

# Earth Sciences: Ohio Rocks!

Studying rocks, minerals and fossils can be a lot of fun! By learning more about them, you will also learn about the history of the Earth.



Scientists believe the Earth is very old, over 4.5 billion years! It is made up of many kinds of minerals. A **mineral** is a substance formed within the Earth. Depending on which minerals combine and how, they form different kinds of rocks. Most rocks are made up of at least two minerals.

Rocks can be sorted into three types depending on how they were formed:



Granite  
Igneous Rock

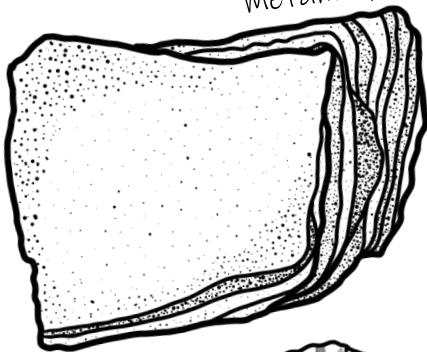
## Igneous

An **igneous rock** is formed when **magma** (melted rock) is cooled and hardened. Long ago in Earth's history, all rocks were igneous.

Slate  
Metamorphic Rock

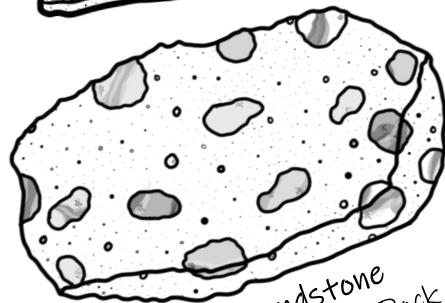
## Metamorphic

A **metamorphic rock** is formed when other rocks are affected by high temperatures and great pressure. They do not melt, but change form.



## Sedimentary

A **sedimentary rock** is formed by sand, silt, clay and small pebbles that are laid down over time. Often, there are layers in the rock created by rivers, lakes or oceans. Sedimentary rocks are the most common type found in Ohio.

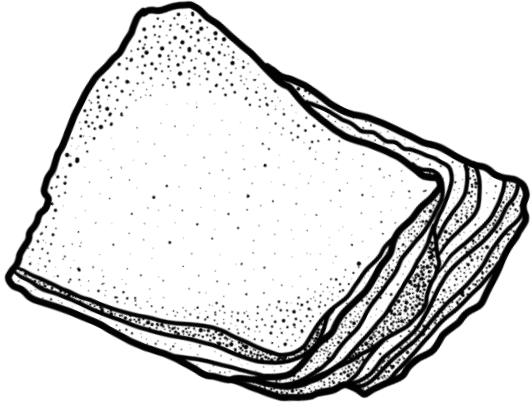


Sandstone  
Sedimentary Rock



# Ohio's Rocks

There are many different kinds of rock found in Ohio. Here are some of the most common types you'll find:



Slate



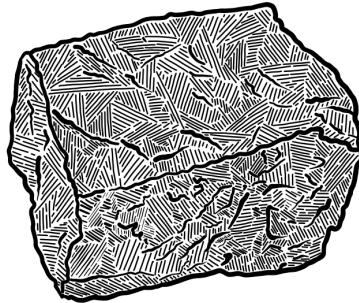
Flint



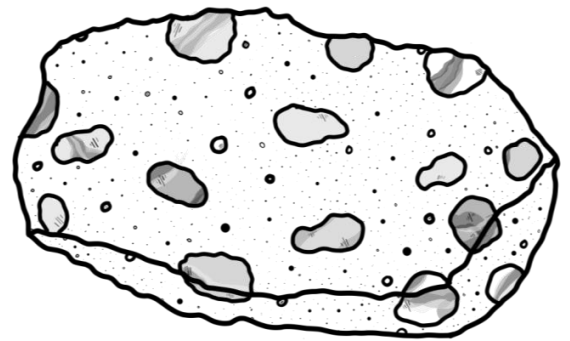
Quartzite



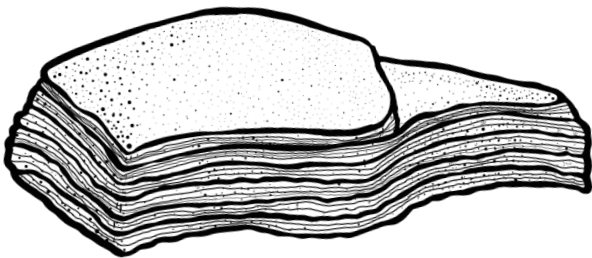
Granite



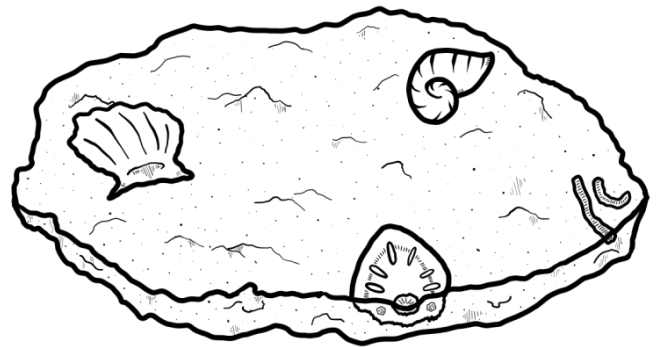
Coal



Sandstone



Shale



Limestone

## Geologist's Advice:

If you received this activity from a Fairfield County Park District's staff member, most of the rocks on this page are also included in the kit. Use this page to help sort your rock samples as you identify them.



# Places to Visit



The best way to study geology is by going outside to natural areas and observing rocks and minerals. Here is a list of places you can visit to learn more about Ohio's geology and rock types:

## **Local** (To Nearby Fairfield County) **Geological Sites**

### Hocking Hill's State Park

- Ash Cave
- Old Man's Cave
- Cantwell Cliffs
- Rock House
- Cedar Falls

### State Dedicated Nature Preserves

- Conkle's Hollow SNP
- Wahkeena Nature Preserve\*
- Rockbridge SNP
- Clear Creek Metro Park
- Shallenberger SNP

### Other

- Stebelton Park at Rock Mill\*
- Rising Park
- Slate Run Metro Park

\*Fairfield County Park District location

## **Ohio's Other Interesting Geologic Sites**

There are so many interesting geologic sites in Ohio. Here are some of our favorites from each section of the state:

### CENTRAL OHIO

- Flint Ridge Ancient Quarries and Nature Preserve
- Olentangy Indian Caverns
- Hayden Falls Park

### SOUTHERN OHIO

- Olentangy Indian Caverns
- Hayden Falls Park
- Flint Ridge

### WESTERN OHIO

- John Bryant State Park
- Ohio Caverns
- Hueston Woods
- Cowan Lake State Park
- Ceasar Creek State Park
- Miller Nature Sanctuary

### NORTHERN OHIO

- Fossil Park (Sylvania)
- Seneca Caverns
- Cuyahoga National Park
- Nelson-Kenny Ledges State Park
- Kelly's Island Glacial Grooves

### EASTERN OHIO

- Lake Katherine State Nature Preserve
- Leo Petroglyphs

# Making Rock Observations



1) Carefully cut out each of the **Rock Sample Cards** and the **Rock Observation Worksheets** along the dotted line.

2) A small set of rock samples common to Ohio are included with this kit. Use these samples when completing the **Rock Observation Worksheets**.

3) You will also need:

- Writing and coloring utensils
- Vinegar
- Steel nail (included)
- Magnifying glass (included)

4) Ask a Naturalist if you need help!

## Rocks Included:

- Limestone
- Sandstone
- Quartzite
- Coal
- Flint/Chert
- 
- 
- 
- 
- 

## Investigating Your Rocks:

Identifying rocks requires a lot of careful and patient observation. Don't just look at the color, feel the rock's texture, weight and edges. Are layers present? What about fossils? Did you use a magnifying glass to look at the grains? Did the rock leave behind anything on your hands- dust or sand?

**After investigating all the rocks included with this activity, try collecting and identifying a few of your own. Ask a Naturalist if you need help!**

## Acid Test:

Geologists perform an acid test to see if carbonate is present in a rock. Carbonate bubbles and fizzes when exposed to acid (vinegar).

