



Science Unit: *Geology and Plate Tectonics*

Lesson 1: *Describing Rocks and Minerals*

School Year: 2011/2012
Developed for: Laura Secord Elementary School, Vancouver School District
Developed by: Linda (Hanson) Herbert (scientist); Lesley Chambers and Phil Green (teachers)
Grade level: Presented to grade 6/7; appropriate for grades 3 – 7 with age appropriate modifications
Duration of lesson: 1 hour and 20 minutes
Notes: Reasonably priced rock kits can be purchased from Fisher Scientific. These 50 piece kits contain numbered samples of a variety of minerals, rocks of all three types, ores of common metals and samples for conducting hardness tests.
Item: Classroom collection, catalogue # S84011
If streak plates are unavailable you can use the unglazed back of a regular porcelain tile. Many hardware stores will give you their broken tiles for free, just ask. The surface used for the streak tests should be white or light in color.

Objectives

1. Learn the difference between rocks and minerals.
2. Observe a variety of rock and mineral samples.
3. Practice making and recording scientific observations.

Background Information

All rocks are made of minerals. Minerals are homogeneous materials that occur naturally in the earth's crust. Some rocks are pieces of a single type of mineral while others are composed of multiple minerals. The minerals found in a particular rock sample will often allow it to be identified. Geologists use specific physical properties to help them identify the minerals found in rocks. Some of the more common properties include colour, streak, luster, hardness, crystal structure, cleavage, magnetism, transparency and specific gravity. The properties we will be examining in this lesson are defined below.

Vocabulary

Minerals: Pure, naturally occurring inorganic elements or chemical compounds. Have a well-defined chemical composition. The "building blocks" of rocks.
Rocks: Made up of one or more minerals.
Luster: Describes the shine of a rock/mineral sample.
Streak: The mark left behind when a rock or mineral is rubbed across a rough surface like a streak plate.
Cleavage: The way in which certain minerals fracture along distinct planes. This results from the chemical structure of the mineral's crystals.
Magnetism: A characteristic that describes if a mineral is attracted to other magnetic substances (such as a magnet).
Geologist: A scientist who studies rocks and minerals.



SCIENTIST IN RESIDENCE PROGRAM

Materials

- Rock kits (1 per group)
- magnifying glasses (if available)
- magnets (1 per group)
- handouts of the Mohs hardness scale (1 per group)
- streak plates (minimum of one per group) or unglazed porcelain tiles with white backs
- paper clips (or nails) and copper pennies (pre 1982) for hardness tests if desired

In the Classroom

Introductory Discussion

1. Hold up a large rock sample such as granite – ask students “what is this?” and wait for the answer, a rock. Hold up a very different looking rock sample (such as obsidian) and again ask “what is this?” Ask the students why they think rocks come in so many different types. Record discussion ideas on the board and/or have students record in their science notebooks.
 - Questions to help guide the discussion as it evolves: How do rocks differ from one another? What is a mineral? What is a rock? What are some properties that we can use to describe and classify rocks? Record student ideas on the board. Describe the various properties as they are mentioned and introduce related vocabulary words (mineral, rock, luster, crystal, cleavage etc.).
 - Ask: What properties do geologists use to describe and classify rocks?
 - Color, streak, luster, hardness, crystal structure (and size). Cleavage, magnetism, reaction with specific chemicals (record ideas on board).
 - Discuss the usefulness and limitations of the various properties and how we can observe/test each of the properties.
 - For example: why is color not always a reliable property? Use quartz as an example to demonstrate that the color of some minerals can vary dramatically. This is most common in translucent minerals such as quartz where trace substances can greatly influence color.
 - How can we test hardness? Introduce the Mohs hardness scale.
 - Handout worksheets and Mohs hardness scales and go over activity instructions.
2. Short description of other items to discuss or review.
 - Discuss how scientific pictures can differ from regular pictures in both appearance and purpose. Scientific pictures/observations need to be detailed, clear and be precise.
 - Instruct students that they should observe both rock and mineral samples. If necessary reiterate how rocks and minerals differ to help them with this process. If you have rock kits with numbered samples you can assign specific samples to observe or a specific range of samples they must select from.
3. Briefly describe science experiment/activity.
 - Students will work individually to observe and record their observations of several rock/mineral specimens of their choice.
4. Briefly describe the processes of science that the students will focus on: Students will focus on making and recording observations.
5. Briefly describe safety guidelines.



