# Rocks

# Teacher's Guide


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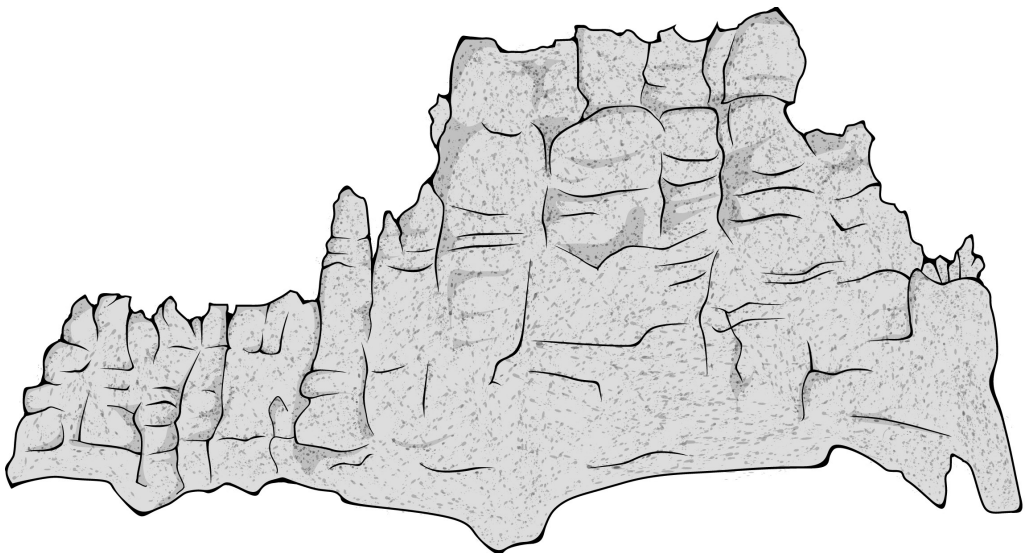

Elementary Science


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# Table of Contents

# 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. Soil is made partly from weathered rock, partly from plant remains - and also contains many living organisms.

**The Living Environment - Evolution of Life (4F)**
By the end of the fifth grade, students should know that:

• Many thousands of layers of sedimentary rock provide evidence for the long history of the earth and for the long history of changing life forms whose remains are found in the rocks. More recently deposited rock layers are more likely to contain fossils resembling existing species.

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

**Earth and Space Science - Content Standard D:**
As a result of activities in grades K-4, students should understand that:

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.

• Fossils provide evidence about the plants and animals that lived long ago and the nature of the environment at that time.

# Student Learning Objectives

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

- Define rock as a solid, naturally-occurring mixture of minerals.
- Define minerals as solids with a definite chemical composition and crystal structure.
- Describe geology as the study of Earth; its materials, such as rocks; and its history. Geologists are scientists who study Earth's processes and past.
- Identify the three primary groups of rocks: igneous, sedimentary, and metamorphic.
- Differentiate between magma and lava.
- Explain that igneous rocks are formed when molten rock cools and solidifies.
- Differentiate between the texture of igneous rocks formed inside Earth and those formed on Earth's surface.
- Understand that most sedimentary rocks are made up of sediments, such as sand, silt, pebbles, and even fossils.
- Explain the process by which sedimentary rocks are formed, using the terms "compaction" and "cementation."
- Define fossils as the remains or traces of once-living things. Explain how fossils give us information about living things that inhabited Earth long ago.
- Describe how rocks change in form to become metamorphic rocks as a result of heat or pressure.
- Explain that metamorphic rocks are classified by the arrangement of grains they contain.

# 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 program, ask the class to write down the first thing that comes to mind when they hear the word “rock.” Allow students to share their words with the class. Students may talk about the physical characteristics of rocks (hardness, color, etc.). They might also mention some of the everyday uses of rocks, such as constructing buildings, rock climbing, or adding salt to food.

