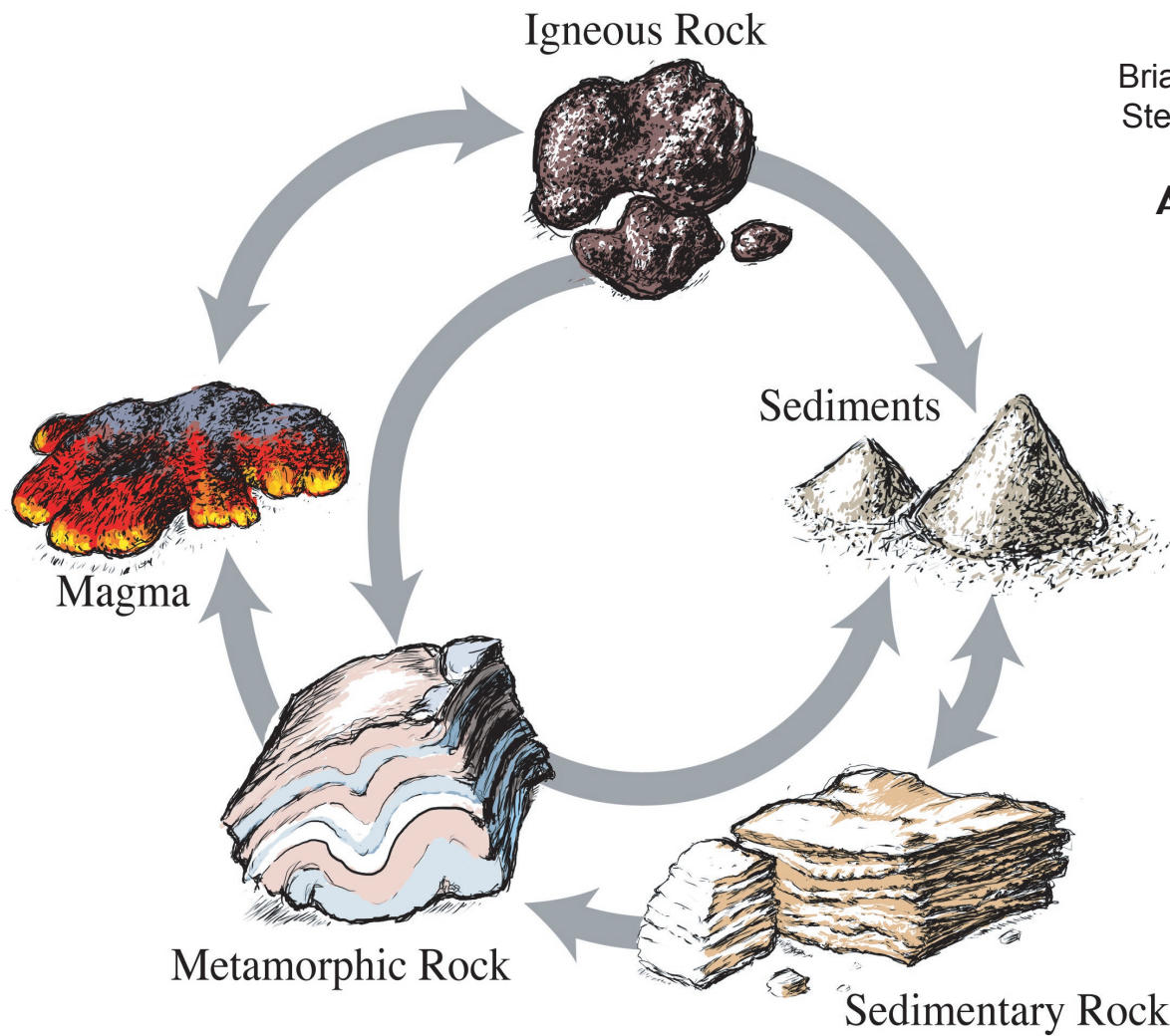


The Rock Cycle

Teacher's Guide



Editors:

Brian A. Jerome, Ph.D.
Stephanie Zak Jerome

Assistant Editors:

Louise Marrier
Hannah Fjeld

Graphics:

Dean Ladago
Fred Thodal
Lyndsey Canfield

A Message from our Company . . .

Visual Learning is a Vermont-based, family owned company specializing in the creation of science programs. As former classroom science teachers we have designed our programs to meet the needs and interests of both students and teachers. Our mission is to help educators and students meet educational goals while experiencing the thrill of science!

Viewing Clearances

The video and accompanying teacher's guide are for instructional use only. In showing these programs, no admission charges are to be incurred. The programs are to be utilized in face-to-face classroom instructional settings, library settings, or similar instructional settings.

Duplication Rights are available, but must be negotiated with the *Visual Learning Company*.

Television, cable, or satellite rights are also available, but must be negotiated with the *Visual Learning Company*.

Closed circuit rights are available, and are defined as the use of the program beyond a single classroom but within a single campus. Institutions wishing to utilize the program in multiple campuses must purchase the multiple campus version of the program, available at a slightly higher fee.

Video streaming rights are available and must be negotiated with the *Visual Learning Company*.

Discounts may be granted to institutions interested in purchasing programs in large quantities. These discounts may be negotiated with the *Visual Learning Company*.

