

Minerals & Rocks: Mineral Identification Lab

Lesson: Explore - Mineral Identification Lab

Subject/Grade: Earth Science 30, Science/7, and Science/4

Stage 1: Identify Desired Results

Outcome(s)/Indicator(s)

Earth Science 30

ES30-LS1 Examine the processes that lead to the formation of sedimentary, igneous and metamorphic rocks and minerals. [SI]

Indicator(s):

- b) Identify the characteristics geologists use to determine whether an Earth material is a mineral.
- d) Observe and classify mineral samples using standard physical properties (cleavage, fracture, crystal form, hardness, luster, colour, magnetism and streak).

Grade 7 Science

EC7.2 Identify locations and processes used to extract Earth's geological resources and examine the impacts of those locations and processes on society and the environment.

Indicators

- b) Distinguish between rocks and minerals using physical samples, pictures, and/or video recordings and identify the minerals most often found in rocks in Saskatchewan and around the world (e.g., quartz, calcite, feldspar, mica, hornblende).
- c) Classify rocks and minerals based on physical properties such as colour, hardness, cleavage, lustre, and streak.

Grade 4 Science

RM4.1 Investigate physical properties of rocks and minerals, including those found in their local environment. [CP, SI]

Key Understandings: ('I Can' statements)

I can... explain what a mineral is.

I can... make observations that describe the physical properties of minerals.

I can...record and organize my observations into a chart.

I can... use a mineral identification chart to name a mineral based on my observations.

Essential Questions:

- What is a mineral?
- What are some physical properties of minerals that can be used to identify them?

Concepts:

- Mineral Identification
- Physical Properties of Minerals

Scientific Inquiry

- Make **observations** that describe physical properties of minerals
- Record and organize observations in a chart format

Teacher Background

In this lesson students explore the physical properties of minerals through observations and identification. Students will apply their learning from the previous lesson on how physical properties aid in identifying minerals.

Teacher Preparation -

1. Have a system to label your minerals. For example, use white out, black permanent marker and clear nail polish to label your mineral samples with numbers. Then, create a spreadsheet with the numbered mineral labels and the mineral name. If you are using borrowed minerals or a mineral kit and cannot label them, then make sure the minerals are in the correct spots of the kit to begin with and then take a picture.

For example -

Box 1 (Grey/Black)	Box 2 (Clear/White)	Box 3 (Blue)
Graphite	Halite	Calcite
Galena	Quartz	Bornite
Magnetite	Plagioclase Feldspar	Sodalite
Kyanite	Calcite	Kyanite

2. Divide your class into groups and make mineral kits/boxes for each group. Shoe boxes work well and are easy to label. During the lab make sure students write down which shoe box kit they used, so if you have to double check observations/answers you can find the exact mineral that they were observing. If you don't have enough of the same type of mineral for each group, you can arrange them by colour (or some other scheme). Each box should have four minerals of the same colour, so students could not focus on colour to try to ID their minerals (colour is not always a reliable characteristic because some minerals can be a variety of different colours). Also, each box should have a penny, butter knife, glass, streak plate ± magnets, and ± 1 mol HCl ± pipettes. Design your boxes based on the minerals you have available.
3. Then create a mineral ID chart based on the minerals you used. For example.....

Mineral Identification Chart

Mineral	Hardness	Colour	Streak	Luster	Cleavage	Other
Graphite C	1-2	Grey-Black	Grey-Black	Dull Metallic	1	Marks paper
Halite NaCl	2.5	Many	White	Glassy	Cubic 3 at 90°	Salty Taste
Galena PbS	2.5	Lead Grey	Lead Grey	Metallic	Cubic Crystals	Heavy
Calcite CaCO ₃	3	Many	White	Glassy	2 not at 90°	Reacts with HCl

Stage 3: Build Learning Plan

Refresher:

Time: 10 min

- Go over mineral identification briefly.
- **Answer the exit slip questions that students handed in from the Introduction to Minerals Lesson.**

Questions – How would you identify minerals? What physical properties do minerals have?

Explore:

Time: 30 - 45 min

- Go over Safety and hand out the worksheets.
- Explain to the students that they will work in groups and will have to observe and fill out the worksheet for all four minerals that they have at their table.
- Let the groups pick a box set of minerals and tools.
- Separate the groups far apart while they work.

Students will explore the physical properties of minerals and will be working on the worksheets. Circulate around to all the groups to check in. Some questions you could ask...

