



Rock Detectives

Rock Identification

Time: approximately 90 minutes

Adapted from Fossils to Fuel 2 — An Elementary Earth Science Curriculum, developed for the Oklahoma Energy Resources Board, an agency of the State of Oklahoma.

GRADE LEVEL: 3, 5 and 6

SUBJECTS: Science

WONDER WHY...

Why do rocks look different from each other?

CONCEPT

Rocks are a natural, solid, nonliving material made of two or more minerals. Using a dichotomous key, rocks can be identified by physical properties such as color, luster, texture, feel or grain size

CORRELATIONS TO CCSS AND ARKANSAS FRAMEWORKS:

<http://www.arkansasenergyrocks.com/educators/activities/Rock-Detectives-Correlations.pdf>

TEACHER INFORMATION

For more Arkansas specific information, see also:

<http://www.encyclopediaofarkansas.net/encyclopedia/entry-detail.aspx?search=1&entryID=2221>

http://www.geology.ar.gov/geology/general_geology.htm

<http://www.encyclopediaofarkansas.net/encyclopedia/entry-detail.aspx?search=1&entryID=401>

<http://www.encyclopediaofarkansas.net/encyclopedia/entry-detail.aspx?search=1&entryID=6011>

http://cber.uark.edu/Revisiting_the_Economic_Impact_of_the_Fayetteville_Shale.pdf

Earth's outer layer, or crust, is made mostly of rock. Rocks are naturally occurring solid material consisting of two or more minerals. Rock identification is based on observable physical properties such as: luster, color, feel/texture, shape, and grain size.

Rocks occur in three major groups based on how they are formed.

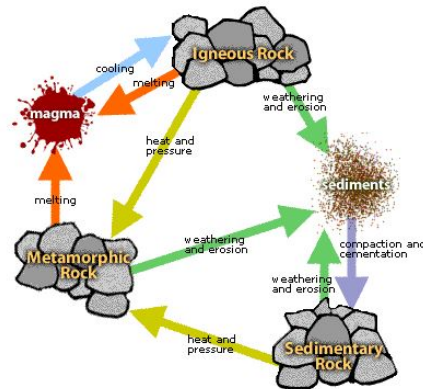
- **Igneous rocks** are formed underground as magma (melted rock) which cools, and turns into a solid called igneous rock. Igneous rocks can also be formed on the surface of the earth when molten magma from volcanoes cools.
- **Metamorphic rocks** form when existing sedimentary or igneous rocks are subjected to increased heat and pressure inside the Earth's crust.
- **Sedimentary rocks** form from sediments. Sediment is created by the erosion, or breaking up of, igneous, metamorphic or sedimentary rocks. As these sediments and other materials, such



as plants and animals, are buried deep below ground they are subjected to increased heat and pressure. This increased heat and pressure changes the sediment to sedimentary rock.

Over many years igneous, metamorphic and sedimentary rocks are formed and then worn away by erosion again and again. This continuous process that rocks go through is called the **rock cycle**. As seen in Figure 1, (*see also printable master of rock cycle*) the three types of rocks can change from one type to another at different points within the rock cycle.

In this activity, students will become rock detectives and use physical properties to classify rocks.



MATERIALS

- Collection of 10 rocks per group (Number rocks for identification activity; **See Student Handout 2** for a list of rocks that should be used. If these examples are not available, different rocks may be substituted for those listed. If rocks are substituted, the **Dichotomous Key** and **Rock Identification Chart** must be changed. These Handouts are in a Word document can be edited to reflect the changes.)
- 2 magnifying lenses per group
- 1 per group – **Rock Detective Lab Sheet Student Handout 1**
- 1 per student – **Rock Identification Dichotomous Key Student Handout 2**
- 1 per student – **Rock Identification Chart Student Handout 3**
- 1 per student – **Rock Identification Conclusion Student Handout 4**
- One or more books on rocks and rock collecting.
 - Suggested titles:
 - Let's Go Rock Collecting***, By: Roma Gans, Illustrated by: Holly Keller, ISBN-13: 978-0-06-445170-3
 - If You Find a Rock*** by Peggy Christian (Author), Barbara Hirsch Lember (Photographer) 13: 978-0152063542
 - Rocks: Hard, Soft, Smooth, and Rough*** Natalie M. Rosinsky (Author) , Matthew John (Illustrator) 13: 9781404803343
 - The Rock Factory: The Story About the Rock Cycle*** (Science Works) by Jacqui Bailey (Author) , Matthew Lilly (Illustrator) 13: 978-1404819979
 - Jump into Science: Rocks and Minerals*** by Steve Tomecek (Author) , Kyle Poling (Illustrator) 13: 978-1426305382



Looking at Rocks (My First Field Guide) by Jennifer Dussling (Author) , Tim Haggerty (Illustrator) 13: 978-0448425160

PROCEDURE

SAFETY:

Before the lab begins stress the following safety rules with students:

Keep rocks on the table or desktop.