Use and Copyright:

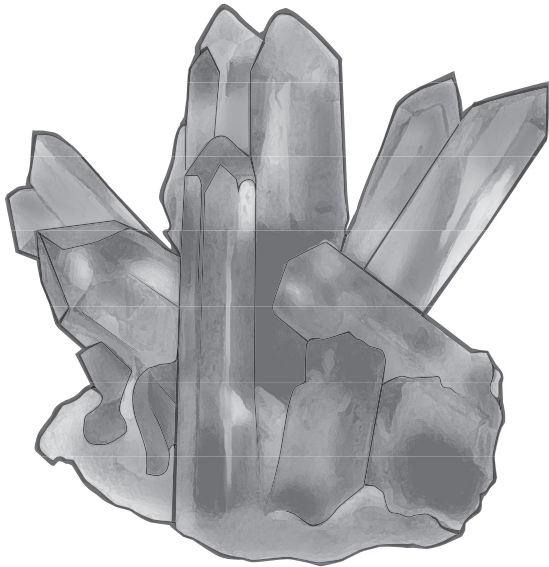
The purchase of this video program entitles the user the right to reproduce or duplicate, in whole or in part, this teacher's guide and the black line master handouts for the purpose of teaching in conjunction with this video, *The Rock Cycle*. The right is restricted only for use with this video program. Any reproduction or duplication, in whole or in part, of this guide and student masters for any purpose other than for use with this video program is prohibited.

The video and this teacher's guide are the exclusive property of the copyright holder. Copying, transmitting, or reproducing in any form, or by any means, without prior written permission from the copyright holder is prohibited (Title 17, U.S. Code Sections 501 and 506).

Copyright © 2007

ISBN 978-1-59234-178-8

Table of Contents



A Message from our Company	2
Viewing Clearances	2
Use and Copyright	2
National Standards Correlations	4
Student Learning Objectives	5
Assessment	6
Introducing the Program	7
Program Viewing Suggestions	7
Video Script	8
Answer Key to Student Assessments	12
Answer Key to Student Activities	13
Pre-Test	14
Post-Test	16
Video Review	18
Vocabulary	19
Writing Activity	20
Identifying Rock Types	21
Mapping the Rock Cycle	23
Changing Rocks	25

National Standards Correlations

Benchmarks for Science Literacy

(Project 2061 - AAAS)

Grades 3-5

The Physical Setting - Processes That Shape The Earth (4C)

By the end of the fifth grade, students should know that:

- Rock is composed of different combinations of minerals. Smaller rocks come from the breakage and weathering of bedrock and larger rocks.
- Waves, wind, water, and ice shape and reshape the earth's land surface by eroding rock and soil in some areas and depositing them in other areas, sometimes in seasonal layers.

National Science Education Standards (Content Standards: K-4, National Academy of Sciences)

Earth and Space Science - Content Standard D

As a result of their activities in grades K-4, all students should develop an understanding of:

Properties of Earth Materials

- Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials, as sources of fuel, or for growing the plants we use as food. Earth materials provide many of the resources that humans use.

Changes in the Earth and Sky

- The surface of the earth changes. Some changes are due to slow processes, such as erosion and weathering, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.

Student Learning Objectives

Upon viewing the video and completing the enclosed student activities, students will be able to do the following:

- Explain that rocks are non-living substances made up of one or more minerals.
- Understand that a mineral is a natural substance with a definite crystal structure.
- Differentiate between the three main groups of rocks including: igneous rocks, sedimentary rocks, and metamorphic rocks.
- Summarize the characteristics of igneous rocks and the function of magma and lava in forming igneous rocks.
- Explain that some sedimentary rocks are formed from sediments or particles which are deposited, compacted, and cemented into rock.
- Understand that metamorphic rocks are formed from other rocks that change as a result of heat, pressure, or chemical reactions.
- Compare and contrast the main characteristics of each of the three main types of rocks.
- Generally explain the process of weathering and its role in breaking down rocks and other materials into smaller and smaller pieces.
- Describe erosion as the process of transporting weathered rocks, particles and sediments from one place to another.
- Illustrate the rock cycle, in a sketch highlighting ways that rocks change from one form to another.
- Understand that the rock cycle does not always circulate in one direction, but that rocks can change from one type to another depending on conditions.

Assessment

Preliminary Test (p. 14–15):

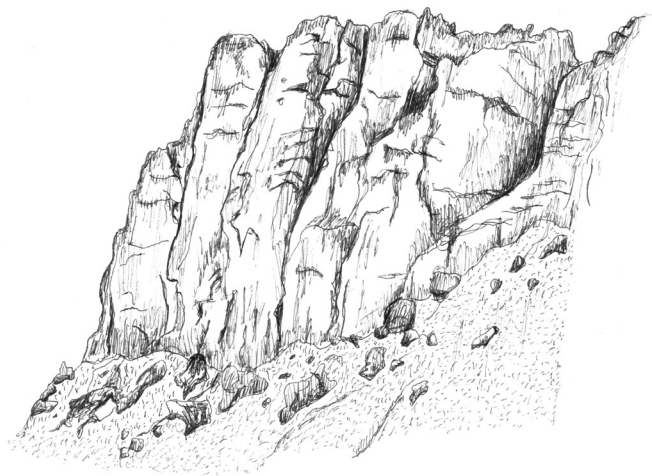
The Preliminary Test is an assessment tool designed to gain an understanding of students' preexisting knowledge. It can also be used as a benchmark upon which to assess student progress based on the objectives stated on the previous pages.

