

# **Grade 4**

## **Unit 4**

# **Rocks and Minerals**

## **Competency Goal 2**

**Writers:**

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**Unit Title/Unit number: Rocks and Minerals/ Unit 2**

**III. Time frame for Unit: 4-5 Weeks**

**IV. Major Goal**

NCSOS Competency Goal 2: The learner will conduct investigations and use appropriate technology to build an understanding of the composition and uses of rocks and minerals.

**V. Objectives in RBT Tag Chart**

Unit Title: Rocks and Minerals		Number of Weeks:
Number	Competency or Objective	Number
2.01	Describe and evaluate the properties of several minerals.	B5
2.02	Recognize that minerals have a definite chemical composition and structure, resulting in specific physical properties including: hardness, streak color, luster, and magnetism.	A2
2.03	Explain how rocks are composed of minerals.	B2
2.04	Show that different rocks have different properties.	B3
2.05	Discuss and communicate the uses of rocks and minerals.	B2
2.06	Classify rocks and rock-forming minerals using student made rules.	B2
2.07	Identify and discuss different rocks and minerals in North Carolina including their role in geologic formations and distinguishing geologic regions.	A2

**VI. NC English Language Proficiency (ELP) Standard 4 (2008)- for Limited English Proficient students (LEP)**

English language learners communicate information, ideas, and concepts necessary for academic success in the content area of SCIENCE.

Suggestions for modified instruction and scaffolding for LEP students and/or students who need additional support are embedded in the unit plan and/or are added at the end of the corresponding section of the lessons. These suggestions are presented in a text box. The amount of scaffolding needed will depend on the level of English proficiency of each LEP student. Therefore, entering, beginning, and developing level students will need more support with the language needed to understand and demonstrate the acquisition of concepts than expanding or bridging level students.

## VII. Materials

<p>Lesson 1</p>	<p>(Per group of 4-5 students)</p> <ul style="list-style-type: none"> <li>rock and mineral samples that are numbered (enough of each kind so that every student group gets the same samples), and hand lenses for each student</li> </ul> <p>*a great introductory rock collection is available for \$15.00 from Sargent Welch. It includes 15 rocks (5 igneous, 5 metamorphic, and 5 sedimentary)</p> <p><a href="http://sargentwelch.com/sargent-welch-introductory-rock-collection/p/IG0041250/">http://sargentwelch.com/sargent-welch-introductory-rock-collection/p/IG0041250/</a></p>
<p>Lesson 2</p>	<p>Per Student:</p> <p>Science Notebook          2 Chocolate Chip Cookies (store bought – crunchy)          Toothpick          2 Paper towels          Rock (preferably granite – available through science suppliers or at businesses that carry landscape materials)</p>
<p>Lesson 3</p>	<p>Per Student:</p> <p>Student Notebook          Hand lens          Toothpick          1 piece of plain white paper          Small amount of crushed granite</p> <p>Per Group</p> <p>Quartz, feldspar, mica (1 piece of each sample per group)</p>

Lesson 4	<p>Per Group:  Collection of Rocks – can be the same one used in lesson 1  Rock Guide Books  6 rock samples not yet used by the students</p> <p>Per Student:  Hand lens</p>
Lesson 5	<p>Per Student:  Science notebook  Hand lens  <i>Mineral Identification Data Chart</i>  <i>Mohs Hardness Scale With Examples of Common Tests</i>  Small piece of chalk  1 piece of Feldspar (labeled a. but not named)  1 piece of Talc (labeled b. but not named)</p> <p>Per Group:  Set of four minerals, numbered but not named: (1) Fluorite, (2) Gypsum, (3) Calcite, (4) Quartz  Penny, unbent paper clip, empty glass baby food jar  Copy of Mohs Hardness Scale</p> <p>Per Class:  Several sample minerals of the teacher's choosing</p>
Lesson 6	<p>Per Pair of Students</p> <ul style="list-style-type: none"> <li>• Magnetite</li> <li>• Magnet</li> <li>• Streak plates (small unglazed</li> </ul>

	porcelain plate) <ul style="list-style-type: none"> <li>• 1 piece of pyrite</li> <li>• 1 piece of hematite</li> <li>• Several sample minerals that are colorful</li> </ul>
Lesson 7	Rock and mineral samples from North Carolina NC Department of Transportation maps <i>Key to Rock and Mineral Specimens</i> <i>Rock and Mineral Identification Cards</i> Yarn <i>Rock and Mineral Matching Game</i> <i>2.07Objective Assessment</i>

### VIII. Big Ideas

In North Carolina fourth grade students are required to investigate the composition and uses of rocks and minerals.

The goal of this standard is to think and analyze in terms of systems. Thinking and analyzing in terms of systems will help students keep track of mass, energy, objects, organisms, and events referred to in the other content standards.

In these years, students should accumulate more information about the physical environment, becoming familiar with the details of geological features, observing and mapping locations of hills, valleys, rivers, etc., but without elaborate classification. Students should also become adept at using magnifiers to inspect a variety of rocks and soils. The point is not to classify rigorously but to notice the variety of components.

By the end of the 4th grade, students should know that

- Waves, wind, water, and ice shape and reshape the earth's land surface by eroding rock and soil in some areas and depositing them in other areas, sometimes in seasonal layers.
- Rock is composed of different combinations of minerals. Smaller rocks come from the breakage and weathering of bedrock and larger rocks. Soil is made partly from weathered rock, partly from plant remains-and also contains many living organisms.
- Materials may be composed of parts that are too small to be seen without magnification.
- When a new material is made by combining two or more materials, it has properties that are different from the original materials. For that reason, a lot of different materials can be made from a small number of basic kinds of materials.

These Benchmarks were found under “The Physical Setting” for Science Benchmarks 2061

[www.project2061.org/publications/bsl/online/bolintro.htm](http://www.project2061.org/publications/bsl/online/bolintro.htm)

The National Science Standards divides science into three standards: life science, physical science, and earth and space science. When learning about rocks and minerals students utilize the physical science standards: properties of objects and materials and magnetism as well as the earth and space science standards: properties of earth materials and changes in the earth and sky.

## **IX. Unit Notes**

The study of rocks and minerals in fourth grade builds on the knowledge that the students gained in first grade as they began to develop an understanding of solid earth materials. In order for the students to achieve a true understanding of rocks and minerals they must experience the rocks and minerals by physically using them in their study. Putting together a classroom collection can be done economically, and can be utilized for many years. In this unit many of the rocks and minerals suggested can be substituted for others to which you might have greater access. What the students learn in fourth grade lays the groundwork for their study of landforms in fifth grade.

## X. Global Content

<b>NC SCS Grade 4</b>	<b>21<sup>st</sup> Century Skills</b>	<b>Activity</b>
<b>Communication Skills</b>		
2.02, 2.03, 2.06	Conveying thought or opinions effectively	1, 2, 6
2.05, 2.06, 2.07	When presenting information, distinguishing between relevant and irrelevant information	1, 7
2.06, 2.05	Explaining a concept to others	1, 4
	Interviewing others or being interviewed	
<b>Computer Knowledge</b>		
	Using word-processing and database programs	
2.03, 2.04	Developing visual aides for presentations	2, 3
2.03	Using a computer for communication	2
	Learning new software programs	
<b>Employability Skills</b>		
	Assuming responsibility for own learning	
	Persisting until job is completed	
2.01, 2.02, 2.03, 2.04, 2.05	Working independently	2,3,4,5
	Developing career interest/goals	
	Responding to criticism or questions	
<b>Information-retrieval Skills</b>		
2.01, 2.02, 2.04, 2.05, 2.07	Searching for information via the computer	3,5,7
2.04, 2.05, 2.07	Searching for print information	3,4,7
	Searching for information using community members	
<b>Language Skills - Reading</b>		
	Following written directions	
	Identifying cause and effect relationships	
	Summarizing main points after reading	

2.04, 2.05, 2.07	Locating and choosing appropriate reference materials	3, 7
	Reading for personal learning	
<b>Language Skill - Writing</b>		
2.01, 2.02	Using language accurately	5
2.01, 2.02, 2.03	Organizing and relating ideas when writing	2,5
	Proofing and Editing	
2.06	Synthesizing information from several sources	1
	Documenting sources	
	Developing an outline	
2.03, 2.06	Writing to persuade or justify a position	1, 2
	Creating memos, letters, other forms of correspondence	
<b>Teamwork</b>		
2.06	Taking initiative	1
2.01, 2.02, 2.03, 2.04, 2.05, 2.06, 2.07	Working on a team	1,2,3,4,5,6,7
<b>Thinking/Problem-Solving Skills</b>		
	Identifying key problems or questions	
2.03	Evaluating results	2
	Developing strategies to address problems	
	Developing an action plan or timeline	

## **XI. Vocabulary**

**Crystals** – found in minerals and have a regular geometric shape

**Geologists** – scientist who study rocks and minerals to help us learn about the formation of the earth

**Granite** – rock composed of the minerals: Quartz, Mica, and Feldspar

**Hardness** - how resistant a mineral is to being scratched



**Igneous rocks** - formed from minerals that have melted deep within the Earth

**Luster** - the way a mineral reflects light

**Magnetic minerals** – minerals which show magnetic properties. Two examples are magnetite and hematite

**Metamorphic rocks** - formed from igneous, sedimentary, or other metamorphic rocks which contain minerals that have been changed by heat, pressure, or chemical action

**Mineral** - occur in nature and have definite chemical compositions and physical properties. They are the raw materials of rocks.