Pass around a collection of rocks that includes metamorphic, igneous, and sedimentary rocks. Ask students to describe the rocks to the class. Encourage them to observe the different properties of the rocks, including color, texture, and unique markings. Have the class choose properties by which they want to group the rocks. Place the rocks in groups based on the properties selected by the class. Explain to students that geologists, which are scientists who study Earth’s processes, classify rocks based on how they are formed. Tell students to pay close attention to the video to learn more about rocks.

# 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. Everyday we benefit from rocks. Rocks are useful to us in lots of ways.
2. Many people live or work in buildings made from rocks.
3. We drive on roads which are built with rocks.
4. Floors and countertops in houses are made of rocks.
5. And, believe it or not, ground up rocks are even used in the production of toothpaste and soap.
6. So, what exactly are rocks?
7. How are rocks formed?
8. And, what are some of the major kinds of rocks?
9. During the next few minutes, we are going to explore these questions and others...
10. ... as we investigate some of the fascinating characteristics of rocks.
11. **Graphic Transition – What are Rocks?**
12. You've probably tried skipping rocks in a lake.
13. Or maybe you've admired a view dominated by rocks.
14. Perhaps you have even been rock climbing.
15. But, have you ever thought about what rocks actually are?
16. A rock is a solid, naturally-occurring mixture of minerals.
17. Your next question probably is, "What is a mineral?"
18. Simply put, minerals are solids with a definite chemical composition and crystal structure.
19. There are many different kinds of minerals, such as copper,...
20. ...gold,...
21. ...galena,...
22. ...and quartz, to name just a few.
23. So, you can think of rocks as a mixture of minerals combined to form a solid substance.
24. For example, this rock, called granite, is made up of three main minerals: feldspar; quartz; and black mica, or biotite.
25. Together, these minerals make up the rock granite.
26. **Graphic Transition – Grouping Rocks**
27. As we mentioned, rocks provide us with many benefits which make our lives easier.
28. Rocks also help us to better understand the Earth and its history.
29. Geology is the study of Earth; its materials, such as rocks; and its history.
30. And geologists are scientists who study Earth's processes and Earth's past.
31. Studying rocks is an important aspect of the job of many geologists.
32. Placing rocks into different groups, referred to as classifying rocks, is helpful to geologists.
33. There are hundreds of different kinds of rocks. Therefore, by placing rocks into groups, it makes the study of rocks easier and more manageable.
34. One way geologists classify rocks is based primarily on how they are formed.
35. Using this system of classification, there are three main types of rocks: igneous rocks,...

# Video Script

36. ... sedimentary rocks,...
37. ... and metamorphic rocks.
38. **Graphic Transition – Rocks from Melting**
39. This rock, which feels cold to touch,...
40. ... could once have been unbelievably hot.
41. **You Compare!** Describe the difference between this rock and the material from which it was made.
42. That's right! This rock is cold and solid, but molten rock is a hot liquid.
43. Molten rock called lava is located above ground and magma is molten rock located inside Earth.
44. Molten rock is rock in a liquid or liquid-like form and can be as hot as 1200 degrees Celsius!
45. When molten rock cools and solidifies, rocks called igneous rocks are formed.
46. Igneous rocks are often found in and around volcanoes.
47. This lava is flowing out of a volcano in Hawaii.
48. When lava hardens, it forms a type of igneous rock called basalt. Basalt is the most abundant rock found in the crust of the Earth.
49. Rocks that form on the surface…
50. ... tend to have a fine-grained texture.
51. Texture refers to the look and feel of a rock's surface.
52. Rocks, such as pegmatite, formed inside Earth tend to have a coarse-grained texture.
53. **You Compare!** Which rock was formed inside Earth and which rock was formed on the surface?
54. That's right. This rock, called granite, was formed inside Earth.
55. Whereas this rock cooled quickly on the surface.
56. This is just one characteristic that geologist consider when classifying igneous rocks.
57. **Graphic Transition – Rocks from Particles**
58. If you have ever walked on a cement sidewalk...
59. ... or sprinkled salt on your food, you have benefited from sedimentary rocks.
60. **You Observe!** Describe what you see in this rock.
61. You can see many small particles, referred to as sediments.
62. Most sedimentary rocks are made up of sediments.
63. The Grand Canyon is...
64. ...made up of layers and layers of sedimentary rock, reaching a depth of 1,500 meters, or nearly a mile.
65. Some of the most noticeable features of sedimentary rocks are layers, referred to as strata.
66. Sedimentary rocks form when sediments, such as sand, silt, pebbles, and even once-living things, are deposited by water, wind, or ice.
67. Once they're deposited, sediments are then pressed together in a process called compaction.