Post-Test (p. 16–17):

The Post-Test can be utilized as an assessment tool following student completion of the program and student activities. The results of the Post-Test can be compared against the results of the Preliminary Test to assess student progress.

Video Review (p. 18):

The Video Review can be used as an assessment tool or as a student activity. There are two sections. The first part contains questions displayed during the program. The second part consists of a five-question video quiz to be answered at the end of the video.



Introducing the Program

Before showing the video to students, ask the class to describe places they see rocks everyday. Ask students if they know the names of different types of rocks or minerals they encounter in their daily lives. For example, a student may have marble countertops in their kitchen, a slate roof on their home, or granite steps. Have a volunteer write down any names of rocks mentioned by students.

Briefly describe to the class three main rock types including: igneous, metamorphic, and sedimentary rocks. Provide examples of each type of rock. Try to choose examples with which students are familiar. Also pass around a representative piece of each type of rock so students can see and feel the differences between them. Next explain the basic concept and parts of the rock cycle, being sure that students understand the cycle is not always orderly but can jump around. After showing students the video, review the main features of the rock cycle. Create a diagram on the blackboard of the rock cycle.

Program Viewing Suggestions

The student master “Video Review” is provided (p. 18) for distribution to students. You may choose to have your students complete this Master while viewing the program or do so upon its conclusion.

The program is approximately 14 minutes in length and includes a five-question video quiz. Answers are not provided to the Video Quiz in the video, but are included in this guide on page 12. You may choose to grade student quizzes as an assessment tool or to review the answers in class.

The video is content-rich with numerous vocabulary words. For this reason you may want to periodically stop the video to review and discuss new terminology and concepts.

Video Script

1. Yosemite Valley is a major landmark in North America. . .
2. . . . as is the breathtaking Grand Canyon. . .
3. . . . and the towering Rocky Mountains which span the United States and Canada.
4. Other spectacular sites include Niagara Falls. . .
5. . . . these formations in Bryce Canyon. . .
6. . . . and the Appalachian Mountains.
7. The dominant features in these places are rocks.
8. While rocks are not living things, they provide us with beautiful scenery, . . .
9. . . . materials we use everyday, . . .
10. . . . and a fascinating story.
11. During the next few minutes we are going to explore some of the story behind rocks, . . .
12. . . . and explore how rocks change. . .
13. . . . as we investigate the rock cycle.
- 14. Graphic Transition – What Are Rocks?**
- 15. You Compare!** How are these sea lions different from these rocks?
16. The sea lions are living things and the rocks are not.
17. Rocks are non-living substances made up of one or more minerals.
18. You have probably heard of minerals before.
19. Gold, diamonds, and pyrite are all minerals. A mineral is a natural substance that has a definite chemical make up and crystal structure.
20. Quartz is an example of a mineral that has a definite crystal structure and definite chemical make up.
21. Rocks tend to be made up of two or more minerals.
22. There are hundreds of different kinds of rocks on Earth.
23. To make rocks easier to study, they are classified into three main groups: igneous rocks, sedimentary rocks, and metamorphic rocks.
24. Let's take a closer look at these three groups of rocks.
- 25. Graphic Transition – Types of Rocks**
26. Temperatures within the Earth can be so hot that solid rock is melted into a liquid called molten rock.
27. Igneous rocks are formed when hot molten rock cools.
28. Molten rock inside Earth is called magma. Granite, seen here, and gabbro are examples of igneous rocks formed from solidified magma.
29. Lava is molten rock on Earth's surface. Rocks formed from cooled solidified lava include obsidian and basalt, to name just a couple.
30. Sandstone, a type of sedimentary rock, makes up the arches and walls here in Arches National Park, Utah.
31. Much of the cement used in making this building was derived. . .
32. . . . from another sedimentary rock called limestone.

Video Script

33. Sedimentary rocks are made up of different types of particles, or sediments, such as sand, tiny particles of silt, or small pebbles.
34. Sedimentary rocks form when sediments are deposited by water, wind, or ice. The sediments are then compacted and cemented together.
35. There are other ways sedimentary rocks form as well, such as when mineral-rich water evaporates and leaves formations such as these.
36. Other sedimentary rocks such as coal and limestone are formed from the remains of once living things.
37. The third group of rocks are referred to as metamorphic rocks.
38. The changing of one type of rock into another type as a result of heat, pressure, or chemical reactions within the Earth forms metamorphic rocks.
39. For example, when shale, seen here, is exposed to heat and pressure it can change into . . .
40. . . . slate which is used on roofs.
41. And when sandstone is exposed to heat and pressure. . .
42. . . . it can change into a rock called quartzite.
43. This is just a quick overview of the major groups of rocks and some of the processes responsible for their formation.
- 44. Graphic Transition – Weathering**
45. The rocks on this beach were not always smooth and round.
- 46. You Decide!** How did these rocks get so smooth and round?
47. Over many, many years the action of waves, and the process of rocks rubbing against each other caused them to become rounded. Over time, the rocks also became smaller.
48. Weathering is the process responsible for breaking down rocks and other materials on Earth's surface into smaller and smaller pieces.
49. Some agents of weathering include moving water, ice, and even chemicals in rain water.
50. The Grand Canyon, which is nearly a mile deep, has been worn down over millions of years by weathering.
51. The Colorado River at the bottom of the canyon is responsible for carrying away materials weathered from the canyon walls.
52. Erosion is the process of transporting weathered rocks, particles, and sediments from one place to another.
53. So, through the process of weathering and erosion, rocks are broken down into smaller and smaller pieces, which are then carried away by moving water, wind, or other forces to another place.
- 54. Graphic Transition – The Rock Cycle in Action**
55. This piece of shale was probably formed as fine sediments slowly settled in a deep water ocean or lake.

