

3.C.4 Minerals: Observe and Identify

A hands-on introduction to the properties of minerals

Grade Level	3
Sessions	(1): 1 at 40-60 minutes
Seasonality	None
Instructional Mode(s)	Whole Class, Small Groups
Team Size	2-4 students
WPS Benchmarks	03.SC.TE.01, 03.SC.TE.04, 03.SC.IS.01, 03.SC.IS.02, 03.SC.IS.03, 03.SC.IS.06, 03.SC.ES.01, 03.SC.ES.03
MA Frameworks	3-5.TE.1.1, 3-5.TE.2.2, 3-5.ES.0.1, 3-5.ES.0.2
Key Words	Cleavage, Color, Hardness, Luster, Mineral, Property, Rock, Streak

Summary

This lesson provides students with the opportunity to observe various properties of minerals and to record their observations in a notebook.

Learning Objectives

2002 Worcester Public Schools (WPS) Benchmarks for Grade 3

1. 03.SC.TE.01 Identify materials used to accomplish a design task based on a specific property, e.g., weight, strength, hardness, and flexibility.
2. 03.SC.TE.04 Describe different ways in which a problem can be represented, e.g., sketches, diagrams, graphic organizers, and lists.
3. 03.SC.IS.01 Ask questions and make predictions that can be tested.
4. 03.SC.IS.02 Select and use appropriate tools and technology (e.g., calculators, computers, balances, scales, meter sticks, graduated cylinders) in order to extend observations.
5. 03.SC.IS.03 Keep accurate records while conducting simple investigations or experiments.
6. 03.SC.IS.06 Record data and communicate findings to others using graphs, charts, maps, models, oral and written reports.
7. 03.SC.ES.01 Give a simple explanation of what a mineral is and some examples (i.e., quartz, mica).

8. 03.SC.ES.03 Identify the physical properties of minerals (hardness, color, luster, cleavage, and streak), and explain how minerals can be tested for these different physical properties

2001 Massachusetts Frameworks for Grade 3

1. 3-5.TE.1.1 Identify materials used to accomplish a design task based on a specific property, e.g., weight, strength, hardness, and flexibility.
2. 3-5.TE.2.2 Describe different ways in which a problem can be represented, e.g., sketches, diagram, graphic organizers, and lists.
3. 3-5.ES.1 Give a simple explanation of what a mineral is and some examples, e.g., quartz, mica.
4. 3-5.ES.2 Identify the physical properties of minerals (hardness, color, luster, cleavage, and streak), and explain how minerals can be tested for these different physical properties.

Additional Learning Objectives

1. Students will improve writing and organizational skills by keeping a journal.

Required Background Knowledge

None

Essential Questions

1. What is a mineral?
2. What are some properties of minerals?
3. What are some tests geologists use to identify minerals?

Introduction / Motivation

Explain to students that they will be learning about the “properties” of minerals and will make their own “Rock Discovery” notebooks. Ask students what they already know about rocks and minerals. As a class, discuss the differences between a rock and a mineral (see Vocabulary with Definitions).

Procedure

The instructor will:

1. Provide students with an observation notebook (See Appendix A: Instructor's Notes)
2. Ask them to write their names on the front of their "notebooks" (worksheet) and to start a table of contents on the inside of the first page of the worksheet.
3. Define "mineral" in a visible location and explain the different properties used to identify minerals: luster, hardness, cleavage, and streak (see Vocabulary with Definitions and Appendix A: Identifying Minerals).
4. Allow students to examine various examples of minerals.
5. Lead students through the attached worksheet.

Materials List

Materials per Class	Amount	Location
Rock Collection	One	Science store, internet
Streak Stone	One per group	Science store, internet

Materials per Student	Amount	Location
<u>Rock and Mineral Journal:</u> <u>Minerals Worksheet</u>	-One copy of instructions -One copy of cover page -One single-sided copy of observation sheet -Two double-sided copies of observation sheet	End of lesson plan – print or photocopy
Blank Sheet of Paper	One	Classroom
Magnifying Glass	One	Classroom

Vocabulary with Definitions

1. *Cleavage* – The pattern that results when a mineral is broken.

2. *Hardness* – The ability of a mineral to scratch another material or to be scratched by another material.
3. *Luster* – The way light reflects off the surface of a mineral (dull, waxy, greasy, oily, pearly, silky, glassy, resinous, metallic).
4. *Mineral* – A naturally occurring inorganic substance that has specific characteristics (coal, calcite, diamond, quartz, gold, carbon, salt).
5. *Rock* – A lump or mass of hard consolidated mineral matter (e.g. granite, limestone, slate).
6. *Streak* – The color of a mineral’s powder; tested by scratching the mineral across a streak plate.
7. *Streak Plate*: A porcelain plate used to test the streak of a mineral.

Assessment / Evaluation of Students

The instructor may assess the students in any/all of the following manners:

1. Observe student groups at work.
2. Collect student worksheets/journal to determine: (a) whether or not students understand the different “properties” used to identify minerals, and (b) the correct way to make accurate observations.
3. Ask students to explain how they used each “test” while observing their minerals.

Lesson Extensions

1. As a class, ask students to graph the various properties of minerals and to note observed trends.

Attachments

1. [Rock and Mineral Journal: Minerals](#)
2. [Appendix A: Instructor’s Notes](#)
3. [Appendix B: Identifying Minerals](#)

Troubleshooting Tips

None

Safety Issues

1. A test for “cleavage” was intentionally left out of this lesson because it is not safe to conduct such a test in the classroom. The instructor may discuss this important test orally.