Do not put rocks in your mouth.

Wash your hands after handling rocks.

1. Introduce the lesson with background information about the rock cycle. Depending on the level of your students, you may use one of the following videos or one of your own choosing:

<http://studyjams.scholastic.com/studyjams/jams/science/rocks-minerals-landforms/rock-cycle.htm>

<http://www.youtube.com/watch?v=ihfKNRdIE2E>

<http://www.neok12.com/php/watch.php?v=zX616a577c597f7c784c720a&t=Types-of-Rocks>

<http://video.mit.edu/watch/rock-cycle-13017/>

<http://www.schooltube.com/video/503ca205aae459f47494/The-Rock-Cycle>

Display **Figure1 – Rock Cycle** and discuss possible changes in rocks that might occur.

2. Divide students into groups. Give each group a container of 10 numbered rocks. Use the rocks listed on the chart or select others that you prefer. **If you change the rocks, you must also change the dichotomous key and the identification Handouts.**

Note: Rocks that are required for 5th grade AR frameworks identification are halite, feldspar, sulfur, quartz, diamonds, gypsum, calcite, talc, and hematite.

3. Students will place all the rock samples out on their table. Have students suggest how they will sort the rocks using physical properties. Guide their discussion so their results include at least the four properties listed in the Rock Identification Chart. Others may be added to meet specific AR frameworks. Have groups share and discuss results.
4. Distribute a copy of **Student Handout 1—Lab Sheet, Student Handout 2— Dichotomous Key, Student Handout 3— Rock Identification Chart** and go over the procedure with students.

Note: For 5th grade hardness, fluorescence, and streak could be added to Student Handout 3 – Rock Identification without having to change the dichotomous key.



5. Students will select one rock from the rock samples, and then read carefully through the Rock Identification Dichotomous Key to classify and name the rock.
6. Record the rock number on the Rock Identification Sheet in the blank next to the correct name of the rock.
7. Record the physical properties of the rock.
The following web sites may be helpful for more background:
http://www.rocksandminerals4u.com/properties_of_minerals.html
<http://www.rocksforkids.com/RFK/identification.html#Properties>
http://www.geo.utexas.edu/courses/303/303_lab/MineralOverhead.pdf
8. Repeat steps 5-7 until all rock samples have been classified. Have students share their results with the class. Correct any errors in classification and discuss how misclassification occurred.

EXTENSION:

1. Write a short story from the viewpoint of a particular sedimentary, igneous or metamorphic rock as you travel through the rock cycle moving from one type of rock to another.
2. Develop a poster about the rock cycle and determine how igneous, sedimentary and metamorphic rocks are formed.
3. Copy the rock cycle parts (words, phrases, pictures) on paper plates and arrows so students can manipulate them to create the rock cycle. Use this activity as a formative assessment to determine that students understand the rock cycle.

VOCABULARY

crude oil – oil in its natural liquid state (a mixture of gases, oil, and water) as it comes from the ground

dichotomous key – a key used for the identification of objects based on a series of choices

granular – containing small, hard particles or grains

igneous rocks - form when the magma (melted rock) cools and turns solid

layering – horizontal layers or lines

luster - the way light reflects from a surface

metamorphic rocks - form when existing rocks are exposed to increased heat and pressure inside the Earth's crust.