Video Script

56. Shale is a sedimentary rock.
57. But when buried, and put under intense heat and pressure, shale can change into a metamorphic rock called schist.
58. Schist is a common rock in the Green Mountains of Vermont.
59. If schist is put under even more heat and pressure, it has the potential to melt. . .
60. . . . and eventually to solidify and form an igneous rock.
61. Notice how these changes can be illustrated in a circle. This illustration and process is referred to as the rock cycle.
62. The rock cycle involves the continuous changing of rocks from one form to another.
63. Let's start the rock cycle with molten rock – magma or lava.
64. When molten rock cools and solidifies it forms an igneous rock.
65. Through the process of weathering, the igneous rock is broken down into smaller and smaller pieces, which are then transported via the process of erosion.
66. The particles are deposited, compacted, and cemented together, forming a sedimentary rock.
67. If the sedimentary rock is buried it can undergo heat and pressure, altering the rock into. . .
68. . . . a metamorphic rock. In turn, if a metamorphic rock undergoes additional heat and pressure, the rock will melt into molten rock. . .
69. . . . starting the cycle all over again.
- 70. Graphic Transition – Pathways in the Rock Cycle**
71. In nature the rock cycle is not quite as simple and straightforward as we just discussed.
72. For example, igneous rocks don't always become sedimentary rocks.
73. If placed under heat and pressure, igneous rocks can become metamorphic rocks, and. . .
74. . . . they may be remelted into magma and harden into igneous rocks again.
75. Metamorphic rocks can also be broken down by weathering and eventually form sedimentary rocks.
76. Sedimentary rocks undergoing great heat and pressure can become metamorphic rocks. And then be melted into molten rock, which cools to form igneous rocks.
77. Or sedimentary rocks may be broken down via weathering. . .
78. . . . into particles which will form new sedimentary rocks later on.
79. So, as you can see, the rock cycle is more like a rock web, where many different processes can act on rocks.
- 80. Graphic Transition – Summing Up**
81. During the past few minutes, we took a look at how rocks are formed, the various types of rocks, and the rock cycle.
82. We began by seeing that rocks are non-living substances from the Earth's crust made up of one or more minerals.
83. The three major categories of rocks were explored.
84. Igneous rocks are made from molten rock in the form of magma or lava.

Video Script

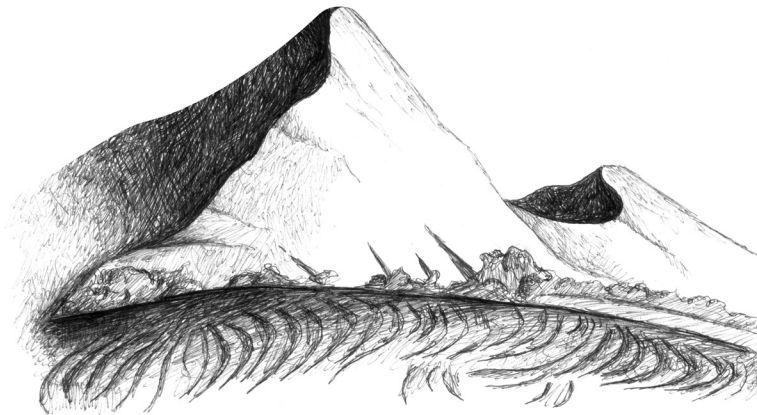
85. Sedimentary rocks are formed by the compaction and cementation of sediments.
86. And metamorphic rocks are rocks that have been changed as a result of heat, pressure, or chemical reactions.
87. We discussed the process of weathering, which involves the breaking down of rocks into smaller pieces through the action of moving water, wind, ice, or chemicals.
88. The underlying concepts and processes of the rock cycle were highlighted.
89. We saw how the different rocks on earth can be changed into other types of rocks through the processes of melting, weathering, deposition, and metamorphism.
90. So, the next time you walk on the sidewalk, . . .
91. . . . skip a stone across the water, . . .
92. . . . or take a walk on the beach, . . .
93. . . . take a moment to think about how the stones you see fit into the Earth's rock cycle.

Graphic Transition – Video Assessment

Fill in the correct word to complete the sentence. Good luck, and let's get started.

1. _____ are made up of one or more minerals.
2. _____ rocks are formed when molten rock cools.
3. The process of _____ is responsible for breaking down rocks.
4. Compaction and cementation are vital in forming _____ rocks.
5. The rock _____ is the continual changing of rocks from one form to another.

Answers can be found on page 12.