**Mohs scale** – used by geologists to classify a given mineral's hardness

**Rock** - earth materials made up of different kinds of minerals

**Scratch test** – used to determine the hardness of a mineral

**Sedimentary rocks** - formed as particles settle to the bottom of oceans and lakes

**Streak color** - when an unknown mineral is rubbed against a streak plate (unglazed piece of porcelain) it may produce a colored line if it is softer than the streak plate

**Streak plate** - unglazed porcelain material that is used to determine the streak color of a mineral by rubbing a mineral over its surface

**LEP Modification:** During the unit provide LEP students with additional support when introducing new vocabulary. Use visuals and/or a physical action to correspond with each term. Keep new terms visible on a word wall and/or have LEP students make a mini picture dictionary to reinforce and support vocabulary throughout the unit study.

## **Activities/Lessons**

**Lesson 1: How Can Rocks and Minerals Be Put into Groups?**

**Lesson 2: That's the Way the Cookie Crumbles!**

**Lesson 3: Can We Take a Rock Apart?**

**Lesson 4: Grouping Rocks**

**Lesson 5: How Hard is That Mineral?**

**Lesson 6: What's in a Streak? And, Can a Mineral Attract a Magnet?**

**Lesson 7: Are They From North Carolina?**

**Unit Title: Rocks and Minerals**

**Lesson 1: How Can Rocks and Minerals Be Put into Groups?**

**Length of Lesson: 4 class periods**

**Objective Included:**

**2.06** Classify rocks and rock-forming minerals using student-made rules.

**Language (ELP) Objectives:** LEP students will

- Listen and respond to oral presentations about rocks and minerals
- Discuss and explain method for sorting rocks and minerals in small groups
- Write or draw a reflection to defend reasoning for grouping rocks and minerals

**Lesson Introduction:**

**Rocks** are earth materials made up of minerals. **Minerals** occur in nature and have definite chemical compositions and physical properties. They are the raw materials of rocks. **Geologists** study rocks and minerals to help us learn about the formation of the earth. Geologists classify rocks according to their properties or characteristics that can be observed and also by how they are formed. Minerals are classified by using observable properties such as color, hardness, luster, cleavage, and streak. 4<sup>th</sup> grade students usually do not know how scientists put rocks and minerals into groups. In this lesson the students try to make their own set of rules for sorting their rock and mineral samples.

**Materials:**

(per group of 4-5 students)

- rock and mineral samples that are numbered (enough of each kind so that every student group gets the same samples), and hand lenses for each student

\*a great introductory rock collection is available for \$15.00 from Sargent Welch. It includes 15 rocks (5 igneous, 5 metamorphic, and 5 sedimentary)

<http://sargentwelch.com/sargent-welch-introductory-rock-collection/p/IG0041250/>

### **Engage:**

Process Skills: Observe, Communication

Have many rocks and minerals on display in the classroom to elicit interest by the students. Ask the students to name some rocks and minerals that they have heard of. As they name different rocks and minerals make a list on chart paper of the things they name. Use one color marker to make this list. The students may name some things that are not rocks or minerals. That is alright. Add them to the list as well. At this point the students probably use the terms rocks and minerals but don't really know what they are. Explain to the students that they are beginning a unit about rocks and minerals and they will learn many new things. Tell them that throughout the unit when a rock or mineral is named you (or a student) will check it off of the list the class has made. Also explain that when a rock or mineral is discussed in class that is not on the list it will be added to the list with a different color marker.

At the end of the unit the list will be studied and if there are items listed on it that have not been checked they will be researched to see if they really are a rock or mineral. Ask the students if they know how rocks and minerals are put into groups. It is okay that at this point many of them will not know the difference between a rock and a mineral. This discussion and list making will probably last a class period.

**LEP Modification:** Entering and beginning LEP students will not have the vocabulary to participate expressively in this activity. However, they can benefit from the exposure to their peers' suggestions, especially if the terms suggested by students are accompanied with visual images (prepare a library of clip art or magazine clippings or sketch as you go).

### **Explore:**

Process Skills: Classify, Observe, Communicate

Explain to the class that today they will be **geologists** (scientists who study rocks and minerals to help us learn about the formation of the earth) and they will work with their student groups to

place the rock and mineral samples into groups. Tell the students that they will be able to decide on the way that the rocks and minerals will be put into groups. However, they must be able to explain to the class their reasoning for the groups that they form. Give each group of students samples of rocks that include **igneous**, **metamorphic**, and **sedimentary** rocks as well as several minerals of your choosing. Have the students examine each rock/mineral sample with a hand lens before making any grouping decisions. It is best to time this part of the activity. The amount of time that you choose should correspond to the number of samples you are using.

After the students have taken time to examine all of the samples allow them to begin grouping the samples. As the students work, circulate around the room and ask questions about their reasoning such as: What rule did you use to form this group? Do you think all of the groups are sorting the rocks and minerals this way? Make sure that they are including every sample in a group and not leaving any samples by themselves. Give the students 10-15 minutes for this part of the activity. When the time is up ask the students not to move their rock/mineral samples anymore. As the student groups hear other student groups explaining their reasoning they will often want to change what they have done. This can be avoided by having the *no hands on the table during discussion* rule.

**LEP Modification:** All LEP students can participate, even if non-verbally, in the observation and sorting of the samples. They may not be able to explain their reasoning for sorting, but you could offer some suggestions as to how they may have sorted based on the groups you see and allow entering LEP students to answer “yes” or “no.” Mixed ability groups and partnering Entering LEP students with someone who can provide additional support will be beneficial.

### **Explain:**

Process Skills: Communicate, Classify

Ask for groups to volunteer to share how they organized their rock/mineral samples. As they show their groupings to the class make sure that they explain the sorting rules that they used. Point out to the class when similarities occur from group to group and when differences occur.

**LEP Modification:** As other groups are sharing, if there are different sorting rules, you should *show* how they sorted (on overhead, in front of class, or call students over to the desk of that group) so that LEP students can make the connection between what they see and the language they hear.

When all of the student groups finish sharing ask the class why all of the groups did not use the same rules when sorting the rock/mineral samples. Discuss with the class whether or not it would be hard for scientists to study rocks/minerals if all of the scientists used different rules to organize them. Lead the class to the realization that by using common rules scientists are better able to study rocks and minerals. Explain that one way scientists could put the samples into different groups would be to separate them by rock or mineral. Introduce the definition of a **mineral** as something that occurs in nature and has a definite chemical composition and definite physical properties. Minerals are the raw materials of rocks. **Rocks** are made up of different kinds of minerals. Tell the students which of their samples (identify these by the numbers on them) are minerals.

**LEP Modification:** The definition of **mineral** will have to be scaffolded. Use visuals and examples to demonstrate “occurs in nature,” “chemical composition,” and “physical properties.”

### **Elaborate:**

Process Skills: Classify, Observe, Communicate, Infer

Ask the students to move their rocks and minerals into separate groups. Explain that even though they have divided their samples up into two groups they can go farther. Tell the students that they are going to focus on the rock group for awhile. Take up the mineral samples. Have the students try to place their rocks into different groups. Encourage them to use their hand lenses to observe the many physical properties of their rocks. Visit the different groups and ask them questions such as: How are these rocks alike? How are they different? How can you tell that these rocks are made of more than one material? Have the students start collecting information about their rocks in their science notebooks. As they begin to make connections about which rocks they think go together ask them to draw their rocks and record observable properties of the rocks in their

science notebooks. Make sure that they also record the number on the rock so that they can accurately identify the rock later. For homework ask the students to each bring in a rock the next day. Have some extra rocks available in the classroom for students who may have trouble bringing one from home.

**LEP Modification:** Allow entering and beginning level LEP students to point to and/or rephrase your questions so that they can respond “yes/no” or with either/or options. Model what you mean by “recording observable properties.” Entering and beginning LEP students can either draw or label them with a word bank provided.

### **Evaluate:**

Process Skills: Classify, Communicate

When the students bring in their rocks the next day have them label their rocks with their initials so they will not confuse them with rocks belonging to other students. In small groups have the students place the rocks into groups. Then as a class start placing some groups together based on the rules that the students have determined. When the class feels comfortable with the groups that they have made have them write in their science notebooks defending their choice of groups. For each group of rocks the students must explain their reasoning. Make sure that you check the science notebooks to assess the students’ ability to defend their reasoning for their groups of rocks and minerals.

**LEP Modification:** All LEP students can participate in the classification activity. Accept the following modifications from entering, beginning, and developing LEP students for science notebook evaluation:

- Entering: Labeled features of classification (word bank provided, teacher can prompt student with yes/no questions)
- Beginning: Written phrases or short sentences defending classification process. May be written in a list format.
- Developing: Written sentences related to classification process. A short description of process used.
- Expanding & Bridging: At these levels students have enough language skills to describe and defend their classification process, writing several sentences or a paragraph.

