

Mineral ID Lab - Teacher Information

Objective: Complete the tasks/tests at six different stations and make observations to identify mineral samples.

Station Descriptions:

- 1 - Color vs. Streak** - Compare the color of the mineral with the color of the streak it creates.
- 2. Mohs Scale of Hardness** - Estimate the hardness of 3 minerals based on the results of testing with a penny and nail.
- 3. Mass & Density** - Compare the mass and density of various mineral samples using a scale and water displacement.
- 4. Chemical Composition** - Identify the elements in common minerals and test samples for effervescence to show presence of carbonates
- 5. Crystals, Cleavage, and Fracture** - Compare the way different mineral samples break and their crystal structure/shape.
- 6.Special Properties** - Test samples for magnetism, fluorescence, refraction, opacity, etc.

Materials Needed:

- Copies of Student Note worksheets (half page) & Activity worksheet (2 pages)
- Copies of the Station Signs
- Mineral ID Kits for each station as listed below:
 - 1 - Color vs. Streak** - 8 mineral samples with different colors/streaks, streak plates, paper towels, magnifying glasses
 - 2. Mohs Scale of Hardness** - 8 mineral samples with different hardness rating, glass plate, nail, penny, Mohs Scale
 - 3. Mass & Density** - 4 samples ranging from low (talc) to high density (galena), graduated cylinder, electronic scale, displacement can, calculator
 - 4. Chemical Composition** - Samples (need at least one from each group of minerals), periodic table, labels for each sample (chemical formula) provided on the bottom of the station sign
 - 5. Crystals, Cleavage, and Fracture** - 7 samples (staple bags), magnifying glasses, picture guide for cleavage & fracture
 - 6.Special Properties** - Samples (including magnetite, calcite (clear), pyrite, quartz, mica, talc, barite, and any others that relate to the questions on the student worksheet), magnet, UV light, vinegar, safety goggles

NOTE: See the answer key included with the lesson's PowerPoint for specific minerals I used in my kits.

Mineral ID Tests

_____ - The color a mineral appears to be; may vary from sample to sample

_____ - The color of a mineral in a powder form; tested using a white plate

LUSTER – How a mineral reflects _____, such as metallic, glassy, dull, pearly

TRANSPARENCY/OPACITY – Whether or not a mineral allows light to pass through it, may be _____, semi-transparent, or _____

_____ – Description of what a mineral feels like, such as smooth, rough, grainy

CHEMICAL COMPOSITION – Classified based on the _____ in they contain

DENSITY – _____ ÷ _____ ; use a scale and overflow can/graduated cylinder to

_____ SHAPE – Minerals have specific crystal shapes that can be used for identification.

CLEAVAGE/FRACTURE – Determined by how the mineral breaks apart; _____ = smooth and evenly, _____ = rough and jagged

HARDNESS – Use _____ scale and common objects to figure out a mineral's hardness by the process of deduction.

SPECIAL PROPERTIES – Does it create a double image from _____ ? Glow in _____ light?
Fizz with _____ ? Is it _____ ?

Student Notes

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Student Notes

Mineral Identification Challenge

Name _____

Directions: Read the information provided at each station and complete the activities/tests. Complete each section on this worksheet as you visit the stations.

Station 1: Color vs. Streak - Fill in the chart as you examine/test the samples.

Sample	Color	Streak	◆What do you think it is?
A			
B			
C			
D			
E			
F			
G			
H			

Station 2: Mohs Scale of Hardness - Estimate the hardness of each mineral sample using the tools provided and explain how you determined your answer.

Sample	Observations	Hardness	◆What do you think it is?
A			
B			
C			
D			
E			
F			
G			
H			

Station 3: Mass & Density - Follow the directions to complete this section.

Sample	Mass (g)	Volume (mL)	Density (Mass ÷ Volume)
A			
B			
C			
D			

- Galena has a high density. Which sample is most likely galena? _____
- Graphite has a low density. Which sample is most likely graphite? _____

*Need help with identification? Use the resource books available at each station to help you. If you have extra time, you may check out the links in the Geology section of the Science Spot's Kid Zone.
Go to mrstomm.com → Science Spot Kid Zone → Rocks & Minerals → Look in the 2nd column*

Station 4: Chemical Composition - Complete the chart and then classify each sample. Some groups will may have more than one example.