Answer Key to Student Assessments

Pre-Test (p. 14-15)

1. b - rocks
2. a - igneous
3. c - sedimentary
4. b - metamorphic
5. d - lava
6. a - weathering
7. d - erosion
8. c - the rock cycle
9. b - mineral
10. c - magma
11. false
12. true
13. false
14. true
15. true
16. A rock is a natural substance made up of one of more minerals.
17. An igneous rock is formed when molten rock cools and hardens.
18. A sedimentary rock is composed of sediments such as sand, silt, or other particles compacted and cemented together.
19. A metamorphic rock is a rock that has been changed from one type of rock to another due to heat, pressure, or chemical reactions.
20. As a result of the processes of pressure and heat, a sedimentary rock can be changed into another type of rock called a metamorphic rock.

Post-Test (p. 16-17)

1. d - lava
2. d - erosion
3. b - mineral
4. c - the rock cycle
5. c - magma
6. a - igneous
7. a - weathering
8. c - sedimentary
9. b - rocks
10. b - metamorphic
11. false
12. true
13. true
14. true
15. false
16. A sedimentary rock is composed of sediments such as sand, silt, or other particles compacted and cemented together.
17. A metamorphic rock is a rock that has been changed from one type of rock to another due to heat, pressure, or chemical reactions.
18. A rock is a natural substance made up of one or more minerals.
19. As a result of the processes of pressure and heat, a sedimentary rock can be changed into another type of rock called a metamorphic rock.
20. An igneous rock is formed when molten rock cools and hardens.

Video Review (p. 18)

1. The sea lions are different from the rocks because the sea lions are living things and the rocks are not.
2. The stones got so smooth and round from many years of the action of waves and the process of stones rubbing against each other.

1. **Rocks** are made up of one or more minerals.
2. **Igneous** rocks are formed when molten rock cools.
3. The process of **weathering** is responsible for breaking down rocks.
4. Compaction and cementation are vital in forming **sedimentary** rocks.
5. The rock **cycle** is the continual changing of rocks from one form to another.

Answer Key to Student Activities

Vocabulary (p. 19)

1. rocks
2. mineral
3. magma
4. igneous
5. sedimentary
6. metamorphic
7. lava
8. weathering
9. erosion
10. rock cycle

Writing Activity (p. 20)

Minerals are natural substances that have a definite crystal structure. Minerals are the building blocks that make up **rocks**. There are three main types of rocks. **Igneous** rocks are created when molten rock cools and solidifies. When particles of sand, silt, or other small particles are compacted and cemented together, **sedimentary** rocks are formed. **Metamorphic** rocks are created when one type of rock undergoes a transformation due to heat, pressure, or chemical reactions. The process that breaks down rocks is **weathering**. **Erosion** is the process by which rocks or rock particles are moved from one place to another. The process that illustrates the changes between types of rocks is referred to as the **rock cycle**.

In Your Own Words (p. 20)

1. Rocks are non-living natural substances that are made up of minerals.
2. Sedimentary rock consists of particles which have been compacted and cemented together. Igneous rocks are rocks formed as a result of molten rock which has cooled and hardened. Metamorphic rocks are rocks that have changed from one type of rock to another type of rock through the process of heat, pressure, or chemical reactions within the Earth.
3. The rock cycle is the continual process rocks go through, changing from one form to another over time.

Identifying Rock Types (p. 21–22)

1. Sedimentary rocks often have parallel layers, a dull appearance, and may have fossils. Sedimentary rocks commonly contain fragments of other rocks compressed and cemented together. Examples of sedimentary rocks are: sandstone, limestone, and coal.
2. Examples of igneous rocks are obsidian, basalt, granite, and diorite. An igneous rock is a rock formed when molten rock cools.
3. Metamorphic rocks can look similar to igneous rocks except they often have bands of color, or they possess layers which break along flat surfaces. Metamorphic rocks are formed when igneous or sedimentary rocks undergo heat and pressure. Marble and quartzite are examples of metamorphic rocks.
4. If limestone (a sedimentary rock) is exposed to intense heat and pressure, it can change into marble, a metamorphic rock.

Rock Sample	Characteristics	Type of Rock: Metamorphic/Igneous/Sedimentary	Describe how you think it formed
Granite	large grains visible, multi-colored	Igneous	Formed underground as magma cooled
Obsidian	very small, fine, black grains	Igneous	Formed when lava on surface quickly cooled
Sandstone	small grains of sand, light color	sedimentary	formed when sand grains were deposited, compressed, and cemented together
Limestone	dull appearance, may contain fossils	sedimentary	formed in ocean environment from deposits of once-living corals, shells, and other animals.
Marble	various colors, swirl pattern	metamorphic	Formed when limestone is exposed to heat and pressure.
Quartzite	very hard, white or grey	metamorphic	Formed when sandstone is exposed to heat and pressure

Mapping the Rock Cycle (p. 23–24)

1. igneous rock
2. sediments
3. sedimentary rock
4. metamorphic rock
5. molten rock
- A. weathering and erosion
- B. compaction and cementation
- C. heat and pressure
- D. melting
- E. solidifying

Questions

1. Intense heat and pressure are forces capable of changing sedimentary rock into metamorphic rock.
2. Molten rock is formed when intense heat melts solid rock into a liquid or semi-liquid material. Igneous rock forms when molten rock cools.
3. Sediments form when rocks are broken into smaller and smaller pieces via the process of weathering.
4. Igneous rock: granite, obsidian, basalt
Sedimentary rock: sandstone, limestone, shale
Metamorphic rock: marble, quartzite, slate
5. It is referred to as a cycle because rocks are changing from one form to another, and eventually back to their original form.