Carbonate is present in Limestone.

**You will need vinegar to perform an acid test.**

**Apply a few drops of vinegar to each of your rock samples. Look for small bubbles forming on surface.**

## (Mohs) Hardness Test:

Geologists perform a hardness test, also called a scratch test, to figure out how tough a mineral is. If one mineral can be scratched by another, it means its hardness is less than that mineral. Tough minerals have a higher hardness number, while softer minerals have a lower number.

**You will need a steel nail (included in kit) to perform the hardness test.**

**Carefully attempt to scratch your rock sample using a steel nail.**

**Did it leave behind a scratch?**

**IF YES: Soft Rock**

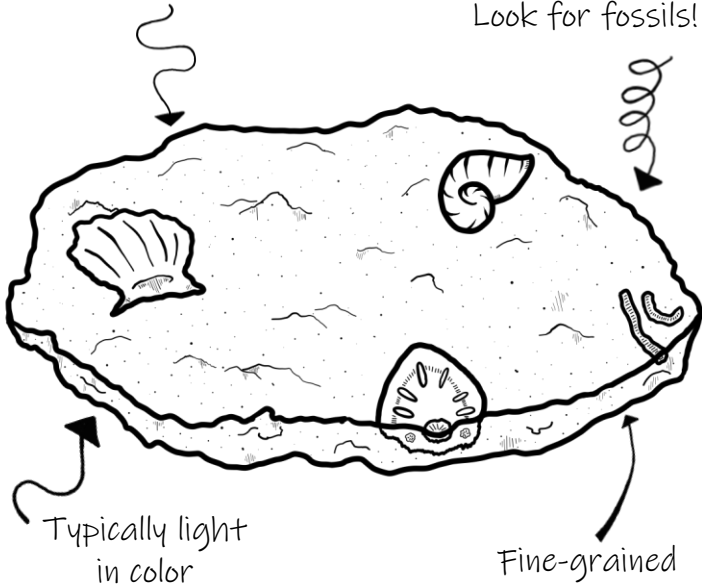
Steel has a hardness of 5. Your rock sample is less than a 5 on the hardness scale, making it a soft rock.

**IF NO: Hard Rock**

Steel has a hardness of 5. Your rock sample is more than a 5 on the hardness scale, making it a hard rock.

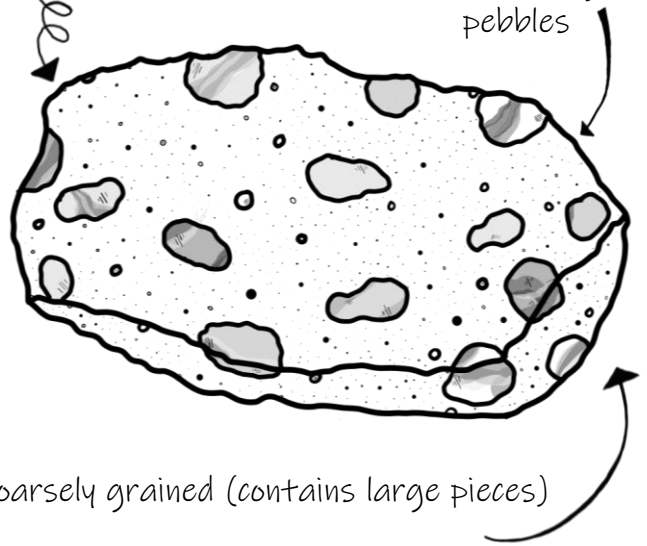
Made from minerals in bones and shells

Look for fossils!



Many colors- from tan, gray, orange, red, yellow, white or even brown!