**Unit Title: Rocks and Minerals**  
**Lesson 2: That's the Way the Cookie Crumbles!**

**Length of Lesson: 3 class periods**

**Objective Included:**

**2.03** Explain how rocks are composed of minerals.

**Language (ELP) Objectives:** LEP students will

- Respond non-verbally and verbally with prompting and modeling to express ideas about connections between chocolate chip cookies and rock samples.
- Compose a simple sentence about the similarities and differences between a chocolate chip cookie and a rock sample with direct instruction and support materials (teacher modeling).

**Lesson Introduction:**

**Rocks** are earth materials made up of minerals that do not have specific chemical compositions. **Minerals** occur in nature and have definite chemical compositions and physical properties. They are the raw materials of rocks. In chocolate chip cookies the chocolate chips may not be evenly distributed in the cookies and the amount of chocolate chips in one cookie may vary from another cookie.

**Materials:**

Per Student:

Science Notebook

2 Chocolate Chip Cookies (store bought – crunchy)

Toothpick

2 Paper towels

Rock (preferably granite – available through science suppliers or at businesses that carry landscape materials)

Per Group:

Balance (this can be triple beam or a simple plastic school balance)



**Engage:**

Process Skills: Observe

Hold up a chocolate chip cookie and tell the students you are angry. Explain to them that you were given this cookie by \_\_\_\_\_, (your principal) but that \_\_\_\_\_ (another teacher) received one as well. Tell the class that you think that the cookie that the other teacher received had more chocolate chips in it. Ask the class if they think that all chocolate chip cookies have the same amount of chocolate chips in them. Most of the students will say no.

**LEP Modification:** Make demonstration more concrete by representing all parties. (Ex.: the teacher gave a cookie to two students and student 1 was angry because he thinks student 2's cookie has more chocolate chips.) The "actors" should use facial expressions, gestures, and pointing to help LEP students understand.

**Explore:**

Process Skills: Observe, Experiment, Measure, Use Numbers

Tell the class that today they are going to test chocolate chip cookies to see how they compare with other chocolate chip cookies. Explain to the students that they will be allowed to eat a cookie at the end of the lesson, but they will not eat the one they will be working with. Give each student a paper towel, cookie, and a toothpick. Make sure that they have a balance for their group. Ask the students to observe their cookie. Have the students count the number of chocolate chips they can see in their cookie and record that count in their science notebook. They will also need to draw their cookie.

**LEP Modification:** Emphasize with gestures and repetition that students should not eat the cookie they are working with. Model counting the visible chips in the cookie and drawing the cookie, especially if it is important that the number of visible chips be accurately represented in the drawing.

Ask the class to name some things that they will need to do in order to be able to compare their cookie to other cookies in the classroom beyond just counting the chips that they can see. Lead the class toward an understanding that the cookie will need to be broken apart. Chocolate chips will need to be extracted and counted. Ask the class

if all the chocolate chips will remain whole when the cookie is taken apart. If the chips are not whole is there another way that we can compare the cookies? Can we weigh the parts of the cookies? Have the class decide what data will need to be collected and how it can be arranged. (At the very least the students should come up with: 1. The number of chocolate chips in each cookie and 2. The chip's overall weight in each cookie should be recorded.) A great way for the students to see everyone's data would be for them to add it to a data chart on an overhead projector or a document camera.

Student	Total Number of Chocolate Chips	Weight of Chips

**LEP Modification:** Either pair entering and beginning LEP students with native speakers or circulate among them to model what to do with broken chocolate chips (how to count them) and to make sure that they only weigh the chips and not other cookie parts.

**Explain:**

Process Skills: Communicate, Interpret Data

When everyone has collected their chocolate chip data discuss what they found. The numbers will vary for several reasons. Have the students come up with different reasons. Several reasons could be: the chocolate chips broke as they were being excavated, some of the "cookie part" stuck to the chips as they were **excavated**, the chocolate chips might not have been evenly distributed when the dough was made. Ask the students to evaluate where their cookie stood based on the number of chocolate chips and the weight of the chips compared to the rest of the class. Address any misconceptions about why the data varied throughout the class. Discuss with the class the fact that in nature there are many mixtures of things and often the parts of a mixture are unevenly distributed.

**LEP Modification:** - Demonstrate the possible reasons as you discuss them.

- Make a continuum for the number of chips and another for the weight of the chips for students to plot their data.
- Give some examples (with visuals) of things in nature that are mixtures and unevenly distributed.

**Elaborate:**

Process Skills: Observe, Communicate

Give each student a rock. Providing a rock such as granite is preferable because the students will be able to see that it is made of different things. Explain that for homework the students will need to take home the rock, observe it very carefully, and write a paragraph making a connection between the rock and the chocolate chip cookie activity.

**LEP Modification:** Entering, beginning, and developing LEP students will not be able to write a paragraph. Try to take a few minutes to have a simple conversation with specific LEP students before they go home about the possible connections between the rock and the cookie. Record some of the key words from the conversation and ask them to write sentences using some of those words (beginning/developing) or draw a picture (entering) using lines or arrows to show connections. Use the following frames to help students write responses: the cookie and the rock are \_\_\_\_\_ because \_\_\_\_\_. Both are \_\_\_\_\_.

**Evaluate:**

Process Skills: Communicate,

The next day ask the students to get with a partner and share their paragraphs. Have the students decide if they think that their connections were correct or not. As the students are discussing this with their partners circulate through the room and listen to their reasoning. When the partner discussions have ended have the class discuss the connections between the cookies and the rock. Most of the students will have observed that the rock sample that they have appears to be made up of different “things” and should make the correlation that these “things” are minerals. Allow students that would like to make corrections to their paragraphs to do so. Take up the corrected paragraphs and check for accuracy.

**Unit Title: Rocks and Minerals**  
**Lesson 3: Can We Take a Rock Apart?**

**Length of Lesson: 5 class periods**

**Objective Included:**

**2.03** Explain how rocks are composed of minerals.

**Language (ELP) Objectives:** LEP students will]

- Hypothesize why rocks do not have equal amounts of minerals.
- Find facts and details from a text about the mineral composition of a rock and create a visual representation.

**Lesson Introduction:**

In this lesson students will put what they learned in *That's the Way the Cookie Crumbles* to use as they examine crushed granite. Just as they separated the parts of the chocolate cookie this time they will separate the parts of crushed gravel. **Granite** is composed of the minerals: Quartz, Mica, and Feldspar. These minerals occur in different proportions, thereby giving each granite sample its own color, texture and structural characteristics. In addition, hornblende, magnetite, hematite, pyrite, zircon, garnet, corundum and other minerals may be present in smaller amounts. When the students are given a sample of the crushed granite they will find many different types of "pieces" in it. In this lesson they will learn that the different "pieces" are in fact different minerals.

**Materials:**

Per Student:

Student Notebook

Hand lens

Toothpick

1 piece of plain white paper

Small amount of crushed granite (This can be made by purchasing crushed granite from a landscaping supply store. The crushed granite available will probably be in fairly large pieces. Place some of the samples in a thick sock and strike the granite with a hammer several times. This is best done outside on concrete.)

Per Group

Quartz, feldspar, mica (1 piece of each sample per group)

### **Engage:**

Process Skills: Observe

Hold up a piece of granite. Ask the students if they recognize the rock. If you were able to provide granite for the last activity the class will probably recognize it even if they do not know the name. Tell the students that you are holding the rock granite. Ask the students if they know what is in granite. Pose the questions: Can we study the parts of the granite like we studied the parts of the chocolate chip cookie? Remember that rocks are composed of minerals. I wonder how many different minerals are in the granite.

### **Explore:**

Process Skills: Observe, Experiment, Classify

Each student will need a piece of white paper, a hand lens and a toothpick. Ask the students if these tools are enough for their investigation. They will realize that they need more than what they have if they are going to take apart a piece of granite. Explain that they are not going to have to take apart the granite, but they are going to have to sort the minerals that make up the granite. Give each student a small sample of the crushed granite. A fingertip pinch is enough. Allow the students ample time to sort the minerals from their granite sample. They will need to use their hand lens in order to see the particles well.

The students will start to find and place together pieces that are all white, pieces that are all pink, and pieces that are shiny black or gray. Encourage them to count the number of pieces that they have in each category and record their findings in their science notebook.

### **Explain:**

Process Skills: Observe, Communicate

Ask the students if they know what they found when they examined the parts that make up granite. They will know that they have found minerals, but they will not know what kind. Place the mineral samples of quartz, feldspar, and mica at each group. Tell the students that these minerals make up granite. Ask the class if the samples look similar to the pieces that they have separated. They should see some similarities. Identify the quartz, the feldspar, and the mica. Tell the class that the mineral feldspar occurs in the greatest proportion in granite. Quartz occurs in the next greatest amount. Mica occurs in the least amount. Have the students examine their piles of sorted minerals to see if their pile matches the order that you gave. If there are disparities discuss these as a class. Explain that just like the chocolate chips in the chocolate chip cookie not all parts of the granite have equal amounts of minerals.