- What characteristics can you observe that might be able to help you in describing the minerals at your table?
- Can other classmates identify your minerals based on the observation chart that you created?
- How can you use the materials at your table to help you describe the minerals?
- What can the different tools/materials tell you about your mineral?
- How do you know that this is a mineral?
- How do you test for ... hardness, streak, etc? And what does that tell you about the mineral?

* Encourage students to draw detailed pictures and label features, (even include coloring). Being able to draw is an important skill for scientists, especially for geologists.

Once students have been given enough time to observe, draw and describe the minerals, give groups a mineral identification chart in order for them to name the minerals that they were observing. Circulate and help groups with some of the identifications by asking questions and giving hints – some of the minerals can be tricky. Make sure all groups have identified the minerals properly. Make sure students are not erasing their observations to match the ID chart that they were given.

Materials/Equipment:

- A set of minerals for each group
- A mineral identification kit for each group (penny, butter knife, glass, streak plate ± magnets, and ± 1 mol HCl ± pipettes).
- Worksheet Handout
- Appropriate mineral identification chart for the minerals used.

Safety Considerations:

- **Wear safety goggles**
- **When using HCl use a small amount and wash the sample and dry the sample with a paper towel. HCl will ruin your clothes if you spill it on yourself. If you notice irritations then wash your hands.**
- **Use caution when handling the mineral samples, streak plates and glass**
- **If something breaks, inform the teacher immediately. They will clean up any spills or broken glass/objects.**
- **Wash hands after handling samples**



Explain:

Time: 5 - 10min

Have each group explain their findings to the rest of the class. They will informally present the minerals that they identified and how they identified it. They will also say the name of the minerals – at this time other groups might speak up/interrupt since there are identical minerals that look completely different.

Some questions you can ask to help in guiding the presentations...

- What were the distinctive physical properties of the minerals that you identified?
- How did you use the tools to test for mineral properties?
- What were some unique physical properties that you thought were the most interesting?
- How can you use the physical properties of minerals to help you identify minerals?
- How many mineral samples are there all together?
- How many different minerals were there on each mineral identification sheet?
- Why is the total number of mineral samples greater than the number of different minerals?

Hopefully the students will realize and point out that some of the minerals are the same and just a different colour. The minerals in the examples above were Kyanite (black and blue) and Calcite (white/clear and blue).

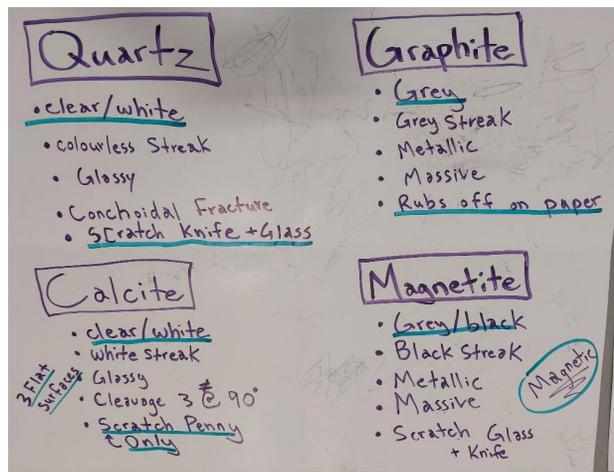
Extend

Final Thoughts – Now that we have learned what a mineral is and how to identify minerals based on their physical properties, how do you think minerals might form?

Mineral formation will be covered in the next lesson.

Possible Adaptations/ Differentiation

- Go through an example together before students explore on their own.
- If you do not have enough minerals to make kits, put the minerals you have at a front table and have groups choose one mineral at a time.
- You don't have to organize your kits by colour.
- Instead of using the lab sheet provided, you could show students a mineral identification book and have them create their own mineral ID field guide based on the samples you have given them.
- For younger students, you could have them work in groups with chart paper. Written on the chart paper are the minerals with key identifying characteristics. Students place the minerals on the proper spots on top of the chart paper.



Stage 4: Determine Evidence for Assessing Learning

Learners will show they achieved the skills by...

1. Drawing and recording observations of different minerals.
2. Being able to identify different minerals based on physical properties (cleavage, fracture, crystal form, hardness, luster, colour, magnetism and streak).
3. Responses to in class questions and discussions. (See below)

Feedback that students will receive...

1. Drawing and recording will meet established criteria – marked as incomplete or complete with feedback.
2. The mineral identification worksheet that will be marked out of ten, but worth 1%.
3. Informal class responses and discussion on trying to identify minerals.