Additional Resources

1. Good background on the differences between rocks and minerals.
<http://www.rocks-and-minerals.com/> (accessed 5 January 2006).

Name _____

Date _____

Rock and Mineral Journal: Minerals

Part 1:

1. Write your name on the cover of the notebook and then open to the first page.
2. At the top of the first page write "Table of Contents".
3. On the next page, write the number "2" in the top right corner.
4. Wait for your teacher's instructions before moving to the next part.

Part 2:

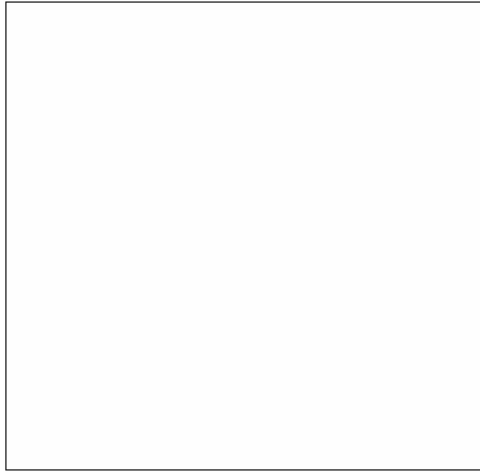
1. Once you receive your mineral, **observe** it carefully and try to find some of the properties that your teacher described.
2. Write the name of your mineral, draw a picture of it, and write a few sentences about some of its properties in your journal.
3. On each page, mark the page number in the top right corner.
4. After you finish making your observations, write the name of each mineral that you observed in the "Table of Contents".
5. Write the page number in the "Table of Contents" so that your teacher can find information about that mineral in your notebook.

My Mineral Journal

Name: _____

Name of Mineral: _____

Picture:



Description: _____

1. If you scratch the mineral with your fingernail, do pieces of it fall on your desk? If not, what material might be able to take pieces of the rock off?

2. What color is the mineral?

3. How well does the mineral reflect light? Would you say its dull, shiny or glassy?

4. If you hit this mineral with a hammer, how do you think it would break? Would the broken surface of the rock look smooth or rough?

5. What color powder did the mineral produce on the streak plate?

Appendix A: Instructors Notes

The teacher may assemble the notebooks or have students assemble them.

Assembling Notebooks:

1. Fold each page of the notebook in half.
2. Place the cover page of your notebook face down on a flat surface.
3. Place the blank side of the single-sided copy of the observation page on top of the cover page.
4. Place the remaining double-sided observation pages on top of the single-sided copy.
5. Place two to three staples at the center of notebook.

Appendix B: Identifying Minerals

Taken directly from: <http://library.thinkquest.org/3639/Identification.html> on 5 January 2006.

Cleavage

“Cleavage is the way that a mineral breaks along well defined planes of weakness. The planes are between layers of atoms or other places where the atomic bonding is the weakest. Most cleavage surfaces are not always perfectly smooth like crystal faces, although they are very consistent and reflect light evenly. Cleavage is described as perfect, distinct, indistinct, or none.

Color

“The color of a mineral is a useful identification feature. Although it helps to identify minerals, color identification can trick you. Many minerals, like quartz, occur in a lot of different colors, and many minerals are boring white or even colorless.

Fracture

“If you hit a mineral with a geological hammer, it breaks, leaving the surfaces rough and uneven. This is called fracture. Cleavage surfaces are usually flat and exactly the same. Fractures are not the same each time. Common fracture terms are uneven, shell-like, jagged, and splintery.

Hardness

“Hardness is also a way to identify a mineral or rock. Hardness is the measurement of how resistant the mineral is to being scratched. On the Mohs’ scale, the softest mineral is talc to the hardest mineral, diamond. The chart was created by Friedrich Mohs. Minerals with higher numbers will scratch those with lower numbers. You can also

scratch minerals with household objects. For example: any mineral scratched by a coin has a hardness less than $3\frac{1}{2}$.

Mohs' Scale of Hardness

1	Talc
2	Gypsum
3	Calcite
4	Fluorite
5	Apatite
6	Orthoclase
7	Quartz
8	Topaz
9	Corundum
10	Diamond

Specific Gravity (S.G.)

“Comparing the weight of a mineral with the weight of an equal volume of water gives a mineral's specific gravity. This is shown in numbers. An S.G. of $2\frac{1}{2}$ shows a mineral weighs $2\frac{1}{2}$ times as much as water.

Transparency

“Transparency refers to the way light passes through a mineral sample. It varies, depending on the way the mineral atoms are bonded together. Mineral samples that you can see through are transparent. If you can not see through it, the mineral sample is translucent. When no light can pass through the mineral, even when it is cut very thin, it is opaque.

Streak

“The color of a mineral's powder is called streak. You can see the streak of a mineral by rubbing the rock across the surface of an unglazed porcelain tile. If the mineral is very hard, crush a small amount of it off with a geological hammer, or rub it against a hard surface. Streak is more reliable in identification than the color of the mineral because it is more consistent.

Luster

“Luster defines the way light is reflected off a mineral's exterior. The kind and intensity of luster vary according to the nature of the mineral surface and the amount of light exorbed. Well-recognized words used to describe luster are dull, metallic, pearly, glassy, greasy, and silky.”