mineral - a solid inorganic material found in the Earth's crust; the building blocks of rocks

natural gas - colorless, odorless gas found in the Earth

physical property – what can be seen or measured

pore – openings or spaces within a rock

rock - the solid part of earth made of two or more minerals

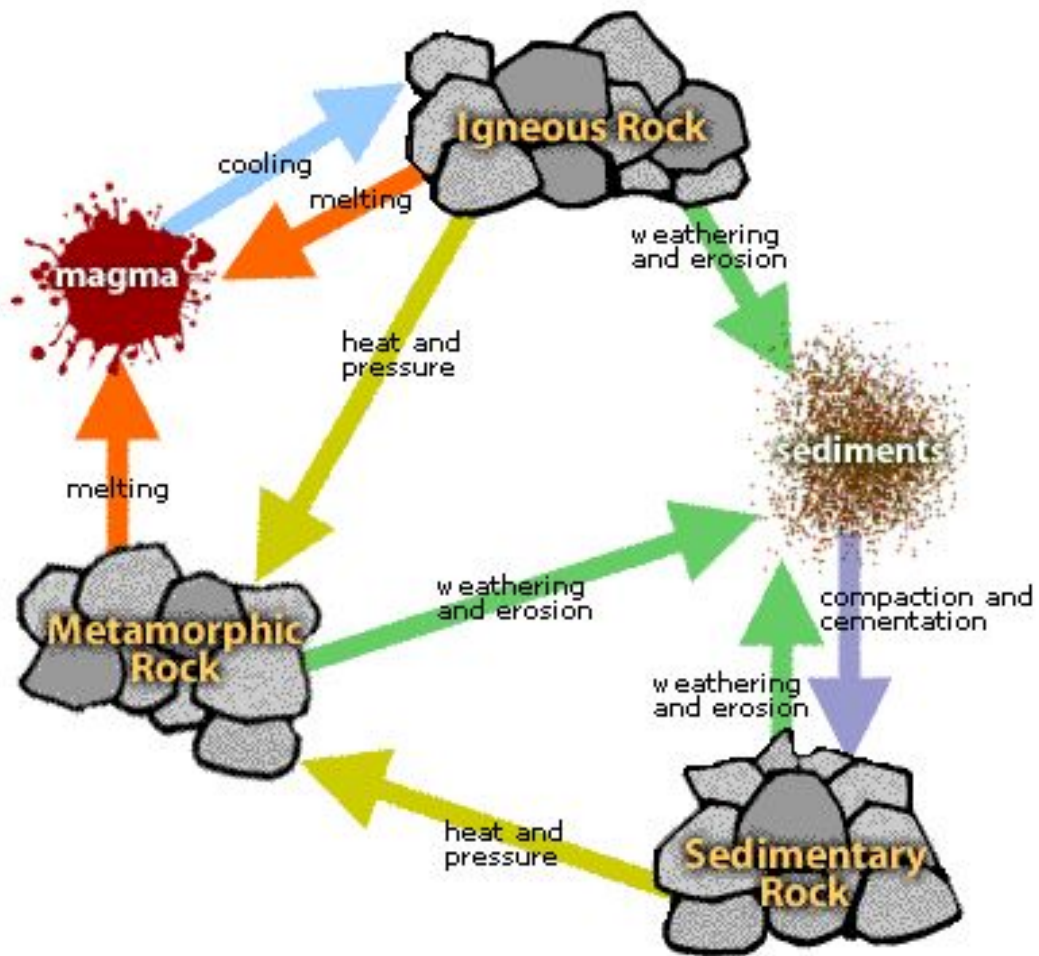
rock cycle - the series of events that rocks, over time, go through that changes them from one type of rock to another.

sedimentary rocks - form when sediments and other materials press together and harden

texture – characteristic of a rock that you can see and feel

STUDENT HANDOUTS – (See separate files for editable Word documents, teacher answer keys follow.)

Rock Detectives
Rock Cycle
Figure 1





Name _____ Date _____

ROCK DETECTIVE Student Handout 1 Lab Sheet

WONDER WHY...

Why do rocks look different from each other?

CONCEPT

Rocks are a natural, solid, nonliving material made of one or more minerals. Using a dichotomous key, rocks can be identified by **physical properties** such as color, luster, texture, feel or grain size.

MATERIALS FOR ACTIVITY

- 1 collection of 10 rocks per group
- 2 magnifying lens per group
- 1 Rock Identification Sheet per student
- 1 Rock Identification Dichotomous Key per student

SAFETY

- Keep rocks on the table or desktop.
- Do not put rocks in mouth.
- Wash hands after handling rocks.

