

Rock Properties

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Science Content Standards: Grade 4, 4a — *Students know* how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to their properties and methods of formation (the rock cycle).

Lesson Concept: Rock types can sometimes be determined by their physical properties.

Conceptual Flow:

- ▶▶ Rocks are made of different combinations of minerals.
 - Minerals are described and identified by a set of properties, such as hardness, cleavage, color, and streak.
 - Hardness is determined by Mohs hardness scale.
- ▶▶ Rocks have observable characteristics. Igneous, sedimentary and metamorphic rocks can be identified by specific characteristics.
 - Some characteristics of rocks help to determine whether a rock is metamorphic, sedimentary, or igneous.
- ▶▶ Rock types are based on how they are formed.
 - Igneous rocks are formed from molten lava that has been cooled. Igneous rocks tend to be glassy or porous.
 - Metamorphic rocks are formed through extreme heat and pressure. Metamorphic rocks may have more than one color banded.
 - Sedimentary rock is formed from sediment and pressure. Sedimentary rocks may have fossils, may be grainy, and may be made up of smaller rocks.

Teacher Background:

Rocks are usually made from combinations of different minerals and are identified from their composition and texture. Molten magma and lava cool and solidify to form igneous rocks. Metamorphic rocks form when a parent rock of any type is subjected to significant increases in pressure and temperature, short of melting. Sedimentary rock forms when rock is weathered, transported by agents of erosion, deposited as sediment, and then converted back into solid rock—a process called lithification.

Rocks that are hard but show no layering are likely to be igneous rocks. Often they have interlocking

crystalline textures. Rocks that are soft, particularly those with layers, are likely to be sedimentary rocks. They often have “fragmental” textures; they look like broken grains of older rocks cemented back together. Hard rocks that have their minerals lined up or arranged in uneven layers are likely to be metamorphic rocks. This description briefly depicts some of the most common rocks; however, there are many exceptions.

(Excerpted from the *Science Framework for California Public Schools: Kindergarten Through Grade Twelve*.)

Materials Needed for the Lesson:

Teacher Materials

- Rock samples
- A large chart of the “Data Collection” student handout
- Transparency of “Name That Rock Type”

Student Hands-on Materials

For each group of students

- Plates of 8 rocks including sedimentary, metamorphic, and igneous; numbered 1-8 (see note below); Same rock samples should have the same number for each group (e.g., #1 and #3 sedimentary, etc.)
- Hand lenses
- Pencils

Student Handouts

- “Rock Data Collection” sheet
- “Name That Rock Type”

Note: Collections of rocks purchased from a company that sells science materials are often numbered, therefore you will not need to number the rocks. Be aware that the rock numbers you select from your purchased collection may not be consecutive numbers (e.g., 1, 3, 8).

5E Lesson: Rock Properties

Teacher Does	Student Does	Concept
<p><u>ENGAGE:</u></p> <p>Have some rock samples sitting up on the front table in front of the teacher.</p> <ul style="list-style-type: none"> ▶ What is it about a rock that makes you want to pick it up? <p>Distribute plate of rocks to each group of students.</p> <ul style="list-style-type: none"> ▶ In your groups, sort the rocks into groups and explain the reason you grouped them the way you did. (5 min.) Choose one person to be the reporter for your group. <p>Walk around questions:</p> <ul style="list-style-type: none"> ▶ What do you notice is the difference between these two rocks? Is there something else that is different about these two rocks? ▶ How do the rocks feel? ▶ Is there another rock you would/could put with that rock(s)? ▶ What is your favorite rock? Why is that one your favorite rock? ▶ Is there a different way to group the rocks? ▶ Table 1, how did you sort your rocks? <p>Continue with the rest of the groups.</p> <p>Chart students' responses on the board.</p> <ul style="list-style-type: none"> ▶ <i>Put all your rocks back onto the plate and move them to the center of the table/group.</i> ▶ <i>Scientists use tools to help them make more detailed observations.</i> <p>Get out a hand lens and model the appropriate use.</p> <p>Use the large chart of the "Data Collection" student handout and model how to record data as a "think aloud." Use a hand lens, look carefully at rock (a different rock than what students have).</p> <ul style="list-style-type: none"> ▶ <i>"I notice this rock has little sparkles; it's shiny; it's all one color with extra sparkles, it has little holes"</i> 	<p>Expected Student Response (ESR): It is shiny, pretty in the water, has different colors, see a fossil in it, has a neat shape, looks sparkly</p> <p>Sort rocks into groups and explain the reason for the groups.</p> <p>ESR: Light and dark; shiny and not shiny; sparkly; heavy and light; all one color and more than one color</p>	<p>Rocks have observable characteristics.</p>