**LEP Modification:** Use gestures and/or sketches to show the proportional composition of minerals in granite.

**Elaborate:**

Process Skills: Communicate

Compile a list of rocks that you have determined the students will be able to find information about. Make sure that you have enough names of rocks so that each student will have their own. Write the names of the rocks on slips of paper. The following day, have each student draw from a container the name of a rock that you have written on a piece of paper. The students will use books in your classroom, books from the library, and the internet to research their assigned rock and find out what minerals compose it. The students will then present their findings to the class.

**LEP Modification:**

- Pair Entering and Beginning LEP students with native speakers for this activity.
- Provide resources commensurate with LEP students' reading levels. (If resources are not available, developing and expanding level students may need to work with a partner for the research part of this activity.)
- Control LEP students' choice of rocks so that you can provide an outline of how many minerals they should expect to find.

**Evaluate:**

Process Skills: Communicate

Have the students make a visual representation on an 8 ½ x 11 piece of paper that shows and explains that all rocks are composed of minerals. They will need to use at least one example of a rock and the minerals that it contains. This can be done very simply using crayons and pencils. You can decide if you would like the students to do this from memory or use gathered information.

**LEP Modification:** Use a previous student- or teacher-created model to show LEP students what type of product you expect.

**Unit Title: Rocks and Minerals****Lesson 4: Grouping Rocks**

**Length of Lesson: 2 days**

**Objective Included:**

**2.04** Show that different rocks have different properties.

Language (ELP) Objectives: LEP students will

- Describe the different properties of rocks
- Explain how geologists use the properties to classify rocks.
- Provide a written explanation for classifying rock samples.

**Lesson Introduction:**

**Minerals** occur in nature and have definite chemical compositions and physical properties. They are the raw materials of rocks. **Rock** types are characterized by the types of minerals in them and the process by which they were formed. Some minerals are valuable enough to be mined. Minerals make rocks look different from each other. A granite rock, for example, has different minerals than a basalt rock. However, even rocks with the same minerals may

look different due to variations in the relative amounts of minerals and the processes by which they are formed.

Some rocks may contain minerals in the form of crystals.

**Crystals** have a regular geometric shape. Crystals can be small or large. Large crystals can be seen in some rocks (granite). In other rocks, such as obsidian, the crystal formation is microscopic. The size of the crystals in a rock depend on how fast the rock cooled. The faster the rock was cooled, the smaller the crystal formation: the slower the rock was cooled, the larger the crystals that were formed.

**Igneous rocks** are formed from minerals that have melted deep within the Earth. These melted minerals are called magma. As magma is pushed to the surface of the Earth, the minerals begin to cool and harden. If the magma cools quickly, it can produce a rock like obsidian or basalt. When gas is released inside the magma as it cools it can produce the rock pumice which has large air spaces in it and will float in water.

**Sedimentary rocks** are formed as particles settle to the bottom of oceans and lakes. These materials (known as sediment) consist of sand, mud, bodies of animals, shells, and other materials. Over millions of years, these sediments are covered by other particles and the layers are pressed down by the weight of the sediments and water above. Gradually, the sediments are hardened into sedimentary rock.

**Metamorphic rocks** are formed from igneous, sedimentary, or other metamorphic rocks which contain minerals that have been changed by heat, pressure, or chemical action. Strong heat and pressure inside the Earth can cause minerals in rocks to change. One example of a metamorphic rock is slate which was changed from shale.

**Materials:**

Per Group:

Collection of Rocks – can be the same one used in lesson 1

Rock Guide Books (the school library may have these or you can get them at most public libraries)

6 rock samples not yet used by the students

Per Student:

Hand lens



## **Engage:**

Process Skills: Observe, Communicate

As a class, review the difference between **rocks** and **minerals**. Hold up several different rocks. Ask the students if they know how the rocks differ. Some students may say that the rocks are made of different minerals. They are correct. Ask if there is another way the rocks are different. The students will probably come up with other differences such as color and texture.

**LEP Modification:** - Use a T-chart when reviewing the difference between rocks and minerals. Hold up examples of the differences as students suggest them.  
- List the differences in rocks that students suggest and show examples.

## **Explore:**

Process Skills: Observe, Classify

Tell the class that there are three different types of rocks and today they are going to sort their rocks into the three types. They are going to use the rules that **geologists** use in sorting rocks. Write these rules on the board.

### Sample Type 1

- Rounded-appearing mineral and rock particles that are cemented together
- Often in layers

### Sample Type 2

- With or without observable crystals
- Not in layers
- With or without air holes
- Could be glass-like

### Sample Type 3

- Crystals/minerals lined up (aligned)
- Often in layers, sheet-like

**LEP Modification:** Use gestures, visuals and examples to demonstrate the three sample types. Post the visual images with the written rules for LEP students to use as a reference.

Give each group 3 pieces of paper with one titled Type 1, another Type 2, and the last Type 3. Explain to the class that it will not be easy to sort their rock sample, but you know that they can do it. Suggest that the group classifying the most samples correctly in 20 minutes will be the winners. As the students work move among the groups answering questions but do not identify samples. The student groups should classify their samples as Type 1, Type 2, or Type 3. At the end of 20 minutes, call time.

**LEP Modification:** All groups should be mixed by ability so that LEP students are evenly dispersed. Encourage the native speaking group members to use the language of the rules (layers, crystals, etc.) when sorting to help LEP students learn the vocabulary.

### **Explain:**

Process Skills: Classify

Tell the students that the rocks are really classified as **sedimentary** (Sample Type 1), **igneous** (Sample Type 2), or **metamorphic** (Sample Type 3). Have the students write sedimentary on the Type 1 paper, igneous on the Type 2 paper, and metamorphic on the Type 3 paper. Check the classification that the student groups have made against the rock's true classifications by walking around and doing a quick visual check.

### **Elaborate:**

Process Skills: Classify

Have the students make a chart in their science notebooks with the headings **sedimentary**, **igneous**, and **metamorphic**. Using rock guide books have the students identify the rocks that they have been sorting and place them in the appropriate column.

### **Evaluate:**

Process Skills: Observe, Classify, Communicate

Separate the groups so that each individual is working alone. Get six different rock samples the students have not yet seen. Label the rock samples 1-6. Pass the samples around and ask the students to identify the samples as **igneous**, **metamorphic**, or **sedimentary** based on the descriptions that they used to sort the other set of

rocks. They should record their answers on a piece of paper. The students should not only name what type of rock they think that they have, but they should also support their reasoning with an explanation.

**LEP Modification:** Reduce the number of samples to three for Entering and Beginning LEP students. Allow Developing LEP students to use a notes sheet that includes the three types of rocks, the sorting rules and accompanying pictures. For the explanation requirement, allow LEP students to draw the rocks and then draw lines from the observable characteristics of the rocks to the sorting rules descriptions. Beginning LEP students can provide short phrases for their explanation.

**Unit Title: Rocks and Minerals**  
**Lesson 5: How Hard is That Mineral?**

**Length of Lesson: 5 Class Periods**

**Objectives Included:**

- 2.01** Describe and evaluate the properties of several minerals.
- 2.02** Recognize that minerals have a definite chemical composition and structure, resulting in specific physical properties including:
- Hardness
  - Streak color
  - Luster
  - Magnetism

**Language (ELP) Objectives:** LEP students will

- Listen and demonstrate comprehension of an oral presentation about mineral properties by responding verbally or non-verbally to simple questions and statements about mineral properties.
- Describe how “scratch test” experiments show that minerals have different physical properties such as hardness.
- Compare predictions about a mineral’s hardness to Mohs Hardness Scale.
- Research and present information about the physical properties of assigned mineral.

**Lesson Introduction:**

A mineral is a chemical element or compound found on earth.

1. It occurs naturally.
2. It is inorganic (not made from living things).
3. It has a definite chemical composition, meaning that it contains the same elements in the same proportions.
4. It has a crystalline structure (atoms are arranged so they form a particular geometric shape).

Minerals have definite physical properties, which can be tested.

These include:

**Hardness**

This is how resistant a mineral is to being scratched. **Geologists** use the **Mohs scale** to classify a given mineral’s hardness. To test this they scratch the unknown mineral with various items, such as a fingernail (hardness of about 2.5), a penny (3), and a steel nail (5.5). The item that first scratches the unknown is harder than the unknown so now it is an estimate according to the scale.

MOHS SCALE OF HARDNESS	
MINERAL EXAMPLE	HARDNESS
TALC	1
GYPSUM	2
CALCITE	3
FLUORITE	4
APATITE	5
FELDSPAR	6

QUARTZ	7
TOPAZ	8
CORUNDUM	9
DIAMOND	10

### **Streak color**

Although the observable color of a mineral is the most obvious, it is the least reliable. Some specimens of minerals are always the same color but some can be different colors. When an unknown mineral is rubbed against a streak plate (unglazed piece of porcelain) it may produce a colored line if it is softer than the streak plate. The streak of color left behind can help identify the mineral. Many times a mineral leaves a streak that is a different color than it appears. Observing streak color is more reliable than a simple observation of a mineral's appearance.