PROCEDURE

1. Place the rock samples out on the table.
2. Select one rock from the rock samples.
3. Read carefully through the Rock Identification Dichotomous Key to classify and name the rock.
4. Record the rock number on the Rock Identification Sheet in the blank next to the correct name of the rock.
5. Record the physical properties of the rock.
6. Repeat steps 2-5 until all rock samples have been classified.
7. Share your results with the class.



Student Handout 2 Rock Identification Dichotomous Key

1. What is the overall color of the rock?
 - a. Rock is black in colorGo to step 2
 - b. Rock is not blackGo to step 3

2. Is the rock glassy or not?
 - a. Rock is smooth and glassyObsidian (Igneous)
 - b. Rock is not glassyGo to step 4

3. Inspect the rock carefully **without** the hand lens. Are there large holes or pores?
 - a. Rock has visible holes or poresGo to step 5
 - b. Rock has small or unseen poresGo to step 6

4. Does the rock show layering or is it more blocky?
 - a. Rock is layeredShale (Sedimentary)
 - b. Rock is not layered it is more blockyCoal (Sedimentary)

5. What is the overall color of the rock?
 - a. Rock is grey or light greyPumice (Igneous)
 - b. Rock is reddish-brown or dark brownScoria (Igneous)

6. Look closely at the rock **with** a hand lens. Does the surface sparkle or have crystals?
 - a. Rock sparkles or appears crystallineGo to step 7
 - b. Rock is dull and doesn't sparkleGo to step 8

7. Look carefully at the rock. Is the rock multicolored or not?
 - a. Rock color is multicolored or speckledGo to step 9
 - b. Rock color is the same throughoutMarble (Metamorphic)

8. Look closely at the rock **with** a hand lens. Are the grains large or small?
 - a. Rock grains are pebble size and/or mixed sizes Conglomerate (Sedimentary).
 - b. Rock grains are mostly sand sizeSandstone (Sedimentary)

9. Does the rock show layering of grains?
 - a. Rock grains are in layersGneiss (Metamorphic)
 - b. Rock grains are scattered with crystalsGranite (Igneous)



**Rock Detectives
Rock Identification Chart
Student Handout 3
Teacher Key**

IGNEOUS	<p>Color: Black Luster: Glassy Feel/Texture: Glassy, smooth Grain Size: Cannot see grains</p> <p>OBSIDIAN # 6</p>	<p>Color: Light colored Luster: Dull Feel/Texture: Many holes or pores Grain Size: Fine grained</p> <p>Pumice 7</p>
	<p>Color: Reddish Brown – Dark Brown Luster: Dull Feel/Texture: Many holes of pores Grain Size: Fine grained</p> <p>SCORIA # 9</p>	<p>Color: Variable Luster: Crystalline Feel/Texture: Crystals visible Grain Size: Coarse</p> <p>Granite# 4</p>
SEDIMENTARY	<p>Color: Grey – Dark grey – black Luster: Dull Feel/Texture: Thin layers visible Grain size: Fine to very fine grained</p> <p>SHALE # 10</p>	<p>Color: Variable Luster: Crystalline Feel/Texture: Crystals visible Grain Size: Coarse</p> <p>SANDSTONE # 8</p>
	<p>Color: Black – Dark grey Luster: Dull – Shiny Feel/Texture: Blocky Grain Size: Fine grained</p> <p>COAL # 1</p>	<p>Color: Variable Luster: Dull Feel/Texture: Grainy – rough Grain size: Larger than sand size grains</p> <p>CONGLOMERATE # 2</p>
METAMORPHIC	<p>Color: Variable Luster: Crystalline – sparkles Feel/Texture: Rough Grain size: Fine grained</p> <p>MARBLE # 5</p>	<p>Color: Variable Luster: Crystalline – sparkles Feel/Texture: Layers of crystals or color Grain size: Fine to coarse</p> <p>GNEISS # 3</p>



Name _____ Date _____ **ROCK DETECTIVE**

**CONCLUSION
STUDENT HANDOUT 4
Teacher Key**

1. What properties did you use to classify your rocks?

Possible answer: Physical properties such as luster, color, grain size and composition.

2. Do all rocks of a specific rock type have the same properties?

Possible answer: No, for example, sedimentary rocks can vary in color, texture, and grain size.

3. In what type of rock do you think crude oil and natural gas are most likely to be found? Why?

Possible answer: Sedimentary rocks -- because of the three rock types they are the most likely to contain pores and connected pores where oil and natural gas can be trapped and stored.