May be made up of sand and larger pebbles



# Limestone

Sedimentary

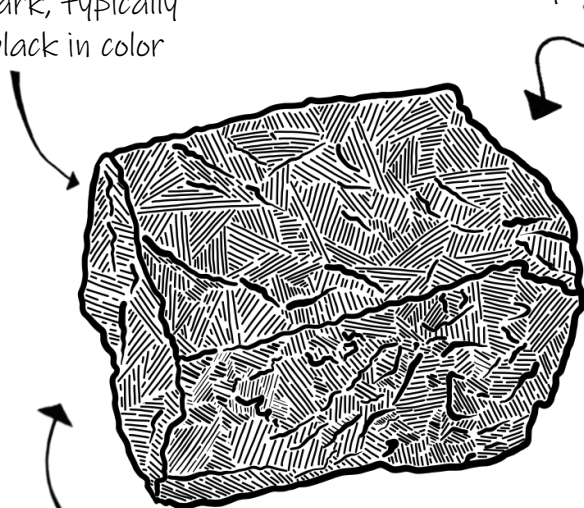


# Sandstone

Sedimentary

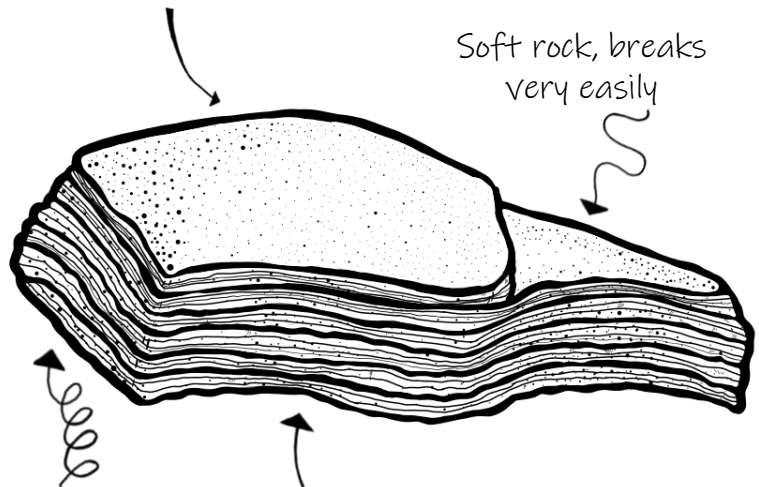
Dark, typically black in color

Usually breaks easily



Mostly made of clay particles

Soft rock, breaks very easily



# Coal

Sedimentary



# Shale

Sedimentary

# Sandstone

## *Sedimentary*

### How does Sandstone form?

Sandstone in Ohio was formed many thousands of years ago by lakes, rivers and shallow oceans. Over time, sand and pebbles were deposited and cemented together to create sandstone.

### What does Sandstone look like?

Sandstone is made from sand and small pebbles. It can be many colors, from red, orange, tan, brown to even yellow or gray. Layers are often visible.

### Testing characteristics:

- May be many colors
- Finely to coarsely grained
- May contain pebbles
- May show distinct layers
- **Can be soft or hard depending on sediments**

### Where to find Sandstone in Ohio:

Sandstone is most common in the eastern half of Ohio.

**Best Locations:** Hocking Hills State Park, Stebelton Park at Rock Mill, Rising Park

# Shale

## *Sedimentary*

### How does Shale form?

Shale is mostly made from clay particles and can be found anywhere there was once standing water. Clay collected on the bottom of a lake or pond and compressed together, forming Shale.

### What does Shale look like?

Distinct layers with sometimes different colors.

### Testing characteristics:

- Distinct layers
- Finely grained
- Breaks apart easily, especially when wet
- **Soft rock**

### Where to find Shale in Ohio:

Shale beds are most common in the eastern region of Ohio.

**Best Locations:** Shale Hollow Park, Highbanks Metro Park, Stroud's Run State Park

# Limestone

## *Sedimentary*

### How does Limestone form?

Limestone beds are formed in areas with tropical marine environments and freshwater lakes. Parts of Ohio were once covered by a shallow sea. Limestone is made from minerals in bones and shells- some pieces may even have whole shells or coral visible!

### What does Limestone look like?

Typically light in color and finely grained. May contain fossils.

### Testing characteristics:

- Light-colored
- Finely grained
- Bubbles when exposed to acid (vinegar)
- May contain fossils
- **Soft Rock**

### Where to find Limestone in Ohio:

Limestone is most common in the western half of Ohio.