# Video Script

68. Sediments are glued together with cement-like substances which hold the particles together.
69. These processes may take hundreds of thousands, or even millions, of years to form a sedimentary rock.
70. Sedimentary rocks are often classified by the size of the particles that they contain.
71. Some sedimentary rocks, such as these in Mono Lake, California, were formed when chemicals separated in mineral-rich water.
72. The salt deposits, seen here in Death Valley, were formed as salt-rich water evaporated, leaving behind salt crystals.
73. Some sedimentary rocks, such as coal and limestone, are made from the ancient remains of once-living plants and animals.
74. Sedimentary rocks sometimes contain fossils. Fossils are the remains or traces of ancient once-living things.
75. These sedimentary rocks contain the actual bones of dinosaurs.
76. And this piece of fossilized limestone in New York State contains the imprints of ancient marine-dwelling organisms, which lived in seas that once covered the surface of the land.
77. Fossils are important because they give us clues about ancient plants and animals which lived long ago.
78. **Graphic Transition – Changed Rocks**
79. The third type of rocks we will discuss are metamorphic rocks.
80. Metamorphic rocks have been changed from another type of rock as a result of heat or pressure.
81. This white rock, for example, is made up of millions of animals that lived in oceans millions of years ago.
82. When these animals died, they fell to the ocean floor, forming deep layers, which eventually formed rock called limestone.
83. Through heat and pressure, the limestone was transformed into a new, harder, and different rock – marble.
84. It's hard to imagine the forces of pressure deep inside the Earth, but try stacking several books on top of your hand. You can feel a lot of pressure.
85. Now imagine the pressure placed on the rocks deep inside this mountain by the rocks above them. This type of pressure has the ability to change existing rocks into other types of rocks.
86. In some cases, pressure is so great it generates intense heat that actually changes the texture or chemical makeup of underlying rocks.
87. Metamorphic rocks are classified by the arrangement of the grains they contain.
88. Slate, seen here on this roof, is a metamorphic rock with grains arranged in parallel layers. Therefore slate easily splits into flat pieces.
89. Quartzite is a metamorphic rock which possesses grains that are arranged randomly.
90. There are a variety of metamorphic rocks with a wide range of characteristics.

# Video Script

**91. Graphic Transition - Summing Up**

92. During the past few minutes we have investigated many of the fascinating characteristics and uses of rocks.
93. We began by learning that rocks are naturally-occurring substances made up of a mixture of minerals.
94. The vast number of rocks can be classified into three main groups.
95. Igneous rocks are formed when molten rock cools and solidifies.
96. Sedimentary rocks are created when sediments are deposited, compacted, and cemented together.
97. And metamorphic rocks are formed when other types of rocks are changed due to pressure and heat.
98. So, the next time you walk on a rock…
99. ...or throw a stone,…
100. ...think about how the rock was formed.
101. You just might think about rocks a little differently.

**102. Graphic Transition – Video Assessment**

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

1. Rocks are made up of a mixture of _____.
2. Rock in liquid form at Earth's surface is called _____.
3. When lava cools and hardens it forms _____ rock.
4. Limestone and coal are examples of _____ rock.
5. _____ rocks are created by heat and pressure from other rocks.

