

# Investigate Three Types of Rocks

## OVERVIEW

Students will collect rocks, learn the three rock types, and begin to describe specimens scientifically.

- **Before Your Visit:** Students will collect and observe mystery rocks in their neighborhood and gather clues about sedimentary, igneous, and metamorphic rocks.
- **During Your Visit:**
  - In the Gottesman Hall of Planet Earth, student teams will find and investigate sedimentary, metamorphic, and igneous rocks.
  - In the Guggenheim Hall of Minerals, students will examine minerals to explore their physical characteristics.
- **Back in the Classroom:** Students will draw on the Museum experience to improve their descriptions of the rocks they collected.

## NYS Intermediate Level Science Core Curriculum Grades 5-8

**PS 2.2g:** Rocks are classified according to their method of formation. The three classes of rock are: sedimentary, metamorphic, and igneous. Most rocks show characteristics that give clues of their formation conditions.

## BACKGROUND FOR EDUCATOR

Ours is a rocky planet. The oceans and atmosphere account for only a fraction of a percent of its total mass. Geology, the study of Earth, is largely a study of rocks. Rocks come in many types, but generally fall into three major types: metamorphic, sedimentary, and igneous. Each type is based on the conditions under which those rocks formed. Over vast expanses of time, changes in temperature and pressure within Earth may transform rocks into other rock types. This process is called the rock cycle.

- **Sedimentary rocks** are formed when sediments (particles of rock) accumulate, consolidate, and compact, or lithify. Over time, extremely thick layers may form. Common forms of sedimentary rock include sandstone, formed by the accumulation and cementation of sand particles; limestone, formed when shells accumulate; shale, formed by silt and clay; and gypsum deposits and chalk, formed when minerals precipitate directly from water. Sedimentary rocks frequently show stratification: layering that reflects changing rates and methods of accumulation. Differences in sediment, accumulation time, and environment can produce a wide range of sedimentary rocks. Fossils are almost exclusively found in sedimentary rocks.
- **Igneous rocks** form from molten rock. They may form underground or on the surface, at the site of volcanic eruptions. Variations in formation conditions result in a wide range of igneous rocks. A common example is granite, which has large crystals, indicating a slow cooling process. Rapidly-cooling igneous rocks, such as basalt, may have smaller crystals or none at all.
- **Metamorphic rock** are rocks that have been changed by heat and pressure into a new rock type. These rocks may show the signs of physical changing. Pebbles found in a sedimentary rock can be stretched and folded as metamorphic processes act on the initial rock. Slate and gneiss are two examples. Differences in pressure, temperature, and duration of exposure can result in a wide range of metamorphic rocks.

## BEFORE YOUR VISIT

### Activity: Collect Mystery Rocks

Students will collect and observe mystery rocks in their neighborhood and gather clues about the three rock types. (After their visit to the Museum, they will revisit their mystery rocks to hypothesize about what rock types they belong to.)

Materials: computer and projector (or printouts)

Tell students that they will be finding “mystery rocks” in their neighborhood and bringing them to class.

Beforehand, go to the “Start a Rock Collection” OLogy activity ([amnh.org/ology/rock\\_collection](http://amnh.org/ology/rock_collection)) and review “Step 1: Collect” with students. Go over the materials they will need and the important safety information.

After students bring in the rocks, refer them to “Step 2: Observe and Sort Your Rocks” of the OLogy activity. Have them observe characteristics such as color and texture and write down and draw the rock. Encourage questions about the rock samples.

Tell students that they will learn more about the different types of rocks during their Museum visit. Afterwards, they’ll make more observations about their mystery rocks, sort them by type, and organize them into collections.

### Activity: Three Types of Rocks

Use the “If Rocks Could Talk” OLogy article ([amnh.org/ology/ifrockscouldtalk](http://amnh.org/ology/ifrockscouldtalk)) to introduce students to the three types of rocks and to the rock cycle. The article contains six “interviews” with rocks.

Materials: computer and projector, or printouts of each interview

On the board, create three columns and title them Sedimentary, Igneous, and Metamorphic. Then have the class “meet” six different rocks. For each interview, select two students to read the interview out loud by role-playing the scientist and the rock. At the end of each interview, discuss as a class students’ observations about each rock, and record them in the appropriate column.

Tell students that at the Museum, they’ll have a chance to meet some of these rocks in person.

## DURING YOUR VISIT

### Gottesman Hall of Planet Earth

#### 1st floor (45-60 minutes)

Students will find and investigate sedimentary, metamorphic, and igneous rocks in the hall. Divide students into small teams and have each focus on a specific rock type (sedimentary, igneous, or metamorphic). Have students use their worksheets to visit that part of the hall (marked on map) and study specimens. They will learn how the three major rock types vary as a result of the conditions under which they formed, learn about those conditions, and observe the characteristics of that each type shares.