### **Luster**

The way a mineral reflects light. Does the mineral appear to be a metal (metallic luster), or does it look like a nonmetal (nonmetallic luster)?

### **Magnetism**

There are few minerals that show this property. However, once a specimen is established as magnetic, identification is rather easy. A few minerals may not be magnetic, but are still attracted to magnets. A compass needle is a good test device for testing magnetism as is a magnet on a string that might sway near the specimen. Good examples of magnetic minerals are Magnetite and Hematite.

The understanding of the following two physical properties are not required of North Carolina 4<sup>th</sup> graders, but are used by geologists in determining the identification of minerals. Often 4<sup>th</sup> graders will observe these properties and ask questions about them.

### **Fracture and Cleavage**

These terms describe the way a mineral breaks. If a mineral fractures, it breaks along rough edges. If it cleaves, then it breaks along smooth, flat surfaces.

## Crystal Form

Each mineral is composed of crystals that have a particular shape.

### Materials:

For each student:

Science notebook

Hand lens

*Mineral Identification Data Chart*

*Mohs Hardness Scale with Examples of Common Tests*

Small piece of chalk

1 piece of Feldspar (labeled a. but not named)

1 piece of Talc (labeled b. but not named)

For each group of 4 students:

Set of four minerals, numbered but not named: (1) Fluorite, (2)

Gypsum, (3) Calcite, (4) Quartz

Penny, unbent paper clip, empty glass baby food jar

Copy of Mohs Hardness Scale

For the class:

Several sample minerals of your choosing

### Engage:

Process Skills: Observe, Communicate, Classify

Review with the students their definition of **rocks** as being earth materials made up of minerals. Explain that we have discussed the definition of **minerals** as being elements or compounds that occur naturally in the earth's crust, but we haven't really learned a lot about them. Hold up one of your sample minerals. Ask the students to share some ways that they might describe the mineral. The students will probably name some of the properties that they used to describe their rock samples in lesson 1 such as color, shiny or not shiny, edges smooth or jagged, etc. Introduce the word **luster** as the way a mineral reflects light. Is it shiny or not? Ask the students to observe the luster of the sample that you are showing them. Encourage the sharing of their observations and continue the discussion with the other mineral samples that you have.

**LEP Modification:** When introducing the word **luster**, incorporate hands-on realia to help LEP students understand the meaning of "shiny."

**Explore:**

Process Skills: Observe, Classify, Communicate, Experiment

Put the students in groups of three or four. Tell the students they are going to have the opportunity to examine some minerals in their groups to see if they can identify them by their properties. Give each group a set of four numbered minerals. Have them write a thorough description of each mineral in their science notebooks. Tell them to be sure to include properties of color, texture, and luster for each mineral. Allow about ten minutes for this activity.

**LEP Modification:** Allow LEP students to draw the minerals in their science notebooks. They should include color and texture in their drawings. You can show them how to use yellow “rays of light” around their drawing to show luster. Provide a word bank to help students label specific properties.

Follow with a class discussion of mineral properties. Write Mineral 1, Mineral 2, Mineral 3, and Mineral 4 on the board and have groups offer characteristics of each mineral. Ask, “What if I was to ask you to hold up the mineral that is white? Which one would you hold up? What if I were to ask you to hold up the rough one? The shiny one?” Students should point out that more than one mineral has each of those properties. Draw their attention to this fact on the board. (Words such as shiny, rough, and white should appear numerous times.) The students should see that the descriptions that they recorded of the minerals do not really differentiate between the mineral samples. Collect the minerals.

**LEP Modification:** Introduce the meaning of “rough” with gestures, pictures and/or examples. Rather than using hypothetical questions, say, “Hold up the white mineral. Hold up the rough one – the shiny one.”

Tell the students they will perform a test to identify the minerals that they described but first they must practice their testing skills. Explain to the students that they will be testing the minerals to see how hard they are. To perform the test they will use special “tools”.

Talk about the fact that in this case the “tools” will be their own fingernails, pennies, and paperclips that have been partially unbent. Today they will practice a test called the **scratch test** to determine hardness and instead of doing the test on the minerals they will practice it on chalk. When scratching test objects students should be encouraged not to make lots of scratching (no going back and forth repeatedly) marks. One or two passes should get the desired result.

**LEP Modification:** Demonstrate how you expect students to scratch (as well as how *not* to scratch).

Have the groups share their tools and practice their scratching. When everyone is finished discuss how this went for the students. They should have been able to scratch the chalk with all of their tools. The students probably found it easier to scratch the chalk with the paperclip than with their fingernail. You will also need to make sure that all of the students used the edge of the penny to scratch the chalk. When the discussion has ended take up the materials for use the next class period.

**LEP Modification:** Use a visual (such as a continuum) to put the tools in order of how easily they scratched the chalk.

During the next class period explain to the students that before beginning the scratch test each group will need to predict which mineral they think is the hardest and record their predictions in the *Mineral Identification Data Chart* at the end of this lesson or they can draw their own table in their science notebooks. After the students have completed their predictions give each group a penny, a paper clip that has been partially unbent, and an empty glass baby food jar, as well as their four mineral samples. Explain how they will use the *Mineral Identification Data Chart*. Tell the students that they will test each mineral sample to see what scratches it or what it scratches. When a mineral is scratched or scratches another object they will put an X in the box under the object. Have the students take turns within their groups scratching the minerals with their fingernails, pennies, and paperclips. Lastly have the students attempt to scratch the baby food jar with their mineral samples.

**LEP Modification:** Model on the overhead or class chart how to test a mineral with all three tools and the baby food jar, plus how to record the results on the individual data charts.



**Explain:**

Process Skills: Communicate

When the students have completed all of their scratch tests they will rank their samples in order from softest to hardest. At this point give the students the sheet *Mohs Hardness Scale With Examples of Common Tests* to identify the mineral samples they have tested. Explain to the students that **Mohs scale** was created in 1812 by Friedrich Mohs. It is based on ten common minerals and their ability to be scratched by other objects. Minerals not on the original scale can be compared to minerals that are on the original scale. Ask the students to name their mineral based on the abbreviated version of Mohs Hardness scale that you have shared with them. When the students have completed their identification discuss their results as a class. Did they find that Gypsum is the softest, followed by Calcite, then Fluorite, and Quartz being the hardest? How did their results compare with their predictions?

**LEP Modification:** Allow Entering, Beginning, and Developing LEP students to work in pairs or small groups with native speakers in order to name their mineral based on the hardness scale. Make sure to write the names of the minerals in order before or as you say them and display a sample of the mineral as you say its name.

**Elaborate:**

Process Skills: Communicate

With the students working in pairs assign each pair a mineral. Have them use the Internet and go to the Mineral Gallery <http://mineral.galleries.com/> to research their mineral. Visit this site before the assignment to compile a list of the minerals that you wish for the students to use. The students should gather information that can be used in an oral presentation. They will report to the class the mineral's name, description, and use. Their presentation should include visual aids, such as pictures (drawn or printed) and maps. The maps can show where in North Carolina, the United States, or even the world the mineral is found. The students should know and be able to explain the mineral's number on Mohs Hardness Scale and in turn explain to the class what tools can scratch their mineral.

**LEP Modification:** Be mindful of additional support when grouping Entering/Beginning LEP students. Entering/Beginning LEP students will not be able to contribute as much research and facts for the presentation, but can play a role in creating visual aids for the group. Teacher should work with particular LEP students to help all group members participate in the oral presentation (i.e. ask WH questions, restate facts, name pictures).

### **Evaluate:**

Process Skills: Observe, Classify, Communicate

Student's ability to understand the concept taught can be evaluated in a number of ways. 1) As the students work on *Mineral Identification Data Chart* check their work to make sure that they are making the connection between the results of the scratch tests that they are doing and the order from softest to hardest on Mohs Hardness Scale. 2) When the students make their oral presentations check to make sure that they are addressing all of the properties of the mineral that you assigned them. 3) Give each student two mineral samples labeled only with the letters a. (feldspar) and b. (talc). Explain to the students that now that they know four of the minerals on Mohs Hardness Scale and how to test for hardness they will need to try to identify the two minerals (a. and b.) that you have given them. The minerals are not ones that they have identified before and neither one is a diamond. Tell the students that they may not be able to narrow their choice down to one answer. If that is the case they may list all of the minerals in a category. Give the students all of the materials that they will need to complete their scratch test. Have the students complete the scratch test for hardness on both minerals and identify the minerals. They will be able to identify Talc, but for the Feldspar they will list Feldspar, Topaz, and Corundum. This is because all three of them (plus the Quartz they have already identified) can not be scratched by any of the tools, but it can scratch the glass.

**LEP Modification:** Group Entering and Beginning LEP students for part 3 of the evaluation. Use gestures and simplified language to show them what you expect them to do (repeat the scratch test with new minerals). As they perform the scratch tests, allow them to point to the scale to show their findings. You may have to help them understand that there is more than one right answer with facial expressions and pointing to the scale. Encourage them to repeat the names of the minerals after you and to write them where you have asked the other students to.