**Best Locations:** Hueston Woods State Park & Caesar Creek State Park

# Coal

## *Sedimentary*

### How does Coal form?

Coal is made from plants that lived millions of years ago. Dead plants were buried by layers sediments. Heat and pressure turned the dead plants into coal.

### What does Coal look like?

There are four types of coal- the most common type found in Ohio is called *Bituminous Coal*. Coal is typically darkly colored, and can be shiny.

### Testing characteristics:

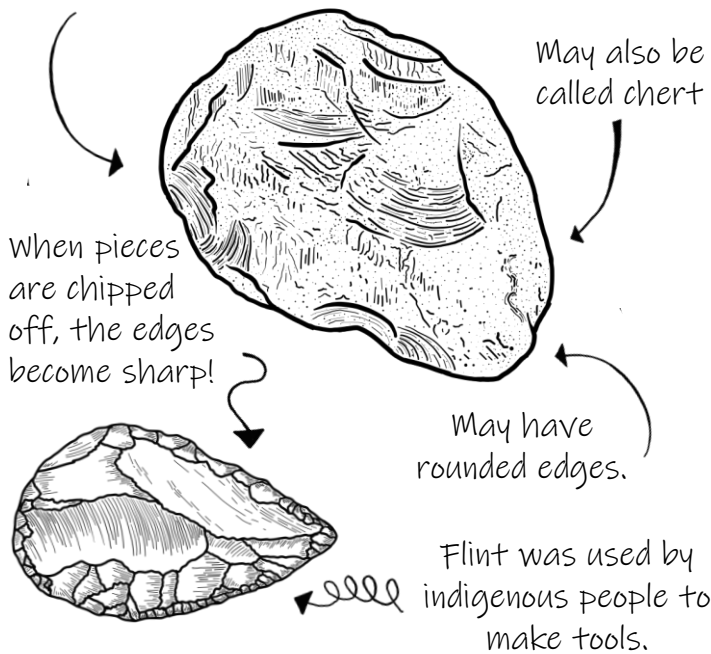
- Dark-colored- typically black
- Leaves dark streak on paper
- Distinct layers
- Easily breakable
- **Soft rock**

### Where to find Coal in Ohio:

Coal beds are found in the eastern most part of the state. Ohio has a long history of mining coal and many small mining towns still exist in this area of the state.

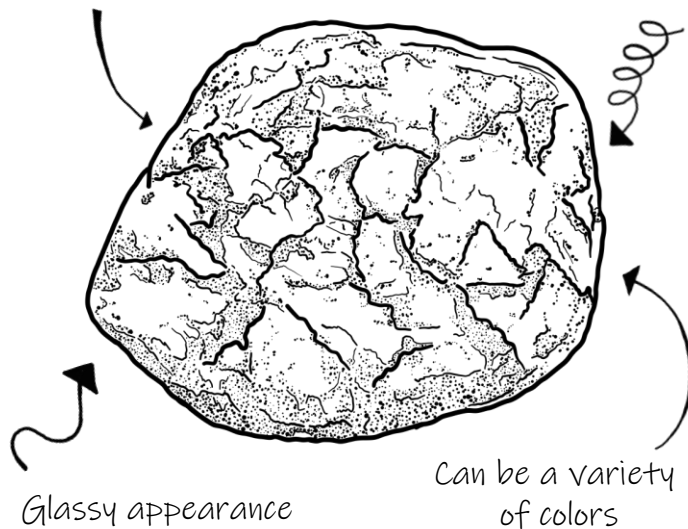
**Best Locations:** Lake Hope State Park, Robinson's Cave, King's Hollow Tunnel

Found in a variety of colors- red, white, black, orange, or gray.



Quartzite is made of quartz. Quartz is the most common mineral on Earth.

Quartz can be found in other rocks including sandstone and granite.