### Guggenheim Hall of Minerals

#### 1st floor (30 minutes)

Students will explore the mineral composition of rocks. Have students select and examine minerals to see that minerals have a wide range of physical characteristics, which may result in different rock characteristics.

**Plan how your students will explore the Gottesman Hall of Planet Earth using the student worksheets.** Split your class into small teams, and assign them to one of three categories (sedimentary, igneous, or metamorphic).

Distribute the corresponding worksheets to the students in each team. You may want to review the worksheets and the map of the exhibition with students to make sure they understand what they are to do.

## BACK IN THE CLASSROOM

### Activity: Three Types of Rocks

In this wrap-up activity, students will share their findings from the Museum and revisit their mystery rocks from the pre-visit activity.

Begin by having students in each team share their findings from the hall. Record their data about the three rock types in a class chart.

Then have students revisit their mystery rocks. Using their evidence from observations, combined with information gathered during their Museum visit, invite students to hypothesize about what rock types they belong to, and to list additional questions about their rocks and possible research that will be needed.

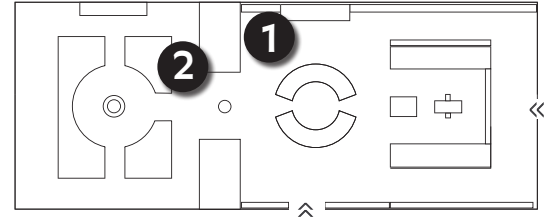
Return to the "Start a Rock Collection" OLogy activity ([amnh.org/ology/rock\\_collection](http://amnh.org/ology/rock_collection)) and complete Step Three. Students may want to display their mystery rocks in a shoebox or other display, and teach others about their rocks. Many questions may remain, so have students carefully explain what they know and do not know.



# Student Worksheet: TEAM SEDIMENTARY

## Stop 1: Three Types of Rocks

Observe the rocks and complete the data chart below.



Type of rock	How was it formed?	List characteristics of this rock.
Sedimentary		
Igneous		
Metamorphic		

## Stop 2: Sandstone (specimen # 21)

Draw the sandstone.

Where was this rock found? \_\_\_\_\_

How did it form? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Imagine you are a geologist telling others about this rock specimen. How would you describe it?

\_\_\_\_\_

\_\_\_\_\_

Does the appearance of this rock provide evidence about the way it formed? Explain on the back of this page.

## Stop 3: Pick Your Own! Now find a new sedimentary rock somewhere else in the Hall.

Draw this rock and mark its location on the map.

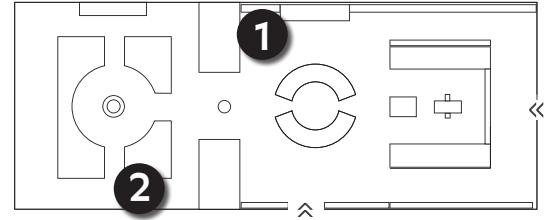
How do you know that this is a sedimentary rock?

Imagine you are a geologist who has just found this specimen in the field. What will you do next? What questions do you have about this rock?

# Student Worksheet: TEAM IGNEOUS

## Stop 1: Three Types of Rocks

Observe the rocks and complete the data chart below.



Type of rock	How was it formed?	List characteristics of this rock.
Sedimentary		
Igneous		
Metamorphic		

## Stop 2: Granite (Specimen #2)

Draw the granite.

Where was this rock found? \_\_\_\_\_

How did it form? \_\_\_\_\_

Imagine you are a geologist telling others about this rock specimen. How would you describe it? \_\_\_\_\_

How do the characteristics of this rock provide evidence about the way it formed? Explain.

\_\_\_\_\_

\_\_\_\_\_

## Stop 3: Pick Your Own! Now find a new igneous rock somewhere else in the Hall.

Draw this rock and mark its location on the map.

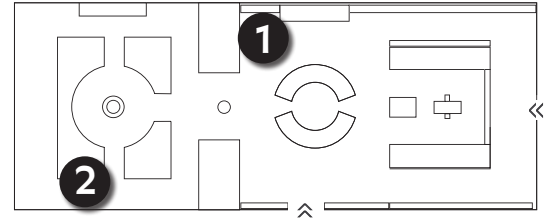
How do you know that this is an igneous rock?

Imagine you are a geologist who has just found this specimen in the field. What will you do next? What questions do you have about this rock?

# Student Worksheet: TEAM METAMORPHIC

## Stop 1: Three Types of Rocks

Observe the rocks and complete the data chart below.