Family/Group	Chemical Description	Examples
Silicates	Contains _____ and oxygen	
Carbonates	Contains _____ and oxygen	
Halides	Contains _____, chlorine, iodine, or _____	
Sulfates	Contains _____ and oxygen	
Oxides	Contains a metal and _____	
Native Elements	Made up of a single _____	

Station 5: Crystals, Cleavage, & Fracture - Determine whether each sample is an example of cleavage or fracture and then identify its crystal structure.

Sample	Cleavage or Fracture?	Crystal Shape(s)	◆ What do you think it is?
A	<input type="checkbox"/> Cleavage <input type="checkbox"/> Fracture		
B	<input type="checkbox"/> Cleavage <input type="checkbox"/> Fracture		
C	<input type="checkbox"/> Cleavage <input type="checkbox"/> Fracture		
D	<input type="checkbox"/> Cleavage <input type="checkbox"/> Fracture		
E	<input type="checkbox"/> Cleavage <input type="checkbox"/> Fracture		
F	<input type="checkbox"/> Cleavage <input type="checkbox"/> Fracture		
G	<input type="checkbox"/> Cleavage <input type="checkbox"/> Fracture		

Station 6: Special Properties - Answer these questions as you test the special properties of the minerals.

1. Magnetite is magnetic, but may have a rough texture. Which sample is magnetite? _____
2. Calcite will cause a double image due to refraction. Did you find any calcite in the group? _____
3. Some minerals glow in UV light. Which samples had this property? _____
4. Pyrite (Fool's Gold) has a metallic luster. Which sample is pyrite? _____
5. Quartz has a glassy luster. Which sample is quartz? _____
6. Mica has a pearly luster and a glassy texture. Which sample is mica? _____
7. Opaque means light cannot pass through it, while others are transparent allowing light to travel through.
Which samples were transparent? _____
8. Did any minerals react with vinegar? If so, how would they be classified? _____

Station 1 - Color vs. Streak

1 - Examine the samples provided and record the color for each in the chart on your worksheet.

2. **LIGHTLY** drag each sample across the streak plate (white ceramic plate) and record the color in the chart on your worksheet.

NOTE: Some minerals are harder than the streak plate and will scratch it, so you will not see a color/streak. Record "no color" or "no streak" in the chart for those minerals.

3. Use your observations to identify each mineral by name using the clues below. Write the names in the last column of the chart.



The red-brown streak of the mineral hematite.



**Video tutorial available on
sciencespot.net → Kid Zone → Rocks & Minerals**

Streak Results for Common Minerals (Not necessarily the ones in your kit!)