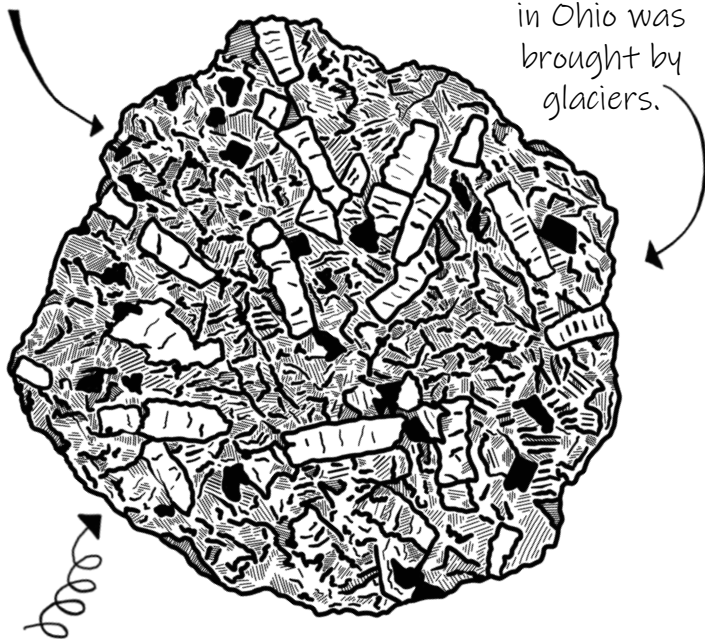
**Flint (Chert)**  
Sedimentary



**Quartzite**  
Metamorphic

May contain large crystals

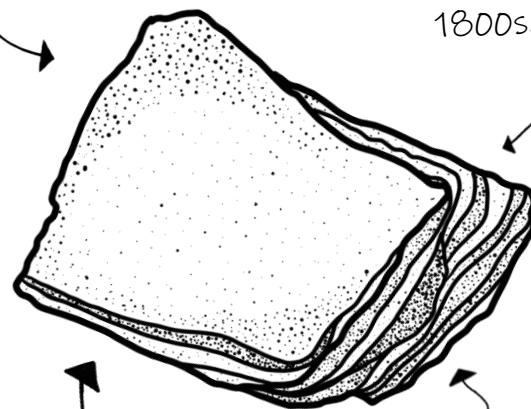
Granite found in Ohio was brought by glaciers.



Can be many colors- from white, pink, gray, black to even yellow or tan!

Fine-grained

School children used slate boards to practice writing and math during the 1800s.



Dark gray or black in color

Flat and smooth



**Granite**  
Igneous



**Slate**  
Metamorphic

# Quartzite

*Metamorphic*

## How does Quartzite form?

Quartzite forms when sandstone or chert (flint) is exposed to heat and pressure. Quartzite is made of quartz. Quartz is the most common mineral on Earth.

## What does Quartzite look like?

Can be many different colors- from white, gray, clear, and even pink. Medium grained with visible crystals.

## Testing characteristics:

- Very hard
- Can feel gritty or smooth
- Variable in color
- Quartzite pebbles may be found within other rocks, like sandstone
- **Hard rock**

## Where to find Quartzite in Ohio:

**Best Locations:** Leo Petroglyphs State Memorial, Lake Katherine State Nature Preserve, Wahkeena Nature Preserve, Hocking Hills State Park

# Flint (Chert)

*Sedimentary*

## How does Flint form?

Flint is made of very tiny crystals. Flint and chert are the same type of rock. 'Chert' is typically used by Geologists (scientists who study rocks. 'Flint' is used when describing an arrowhead, tool or another artifact that has been worked by indigenous people.

## What does Flint look like?

Can be many different colors- from black to gray to even brighter shades like orange and red. Somewhat glassy appearance. May have sharp or rounded edges.

## Testing characteristics:

- Very hard, but brittle
- Color is not reliable
- Sharp edges when broken
- **Hard rock**

## Where to find Flint in Ohio:

**Best Location:** Flint Ridge Ancient Quarries and Nature Preserve

# Slate

*Metamorphic*

## How does Slate form?

Slate is shale that has been compressed and changed over time.

## What does Slate look like?

Pieces of slate are typically flat on the top and bottom, and dark gray to black in color. Resistant to weathering, roofs made from slate can be found around the world.