Type of rock	How was it formed?	List characteristics of this rock.
Sedimentary		
Igneous		
Metamorphic		

## Stop #2: Deformed Conglomerate (Specimen #6)

Draw the deformed conglomerate.

Where was this rock found? \_\_\_\_\_

How did it form? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Imagine you are a geologist telling others about this rock specimen. How would you describe it?

\_\_\_\_\_

Does the appearance of this rock provide evidence about the way it formed? Explain.

\_\_\_\_\_

\_\_\_\_\_

## Stop 3: Pick Your Own! Now find a new metamorphic rock somewhere else in the Hall.

Draw this rock and mark its location on the map.

How do you know that this is a metamorphic rock?

Imagine you are a geologist who has just found this specimen in the field. What will you do next? What questions do you have about this rock?

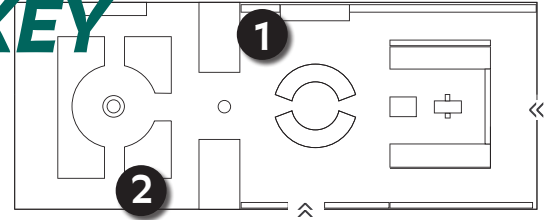


# Student Worksheet: TEAM IGNEOUS

## ANSWER KEY

### Stop 1: Three Types of Rocks

Observe the rocks and complete the data chart below.



Type of rock	How was it formed?	List characteristics of this rock.
Sedimentary	<i>(Formed from the accumulation of sediments over time)</i>	<i>(May show layering and contain small particles)</i>
Igneous	<i>(Formed from liquid rock called magma)</i>	<i>(Contains crystals that touch on all sides. Crystals may be large or small.)</i>
Metamorphic	<i>(Changed by heat and pressure into a new rock type)</i>	<i>Shows signs of physical change, including stretching and folding)</i>

### Stop 2: Granite (Specimen #15)

Draw the granite.

Where was this rock found? *(Stillwater Complex, Montana)*

How did it form? *(from magma, melted rock)*

Imagine you are a geologist telling others about this rock specimen. How would you describe it? *(This rock has lots of crystals in it;*

*some are light and others dark.)*

How do the characteristics of this rock provide evidence about the way it formed? Explain.

*(This rock has crystals in it that touch on all sides. It is an igneous rock that formed from magma.*

*Because the crystals are large, this magma cooled slowly.)*

### Stop 3: Pick Your Own! Now find a new igneous rock somewhere else in the Hall.

Draw this rock and mark its location on the map.

How do you know that this is an igneous rock?

*(Answers will vary.)*

Imagine you are a geologist who has just found this specimen in the field. What will you do next? What questions do you have about this rock?

*(Answers will vary.)*

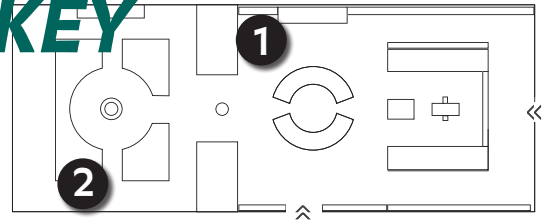


# Student Worksheet: TEAM METAMORPHIC

## ANSWER KEY

### Stop 1: Three Types of Rocks

Observe the rocks and complete the data chart below.



Type of rock	How was it formed?	List characteristics of this rock.
Sedimentary	<i>(Formed from the accumulation of sediments over time)</i>	<i>(May show layering and contain small particles)</i>
Igneous	<i>(Formed from liquid rock called magma)</i>	<i>(Crystals that are touching on all sides. Crystals may be large or small)</i>
Metamorphic	<i>(Changed by heat and pressure into a new rock type)</i>	<i>(Shows signs of physical change, including stretching and folding)</i>

### Stop #2: Deformed Conglomerate (Specimen #6)

Draw the deformed conglomerate.

Where was this rock found? *(The Henlow Greenstone Belt, Ontario Canada.)*

How did it form? *(Sedimentary rock formed when pebbles and sediments accumulated in a stream. Over time, the sedimentary rock was deformed by pressure and heat.)*

Imagine you are a geologist telling others about this rock specimen. How would you describe it?  
*(This rock is black and white, with wavy white parts in it.)*

Does the appearance of this rock provide evidence about the way it formed? Explain.  
*(The wavy white lines show that pebbles inside this rock have been stretched by heat and pressure. This is evidence that the rock has changed over time. This means that it is metamorphic.)*

### Stop 3: Pick Your Own! Now find a new metamorphic rock somewhere else in the Hall.

Draw this rock and mark its location on the map.

How do you know that this is a metamorphic rock?  
*(Answers will vary.)*

Imagine you are a geologist who has just found this specimen in the field. What will you do next? What questions do you have about this rock?  
*(Answers will vary.)*