**Answers can be found on page 12.**

# Answer Key to Student Assessments

## Pre-Test (p. 14-15)

1. b - fine-grained
2. c - geology
3. a - compaction
4. a - rock
5. d - sedimentary
6. b - lava
7. c - fossils
8. d - metamorphic
9. a - strata
10. c - cementation
11. false
12. true
13. true
14. false
15. true
16. Magma is molten rock inside Earth. Molten rock on Earth's surface is called lava.
17. Fossils are the remains or traces of once-living organisms. They give geologists clues about the types of plants and animals that lived on Earth long ago.
18. Sediments are deposited by wind, ice, or water and then pressed together in a process called compaction. The sediments are then cemented together to form a rock.
19. Igneous rocks formed inside Earth have a coarse-grained texture because they cool slowly. Igneous rocks formed on Earth's surface have a fine-grained texture, due to rapid cooling caused by the difference in temperature between the lava and surrounding air.
20. Heat and pressure cause limestone to become marble.

## Post-Test (p. 16-17)

1. b - lava
2. a - compaction
3. a - strata
4. d - metamorphic
5. c - fossils
6. b - fine-grained
7. a - rock
8. c - cementation
9. c - geology
10. d - sedimentary
11. true
12. false
13. false
14. true
15. true
16. Sediments are deposited by wind, ice, or water and then pressed together in a process called compaction. The sediments are then cemented together to form a rock.
17. Heat and pressure cause limestone to become marble.
18. Igneous rocks formed inside Earth have a coarse-grained texture because they cool slowly. Igneous rocks formed on Earth's surface have a fine-grained texture, due to rapid cooling caused by the difference in temperature between the lava and surrounding air.
19. Magma is molten rock inside Earth. Molten rock on Earth's surface is called lava.
20. Fossils are the remains or traces of once-living organisms. They give geologists clues about the types of plants and animals that lived on Earth long ago.

## Video Review (p. 18)

1. The rock is cold and solid, but the molten rock from which it was formed is a hot liquid.
2. The coarse-grained rock was formed inside Earth. The fine-grained rock was formed on Earth's surface.
3. You can see many small particles, referred to as sediments.

1. minerals
2. lava
3. igneous
4. sedimentary
5. metamorphic

# Answer Key to Student Activities

## Vocabulary (p. 19 )

1. rock
2. mineral
3. geology
4. molten rock
5. igneous
6. geologists
7. texture
8. strata
9. fossils
10. metamorphic

## Writing Activity (p. 20)

**Rocks** are solid, naturally-occurring substances made up of a mixture of **minerals.** Geologists classify rocks based on how they are **formed**. There are three primary types of rocks: **igneous**, sedimentary, and metamorphic. **Sedimentary** rocks are formed when small particles, referred to as **sediments**, are deposited by water, wind, or ice. After being deposited, they are pressed together through a process called **compaction** and are then cemented together to form a rock. Igneous rocks are formed when **molten** rock, which is rock in a liquid or liquid-like form, cools and solidifies. **Metamorphic** rocks are composed of sedimentary, igneous, or other metamorphic rocks that have changed form as a result of heat and/or **pressure**.

## In Your Own Words (p. 20)

1. Rocks change in form to become metamorphic rocks as a result of heat and pressure.
2. Most sedimentary rocks are made of sediments, which are small particles, such as sand, silt, pebbles, and fossils.
3. A mineral is a solid with a definite chemical

## Classroom Volcano (p. 22 )

1. Intrusive igneous rocks would form inside the bottle, which represents the interior of a volcano.
2. Intrusive igneous rocks have a coarse-grained texture.
3. Extrusive igneous rocks would form somewhere on the modeling clay, which represents the exterior of the volcano.
4. Extrusive igneous rocks have a fine-grained texture.
5. Molten rock, referred to as lava, would have to cool to form extrusive igneous rocks.
6. The liquid that has erupted from the model volcano represents lava, which is molten rock that has reached Earth's surface.

