

FAIRLY SIMPLE MINERAL IDENTIFICATION EXERCISE

John J. Thomas

Purpose

An exercise in the identification of minerals that uses minerals with very distinct characteristics. The students will learn the characteristics of minerals and the process of identification. They will practice with the properties one uses in mineral identification. They will also learn how to use a simple identification chart. This exercise is designed so that the student has success. The worksheet at the end can be done either by first identifying the minerals and then doing the worksheet or by skipping the actual identification and simply using the Mineral Identification Chart to fill in the worksheet.

Definitions

Hardness - how hard a mineral is.

Luster - the way a mineral reflects light.

Color - the color of a mineral.

Cleavage - the way a mineral splits.

Special Properties - characteristics special to a mineral.

Teacher Information

This exercise is designed so that the student has SUCCESS. The minerals all have distinct properties. The only mineral descriptions on the Identification Chart are those of the minerals they (and you) will have in front of them.

All of the definitions are probably strange to you. The following is a more detailed description of each of these properties and the techniques for testing them.

Hardness - how hard materials are. The hardness is defined by Moh's Scale of Hardness. Moh's scale uses ten common minerals ranging from talc (1, the softest) to diamond (10, the hardest). The steps from 1 to 10 are not a regular step scale (diamond is about 100 times as hard as the #9 mineral). There are hardness kits that can be used for testing hardness, but they are unnecessary. We have very nice testers around us:

Fingernail = 2 - 3 hardness (depending on your health. It usually is 2 1/2).

Copper penny = 3 1/2

Steel common nail = 5 1/2

Quartz crystal = 7

You test hardness by scribing the mineral the way you would draw a line. Run your fingernail along the mineral as though the mineral is hard fudge and your fingernail is a knife you are using to cut it. Don't pick at it. Then scratch across the cut line. If you scratched it with your hardness tester, you will feel a notch. The harder the mineral the more you may have to lean into it to scratch it. Don't be afraid! You will not hurt it. The ease of making a scratch lets you decide how hard the mineral is. For example, if you can scratch a mineral easily with your fingernail, it has hardness 1. If it is quite difficult to scratch, 2, not hard and not easy = 1 1/2. If you can just barely scratch the mineral, 2-2 1/2. Check yourself by seeing how hard it is to scratch the same mineral with the penny.

Luster - the way that anything reflects light. The scale that we use is a subjective one, but it is quite usable, especially at the opposite ends of the range. This exercise uses a simple one from the following examples:

Dull - no shine, like newly plowed earth
Waxy - a dull shine, like a block of wax
Metallic - bright and shiny like polished silverware
Glassy - bright, transparent shine like a newly polished window
Adamantine - deep, brilliant, multicolored, fire, like a diamond.

Color - exactly that. The color of the mineral. This is the least diagnostic characteristic of a mineral (sorry for the bad news). Quartz, for example, can be clear, white, gray (smokey quartz), almost black, purple (amethyst), green, yellow, and pink (rose). Sometimes color is the only thing you have to use. Streak, which is the color of the mineral when it is powdered, is always a correct color.

Cleavage - the way a mineral splits. Micas (biotite and muscovite) are excellent examples of this. Take a piece of mica and peel the sheets apart. This is cleavage. Watch the students with the mica or they will reduce your samples to a pile of very small flakes.

Special Properties - these are properties of minerals specific to one or two minerals. Examples are:

Taste -yes, geologists lick, smell, and bite minerals. The mineral halite is rock salt and tastes salty. Kaolinite on a fresh surface (scrape a clean surface) smells dusty. If you touch kaolinite with the tip of your tongue, it feels like it sticks, but is actually dried by kaolinite's love of any fluid. Chalk grinds on your teeth when you bite it.

Reaction to acid - calcite fizzes in warm, dilute hydrochloric acid (HCl). Dilute HCl one part of acid to nine parts of water [**always add acid to water**]. Get a friendly high school chemistry or earth science teacher to mix some for you. Even simpler is to use vinegar (it is dilute acetic acid). If you use the acid test, you do it for your students. The acid is very mild, less acid than your stomach, but it melts synthetic clothes. After using the acid, wash the sample off under running water. For safety reasons you may want to get permission from your principal to use the acid.

Double refraction - Iceland spar, the transparent variety of calcite shows double refraction. Make a small dot on a piece of paper and put the Iceland spar on top of it. You will see two dots. One dot appears to be higher than the other. Rotate the crystal and one will rotate around the other. This may project nicely on an overhead projector.

Feel - Talc feels greasy.