Teacher Does	Student Does	Concept
<p>Then model how to record. (little sparkles, one color— golden, little holes).</p>		
<p><u>EXPLORE:</u></p> <ul style="list-style-type: none"> ▶ <i>You will now examine each rock more closely with a hand lens. Each rock has a number; look at the rock carefully and record the number of the rock and then your description in the appropriate box. Observe as many rocks as you can; you may not have time to observe all the rocks.</i> ▶ <i>Each person chooses a rock, when you are finished, put your rock back on the plate and choose another.</i> <p>Distribute Data Collection Sheet, hand lenses and pencils. (10 min.)</p> <p>Walk around questions:</p> <ul style="list-style-type: none"> ▶ <i>What does the rock feel like? What colors do you see? What is different about the rock when you look through the hand lens?</i> <p>Have a large chart of the Data collection sheet up on the board.</p> <ul style="list-style-type: none"> ▶ <i>Table 1 – give me one observation of rock number 1</i> <p>Record description.</p> <ul style="list-style-type: none"> ▶ <i>Table ,2 do you have another different observation to add to #1?</i> <p>Add description. (At the end of each rock description, be sure to give appropriate scientific terms as needed.) Be sure to make explicit the scientific terms as they relate to the students’ observations and write them in the column of scientific terms.</p> <p>Continue around the room with each rock and table group.</p>	<p>Choose a rock, observe with a hand lens, record observations.</p>	<p>Igneous rocks tend to be glassy or porous.</p> <p>Sedimentary rocks may have fossils, may be grainy and may be made up of smaller rocks.</p> <p>Metamorphic rocks may have more than one color banded.</p>
<p><u>EXPLAIN:</u></p> <p>Put transparency of “Name That Rock Type” on the overhead. Pick up a rock from the front table.</p> <ul style="list-style-type: none"> ▶ <i>I notice that this rock has holes and I remember my teacher said that the scientific word for holes is porous. HmMMM, I look on this rock type chart and</i> 	<p>Using the “Data Collection” sheet as a reference, name the rock types that were observed.</p>	<p>Igneous, sedimentary, and metamorphic rocks can be identified by specific characteristics.</p>

Teacher Does	Student Does	Concept
<p><i>I notice that porous matches with the igneous rock type, so this rock must be an igneous rock.</i></p> <p>Distribute “Name That Rock Type” student handout.</p>		
<p><u>EXTEND:</u></p> <p>Read <i>Everybody Needs a Rock</i> by Byrd Baylor and Peter Parnall. Ask students to bring a rock to class. Then try to have students identify the type of rock it may be (this is not an easy task).</p>		

Input Question: What colors do you see? (in Explore section)

Process Question: What is different about the rock when you looked at it through the hand lens? (in Explore section)

Output Question: Is there a different way to group the rocks? (in Engage section)




STUDENT HANDOUT
Rock Data Collection

Rock #	Observations	Scientific Terms

STUDENT HANDOUT

Name That Rock Type

Rock Type Characteristics (Clues)

Sedimentary	Has grains (coarse, medium or fine) Fossils, small pebbles, straight layers 
Metamorphic	2 or more banded colors Wavy or uneven bands  
Igneous	Glassy Porous

Review your data and the characteristics (clues) above, then decide which type each rock is.

Rock #	Rock Type	The one or two clues that helped me to decide
#		
#		
#		
#		
#		