

Lesson 4.3: Minerals

Task	Page(s)	Learning Target
1	2-3	I can describe how you can differentiate between rocks and minerals.
2	4	I can use observable characteristics in order to identify the specimen as either a rock or mineral.
3	5	I can describe how minerals are identified.
4	6	I can use data to determine mineral hardness.
5	7	I can use data to determine mineral hardness using the Mohs Hardness Scale.
6	8-11	I can observe, compare/contrast, and test minerals to identify them.

Task 1 Learning Target: I can describe how you can differentiate between rocks and minerals.

Rocks and Minerals

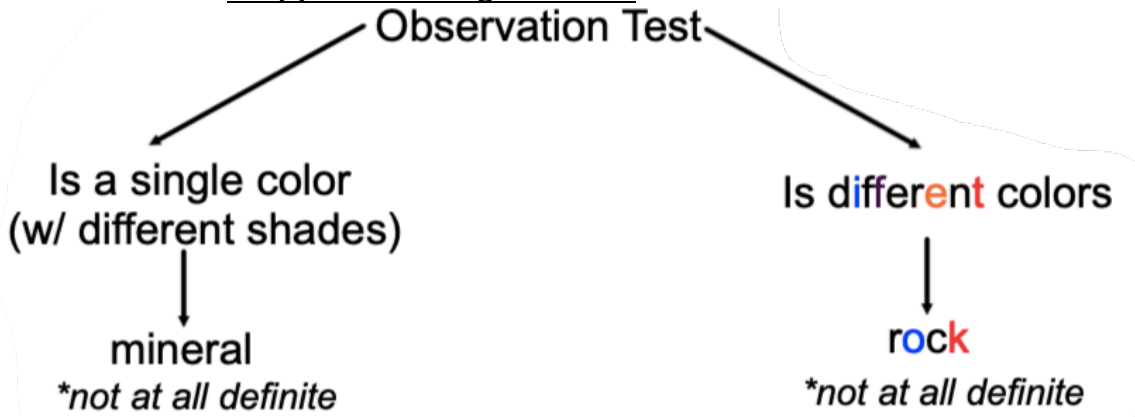
1. Use the textbook and video links to answer the following question: *How do rocks and minerals compare?*

Link 1	Link 2
https://www.brainpop.com/science/earthsystem/crystals/	https://www.youtube.com/watch?v=KYKYzhXBQes

2. Watch the video links below to answer the following question: *How can crystallography help scientists determine rocks from minerals?*

Link 1	Link 2
https://www.youtube.com/watch?v=uqQlwYv8VQI	https://www.youtube.com/watch?v=gLsC4wlrR2A

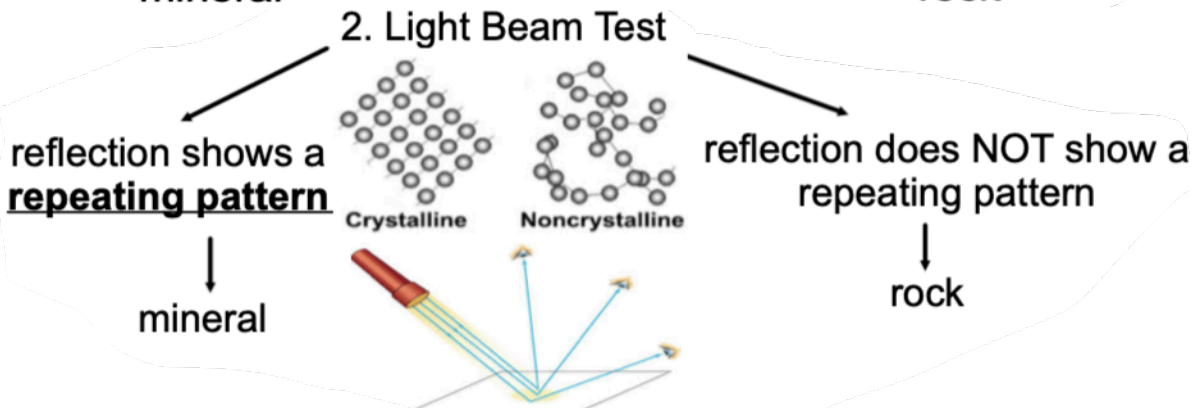
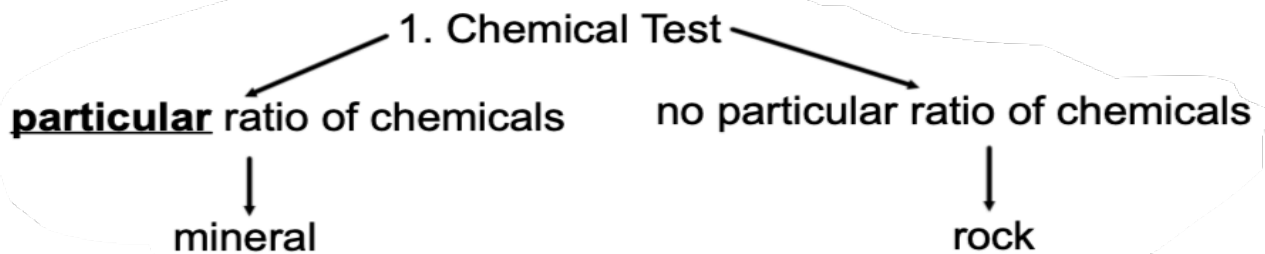
3. Is it a rock or a mineral? ***Copy the following flow chart**