Materials

Minerals - Biotite

Calcite and/or dolomite

Galena

Gypsum

Halite

Kaolinite

Talc

Feldspar, potassium and/or plagioclase

Quartz

Hardness Testers - your fingernail

penny

common nail (carpenter type)

Acid - dilute hydrochloric acid or vinegar

Optional - Iceland Spar crystal

quartz crystal

Identification Chart

Identification Sheet

Worksheet

Sources of materials - both of these suppliers are good, helpful, and quick. Their catalogs are free and are neat!

Ward's Natural Science Establishment, Inc.
P.O. Box 92912
Rochester, NY 14692-9012
800-962-2660

Geosciences Resources
2990 Anthony Rd.
Burlington, NC 27215
800-742-2677

Student Exercise

Give a sample of each of the minerals on the equipment list to your students (we usually let them work in pairs) and let them identify each of them. Give them each a copy of the identification chart and the identification sheet to help them with the identification. You will have to go over each of the properties of minerals so that they will understand them. Test the hardness of all of them. Do the luster of kaolinite (dull) and biotite (metallic). Have them describe the color of each. Let them split the biotite and learn what cleavage is. Show them some special properties such as the fizz of calcite. Let them feel talc, smell kaolinite, and taste halite. Then give them the worksheet and let them follow the trail of the geologist.

MINERAL IDENTIFICATION CHART

Hardness	Luster	Color	Cleavage	Special Properties	Mineral
1	Waxy	Light	Poor, makes flakes	Smooth, greasy feel	Talc
1 1/2	Dull	Light	Crumbly like chalk	Smells clayey on a fresh scraped surface	Kaolinite
2	Waxy to glassy	Light	One Good	Can be clear.	Gypsum
2 1/2	Metallic	Lead gray	None	Occurs as cubes	Galena
2 1/2	Glassy	Clear to light colors	3 excellent, forms cubes	Tastes salty	Halite
2 1/2 to 3	Metallic	Black	1 excellent	Peels into very thin transparent mica flakes	Biotite
2 1/2 to 3	Glassy	Clear	1 excellent	Peels into very thin transparent mica flakes	Muscovite
3	Opaque to glassy	Lots, may be white, gray to dark bluish	3 excellent,	Fizzes in dilute acid. Fizzes in dilute acid when scratched	Calcite Dolomite
5 1/2 to 6 1/2	Glassy to pearly	Pink, green, white, light to dark gray	2 good at right angles	Potassium feldspar is pink, green, and white to light gray. Plagioclase is white to gray to very dark gray. Plagioclase has striations (small scratches or small grooves) on one of the cleavages.	Potassium Feldspar Plagioclase Feldspar
7	Glassy	Clear, white, green, yellow, pink, smokey, gray	None. Fractures like glass	May occur in perfect six sided crystals.	Quartz

MINERAL IDENTIFICATION SHEET

Mineral # _____

Hardness _____

Luster _____

Color _____

Cleavage _____

Special Properties _____

Mineral Name _____

Mineral # _____

Hardness _____

Luster _____

Color _____

Cleavage _____

Special Properties _____

Mineral Name _____

Mineral # _____

Hardness _____

Luster _____

Color _____

Cleavage _____

Special Properties _____

Mineral Name _____

MINERAL WORKSHEET

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THE TRAIL OF THE GEOLOGIST

Fill in the geologist's path from the hammer to the map. The last letter of one word becomes the first letter of the next word. Example: scratch heavy (scratch hheavy).

Clues

- A gray mineral that is softer than a nail, but harder than a fingernail.
- Makes calcite fizz.
- Kaolinite does not shine. It is _____.
- Kaolinite, talc, and gypsum are _____ colored.
- A mineral that feels greasy.
- Often used to tell minerals apart.
- A geologist studies them.
- Halite tastes like _____.
- Biotite forms _____ sheets.
- Used to test how hard a mineral is.

MINERAL WORKSHEET ANSWER SHEET

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THE TRAIL OF THE GEOLOGIST

Fill in the geologist's path from the hammer to the map. The last letter of one word becomes the first letter of the next word. Example: scratch heavy (scratchh heavy).

Clues

G A L E N A A gray mineral that is softer than a nail, but harder than a fingernail.

A C I D Makes calcite fizz.

D U L L Kaolinite does not shine. It is _____.

L I G H T Kaolinite, talc, and gypsum are _____ colored.

T A L C A mineral that feels greasy.

C O L O R Often used to tell minerals apart.

R O C K S A geologist studies them.

S A L T Halite tastes like _____.

T H I N Biotite forms _____ sheets.

N A I L Used to test how hard a mineral is.