## Rocks Around the World (p.24)

1. The Rock of Gibraltar, Roche Percé, and the rock formations in the Garden of the Gods are sedimentary rocks.
2. Giant's Causeway contains igneous rocks.
3. Giant's Causeway is 62-65 million years old.
4. Roche Percé means pierced rock.
5. Tunnels were built to help secure the rock during seiges.
6. Hogback formations are layers of sandstone that have been tilted to form ridges.
7. Answers will vary.

## Making Fossils (p.25)

1. Pressure is created by the weight of overlying rocks and other materials that are piled on top of the sediments.
2. The modeling clay represents sediment, such as mud or sand.
3. If an organism is not covered quickly, it will start to decay or can be eaten by other organisms.

# Pre-Test

Name _____

## Circle the best answer for each of the following questions.

1. Igneous rocks that form on Earth's surface, such as basalt, have this type of texture:

   a. coarse-grained b. fine-grained c. cold d. hot

2. This is the study of Earth, its materials, and its history:

   a. physics b. astronomy c. geology d. biology

3. This is the process by which sediments are pressed together to form sedimentary rocks:

   a. compaction b. osmosis c. diffusion d. condensation

4. A non-living solid made up of a mixture of minerals is called a:

   a. rock b. marble c. strata d. cairn

5. The Grand Canyon is primarily made up of layers of this type of rock:

   a. igneous b. hard c. metamorphic d. sedimentary

6. Molten rock on Earth's surface is called:

   a. strata b. lava c. magma d. metamorphic

7. These often give geologists clues about plants and animals that lived on Earth long ago:

   a. igneous rocks b. minerals c. fossils d. metamorphic rocks

8. This type of rock is changed in form as a result of heat and pressure:

   a. igneous b. granite c. sedimentary d. metamorphic

9. Layers of sedimentary rock are referred to as:

   a. strata b. plateaus c. shale d. contour lines

10. The process by which particles in sedimentary rock are "glued" together is referred to as:

    a. cooling b. igneous c. cementation d. shale

# Pre-Test

Name _____

## Write true or false next to each statement.

11. _____ The three main types of rocks are igneous rocks, marble, and metamorphic rocks.

12. _____ Fossils can sometimes be found in sedimentary rocks.

13. _____ Lava and magma consist of molten rock.

14. _____ Minerals are composed of a mixture of rocks.

15. _____ Metamorphic rocks are often classified by the arrangement of grains.

## Write a short answer for each of the following.

16. Differentiate between lava and magma.

17. What are fossils and how are they useful?

18. Identify the three primary steps involved in the formation of sedimentary rocks.

19. Explain the difference in the texture of igneous rocks formed inside Earth and those formed on Earth's surface. What causes this difference?

20. What forces cause limestone, a sedimentary rock, to become marble, a metamorphic rock?

# Post-Test

Name _____

## Circle the best answer for each of the following questions.

1. Molten rock on Earth's surface is called:

   a. strata b. lava c. magma d. metamorphic

2. This is the process by which sediments are pressed together to form sedimentary rocks:

   a. compaction b. osmosis c. diffusion d. condensation

3. Layers of sedimentary rock are referred to as:

   a. strata b. plateaus c. shale d. contour lines

4. This type of rock is changed in form as a result of heat and pressure:

   a. igneous b. granite c. sedimentary d. metamorphic

5. These often give geologists clues about plants and animals that lived on Earth long ago:

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6. Igneous rocks that form on Earth's surface, such as basalt, have this type of texture:

   a. coarse-grained b. fine-grained c. cold d. hot

7. A non-living solid made up of a mixture of minerals is called a:

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8. The process by which particles in sedimentary rock are "glued" together is referred to as:

   a. cooling b. igneous c. cementation d. shale

9. This is the study of Earth, its materials, and its history:

   a. physics b. astronomy c. geology d. biology

10. The Grand Canyon is primarily made up of layers of this type of rock:

    a. igneous b. hard c. metamorphic d. sedimentary

# Post-Test

Name _____

## Write true or false next to each statement.

11. _____ Fossils can sometimes be found in sedimentary rocks.