Graphite - Black/gray in color with a black streak

Pyrite - Greenish-black streak, which does not match its color

Sulfur - Known for its yellow streak

Hematite - Red-brown streak

Galena - Dark grey streak, but metallic luster

Talc - White streak

Quartz - No color

Magnetite - Black/dark grey in color, reddish-black streak

Mica - No color

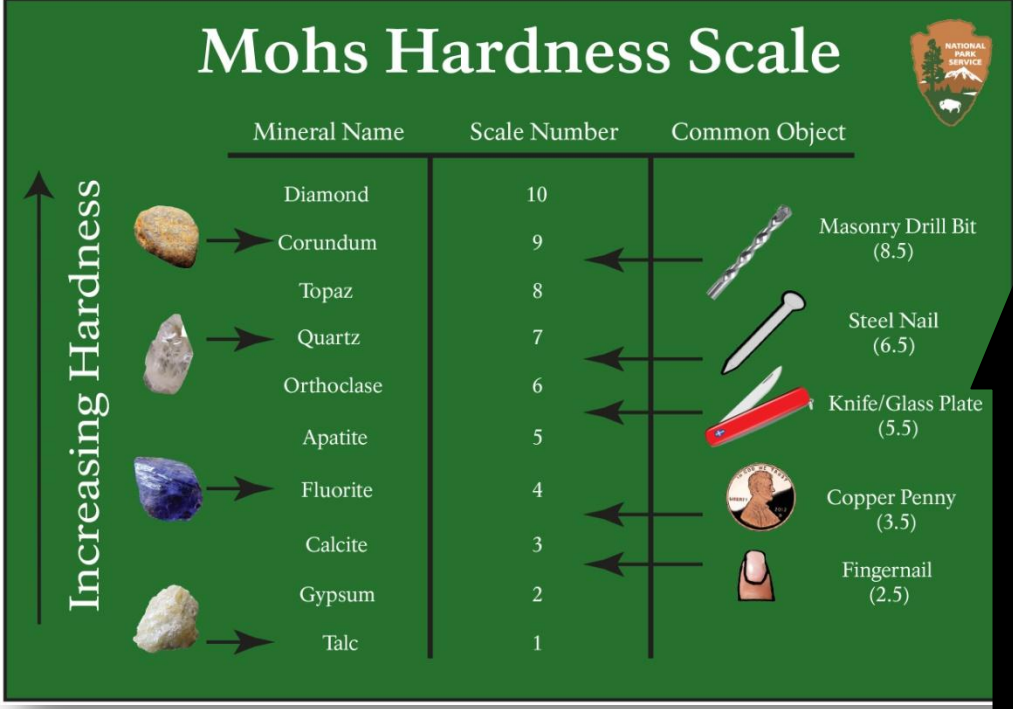
Gypsum - Light-colored streak

Need more information? Check out one of the Rock & Mineral guides or the classroom set of minerals.

Station 2 - Mohs Scale of Hardness

Directions: Estimate the hardness of minerals by testing each one with the materials provided.

To test the hardness of a mineral, start at the bottom of the "Scratch Test" column and work your way upwards with the materials you have in your kit.



	Mineral Name	Scale Number	Common Object
↑ Increasing Hardness	Diamond	10	
	Corundum	9	Masonry Drill Bit (8.5)
	Topaz	8	
	Quartz	7	Steel Nail (6.5)
	Orthoclase	6	Knife/Glass Plate (5.5)
	Apatite	5	
	Fluorite	4	Copper Penny (3.5)
	Calcite	3	
	Gypsum	2	Fingernail (2.5)
	Talc	1	



**Video tutorial available on
sciencespot.net → Kid Zone → Rocks & Minerals**

Examples:

If you can scratch the sample with your fingernail, it has a hardness of 3.5 or less.

If you can scratch a sample with the nail, but not with a penny, it would have a hardness of 4 or 5.

A sample that scratches glass would have a hardness of 7 or higher.

Need more information? Check out one of the Rock & Mineral guides or the classroom set of minerals.

Station 3 - Mass & Density

Directions: Compare the mass and density of various mineral samples using a scale and water displacement.

For each sample ...

- 1 - Use the electronic scale to find the mass of the sample and record in the chart.
- 2 - Find the volume of the rock using the overflow canister and record in the chart.

1st - Fill the canister as full as you can and allow the extra water to drip out into the sink.

2nd - Place an empty graduated cylinder under the spout.

3rd - Gently place the rock in the cylinder and catch all the water with the cylinder.

4th - Measure the volume of water to the nearest milliliter- remember to measure at the bottom of the meniscus (bubble).



- 3 - Calculate the density and **ROUND** to two decimal places (hundredths).



**Video tutorial available on
sciencespot.net → Kid Zone → Rocks & Minerals**

Station 4 - Chemical Composition

DO NOT OPEN THE BAGS!

Directions: Classify common minerals based on their chemical formula. You may use a periodic table to help you!

Family/Group	Chemical Description
Silicates	Must contain silicon and oxygen
Carbonates	Must contain carbon and oxygen
Halides	Must contain fluorine, chlorine, iodine, or bromine
Sulfates	Must contain sulfur and oxygen
Oxides	Contain a metal and oxygen
Native Elements	Made up of a single element

Bag Labels - Cut off this section and use to label the mineral samples.

Quartz - SiO_2

Barite - BaSO_4

Azurite - $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$

Calcite - CaCO_3

Pyrite - ZnS_2

Graphite - C

Magnetite - Fe_3O_4

Talc - $\text{Mg}_3\text{Si}_4\text{O}_{10}(\text{OH})_2$

Muscovite - $\text{KAl}_2(\text{Si}_3\text{AlO}_{10})(\text{OH})_2$

Copper - Cu

Halite - NaCl

Station 5 - Crystals, Cleavage, & Fracture

Part A: Identify whether or not the sample shows cleavage or fracture.