Changing Rocks (p. 25)

1. The sedimentary rock was made up of different colored layers of wax.
2. The heat and pressure of the hand, as well as bending it, changed the rock.
3. The liquid wax represented molten rock which formed an igneous rock when it cooled.

Pre-Test

Name _____

Circle the best answer for each of the following questions.

1. Non-living substances made up of one or more minerals are known as:
a. trees b. rocks c. biotic components d. mines
2. What type of rock is formed when molten rock cools and solidifies?
a. igneous b. metamorphic c. sedimentary d. mineral
3. Sandstone is an example of what type of rock?
a. igneous b. metamorphic c. sedimentary d. mineral
4. When heat and pressure cause a rock to change, this type of rock is formed:
a. igneous b. metamorphic c. sedimentary d. mineral
5. Molten rock that has erupted out of a volcano is known as:
a. sedimentary b. magma c. metamorphic d. lava
6. What process is responsible for breaking down rocks into smaller and smaller pieces?
a. weathering b. erosion c. eruption d. the rock cycle
7. When a river carries away rock particles this is known as the process of:
a. the rock cycle b. eruption c. weathering d. erosion
8. What is the name for the continuous changing of rocks from one type to another?
a. erosion b. metamorphic c. the rock cycle d. weathering
9. A natural substance with a definite crystal structure is a:
a. rock b. mineral c. sea lion d. mountain
10. What is molten rock beneath the Earth's surface called?
a. lava b. metamorphic c. magma d. sedimentary

Pre-Test

Name _____

Write true or false next to each statement.

- 11. _____ Rocks are living substances that grow and change.
- 12. _____ There are three main groups of rocks.
- 13. _____ Igneous rocks cannot become metamorphic rocks.
- 14. _____ When magma emerges from underground, it is called lava.
- 15. _____ Weathering and erosion are the main forces which formed the Grand Canyon.

Write a short answer for each of the following.

16. What is a rock?

17. Describe how an igneous rock forms.

18. What are the characteristics of a sedimentary rock?

19. What is a metamorphic rock?

20. Briefly describe how a sedimentary rock can become a metamorphic rock.

Post-Test

Name _____

Circle the best answer for each of the following questions.

1. Molten rock that has erupted out of a volcano is known as:
a. sedimentary b. magma c. metamorphic d. lava
2. When a river carries away particles this is known as the process of:
a. the rock cycle b. eruption c. weathering d. erosion
3. A natural substance with a definite crystal structure is a:
a. rock b. mineral c. sea lion d. mountain
4. What is the name for the continuous changing of rocks from one type to another?
a. erosion b. metamorphic c. the rock cycle d. weathering
5. What is molten rock beneath the Earth's surface called?
a. lava b. metamorphic c. magma d. sedimentary
6. What type of rock is formed when molten rock cools and solidifies?
a. igneous b. metamorphic c. sedimentary d. mineral
7. What process is responsible for breaking down rocks into smaller and smaller pieces?
a. weathering b. erosion c. eruption d. the rock cycle
8. Sandstone is an example of what type of rock?
a. igneous b. metamorphic c. sedimentary d. mineral
9. Non-living substances made up of one or more minerals are known as:
a. trees b. rocks c. biotic components d. mines
10. When heat and pressure cause a rock to change, this type of rock is formed:
a. igneous b. metamorphic c. sedimentary d. mineral

Post-Test

Name _____

Write true or false next to each statement.

- 11. _____ Igneous rocks cannot become metamorphic rocks.
- 12. _____ There are three main groups of rocks.
- 13. _____ When magma emerges from underground, it is called lava.
- 14. _____ Weathering and erosion are the main forces which formed the Grand Canyon.
- 15. _____ Rocks are living substances that grow and change.

Write a short answer for each of the following.

16. What are the characteristics of a sedimentary rock?

17. What is a metamorphic rock?

18. What is a rock?

19. Briefly describe how a sedimentary rock can become a metamorphic rock.

20. Describe how an igneous rock forms.

Video Review

Name _____

While you watch the video, answer these questions:

You Compare!

1. How are these sea lions different from these rocks?

You Decide!

2. How did these stones get so smooth and round?

After you watch the video, test your knowledge with these questions.

1. _____ are made up of one or more minerals.
2. _____ rocks are formed when molten rock cools.
3. The process of _____ is responsible for breaking down rocks.
4. Compaction and cementation are vital in forming _____ rocks.
5. The rock _____ is the continual changing of rocks from one form to another.

Vocabulary

Name _____

Use these words to fill in the blanks next to the sentences below.

Words

weathering igneous rocks magma metamorphic
sedimentary erosion mineral rock cycle lava

1. _____ Non-living substances made up of one or more minerals.
2. _____ A natural substance that has a definite crystal structure.
3. _____ Molten rock located under the Earth's surface.
4. _____ Rocks that are formed when molten rock cools.
5. _____ Rocks formed when sediments are compacted and cemented together.
6. _____ Rocks that have changed from one type to another as a result of heat, pressure, or chemical reaction.
7. _____ Molten rock that is above the Earth's surface.
8. _____ The process responsible for breaking down rocks and other materials into smaller and smaller pieces.
9. _____ The process of transporting weathered rocks, particles, and sediments from one place to another.
10. _____ The process rocks move through over time, changing from one form to another.