12. _____ Minerals are composed of a mixture of rocks.

13. _____ The three main types of rocks are igneous rocks, marble, and metamorphic rocks.

14. _____ Metamorphic rocks are often classified by the arrangement of grains.

15. _____ Lava and magma consist of molten rock.

## Write a short answer for each of the following.

16. Identify the three primary steps involved in the formation of sedimentary rocks.

17. What forces cause limestone, a sedimentary rock, to become marble, a metamorphic rock?

18. Explain the difference in the texture of igneous rocks formed inside Earth and those formed on Earth's surface. What causes this difference?

19. Differentiate between lava and magma.

20. What are fossils and how are they useful?

# Video Review

Name _____

## While you watch the video, answer these questions:

**You Compare!**

1. Describe the difference between this rock and the material from which it was made.

_____

_____

_____

2. Which rock was formed inside Earth and which rock was formed on the surface?

_____

_____

_____

**You Observe!**

3. Describe what you see in this rock.

_____

_____

_____

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

1. Rocks are made up of a mixture of _____ .
2. Rock in liquid form at Earth's surface is called _____ .
3. When lava cools and hardens it forms _____ rock.
4. Limestone and coal are examples of _____ rock.
5. _____ rocks are created by heat and pressure from other rocks.

# Vocabulary

Name _____

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

| Words | | | | | |
|---|---|---|---|---|---|
| metamorphic | strata | geologists | rock | texture | |
| mineral | fossils | geology | igneous | molten rock | |

1. _____ A solid, naturally-occurring mixture of minerals.

2. _____ A solid with a definite chemical composition and crystal structure.

3. _____ The study of Earth, its materials, and its history.

4. _____ Rock in a liquid or liquid-like form.

5. _____ The type of rock that is formed when molten rock cools and solidifies.

6. _____ Scientists who study Earth's processes and history.

7. _____ The look and feel of a rock's surface.

8. _____ Layers of sedimentary rock.

9. _____ The remains or traces of once-living organisms.

10. _____ Rocks that have changed form as a result of heat and pressure.

# Writing Activity

Name _____

| | | | | | |
|---|---|---|---|---|---|
| sedimentary | rocks | pressure | metamorphic | sediments | |
| igneous | minerals | formed | compaction | molten | |

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

_____ are solid, naturally-occurring substances made up of a mixture of _____. Geologists classify rocks based on how they are _____. There are three primary types of rocks: _____, sedimentary, and metamorphic. _____ rocks are formed when small particles, referred to as _____, are deposited by water, wind, or ice. After being deposited, they are pressed together through a process called _____ and are then cemented together to form a rock. Igneous rocks are formed when _____ rock, which is rock in a liquid or liquid-like form, cools and solidifies. _____ rocks are composed of sedimentary, igneous, or other metamorphic rocks that have changed form as a result of heat and/or _____.

## In Your Own Words

1. Metamorphic rocks were once igneous, sedimentary, or other metamorphic rocks. What caused them to change?

_____

_____

_____

2. What materials make up most sedimentary rocks?

_____

_____

_____

3. What is a mineral?

_____

_____

_____

# Rock Scavenger Hunt

Name _____

**Background:** Rocks are all around us. They can be found in their natural form on the sidewalk, in city parks, and in the woods. They are also used to make objects that we use everyday. For example, marble, a metamorphic rock, is used to make floor tiles. Graphite, a mineral, is used to make pencils. Slate, a metamorphic rock, might have been used to make the walkway into your school. The edges of chalk boards or the legs of chairs are often made of steel. Steel contains iron, which is made from iron ore - a rock. As you can see, rocks are everywhere!