## Testing characteristics:

- Fine-grained
- Dark gray or black
- Hard and brittle
- Flat and smooth
- **Hard rock**

## Where to find Slate in Ohio:

Slate is not readily found in Ohio. It was historically and sometimes still is, used as a roofing material.

# Granite

*Igneous*

## How does Granite form?

Granite is the most common type of *igneous* rock. It was formed when magma (melted rock) slowly cooled a long time ago.

## What does Granite look like?

Granite is usually light in color, may be a combination of gray, yellow, white, tan, pink and black. Usually coarse grains with large crystals.

## Testing characteristics:

- Resistant to weathering
- May be many colors
- May have crystals, shiny appearance
- **Hard rock**

## Where to find Granite in Ohio:

Granite was not formed in Ohio. Much of the granite that can be found in the state was brought by glaciers thousands of years ago. Best locations to find granite are in glacial deposits, river banks and stream beds.











# Edible Rocks: Igneous

Learn more about how igneous rocks are formed with this edible rock recipe:

| Materials  | Ingredients   |
|--|---|
| <ul style="list-style-type: none"> <li>• Help from an adult</li> <li>• An 8x8 square pan</li> <li>• Parchment paper</li> <li>• Candy thermometer</li> <li>• Spoon</li> <li>• Measuring utensils</li> <li>• Saucepan</li> </ul> | <ul style="list-style-type: none"> <li>• ½ cup sugar</li> <li>• ½ cup corn syrup</li> <li>• ½ teaspoon vinegar</li> <li>• ½ tablespoon baking soda</li> <li>• 1 teaspoon vanilla</li> </ul> |

## Igneous Candy

With help from an adult:

| Step     | Instructions   | Cooking Connection  |
|----------|--|---|
| <b>1</b> | Line the bottom and sides of a baking pan with parchment paper. Coat with cooking oil.   | Igneous rocks are formed when molten rock (magma or lava) cools very quickly. This often occurs near volcanos.    |
| <b>2</b> | Measure out sugar, corn syrup and vinegar. Add to a large, deep saucepan. Stir over medium heat. Be careful, mixture may bubble up.                                  |   |
| <b>3</b> | Stir continuously over medium heat until sugar dissolves. Slowly, continue stirring.   | Ingredients in this recipe are heated to a high temperature, then cooled very quickly                             |
| <b>4</b> | Check temperature regularly using a candy thermometer. Wait for mixture to reach 300°F. Stir occasionally.   |   |
| <b>5</b> | As soon as it reaches 300°F (be patient, it may take awhile), remove from heat and stir in baking soda. Mixture will foam. Pour into prepared pan and allow to cool. | The tiny air bubbles gives the candy a sponge-like appearance, similar to <i>pumice</i> , a type of igneous rock. |
| <b>6</b> | Once candy has cooled, cut or break the candy into bite-sized pieces. Observe the sponge-like appearance.  |   |



# Edible Rocks: Metamorphic

Learn more about how metamorphic rocks are formed with this edible rock recipe:

| Materials  | Ingredients   |
|--|---|
| <ul style="list-style-type: none"> <li>• Help from an adult</li> <li>• Slow cooker (Crock Pot)</li> <li>• Baking dish</li> <li>• Parchment paper</li> <li>• Spoon</li> <li>• Refrigerator</li> </ul> | <ul style="list-style-type: none"> <li>• Chocolate chips (any kind)</li> <li>• 1 Tablespoon butter</li> <li>• 1 Tablespoon vanilla</li> <li>• 1 cup sweetened condensed milk</li> </ul> <p>Optional:</p> <ul style="list-style-type: none"> <li>• Cranberries</li> <li>• Walnuts</li> </ul> |