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- Do not touch your face or mouth while handling the rock specimens. Wash your hands with soap at the conclusion of the experiment and especially before eating. Some rock samples are high in lead or other potentially toxic metals so washing hands at the conclusion of the experiment is important.
- Be careful when performing scratch or streak tests. If students are using pieces of tile as streak plates remind them to be careful of the broken edges as they may be sharp.

Science Activity

Activity Title: Describing Rocks and Minerals

Purpose of Activity: To describe a variety of rocks and minerals focusing on properties that differ between samples and could be used for identification.

Methods and Instructions:

Set-up prior to experiment: Rock and mineral kits can be purchased from Fisher Scientific or another educational supplier.

Brief description of how students will work in groups or pairs: Students will work in groups of 4-6 (depending on class size and the number of rock kits available). Students will record their observations individually on worksheets.

1. Go through the worksheet as a class and give the students a chance to brainstorm and complete each section as appropriate.
2. See detailed instructions on attached worksheet.
3. Demonstrate how to do a streak test prior to starting the *Streak Test* section. You should do a few examples to demonstrate why streak tests are a useful tool. For example, ask the class to predict the color of streak made by the pyrite sample (the sample is gold but the streak is grey). Discuss how prospectors used streak tests to determine if they had found gold (gold streak) or fools gold (grey streak). Have the class predict the streak color of rose quartz, obsidian or serpentine (all are colored but produce a colorless/white streak).
4. Prior to starting the *Geological Observation* section have students set up their Mohs hardness scale using the handout provided. Each group will set up one scale. Demonstrate how to use a systematic approach to test the hardness of a sample using the scale.
 - Have the students select the limestone sample (#29)
 - Point out that a nail has a hardness of 5 on the Mohs scale.
 - Have the students try to scratch the limestone using the nail/paperclip. It will scratch the rock. Ask the students if this means that the rock is harder or softer than the nail (softer). Have them conclude that the hardness of limestone is less than 5.
 - Next have them try to scratch the limestone with fluorite (hardness of 4 on the Mohs scale).
 - Continue in a systematic fashion until they reach a sample that does not scratch limestone (likely calcite). Have the students conclude that that the hardness of limestone is between 3-4. You can have them record it as 3-4 or 3.5 to simplify matters.
 - Repeat the demonstration using a rock sample that has a hardness greater than 5 (Eg. agate, sample #47 with a hardness of ~7)
5. The rock kits used for this lesson were purchased from Fisher Scientific (# S84011; ~\$45 each).



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Closure Discussion

1. Discuss the results of the streak tests. Was the streak color always what you expected? Were there any surprises?
2. Discuss the hardness tests. How would you figure out the hardness of your fingernail?
3. Why do you think there are so many different types of rocks and minerals? Why aren't they all the same? What types of observations did you record? What was your most interesting observation?

References

1. Zim, Herbert and Paul Shaffer. 1957. Rocks and Minerals: A Guide to Familiar Minerals, Gems, Ores and Rocks. Golden Press.
2. Chapman, Anita, David Barnum, Carmen Dawkins and William Shaw. 2005. BC Science Probe 7. Nelson.
3. <<http://www.rocksandminerals4u.com/index.html>> Rocksandminerals4u. [website with extensive rock and mineral information, lesson plans, photo galleries and fun activities such as crossword puzzles.] Accessed January 10, 2012.

Extension of Lesson Plan

1. Each student should go home and find a rock sample to bring in for lesson 2 on rock families.



Scientist: _____

Date: _____

DESCRIBING ROCKS AND MINERALS

What words can we use to describe different types of lustre?

Streak Tests

Pick three samples to streak test.

Sample #	Sample colour	Streak colour

Explain your observations; is the streak colour always the same as the sample colour? _____

Testing for Hardness

Set up your Mohs Hardness Scale using the handout provided. The scientist will demonstrate how to use the scale to test the hardness of your samples.

Geological Observation: Pick two samples to observe in detail. Remember to make your scientific drawing clear and accurate.

Record the sample's identification number: _____

What colour or colours is it? _____

What does it look like: Does it have layers? Visible crystals? What kind of lustre does it have? Does it have a pattern?

What colour is its streak? _____

Use the hardness scale to test how hard it is and record the hardness number: _____

What other interesting properties can you observe?

Draw a detailed picture of your sample in the box below.



Record the sample's identification number: _____

What colour or colours is it? _____

What does it look like: Does it have layers? Visible crystals? What kind of lustre does it have? Does it have a pattern?

What colour is its streak? _____

Use the hardness scale to test how hard it is and record the hardness number: _____

What other interesting properties can you observe?

Draw a detailed picture of your sample in the box below.