Writing Activity

Name _____

Words metamorphic minerals igneous erosion rocks sedimentary weathering rock cycle

Use the correct word from above to complete the sentences in the following paragraph.

_____ are natural substances that have a definite crystal structure. Minerals are the building blocks that make up _____. There are three main types of rocks. _____ rocks are created when molten rock cools and solidifies. When particles of sand, silt, or other small particles are compacted and cemented together, _____ rocks are formed. _____ rocks are created when one type of rock undergoes a transformation due to heat, pressure, or chemical reactions. The process that breaks down rocks is _____. _____ is the process by which rocks or rock particles are moved from one place to another place. The process that illustrates the changes between types of rocks is referred to as the _____.

In Your Own Words

1. What are rocks?

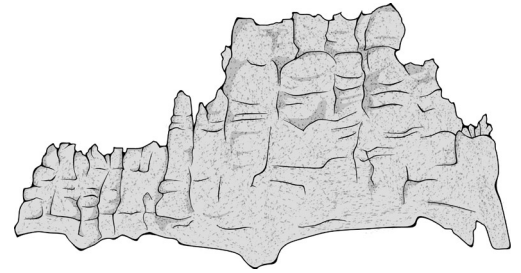
2. List and describe the three main types of rocks.

3. What is the rock cycle?

Identifying Rock Types

Name _____

Background: At first glance you may think that all rocks look alike. But, people who study rocks, called geologists, have identified hundreds of different kinds of rocks on Earth. The different types of rocks can be placed in three broad categories: sedimentary rocks, metamorphic rocks, and igneous rocks. With a little bit of practice you can learn to identify examples of the three main rock types. Let's briefly discuss the characteristics of each rock type.



Igneous rocks are formed when molten rock hardens. Molten rock inside Earth, called magma, hardens to form larger grained igneous rocks. When molten rock on the surface, known as lava hardens, finer grained igneous rocks are created. Texture refers to the size of the grains in igneous rocks. Fine-textured igneous rocks such as obsidian, andesite, and basalt contain grains seen with a magnifying glass. Whereas course-textured rocks such as granite, gabbro, and diorite contain larger grains that can be seen with the naked eye.

Sedimentary rocks can exist in a wide range of forms, but commonly contain fragments of other rocks compressed and cemented together. The particle size can vary greatly from fine sediments to large stones. Sedimentary rocks often have parallel layers, a dull appearance, and may contain fossils.

Metamorphic rocks are formed when igneous or sedimentary rocks undergo heat and pressure to create a different kind of rock. While metamorphic rocks can look similar to igneous rocks, they often have bands of color, or they possess layers which break along flat surfaces.

Materials: magnifying glass, granite, obsidian, sandstone, limestone, marble, quartzite, Identify Rock Types Data Table

Directions:

1. Obtain the rock samples from your teacher and a magnifying glass. Bring the samples to your desk.
2. Your teacher will tell you the name of each rock sample.
3. Find the name of the rock sample on the data table.
4. Work with your first rock sample, and fill out the blank spaces in the data table that correspond to the rock sample with which you are studying.
5. After completing the data table, answer the questions.

Identifying Rock Types

Name _____

Identify Rock Types Data Table

Rock Sample	Characteristics	Type of Rock: Metamorphic/Igneous/Sedimentary	Describe how you think it formed
Granite			
Obsidian			
Sandstone			
Limestone			
Marble			
Quartzite			

Questions:

1. Describe sedimentary rocks and provide an example.
2. Describe igneous rocks and provide an example.
3. Describe metamorphic rocks and provide an example.
4. Explain how limestone (sedimentary rock) might change into marble (metamorphic rock).

