of aluminum foil. **Place** a metal pie plate on the hot plate or pancake griddle and turn the temperature to medium. **Using tongs**, place the aluminum foil packets in the pie tin for about 20 -30 seconds then turn them over for another 20 -30 seconds. **Be careful** that the melting process does not occur so rapidly that the wax splatters. When most of the rock

is in the molten state remove the packet from the pie tin and drop it into an ice water bath. Once the "rock" has cooled, the students may unwrap their aluminum foil packets and examine their "igneous rock". **Ask:**

- Have the colors of the "rock" changed? How?
- Describe changes in the thickness, fragment shape, and surface of the rock.

The students may want to write with their "rocks".

Conclusion

Review weathering and erosion with the students. **Ask** the students to describe how sedimentary, metamorphic and igneous rocks are formed. Why do sedimentary, metamorphic and igneous rocks look different? **Show** the cross section of the Franklin Mountains located under the *Rock, Sediment and Rock tab* of the web site. **Ask** the students to describe what the cross section layers represent. How were they formed?

Extension

Challenge the students to really observe the rocks they encounter daily. **Ask** them to try to classify the rocks as sedimentary, metamorphic or igneous.