**Materials:**
pen or pencil
magnifying lens
research materials (internet, rock guide, encyclopedias)

**Activity:**
1. Your teacher will select an area in which you will look for rocks or things made from rocks. This could be the classroom, the school lobby, or an area outside of school.
2. Find at least four objects made from rocks.
3. For each item, determine from what rocks(s) it is made.
4. Use what you know about types of rocks to determine whether each rock is a sedimentary, metamorphic, or igneous rock. You may want to use a magnifying lens to examine the composition of the rock. You can also use resources to research the rock type.
5. Complete the chart below.

| Item | Rock(s) from which item is made | Sedimentary, igneous, or metamorphic |
|---|---|---|
| Steps into school building | marble | metamorphic |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

# Classroom Volcano

Name _____

**Background:** Volcanos are one of nature's most impressive and potentially dangerous natural occurrences. Did you know that volcanos play a role in the formation of igneous rocks? Igneous rocks form when molten rock cools. They are classified according to their texture and composition. **Intrusive rocks** are formed from molten rock, referred to as magma, inside Earth's crust. **Extrusive rocks** are formed when molten rock that has reached Earth's surface, called lava, cools. Extrusive igneous rocks cool quickly and have a fine-grained, or smooth, texture. Intrusive igneous rocks have a coarse texture with larger grains. In this activity you will make a volcano erupt and see how volcanoes play a role in the formation of igneous rocks.

**Materials:**

| | |
|---|---|
| safety goggles | 1 tablespoon baking soda |
| small plastic bottle | 1/4 cup water |
| modeling clay | dish detergent |
| funnel | baking sheet |
| 1/4 cup white vinegar | orange food coloring |

**Activity:**

**Caution: This activity requires all participants to wear safety goggles.**

1. Stand the empty plastic bottle in the center of the baking sheet. Remove and discard the cap.
2. Use the modeling clay to wrap the bottle and build its base. Cover the sides of the bottle to make it look like a volcano. Make sure to leave the hole uncovered and avoid dropping clay into the hole. Make the volcano look as realistic as possible.
3. Use the funnel to add the water, baking soda, food coloring, and 3 drops of dish detergent.
4. Slowly pour the vinegar into the bottle. Observe the eruption!
5. Answer the questions on a separate piece of paper.

**Questions:**

1. Where on this model would intrusive igneous rocks form?
2. Describe the texture of intrusive igneous rocks.
3. Where on this model would extrusive igneous rocks form?
4. Describe the texture of extrusive igneous rocks.
5. What must happen to lava for extrusive igneous rocks to form?
6. What in nature does the liquid represent once it has erupted from the volcano?

# Rocks Around the World

Name _____

**Background**: Rocks are all around us. However, some rocks are much more fascinating than others because of how they look, the way they have been formed, and the activities for which they are used. In this activity, you will read about some famous rocks and answer the questions that follow.

**Rock of Gibraltar:**
The Rock of Gibraltar is a famous limestone rock in the Mediterranean Sea. It is connected to Spain by a one-mile isthmus, but is part of the United Kingdom. It is 3 miles (4.83 km) long, 3/4 of a mile (1.21 km) wide, and stands 1,396 feet (426 m) at its highest point. It is covered by a nature reserve that is home to 270 species of wild birds and Barbary Apes, which are the only wild monkeys in Europe. Because it is positioned where the Atlantic Ocean meets the Mediterranean Sea, it is a valuable port that has been fought over for hundreds of years. The inside of the rock is filled with a series of tunnels known as the Great Siege Tunnels. Construction began on the tunnels in the late 1700s when France and Spain were trying to capture the rock. The tunnels were rebuilt following the war and were later expanded. During World War II, over 30,000 British soldiers lived on the rock to protect it from Germany, but it was never invaded.