The only way to know for sure...

Advanced

Laboratory Testing



4. **Is it a rock?** How do you decide if something is a rock?

A. Copy the list below and put an X next to the things that you think are rocks:

- | | | |
|---|------------------------------------|--|
| <input type="checkbox"/> cement block | <input type="checkbox"/> dried mud | <input type="checkbox"/> hardened lava |
| <input type="checkbox"/> asphalt (road tar) | <input type="checkbox"/> concrete | <input type="checkbox"/> piece of clay pot |
| <input type="checkbox"/> coral | <input type="checkbox"/> limestone | <input type="checkbox"/> granite |
| <input type="checkbox"/> marble statue | <input type="checkbox"/> coal | <input type="checkbox"/> brick |
| <input type="checkbox"/> gravestone | <input type="checkbox"/> glass | |

B. Explain your thinking. What "rule" or reasoning did you use to decide if something is a rock?

C. Read the "Explanation Text" below.

Use the text to make a T-chart that describes "Is a Rock" "Is Not a Rock"

Explanation Text

The items on the list that are rocks are coal, hardened lava, limestone, a gravestone, marble statue, and granite. Simply, a rock can be defined as any solid mass of mineral or mineral—like matter that occurs naturally as part of our planet (Lutgens and Tarbuck 2003).

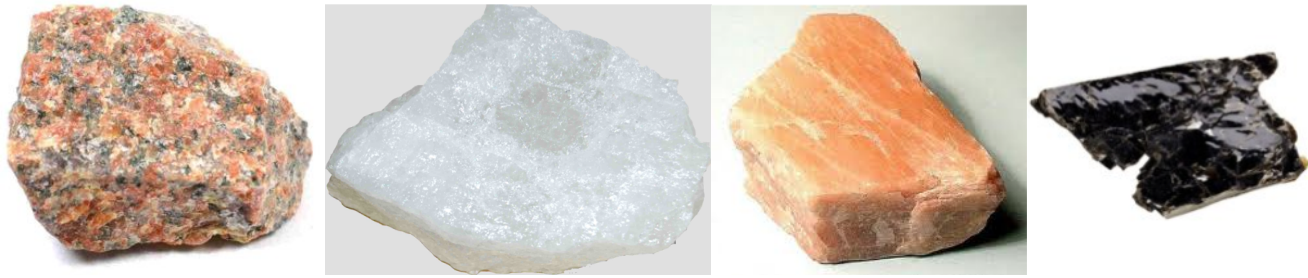
Some rocks, such as limestone, are composed almost entirely of one mineral—in this case, impure masses of calcite. Other rocks occur as aggregates of two or more minerals. For example, granite is a common rock composed of the minerals quartz, hornblende, and feldspar. A few rocks are composed of non-mineral matter. Pumice is a volcanic rock formed by the cooling of frothy lava. Coal is a rock formed by the hardening of solid organic debris.

Some of the items on the list are rock-like in that they are similar to rock material but are not naturally formed through geologic processes. The cement block, piece of clay pot, brick, asphalt, glass, and concrete are all made using some rock material, combined with other materials, and reshaped through a human made process, not a geologic one. The material itself is not "rock." However, the gravestone and marble statue are rock, even though they have been reshaped and polished through a human-made process, because the material they are made of was formed through a geologic process and the original composition unchanged. The material is still rock; only the shape and texture have changed.

Coral is made by living processes, not geologic processes. Soft-bodied organisms secrete calcium carbonate to make hard, rock-like casings that protect their soft bodies. These "community casings" result in the formation of coral reefs.