## Metamorphic Fudge

*with help from an adult:*

| Step | Instructions   | Cooking Connection  |
|------|--|---|
| 1    | Add the chocolate, butter, vanilla and sweetened condensed milk to your slow cooker. | <p>Metamorphic rocks are formed when existing rocks are exposed to heat and pressure (slow cooker). Small pieces of chocolate represent pieces of Sedimentary rock. Cranberries and walnuts (or whatever ingredients you choose) represent the fossils that were once in the Sedimentary rock. Sometimes, fossils are found in metamorphic rock, but they have been squashed and are unrecognizable.</p> <p>The high temperatures and pressure change the rock to something new. <i>Metamorphic</i> is Greek for "change of shape."</p> |
| 2    | Stir in any of the optional ingredients you chose.                                   |   |
| 3    | Heat on low for 2 hours. Stir every 15 minutes.                                      |   |
| 4    | Line a baking dish with parchment paper. Pour melted fudge into baking dish.         |   |
| 5    | Refrigerate until set. Cut into cubes. Store in sealed container in refrigerator.    |   |



# Edible Rocks: Sedimentary

Learn more about how Sedimentary rocks are formed with this edible rock recipe:

| Materials  | Ingredients   |
|--|---|
| <ul style="list-style-type: none"> <li>• Help from an adult</li> <li>• Saucepan</li> <li>• Spoon</li> <li>• Measuring utensils</li> <li>• Large baking dish</li> <li>• Rubber spatula</li> </ul> | <ul style="list-style-type: none"> <li>• 3 cups rice cereal</li> <li>• 3 cups mini marshmallows</li> <li>• 4 tablespoons butter</li> <li>• Pinch of salt</li> <li>• Vanilla</li> <li>• Chocolate chips</li> <li>• M&amp;Ms or other candies</li> <li>• Cooking spray</li> </ul> |

## Sedimentary Sandwiches

*with help from an adult:*

| Step     | Instructions   | Cooking Connection   |
|----------|--|--|
| <b>1</b> | In a saucepan, melt butter over low heat. Once melted, remove from heat.   | <p>Sedimentary rocks are made from sediments. Sediments are materials such as sand, clay, silt or pebbles. In this recipe, the sediments are cereal, chocolate and candy.</p> <p>Over time, wind, water and ice leave behind sediments. These sediments form layers. How many layers are in your sedimentary sandwich? Which is the oldest? Which is the newest? Are some layers and sediments bigger than others?</p> |
| <b>2</b> | Stir in marshmallows, one cup at a time. Add pan back to heat and allow marshmallows to melt.  |  |
| <b>3</b> | Add salt and vanilla. Then, stir in the rice cereal.   |  |
| <b>4</b> | Coat the bottom and sides of a baking pan with cooking oil.  |  |
| <b>5</b> | Add half of the rice cereal and marshmallow mixture to the pan. Cover with chocolate chips and press down with spatula.                                    |  |
| <b>6</b> | Add a second layer of rice cereal-marshmallow mixture. Use a spatula to pat it down. Cover this layer with M&Ms. Allow to cool for an hour before cutting. |  |



# Key Words:



|                          |  |
|--------------------------|--|
| <b>Coarsely Grained</b>  | Contains large specks.   |
| <b>Finely Grained</b>    | Contains tiny specks.  |
| <b>Fossil</b>            | Evidence of life preserved in rock.  |
| <b>Geology</b>           | The study of the Earth and what it is made of.   |
| <b>Geologist</b>         | A scientist or expert in the field of geology.   |
| <b>Glacier</b>           | A slow-moving mass of ice. The most recent glacier left Ohio around 14,000 years ago!  |
| <b>Indigenous People</b> | People that are native to and lived an area hundreds to thousands of years ago.  |
| <b>Igneous Rock</b>      | Rock created by the cooling and solidification of magma.   |
| <b>Magma</b>             | Rock which has been heated to a liquid. Magma is formed deep within the Earth. Magma is called 'lava' once it reaches the Earth's surface. |
| <b>Metamorphic Rock</b>  | Metamorphic is Greek for "change of shape." These rocks have been affected by great temperature and pressure.                              |
| <b>Mineral</b>           | Solid substance formed naturally within the Earth.   |
| <b>Sediment</b>          | Material such as sand, silt, clay and stones. Usually left behind by wind, water or ice.   |
| <b>Sedimentary Rock</b>  | Rock created when silt, sand, mud, pebbles and other sediments are laid down in layers. These layers are compressed to form rock.          |
| <b>Weathering</b>        | The slow wearing away or breaking down of rock due to exposure to wind, water or ice.  |