<b>Mohs Hardness Scale With Examples of Common Tests</b>		
<b>Hardness</b>	<b>Mineral</b>	<b>Common Test</b>
1	Talc	Fingernail Will Scratch It
2	Gypsum	
3	Calcite	A Copper Coin Will Scratch It.
4	Flourite	A Paperclip Will Scratch It.
5	Apatite	
6	Feldspar	Will Scratch Glass
7	Quartz	
8	Topaz	
9	Corundum	
10	Diamond	Will Scratch All Common Materials

## Mohs Hardness Scale With Examples of Common Tests

Hardness	Mineral	Common Test
1		Fingernail Will Scratch It
2	Gypsum	
3	Calcite	A Copper Coin Will Scratch It.
4	Flourite	A Paperclip Will Scratch It.
5		
6		
7	Quartz	Will Scratch Glass
8		
9		
10		

## Mineral Identification Chart

Name:

Date:

Put an X in each box where the object can scratch the mineral or be scratched by the mineral.

	Fingernail	Penny	Paperclip	Glass
Mineral 1 _____ (name)				
Mineral 2 _____ (name)				
Mineral 3 _____ (name)				
Mineral 4 _____ (name)				

Write the four minerals in order from softest to hardest.

Prediction	Proven by Data
1	
2	
3	
4	

Complete Mohs Hardness Scale With Examples of Common Tests		
Hardness	Mineral	Common Test
1	Talc	Fingernail Will Scratch It

2	Gypsum	
3	Calcite	A Copper Coin Will Scratch It.
4	Flourite	A Paperclip Will Scratch It.
5	Apatite	
6	Feldspar	Will Scratch Glass
7	Quartz	
8	Topaz	
9	Corundum	
10	Diamond	Will Scratch All Common Materials

This lesson was adapted from the Illinois State Museum Geology Online website at:  
<http://geologyonline.museum.state.il.us/>

**Resources:**

Mohs' Drill: A fun game to play that tests the student's ability to perform scratch tests on minerals and make decisions about hardness based on data.

<http://www.fossweb.com/modules3-6/EarthMaterials/activities/mohsdrill.html>

Online stores to purchase bagged rocks and minerals:

<http://www.rocksandminerals.com/>

The Mineral Gallery: Web site with photos and information on mineral specimens, plus minerals to purchase:

<http://mineral.galleries.com/>

This Planet Really Rocks: child-created geology project with games, facts, jokes, activities:

<http://library.thinkquest.org/J002289/>

**Unit Title: Rocks and Minerals**

**Lesson 6: What's in a Streak? And, Can a Mineral Attract a Magnet?**

**Length of Lesson: 2 class periods**

**Objective Included:**

**2.02** Recognize that minerals have a definite chemical composition and structure, resulting in specific physical properties including:

- Hardness
- Streak color
- Luster
- Magnetism

Language (ELP) Objectives: LEP students will

- Explain different ways to determine a mineral's streak color and magnetic properties.
- Write a letter justifying why a mineral's streak color should be tested when determining the properties of a mineral.

**Materials:**

Per Pair of Students

- 1 piece of magnetite
- Magnet
- Streak plates (small unglazed porcelain plate)
- 1 piece of pyrite
- 1 piece of hematite
- Several sample minerals that are colorful

**Lesson Introduction:**

The color of a mineral in powder form is called a streak, and the streak is usually more diagnostic than the color of the mineral itself. One of the tools used to observe the streak of a mineral is a streak plate, which is a small unglazed ceramic plate. One of the best examples for the usefulness of a streak plate is gold and fool's gold (pyrite). Real gold has a gold streak. Pyrite, although it looks like

gold, produces a black streak. Our quartz sample would leave a white streak. One important point to remember, though...you can only streak items that have a hardness of 7 or less. In this activity the streaks of pyrite and hematite will be compared. Pyrite has a grey to black streak and hematite has a rusty streak.

### **Engage:**

Process Skills: Observe, Communicate

Ask the students. Do you think that color is a good way to identify minerals? Hold up a sample mineral, and discuss its color with the class. Share another sample mineral with the class. Ask the class. What if I told you that even though the exterior color may seem to be a great way to identify a mineral it often does not show us the true color of a mineral? To see the true color of a mineral we need to look at its streak. That happens when we rub it on something that is harder than it is. What we will use today is called a streak plate. Another property that we need to investigate is magnetism. How can we do that? Let the students come up with a plan for testing the magnetic effects of a mineral. As they brainstorm ideas you may need to steer them away from ideas that will not work and towards the easiest way of simply using a magnet.

**LEP Modification:** - Rephrase the “What if I told you...” question to a more simple, direct statement.

- Show a streak plate when you talk about it.
- Demonstrate the property of magnetism (with something other than minerals) when you mention it.

### **Explore:**

Process Skills: Predict, Observe, Experiment

Tell the students that they will test today for the streak color of minerals and for a mineral’s magnetic effect. Before they can actually test they will need to record predictions in their science notebooks. The students will test all three minerals (magnetite, hematite, and pyrite) for magnetic properties as well as streak color so they should make predictions for all three minerals with both tests. Have the students get their materials for both tests. For the magnetic property test the students will record whether or not they think that the mineral samples will be attracted to a magnet. For the streak test the



students can record what color streak they think the minerals will have.

**LEP Modification:** Provide a template for LEP students to put into their science notebooks where they can record their predictions (yes/no for magnetism and color for streak color – Entering LEP students can use colored writing utensils to record their color predictions and/or copy the color word from the utensil.)

As the students test this they will usually prove themselves wrong about several of the things. Encourage the students by explaining to them that scientists are always testing their predictions and very often they prove themselves wrong, but that is how they learn.

**LEP Modification:** Use facial expression, gestures, and modeling to show LEP students that they should not change their predictions, and that it is okay to have a result different from a prediction.

### **Explain:**

Process Skills: Interpret Data, Communicate

Tell the students that the color of a mineral when it is powdered is called the streak of the mineral. **Streak** can be determined for any mineral by crushing it with a hammer, but it is more commonly (and less destructively) obtained by rubbing the mineral across the surface of a hard, unglazed porcelain material called a **streak plate**. Ask the class if they found anything that surprised them when they tested for streak color. They will probably tell you that the hematite surprised them. The hematite mineral samples are usually a grey color, but the streak they produce is a red-brown color. If the students have completed the Electricity and Magnetism Unit they will probably not be too surprised at the fact that one of the minerals attracted the magnet. They may even remember that the mineral's name is magnetite and in order for it to attract a magnet it must contain iron.

**LEP Modification:** - Encourage LEP students to record the target vocabulary in their science notebooks with accompanying pictures and/or simple definitions (best if student-generated in a mini-dictionary)).  
- Allow LEP students to show you what surprised them by pointing to their predictions and results for hematite in their science notebooks.

**Elaborate:**

Process Skills: Communicate

In order for the students to understand the streak of many more minerals that might not be available in the classroom have the students use the internet and go to The Mineral Gallery.

(<http://mineral.galleries.com/> ) Require each student or pair of students to find the streak color of ten minerals. Ask the students to compare the color of the streak to the actual color of the mineral. All of the information gathered should be recorded in the students' science notebooks.

**LEP Modification:** Entering and Beginning LEP students should work in pairs for this activity. Developing LEP students working alone may need the number of minerals reduced to five.

**Evaluate:**

Process Skills: Communicate

Evaluate the students' understanding of the concepts taught by having them explain in a letter to the principal why a mineral's streak color should be tested when determining the properties of that mineral. They should also explain to the principal that some minerals attract magnets because the minerals contain iron.

**LEP Modification:** Developing LEP students will be able to complete a simplified version of this task using a letter template. Entering and Beginning LEP students can complete the same task using a letter template and inserting labeled drawings and short phrases to explain the differences in streak color and magnetism.

Template example (use all or choose parts to help student write letter:

Dear \_\_\_\_\_,

In science we are learning about \_\_\_\_\_. \_\_\_\_\_

There are different properties geologists use when grouping rocks and minerals. I will tell you about each one. \_\_\_\_\_

A mineral streak color is \_\_\_\_\_ because \_\_\_\_\_. I think it should be tested \_\_\_\_\_

Sincerely,

\_\_\_\_\_

**Unit Title: Rocks and Minerals**  
**Lesson 7: Are They From North Carolina?**

**Length of Lesson: 5 class periods**

**Objectives Included:**

**2.07** Identify and discuss different rocks and minerals from North Carolina including their role in geologic formations and distinguishing geologic regions.

**2.05** Discuss and communicate the uses of rocks and minerals.

**Language (ELP) Objectives:** LEP students will

- Discuss the different geological regions of North Carolina and why certain regions have more rocks and minerals than others.
- Research and record facts about a rock/mineral found in North Carolina and present information to the class.