Mud is a mixture of silt, clay, and water. Silt and clay are fine rock fragments. Mud can dry out, forming hard cakes that appear rock-like. However, it takes long periods of geologic time for dried mud to harden (lithify) into solid sedimentary rock such as shale.

Task 2 Learning Target: I can use observable characteristics in order to identify the specimen as either a rock or mineral.



Using the rock/mineral samples, complete A-D:

- A. Draw a sketch of the samples and record observations.
- B. Describe which is a rock and which is a mineral. Explain.
- C. How would you prove which is a rock and which is a mineral?
- D. What would the test results be if the sample is a rock?
What would the test results be if the sample is a mineral?

Task 3 Learning Target: I can describe how minerals are identified.

Video Resources:

<https://www.brainpop.com/science/earthsystem/mineralidentification/>

<https://www.youtube.com/watch?v=AnAwKo9PsLY>

Properties of minerals - characteristics used to _____

- A. streak:
- B. Mohs Scale:
- C. Crystalline:
- D. Color:
- E. Fracture:
- F. Cleavage:
- G. Luster:
- H. Other properties:

Task 4 Learning Target: I can use data to determine mineral hardness.

Copy the table and answer questions 1 and 2

Applying Science

How hard are these minerals?

Some minerals, like diamonds, are hard. Others, like talc, are soft. How can you determine the hardness of a mineral?

Identifying the Problem

The table at the right shows the results of a hardness test done using some common items as tools (a fingernail, copper penny, nail, and steel file) to scratch certain minerals (halite, turquoise, emerald, ruby, and graphite). The testing tools are listed at the top from softest (fingernail) to hardest (steel file). The table shows which minerals were scratched by which tools. Examine the table to determine the relative hardness of each mineral.

Hardness Test				
Mineral	Fingernail	Penny	Nail	Steel File
Turquoise	N	N	Y	Y
Halite	N	Y	Y	Y
Ruby	N	N	N	N
Graphite	Y	Y	Y	Y
Emerald	N	N	N	N

Solving the Problem

1. Is it possible to rank the five minerals from softest to hardest using the data in the table above? Why or why not?
2. What method could you use to determine whether the ruby or the emerald is harder?

Task 5 Learning Target: I can use data to determine mineral hardness using the Mohs Hardness Scale.

1. Watch YouTube video: "Mineral Hardness Test Mr. B" <https://www.youtube.com/watch?v=9r7C5SD14Hw>

2. Use the Mohs Scale to find the hardness for the following:

- a. talc
- b. calcite
- c. fluorite
- d. feldspar
- e. corundum
- f. diamond

Mohs Hardness Scale	
Test	Hardness
Fingernail easily scratches the mineral <small>*make sure that the mineral is not a 2</small>	1
Fingernail scratches the mineral but not easily	2
Copper penny scratches the mineral	3
The mineral scratches a copper penny but not easily <small>*make sure that the mineral is not a 5</small>	4
The mineral easily scratches a copper penny <small>*make sure that the mineral is not a 6</small>	5
The mineral scratches a glass plate <small>*make sure that the mineral is not a 7</small>	6
The mineral scratches a steel nail <small>*make sure that the mineral is not an 8</small>	7
The mineral scratches quartz <small>*make sure that the mineral is not a 9</small>	8
The mineral scratches topaz <small>*make sure that the mineral is not a 10</small>	9
The mineral scratches all the previous items <small>-It is the hardest of all minerals</small>	10

Task 6 Learning Target: I can observe, compare/contrast, and test minerals to identify them.

Materials:

✓ Magnifying lens	✓ Copper Penny	✓ Glass Plate	✓ Mohs Scale	✓ Set of minerals
✓ Magnet	✓ Steel Nail	✓ Streak Plates (1 white & 1 black)	✓ Identification Key	✓ HCL Acid (Teacher use only)

Procedure:

1. Observe each sample and conduct appropriate tests to complete as much of your data table as possible.
2. Consult the Mohs Scale to help identify the hardness of the mineral.
3. Consult the Mineral Identification Key to help fill in the last column.

Analyze Data:

1. Which mineral was the easiest to identify? Explain the characteristic(s) that made this mineral easy to identify?
2. Identify 2 minerals that were the most difficult to tell apart? What characteristic(s) did these minerals have in common? Describe the trait(s) you used to determine the identity of the minerals?
3. If you were a field geologist, what tools would you want to take on the job? Explain why each tool is important.
4. Minerals are used in our daily lives. Identify and explain three minerals that you use often.

