Section 6

The Rock Cycle

Reading Preview

Key Concepts

- What is the rock cycle?
- What is the role of plate tectonics in the rock cycle?

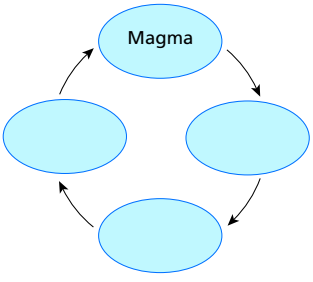
Key Term

- rock cycle

Target Reading Skill

Sequencing As you read, make a cycle diagram that shows the stages in the rock cycle. Write each stage of the rock cycle in a separate circle in your diagram.

Rock Cycle



Lab zone **Discover Activity**

Which Rock Came First?

1. Referring to the photos at the right, make sketches of quartzite, granite, and sandstone on three index cards.
2. Observe the color and texture of each rock. Look for similarities and differences.
3. To which major group does each rock belong?

Think It Over

Developing Hypotheses How are quartzite, granite, and sandstone related? Arrange your cards in the order in which these three rocks formed. Given enough time in Earth's crust, what might happen to the third rock in your series?

Sandstone

Quartzite

Granite

Earth's rocks are not as unchanging as they seem. **Forces deep inside Earth and at the surface produce a slow cycle that builds, destroys, and changes the rocks in the crust.** The **rock cycle** is a series of processes on Earth's surface and in the crust and mantle that slowly change rocks from one kind to another.

A Cycle of Many Pathways

Here's one possible pathway through the rock cycle, shown in Figure 19. The igneous rock granite formed beneath the surface. Then, the forces of mountain building slowly pushed the granite upward, forming a mountain. Slowly, water and wind wore away the granite. These granite particles became sand, carried by streams to the ocean. Over millions of years, layers of sandy sediment piled up on the ocean floor. Slowly, the sediment changed to sandstone, a sedimentary rock. Over time, the sandstone became deeply buried. Heat and pressure changed the rock's texture from gritty to smooth. The sandstone changed into the metamorphic rock quartzite. But metamorphic rock does not end the rock cycle, which continues for millions of years.

FIGURE 19

The Rock Cycle

Igneous, sedimentary, and metamorphic rocks change continuously through the rock cycle.
Interpreting Diagrams *What process leads to the formation of sediment?*

Go Online
active art
For: Rock Cycle activity
Visit: PHSchool.com
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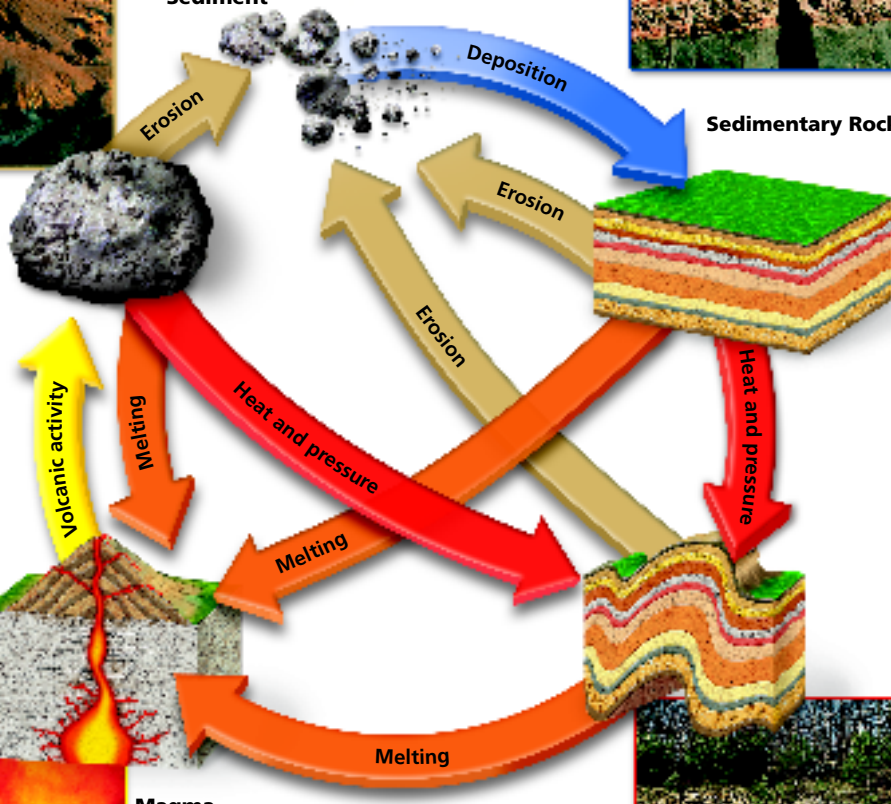
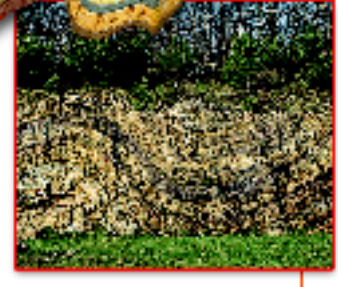