**Lesson Introduction:**

There are many sources of rocks and minerals in North Carolina. One way to get samples for your classroom is to contact the mines listed as a resource at the end of this lesson and make your own set. Make sure that you get enough of each sample to have one for each group of four to five students. Another way to set up a classroom set is to use the samples on the cards in this unit and order the rocks and minerals.

Depending on where the students live in North Carolina they may or may not be familiar with different types of rocks found in the state. Some students may have trouble finding rocks of their own to bring into the class. Have extra samples to share with students.

**Materials:**

Rock and mineral samples from North Carolina (numbered)

NC Department of Transportation maps

*Key to Rock and Mineral Specimens*

*Rock and Mineral Identification Cards*

Yarn

*Rock and Mineral Matching Game*

*2.07Objective Assessment*

## **Engage:**

Process Skills: Observe, Classify

Give each group of four to five students a collection of numbered rocks and minerals found in North Carolina. Do not tell the students the origins of the rocks and minerals. Explain to the students that the samples all have something in common. Challenge the students to find the commonality. Give the students several minutes to draw their own conclusions. Most groups will look for physical features as the common thing between the samples. After several minutes explain to the students that all of the rock and mineral samples are from North Carolina.

## **Explore:**

Process Skills: Observe, Communicate

Where can we find these rocks and minerals in North Carolina? Give the students the NC maps that show the NC counties and the *Key to NC Rocks and Minerals* (adapted from *Key to Rock and Mineral Specimens* used at the 2006 NC Science Teachers Association and Professional Development Institute.) This key may need to be adapted to fit the samples of rocks and minerals that you have collected. The one used in this activity will give you an idea of what can be used. Challenge the students to place the rocks and minerals on the counties in which they were found. Give each group two pieces of yarn that are both long enough to reach from the northern most part of the state to the southern most part of the state. The students will need to use the yarn to divide the state into the three geographic regions. As each group finishes give them *Rock and Mineral Identification Cards*. Once again, these cards will need to be adapted to fit the rock and mineral samples in your classroom. Have the students take turns picking a card, holding up the rock or mineral associated with it, and reading the information about the sample to their group.

**LEP Modification:** - Provide a map of the three geographic regions as a model for LEP students who may not have this background knowledge.  
- Group Entering and Beginning LEP students with native speakers who can assist with reading.

**Explain:**

Process Skills: Communicate

Lead a class discussion about the rocks and minerals.

Questions to pose: In what part of the state do you see more rocks and minerals? Why? In what region do you see the least number of rocks and minerals? Why? Can you name an example of a rock or mineral in the Coastal Plain? Piedmont? Mountains?

**LEP Modification:** Use a map (with gestures) separated into the three regions when leading this discussion and provide visual support with map (mountains, beach, piedmont, plain). Allow LEP students to have more wait time to process questions and formulate responses. Accept gestures and short responses from Entering and Beginning LEP students.

**Elaborate:**

Process Skills: Communicate

Assign each pair of students one common mineral or rock found in North Carolina. Based on class numbers you may need to have more than one pair of students assigned to a sample. Have the students use the internet and guide books to research their NC rock or mineral. In their science notebooks the students should record basic facts about their rock/mineral. If possible a picture printed off of the internet, and ways that their sample is used commercially. Have each pair share their findings with the class.

If your school subscribes to United Streaming it has excellent video clips about the uses of rocks and minerals. These clips could be incorporated into a power point presentation complete with comprehension questions.

**LEP Modification:** Make sure Entering/Beginning/Developing LEP students are paired with a more advanced English speaker. Pre-select websites and print resources commensurate with LEP students' reading levels. Entering and Beginning LEP students will need additional support such as adapted text, but can still participate by writing facts and finding a picture.

**Evaluate:**

Process Skills: Communicate

To evaluate the students' understanding of the objective make a matching game. Use the *Rock and Mineral Matching Game*. Print enough sets so that students can work in pairs. Explain to the students that they are going to play a matching game. They will need to place their picture cards upside down. The partners will take turns picking a picture and then trying to match their picture with the descriptive information card. When the teams have finished give them a key (*Key to NC Rocks and Minerals*) to their cards so that they can check the matches that they have made. As the students are doing this activity monitor the students to make sure that both partners have an understanding of North Carolina rocks and minerals. If you are not able to get the same rock and mineral samples that are used in this unit simply alter the matching game card to match what you have.

**LEP Modification:** Make sure Entering/Beginning/Developing LEP students are paired with a student that can read descriptive information cards aloud, and point out key words in descriptions.

Individually assess the students' knowledge of North Carolina rocks and minerals by using the *2.07 Objective Assessment*. On the board list the 12 rocks and minerals (or however many your class has used) that have been studied in this unit.

## Key to Rock and Mineral Specimens

1. **Alaskite** - Spruce Pine, NC (Mitchell County)
2. **Gneiss** - Hendersonville, NC (Henderson County)
3. **Granite** - Mount Airy, NC (Surry County)
4. **Lilesville Granite** - Rockingham, NC (Richmond County)
5. **Phosphate “rejects”** - Aurora, NC (Beaufort County)
6. **Marble** - (Swain County)
7. **Limestone** - (Pender County)
8. **Olivine** - (Yancey County)
9. **Cretaceous Sand** - (Anson County)
10. **Pyrophyllite** - Robbins, NC (Moore County)
11. **Quartz Gravel** - (Anson County)
12. **Mica** - (Avery County)

(Adapted from *Key to Rock and Mineral Specimens* used at the 2006 NC Science Teachers Association and Professional Development Institute)  
Rock and Mineral Identification Cards

**1. Alaskite**  
Spruce Pine, NC

Alaskite is an extremely light colored variety of granite composed primarily of three minerals – white feldspar, light gray quartz, and silvery muscovite mica. The Alaskite bodies in Mitchell County are 320-390 million years old and occur along the edge of the Blue Ridge

**2. Gneiss**  
Hendersonville, NC

Gneiss is a metamorphic rock consisting of bands and streaks of alternating darker and lighter color minerals. It was originally granite, but later was squeezed at high temperatures deep in the earth and became Gneiss.

**3. Granite**  
Mount Airy, NC

Mount Airy Granite is a medium-grained igneous rock composed of quartz, plagioclase, orthoclase, biotite, and accessory minerals. It formed about 350 million years ago as magma cooled deep inside the earth's crust. Later, erosion gradually removed the layers of rock above it allowing the granite to be exposed at the surface as it is today. The mine where this sample came from is the largest open-face granite quarry in the world. Granite is North Carolina's state rock.

**4. Lilesville Granite**  
Rockingham, NC

Lilesville Granite is a coarse-grained rock. It formed at about the same time and way as the Mount Airy granite, but the large grains and crystals indicate that the cooling was very slow. This granite is used as a source of crushed stone concrete and asphalt.

**5. Phosphate "rejects"**  
Aurora, NC

Phosphate comes from limestone. It was deposited on the ocean floor about 15 million years ago. It is accompanied by fossils of many marine animals. This phosphate reject is used in construction.

**6. Marble**  
Swain County

Marble is a fine grained metamorphic rock derived from limestone. Marble can be several colors including white, pink, and green. This rock will bubble when a weak acid touched it. It is used as building stone and by sculptors.



**7. Limestone**

**Pender County**

Limestone is a sedimentary rock made of the mineral calcite. It also contains a small amount of quartz, sand, and clay. The limestone formed more than 40 million years ago when layers of seashells and lime mud accumulated in a tropical ocean. Pressure from overlying layers and minerals in the seawater cemented the layers into limestone. Groundwater traveling through the limestone dissolved away the fossils forming its current "holey" texture.

**8. Olivine**

**Yancey County**

Olivine is a green mineral that occurs in igneous rocks. The gem form of Olivine is peridot, the August birthstone.

**9. Cretaceous Sand**

**Anson County**

This sample consists of quartz grains deposited about 60 million years ago. It was carried by an ancient river and deposited where the river emptied into the Atlantic Ocean (the coastline was much farther to the west than it is now.)

**10. Pyrophyllite Ore**

**Robbins, NC**

Pyrophyllite is a soft mineral found in metamorphic rock. Similar in appearance to talc it was named for the Greek words for fire and rock since its early use was for hearthstones around fireplaces.

**11. Quartz Gravel**

**Anson County**

This gravel contains mostly quartz. It was carried to Anson County during the flooding of the Pee Dee River years ago. The gravel is rounded by the abrasive action of the river.

**12. Mica**

**Avery County**

Mica is a soft mineral. "Sheets" or layers can be split apart very easily. Mica can be found in all three types of rock: igneous, metamorphic, and sedimentary. Mica is found in "sparkly" toothpaste."

(adapted from *Key to Rock and Mineral Specimens* used at the 2006 NC Science Teachers Association and Professional Development Institute)

## Rock and Mineral Matching Game

**1**

Spruce Pine, NC

This is an extremely light colored variety of granite composed primarily of three minerals – white feldspar, light gray quartz, and silvery muscovite mica. The bodies of this rock in Mitchell County are 320-390 million years old and occur along the edge of the Blue Ridge

**2**

Hendersonville, NC

This is a metamorphic rock consisting of bands and streaks of alternating darker and lighter color minerals. It was originally granite, but later was squeezed at high temperatures deep in the earth and became the rock that it is now.