Participation					
I often contributed good ideas that were relevant to the topic and task. I came to meetings prepared. I did my share of the work.	4	3	2	1	I seldom contributed good ideas. Sometimes I was talking off-task. I did not come to meetings prepared. I did not do my share of the work.
Working with Others					
I often compromised and cooperated. I did take initiative when needed and/or listened and respected the ideas of others.	4	3	2	1	I seldom compromised and cooperated. I did not take initiative when needed and/or did not listen and respect the ideas of others.
Product					
My part of the task is complete and accurate. My work was submitted on time.	4	3	2	1	I did not complete my part of the task. The information I presented was inaccurate and/or not done correctly. It was not completed on time.
Understanding Content					
I can speak about the topic and group work knowledgeably. I can sum-up the lesson.	4	3	2	1	I do not understand what I did in my group. I did not ask or answer questions. I cannot sum-up the lesson.

Mineral Characteristics

Sample	Mineral Color	Luster	Hardness	Streak Color	Other Properties	Mineral Name
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

Mohs Hardness Scale

Test	Hardness
Fingernail easily scratches the mineral <small>*make sure that the mineral is not a 2</small>	1
Fingernail scratches the mineral but not easily	2
Copper penny scratches the mineral	3
The mineral scratches a copper penny but not easily <small>*make sure that the mineral is not a 5</small>	4
The mineral easily scratches a copper penny <small>*make sure that the mineral is not a 6</small>	5
The mineral scratches a glass plate <small>*make sure that the mineral is not a 7</small>	6
The mineral scratches a steel nail <small>*make sure that the mineral is not an 8</small>	7
The mineral scratches quartz <small>*make sure that the mineral is not a 9</small>	8
The mineral scratches topaz <small>*make sure that the mineral is not a 10</small>	9
The mineral scratches all the previous items <small>-It is the hardest of all minerals</small>	10

Mineral Identification Key Mineral Characteristics

Mineral	Mineral Color	Luster	Hardness	Streak Color	Other Properties
Galena	Metallic silver	<input checked="" type="checkbox"/> Metallic <input type="checkbox"/> Non-Metallic	3	Gray to black	High density; cleavage easily observed
Gypsum	White	<input type="checkbox"/> Metallic <input checked="" type="checkbox"/> Non-Metallic	2	White	Scratched by fingernail
Chlorite	Dark green and black	<input type="checkbox"/> Metallic <input checked="" type="checkbox"/> Non-Metallic	2.5	Green	Can see crystals
Muscovite	Glassy, light gray	<input type="checkbox"/> Metallic <input checked="" type="checkbox"/> Non-Metallic	2-2.5	Colorless	Cleavage is easily observed; occurs in large, flexible plates; glassy appearance
Fluorite	Light green	<input type="checkbox"/> Metallic <input checked="" type="checkbox"/> Non-Metallic	4	Colorless	Cleavage can be observed
Calcite	clear, colorless, (looks like glass)	<input type="checkbox"/> Metallic <input checked="" type="checkbox"/> Non-Metallic	3	White	Fizzes when HCL is added, cleavage is easily observed
Feldspar	Salmon; orange	<input type="checkbox"/> Metallic <input checked="" type="checkbox"/> Non-Metallic	6	Colorless	Cleavage can be observed
Hornblende	Mostly black with specks of white & brown	<input type="checkbox"/> Metallic <input checked="" type="checkbox"/> Non-Metallic	5-6	Colorless	Cleavage can be observed
Magnetite	Black to silver	<input checked="" type="checkbox"/> Metallic <input type="checkbox"/> Non-Metallic	5	Black	Magnetic, can see crystals
Pyrite	Gold; brassy yellow	<input checked="" type="checkbox"/> Metallic <input type="checkbox"/> Non-Metallic	6.5	Black (slight green tinge)	Crystals are easily observed
Quartz	Colorless	<input type="checkbox"/> Metallic <input checked="" type="checkbox"/> Non-Metallic	7	None	Glassy luster
Hematite	Metallic silver with specks of earthy red *Can be totally red if oxidized	<input checked="" type="checkbox"/> Metallic <input type="checkbox"/> Non-Metallic	6	Reddish brown	
Sulfur	Yellow	<input type="checkbox"/> Metallic <input checked="" type="checkbox"/> Non-Metallic	2	Yellow	
Talc	Light green with white	<input type="checkbox"/> Metallic <input checked="" type="checkbox"/> Non-Metallic	1	White	greasy feel