You do not need to break the minerals - look at the pieces and edges of each one to give you clues.

CLEAVAGE/FRACTURE

- Cleavage- when a mineral break along a flat, smooth surface



- Fracture- when a mineral breaks along an irregular surface



Part B: Identify the type of crystal shape in each sample using the picture. Use the magnifying lenses and mini microscopes to help you examine the samples.



Cubes



Octahedra



Blades



Hexagonal Prisms



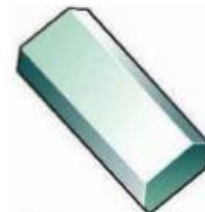
Dodecahedra



Compound Forms



Rhomboheda



Tetragonal Prisms

Need more information? Check out one of the Rock & Mineral guides at your station.



**Video tutorial available on
sciencespot.net → Kid Zone → Rocks & Minerals**

Station 6 - Special Properties

Directions: Complete each test to help you answer the questions on your worksheet.

Magnetism - Use the magnet to see if any of the rocks have magnetic properties.

Fluorescence - Use the UV light in a dark area to see if any of the minerals "glow" or fluoresce.

Refraction - Hold the samples over this page to see if any of them cause a double image.



Transparency vs. Opacity - Hold the sample up to a bright window or the classroom lights. Can light shine through the sample?

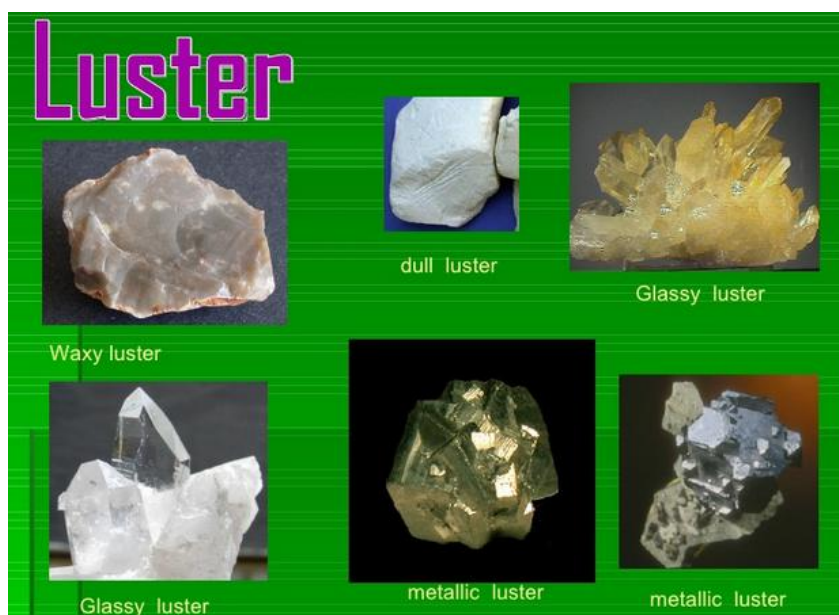
If light passes through it, it is transparent.

If a little light shows through, it is semi-transparent.

If no light can pass through, it is opaque.

Texture - How would you describe the texture of each sample, such as rough, smooth, grainy, etc.?

Luster - How does it reflect light? Use the descriptions in the picture to help you classify the luster of each sample.



Sources:

Cleavage Diagram - <http://image.slidesharecdn.com/mineralsgreg-120215121846-phpapp02/95/minerals-physical-properties-8-728.jpg?cb=1329309258>

Crystal Shapes - <http://image.slidesharecdn.com/chapter3-minerals-110708161714-phpapp01/95/chapter-3-minerals-24-728.jpg?cb=1310142017>

Mohs Scale - https://polishedstoneblog.files.wordpress.com/2015/04/mohs_scale.jpg

Streak Test - <http://faculty.chemeketa.edu/afrank1/rocks/minerals/streak.jpg>

Luster - <http://www.slideshare.net/janellewilson/mineral-identification-lab-1916545>

Cleavage/Fracture - http://images.slideplayer.com/16/4882593/slides/slide_10.jpg

Double Image - <http://gwydir.demon.co.uk/jo/minerals/calcdref.jpg>