**Roche Percé:**
Roche Percé, also referred to as Percé Rock, is one of the largest natural arches in the world. Located at the tip of Gaspe peninsula in Quebec, Canada where the Appalachian Mountains meet the Gulf of St. Lawrence, this limestone rock rises 288.71 feet (88 m) at its highest point and is 1,453,41 feet (443 m) long. Its name means pierced rock because of the two holes that it contains. It once had two arches, but the second has been destroyed as a result of continuous erosion by the ocean. It is possible to walk through the arch at low tide to see the thousands of fossils that are embedded in the rock.

**Garden of the Gods:**
The Garden of the Gods is a 1392-acre public park located in Colorado City, Colorado. The park contains sandstone hogback formations. The hogback formations are layers of sandstone that have been tilted to create ridges. Some have been tilted so much that they are vertical. The tallest ridge, called Kissing Camels, is 320 feet (97.54 m) high. The land was given to the Colorado City in 1909 by the children of Charles Elliot Perkins, the head of a railroad company, who wanted the land to be open to the public. It got its name when a young man, seeing it for the first time, proclaimed that it is “a place fit for the gods to assemble.” It is a large rock climbing destination and is also used by the public for walking, hiking, biking, and horseback riding.

# Rocks Around the World

Name _____

**Giant's Causeway:**
Giant's Causeway consists of 40,000 basalt columns connected together to form stepping stones to the ocean. It is located near the town of Bushmills in Northern Ireland. The Causeway was formed 62 to 65 million years ago over a long period of volcanic activity. The basalt columns look very unusual, but are actually a common feature produced by volcanic activity as a result of rapid cooling. The columns form when lava comes in contact with water, causing the lava to cool rapidly and then contract and fracture. Most columns are hexagonal, meaning they have six sides, although some have 4, 5, 7, or 8 sides. Giant's Causeway has many notable rock formations named after the objects they resemble, such as Camel's Hump, Chimney Stacks, the Harp, and the Organ.

**Questions:**

1. Which of the four rock features mentioned are sedimentary rocks?

2. Which of the four rock features discussed are igneous rocks?

3. How old is the Giant's Causeway?

4. What does Roche Percé mean?

5. What structures were built in the Rock of Gibraltar? Why were they built?

6. Describe the hogback formations found in the Garden of Gods.

7. Describe the coolest rock you have seen. Do you know what type of rock it was? Is it a famous rock?

# Making Fossils

Name _____

**Background**: Fossils are an important window into Earth's history. Fossils are the traces or remnants of once-living things. They help us understand things about Earth's history, such as the animals and plants that once lived on Earth, the customs of people who have inhabited Earth, and the climates that have existed on Earth. Many fossils are found in sedimentary rocks, such as limestone. In order for a once-living thing to be preserved, or fossilized, it must be buried in sediment soon after it dies. Examples of sediment include pieces of rocks, sand, and mud. To form a rock, the sediments must be pressed together in a process called compaction. The sediments are then glued together with a cement-like material. In this activity, you are going to make fossil imprints.

**Materials:**
materials to fossilize (shells, leaves, acorns, etc.)
plaster of Paris
water
cooking oil
container for mixing plaster
modeling clay

**Activity:**
1. Before beginning, prepare the plaster of Paris according to its accompanying directions.
2. Select an object to fossilize.
3. Roll a piece of modeling clay into a ball that is large enough to cover the object.
4. Press the object into the modeling clay.
5. Carefully remove the object. Rub the impression with a small amount of oil to prevent sticking.
6. Pour the plaster of Paris into the mold so that it fills in the impression completely.
7. Wait at least 30 minutes before removing your fossil from the modeling clay.

**Questions:**
1. In this activity, you used your hand to press the object into modeling clay. How is this force commonly created in nature?

2. What object(s) in nature does the modeling clay represent?

3. In order for a dead organism to become fossilized, it must be covered quickly by sediment. What do you think happens to dead organisms if they are not covered quickly?