Extensions

Link this lesson to Saskatchewan resources by including a potash sample. Have students try to figure out what minerals are in the potash sample. They could compare sylvite and halite with quartz. Have students research about the importance of potash to Saskatchewan and create doodle notes/infographic/etc. from what they learned.

- Students could include a drawing of potash with arrows identifying the minerals, draw a map identifying mine locations in Saskatchewan, uses of potash with explanation, mining process, how much Saskatchewan produces, etc.
- Helpful Link - Click on tab "Our Resources" and then subtab "Minerals and Mines"
<https://skgeolhighwaymap.maps.arcgis.com/apps/MapSeries/index.html?appid=a845cbb370f7401597806887318e2676>

Look at the GeoExplore Saskatchewan website for further information and a deeper understanding of the local context. It is a digital version of the original paper Geological Highway Map of Saskatchewan:

Main Website

<https://skgeolhighwaymap.maps.arcgis.com/apps/MapSeries/index.html?appid=a845cbb370f7401597806887318e2676>

For more background information related to this lesson check out

- Main tab "Geo 101"

Name: _____

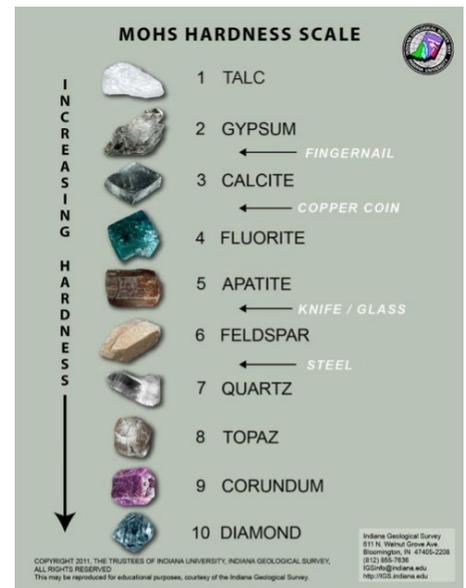
Mineral Identification Lab



- HCl - use a small amount and dry the sample with paper towel
- HCl will ruin your clothes if you spill it on yourself
- If you notice irritations then wash your hands
- Some samples might be pokey and sharp – use caution
- Use caution handling mineral samples, streak plates and glass
- Return all materials and samples

Background Information: Minerals are the building blocks of rocks and sediments comprising the Earth and its landscapes. Minerals are naturally occurring inorganic solids with a definite chemical composition and an ordered internal crystalline structure. Geologists use several different ways to identify minerals. One way is by looking at a mineral's physical properties. You need to use a combination of many tests to identify a mineral.

- **Hardness** – describes a mineral's resistance to scratching. Hardness is measured on a scale of 1 to 10, with 1 being the softest minerals and 10 being the hardest mineral.
- **Colour** – the colour of the mineral.
- **Streak Colour** – the color of the finely ground powder of the mineral when using a streak plate.
- **Luster** – describes the way a mineral reflects light. Minerals can be categorized as Metallic and Nonmetallic.
- **Cleavage** – how a mineral breaks along flat surfaces (usually one, two, three or four surfaces).
- **Fracture** – how a mineral breaks along rough or jagged, irregular surfaces.
- Other properties include crystal shape, heaviness (density), magnetism, and if it reacts with HCl acid.



Observations Criteria and Feedback

Criteria for a Good Drawing	Met	Not Yet
Large enough to show the details		
Illustrates all the parts as realistically as possible		
Illustrates details such as texture, colour, and shape		
Properly labeled (measurements, minerals, and important features.)		
Criteria for a Good Observation		
Accurate Details - proper use of descriptive words based on observations		
Descriptive Words (e.g. Iridescent, spherical, scaly, powdery, etc.) and details (location, colour, texture, quantity, sounds, smells, etc.)		

Feedback:	Current Score

Mineral Name:

Physical Properties/ Observations

Drawing	Hardness
	Colour
	Streak Colour
	Cleavage or Fracture
	Luster
	Shape
	Other
	Other

Mineral Name:

Physical Properties/ Observations

Drawing	Hardness
	Colour
	Streak Colour
	Cleavage or Fracture
	Luster
	Shape
	Other
	Other

Mineral Name:

Physical Properties/ Observations

Drawing	Hardness
	Colour
	Streak Colour
	Cleavage or Fracture
	Luster
	Shape
	Other
	Other

Mineral Name:

Physical Properties/ Observations

Drawing	Hardness
	Colour
	Streak Colour
	Cleavage or Fracture
	Luster
	Shape
	Other
	Other