

# 15

## The Rock Cycle

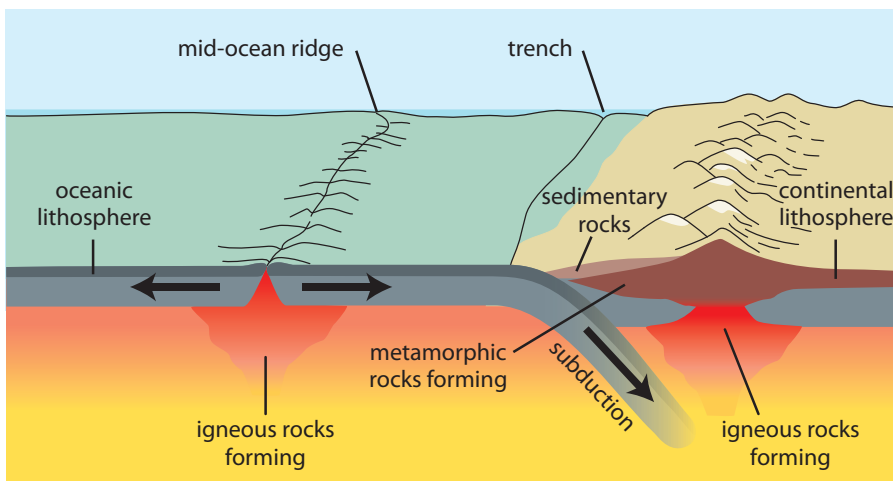
### INVESTIGATION

**T**HE SURFACE OF Earth is ever changing. Some changes happen suddenly, such as volcanic eruptions or destructive landslides. Some happen more gradually, such as lithospheric plates moving and mountains forming. The geological processes that cause these changes also form different types of rock. Since scientists recommend that nuclear waste be stored deep underground, it is important to know about the different types of rock that might be under the surface.

Geologists identify rocks by their properties, including what they are made of, and give the rocks names, such as granite, obsidian, or marble. Geologists also group rocks based on how they formed. You already know how two types of rock form. Igneous rock forms when magma and lava cool and solidify. Sedimentary rock forms when sediments are pressed and glued together. A third type, **metamorphic rock**, is rock that has changed due to extreme heat and/or pressure. In this activity, you will learn more about how one type of rock becomes another in a process known as the **rock cycle**.

### GUIDING QUESTION

**How do rocks form?**



*Rock forms both above and below the surface of Earth.*

## **MATERIALS**

*For each group of four students*

- 1 Rock Cycle Game board
- 1 set of 30 Igneous Rock Cards
- 1 set of 30 Metamorphic Rock Cards
- 1 set of 30 Sedimentary Rock Cards
- 1 set of 9 Geological Process Cards
- 4 game pieces
- 1 number cube

*For each student*

- 1 Student Sheet 15.1, "Geologist's Notes"
- 1 Student Sheet 15.2, "Rock Formation"

## **PROCEDURE**

1. Carefully look at Student Sheet 15.1, "Geologist's Notes." During the activity, you will use this Student Sheet to keep track of what happens to your rocks and to explain how you gathered more rocks.
2. Review the Materials list to make sure you have the materials you need.
3. Give each player nine rock cards: three Igneous Rock Cards, three Metamorphic Rock Cards, and three Sedimentary Rock Cards. Sort the remaining Rock Cards by rock type, and place them on the game board in three separate stacks.
4. Place the Geological Process Cards face down on the game board in a single stack.
5. Place each person's game piece on the Start space.
6. Begin the game by having each person roll the number cube. The person who rolled the highest number should start the game.
7. The first person should toss the number cube and move that number of spaces on the game board. When someone lands on a Geological Process space, they should pick up a Geological Process Card and follow the directions. After reading a card, replace it face down at the bottom of the stack.
8. Continue taking turns and playing the Rock Cycle Game. Remember, each person should record what happens to their rocks on Student Sheet 15.1. All new rocks should also be recorded on this sheet.

9. Stop playing when the second person crosses the Start space again.
10. Your teacher will distribute Student Sheet 15.2, “Rock Formation.” Work with your group and use information from all group members’ Student Sheets to complete Student Sheet 15.2.

## **ANALYSIS**

1. Create a diagram to describe the rock cycle.
  - a. Start by drawing and describing igneous, metamorphic, and sedimentary rock.
  - b. Draw arrows between igneous, metamorphic, and sedimentary rock to show all the ways rock can change into other types of rock.
  - c. Label the arrows with the geological process that causes each change.
  - d. Include the time scale of changes by labeling at least one sudden and one gradual change.
  - e. Draw a star next to a geological process driven by energy from the Sun. Draw a circle next to a geological process driven by energy from Earth’s hot interior.
2. You have learned that different kinds of rock are constantly formed by geological processes, but Earth’s total mass stays constant. How is that possible? Explain using what you learned in this activity.
3. Which type of rock do you think would be most stable for storing nuclear waste? Explain using evidence from this activity.