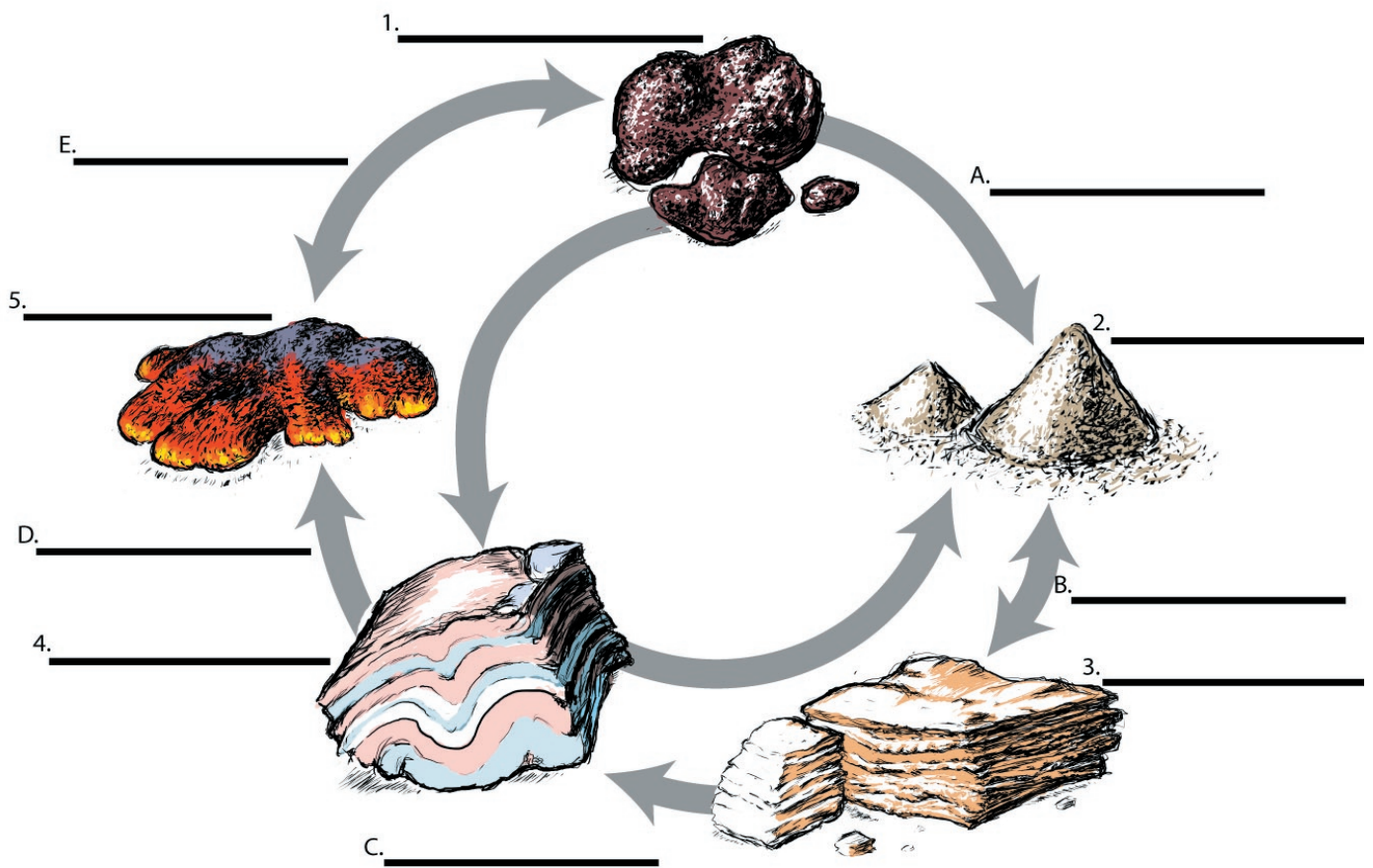
Mapping the Rock Cycle

Name _____

The rock cycle illustrates the ways rocks change from one form to another. Rocks are constantly undergoing weathering, melting and being altered to form new rocks. The diagram below is a great way to illustrate the connections between these processes.

As you know there are three types of rocks: igneous, metamorphic, and sedimentary. Write the correct word in the blank next to the rock type. Also, place the terms sediments and molten rock in the correct places.

There are several different processes in the rock cycle which cause rocks to change form. Write the terms melting, heat and pressure, compaction and cementation, solidifying, weathering and erosion in the correct blanks. Fill in these terms as you proceed in a clockwise direction on the diagram. Once you have done this you have created a finished map of the rock cycle.



Mapping the Rock Cycle Cont.

Name _____

Answer the following questions:

1. What forces change sedimentary rock into metamorphic rock?
2. How is molten rock formed, and what type of rock does it create when it hardens?
3. Describe how sediments form.
4. Provide an example of each of the three rock types.
5. Explain why the rock cycle is referred to as a “cycle”.

Changing Rocks

Name _____

Background: Rocks on Earth are constantly being recycled. While rocks in one place are being broken down into smaller pieces, rocks in another place are being made as molten rock hardens. The continual process of rocks changing and being made into other types of rocks is referred to as the rock cycle. In this activity we will use candle wax or crayons to model the processes similar to those in the rock cycle.

Materials: safety goggles, several different colored crayons or several different colored candles, paper, plastic knife, electric hot plate, small metal pan or can, small clear plastic vial

Activity

1. Obtain a pair of safety goggles and place them over your eyes before starting the activity.
2. Obtain several different pieces of colored wax or crayons (take the paper off).
3. Using the plastic knife, carefully scrape off thin shavings of wax. Keep each colored wax in a separate pile.
4. Take the first pile of shavings and sprinkle them into the clear plastic vial. Gently pack the shavings into the vial with your finger.
5. Go through the same process with the remaining piles of colored shavings, inserting them one layer at a time.
6. Observe the layers of shavings through the side of the plastic vial. This “rock” symbolizes a sedimentary rock.
7. Using the plastic knife and your finger, carefully remove the rock from the vial.
8. Hold the sedimentary rock in the palm of your warm hand and close your fingers over it so it is completely covered by your hand. tightly hold and occasionally squeeze it for two to three minutes.
9. Take the “rock” and fold it. Tightly hold it in your hand another two minutes.
10. This type of rock represents a metamorphic rock.
11. Place the metamorphic rock in the metal pan or can.
12. Place the pan or can on the hot plate and turn the heat to medium-low.
13. Observe how the rock changes over several minutes. The liquid wax represents molten rock.
14. When the rock has completely melted, turn off the hot plate.
15. Let the rock cool overnight, and observe it the next day. This type of rock represents an igneous rock.

Answer the Questions on a separate piece of paper.

1. What were the characteristics of your sedimentary rock?
2. How was the sedimentary rock changed into a metamorphic rock?
3. What did the liquid wax represent, and what happened when it cooled?