Magma and Lava



Metamorphic Rock

The Rock Cycle and Plate Tectonics

The changes of the rock cycle are closely related to plate tectonics. **Plate movements start the rock cycle by helping to form magma, the source of igneous rocks. Plate movements also cause faulting, folding, and other motions of the crust that help to form sedimentary and metamorphic rocks.**

FIGURE 20
Moving Up in the World
This fossil trilobite lived on an ocean floor about 500 million years ago. As plate tectonics moved pieces of Earth's crust, the rock containing this fossil became part of a mountain.

Igneous Rocks Where oceanic plates move apart, magma formed from melted mantle rock moves upward and fills the gap with new igneous rock. Where an oceanic plate is subducted beneath a continental plate, magma forms and rises. The result is a volcano made of igneous rock. A collision of continental plates may push rocks so deep that they melt and form magma. This magma slowly cools and hardens to form igneous rock.

Sedimentary and Metamorphic Rocks The collision of continental plates produces faults, folds, and uplift of the crust. Eventually, the collision could push up a mountain range. Then, erosion begins. The mountains eventually are worn away, leading to the formation of sedimentary rock.

A collision between continental plates can also push rocks down deep into the mantle. There, heat and pressure could change the rocks to metamorphic rock. And so the rock cycle continues, for hundreds of millions of years.

Reading Checkpoint **How can plate movements help to form metamorphic rock?**

Section 6 Assessment

Target Reading Skill **Sequencing** Review your cycle diagram about the rock cycle with a partner. Add any necessary information.

Reviewing Key Concepts

1. **a.** **Defining** Write a definition of the rock cycle in your own words.
   b. **Sequencing** Begin with igneous rock and explain how it could change through two more steps in the rock cycle.
2. **a.** **Reviewing** How do plate movements help to form igneous rocks?
   b. **Relating Cause and Effect** How can the collision of plates lead to the formation of sedimentary rock?
   c. **Predicting** What would be likely to happen to the rock cycle if Earth's interior cooled so much that plate motions stopped?

Writing in Science

Rock Legend Pick one type of rock and write a possible "biography" of the rock as it moves through the rock cycle. Your story should state the type of rock, how the rock formed, and how it might change.

Testing Rock Flooring

Problem

What kind of building stone makes the best flooring?

Skills Focus

designing experiments, controlling variables, drawing conclusions

Suggested Materials

- steel nail • wire brush • water
- plastic dropper • hand lens
- samples of igneous, sedimentary, and metamorphic rocks with flat surfaces
- greasy materials such as butter and crayons
- materials that form stains, such as ink and paints

Procedure

1. Brainstorm with your partner the qualities of good flooring. For example, good flooring should resist stains, scratches, and grease marks, and be safe to walk on when wet.
2. Predict what you think is the best building stone for a kitchen floor. Why is it the best?
3. Write the steps you plan to follow in answering the problem question. As you design your plan, consider the following factors:
   - What igneous, sedimentary, and metamorphic rocks will you test? (Pick at least one rock from each group.)
   - What materials or equipment will you need to acquire, and in what amounts?
   - What tests will you perform on the samples?
   - How will you control the variables in each test?
   - How will you measure each sample's resistance to staining, grease, and scratches?
   - How will you measure slipperiness?
4. Review your plan. Will it lead to an answer to the problem question?
5. Check your procedure and safety plan with your teacher.
6. Create a data table that includes a column in which you predict how each material will perform in each test.

Analyze and Conclude

1. **Interpreting Data** Which material performed the best on each test? Which performed the worst on each test?
2. **Drawing Conclusions** Which material is best for the kitchen flooring? Which material would you least want to use?
3. **Drawing Conclusions** Do your answers support your initial prediction? Why or why not?
4. **Applying Concepts** The person installing the floor might want stone that is easy to cut to the correct size or shape. What other qualities would matter to the flooring installer?
5. **Communicating** Based on your results, write an advertisement for the building stone that performed best as a flooring material.

Design an Experiment

Suppose you are trying to select flooring material for a laboratory where heavy equipment is frequently moved across the floor. Make a hypothesis predicting which type of stone flooring will be strongest. Then design an experiment to compare how well each type resists breakage.