**3**

Mount Airy, NC

This is a medium-grained igneous rock composed of quartz, plagioclase, orthoclase, biotite, and accessory minerals. It formed about 350 million years ago as magma cooled deep inside the earth's crust. Later, erosion gradually removed the layers of rock above it allowing the granite to be exposed at the surface as it is today. The mine where this sample came from is the largest open-face quarry for it in the world. It is North Carolina's state rock.

**4**

Rockingham, NC

This sample is a coarse-grained rock. It formed at about the same time and way as the Mount Airy granite, but the large grains and crystals indicate that the cooling was very slow. It is used as a source of crushed stone concrete and asphalt.

**5**

Aurora, NC

This sample comes from limestone. It was deposited on the ocean floor about 15 million years ago. It is accompanied by fossils of many marine animals. It is used in construction.

**6**

Swain County

This is a fine grained metamorphic rock derived from limestone. It can be several colors including white, pink, and green. This rock will bubble when a weak acid touched it. It is used a building stone and by sculptors.

**7**

**Pender County**

This sample is a sedimentary rock made of the mineral calcite. It also contains a small amount of quartz, sand, and clay. It was formed more than 40 million years ago when layers of seashells and lime mud accumulated in a tropical ocean. Pressure from overlying layers and minerals in the seawater cemented the layers into what it is now. Groundwater traveling through the it dissolved away the fossils forming its current "holey" texture.

**8**

**Yancey County**

This sample is a green mineral that occurs in igneous rocks. The gem form of it is peridot, the August birthstone.

**9**

**Anson County**

This sample consists of quartz grains deposited about 60 million years ago. It was carried by an ancient river and deposited where the river emptied into the Atlantic Ocean (the coastline was much farther to the west than it is now.)

**10**

**Robbins, NC**

This is a soft mineral found in metamorphic rock. Similar in appearance to talc it was named for the Greek words for fire and rock since its early use was for hearthstones around fireplaces.

**11**

Anson County

This gravel contains mostly quartz. It was carried to Anson County during the flooding of the Pee Dee River years ago. The gravel is rounded by the abrasive action of the river.

**12**

Avery County

Mica is a soft mineral. "Sheets" or layers can be split apart very easily. Mica can be found in all three types of rock: igneous, metamorphic, and sedimentary. Mica is found in "sparkly" toothpaste."

**Rock and Mineral Matching Game** – Print one set with numbers and then multiple sets without numbers.

1



[www.itpi.dpi.state.nc.us](http://www.itpi.dpi.state.nc.us)

2



[www.monanseeaucollege.com](http://www.monanseeaucollege.com)

3



[www.ncgranite.com](http://www.ncgranite.com)

4



5



6

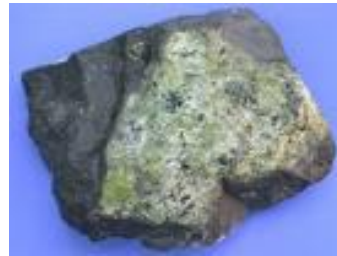


[geology.about.com](http://geology.about.com)

7



8



[www.pitt.edu](http://www.pitt.edu)

9



[nesoil.com](http://nesoil.com)

10



[www.galleries.com](http://www.galleries.com)

11



[www.pavingexpert.com](http://www.pavingexpert.com)

12



[www.esrf.eu](http://www.esrf.eu)

## 2.07 Objective Assessment

### North Carolina Rocks and Minerals

Of the 12 North Carolina rocks and minerals listed on the board pick 4 to describe. Make sure you tell where in North Carolina you can find the rock/mineral, how the rock/mineral is used commercially, and anything else that you know about that rock/mineral.

**LEP Modification:** Follow the suggest modifications for each LEP level as needed for each individual student:

- **Entering:** Student can match pictures of minerals to written phrases with visuals. Student could point to the map to show location.
- **Beginning:** Student can test orally by asking him/her WH-questions. Student could also match mineral visuals with oral descriptions.
- **Developing:** Student can write short phrases or simple sentences to describe rocks using notes or a word bank. Modify number of descriptions to 2 or 3 depending on student.
- **Expanding:** Student can write a description on 3-4 minerals and rocks with use of notes or a study guide for support as needed.
- **Bridging:** Student can write a description on all 4 minerals and rocks with limited support.



## Sources of Rock and Mineral Samples in North Carolina

1. **Alaskite** – Feldspar Corporation, a division of Zemex Corporation, Spruce Pine, NC (Mitchell County)
2. **Gneiss** – Vulcan Materials Company, Hendersonville, NC (Henderson County)
3. **Granite** – NC Granite Corporation, Mount Airy Quarry, Mount Airy, NC (Surry County)
4. **Lilesville Granite** - Vulcan Materials Company, Rockingham Quarry, Rockingham, NC (Richmond County)
5. **Phosphate “rejects”** – PCS Phosphate Company, Aurora, NC (Beaufort County)
6. **Marble** - Nantahala Talc and Limestone Company, (Swain County)
7. **Limestone** – Martin Marietta Aggregates, Rocky Point Quarry, (Pender County)
8. **Olivine** – Unimin Corporation, Green Mountain Mine, (Yancey County)
9. **Cretaceous Sand** – Hedrick Industries, Lilesville Pit, (Anson County)
10. **Pyrophyllite Ore** – Standard mineral Company, Robbins, NC (Moore County)
11. **Quartz Gravel** – Hedrick Industries, Lilesville Pit, (Anson County)
13. **Mica** – Tar Heel Mica Company, (Avery County)

(adapted from *Key to Rock and Mineral Specimens* used at the 2006 NC Science Teachers Association and Professional Development Institute)

**LEP Assessment Modification:** This assessment could be modified in a variety of ways. Choose one, or a combination of several modifications based on your students' proficiency levels and needs.

- Read test aloud
- Divide test into multiple sessions to be given at separate times throughout the day or week.
- Allow extended time
- Reduce the number of questions to the most essential for showing mastery
- Eliminate one answer choice per question.
- Simplify/paraphrase language
- Provide pictures to accompany vocabulary in questions and answer choices.
- Provide materials for students to manipulate in order to demonstrate the desired skill/knowledge.
- Provide study guide or notes

## Assessment

### 2.01 (B5)

1. What is one property used to tell minerals apart?
  - a. **hardness**
  - b. shape
  - c. size
  - d. uses

### 2.01 (B5)

2. Which if the following is a mineral?
  - a. granite
  - b. **quartz**
  - c. basalt
  - d. slate

### 2.02 (A2)

3. Which of the following could be used to test the hardness of a mineral?
  - a. iron nail

- b. penny
- c. fingernail
- d. all of the above**

**2.02 (A2)**

4. Why would a mineral attract a magnet?
- a. it is a metal
  - b. it is strong
  - c. it contains iron**
  - d. it contains a magnet

**2.02 (A2)**

5. Why would geologists test the streak color of a mineral?
- a. the streak color can be a different color than the color of the mineral you actually see**
  - b. it shows if the mineral is soft or not
  - c. the streak color shows if the mineral is shiny
  - d. all of the above

**2.02 (A2)**

6. Which of the following describes luster?
- a. when a rock has been rubbed frequently
  - b. when a mineral reflects light**
  - c. the streak color of a mineral
  - d. how hard a mineral is

**2.03 (B2)**

7. Rocks are composed of \_\_\_\_\_.
- a. living things
  - b. geologic regions
  - c. streak plates
  - d. minerals**

**2.03 (B2)**

8. Granite is composed of \_\_\_\_\_.
- a. mica
  - b. feldspar
  - c. quartz
  - d. all of the above**

2.04 (B3)

9. Igneous rocks are formed from \_\_\_\_\_.
- a. Pressure
  - b. **magma**
  - c. water and sand
  - d. metamorphic rocks

2.04 (B3)

10. Which type of rock is formed from small particles settling to the bottom of water and cementing together?
- a. minerals
  - b. obsidian
  - c. **sedimentary**
  - d. limestone

2.04 (B3)

11. Slate is an example of a \_\_\_\_\_ rock because it changed from the rock shale.
- a. **metamorphic**
  - b. mineral
  - c. volcano
  - d. pressure

2.05 (B2)

12. Which mineral is used to make part of a saw blade because it is the hardest?
- a. talc
  - b. feldspar
  - c. pyrite
  - d. **diamond**

2.05 (B2)

13. Which rock is often used to make kitchen counter tops?
- a. talc
  - b. **granite**
  - c. diamond
  - d. pumice

2.06 (B2)

14. Why would you not classify rocks by their size?

- a. they all might be big
- b. they all might be small
- c. they can be broken into many sizes**
- d. none of the above

**2.07 (A2)**

15. In what region of North Carolina would you find the least number of different rock samples?

- a. mountains
- b. they are equally distributed
- c. piedmont
- d. coastal plains**

**2.07 (A2)**

16. What is the state rock of North Carolina?

- a. mica
- b. granite**
- c. slate
- d. talc