4-H

Natural Resource

Club

Geology

Geology

Learning about geology is fun for people of all ages. "Geology" exists all around you, wherever you live. The Indiana 4-H Geology curriculum was written for youth who enjoy rocks, fossils, and minerals, and for those who want to learn more. The first manual introduces basic geology concepts and terminology and is intended for youth in grades 3-5.

Level 2 continues the study of rocks, minerals, and fossils and in more detail. It also introduces a study of geologic time, glaciers, and field trips that youth can take to see Indiana's geology. *Level 3* introduces more advanced geology topics, including polishing stones, lapidary, world geology, and careers in geology.

Note: Earth Science week is traditionally held the second full week of October. Find out more at: www.earthsciweek.org/.

Indiana 4-H Geology manuals

(Order from Purdue's *The Education Store*, https://mdc.itap.purdue.edu/)

- ❑ Geology 1, Grades 3-5 (#4-H 985)
- ❑ Geology 2, Grades 6-8 (#4-H 986)
- ❑ Geology 3, Grades 9-12 (#4-H 987)
- ❑ Indiana 4-H Geology Facilitator's Guide, (4-H 988-W), www.extension.purdue.edu/extmedia/4H/4-H-988-W.pdf

Invited Speaker Suggestions

Local people who work with or have a knowledge of geology may be difficult to find for the geology project. You might contact a Geology department or Department of Earth and Atmospheric Sciences, if you have a college or university near you. The Indiana Geological Society lists meetings and events on their homepage: http://igs.indiana.edu/.

Resources

- ❑ Indiana 4-H Geology Webpage: www.four-h.purdue.edu/natural_resources/, click on geology
- ❑ Indiana Geological Survey, http://igs.indiana.edu/, has many links, the Educational Resources tab
- ❑ Indiana State Museum, http://indianamuseum.org/visit/, search: fossils or minerals
- ❑ American Geosciences Institute (AGI), www.agiweb.org/
  - Earth Science Week, www.earthsciweek.org/
  - Big Ideas — activities, www.earthsciweek.org/forteachers/bigideas/main.html
  - Images, www.earthscienceworld.org/images/
- ❑ Institute of Meteoritics, http://www.agiweb.org/
  - How To Identify A Meteorite, http://epswww.unm.edu/iom/ident/

Instructor notes

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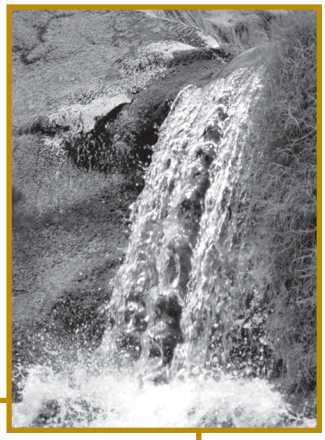
Activities

The following activities were selected from the Indiana 4-H Geology Level 1 manual to introduce geology to your 4-H Natural Resources club. This manual was written using the Experiential Learning model. We recommend that you allow youth to do the activity (experience) as suggested in the manual, giving help as needed. Be sure to discuss the *Think About It*! section with the youth.

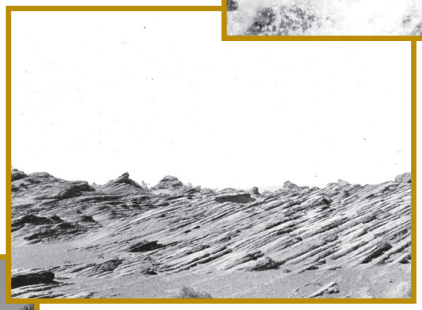
Pages	*Activity Objectives*	*Materials Needed*	*Time (min.)*
The Rock Cycle			
9-11	Youth learn about the three types of rocks (igneous, metamorphic, and sedimentary) in the rock cycle.	Copies of pages 9-11 for individuals or teams	30
Rock Collection and Artwork			
18-20	Youth collect rocks (perhaps bring 3 to the meeting) and try and identify them by comparing to the pictures and descriptions given.	Collected rocks and copies of pages 18-20 or copies of the bookmark (colored) as needed	20-30
21	Youth make a rock collection with the rocks they have collected and identified. Youth create a picture using rocks and write a story about their picture.	Rocks, sand, gravel, and other types of rocks, glue or rubber cement, pencils and paper	20-30
Geology Equipment			
21-23	Youth will begin to learn about geology equipment by reading (or listening to you read) pages 21 & 22 and completing the Word Search on page 23.	Copies of page 23 for each youth or teams of youth	15
Minerals			
24	Read the introduction to the *Minerals* section. Making crystal models: Youth will make paper models of different types of crystals	Copies of Appendix A, pages 33-38	30
25	Growing sugar crystals: Youth will learn how crystals form by growing sugar crystals. The activity takes about 30 minutes to set up but the crystals must be undisturbed and observed for 3-10 days while they form.	Measuring cup, saucepan, wooden spoon, clean glass jar, string, pencil, 1 cup water, 2 cups granulated sugar, liquid candy flavoring, and food coloring (opt.)	30 (plus 3-10 days)
26	• Growing snowflakes: Youth will learn how snowflakes form by growing their own. The activity takes about 30 minutes to set up but the jar must be undisturbed and observed for a day or two.	String, white pipe cleaners, wide mouth pint jar, pencil, boiling water, Borax, scissors, and food coloring (opt.)	30 (plus 1 day)
Fossils			
27	Read the introduction to the *Fossils* section.	Page 27	10
28, 29	• Quick Clay Mold Make: Youth make a mold using clay to understand the process.	Modeling clay, small objects for making molds	20
28	• Making a plaster fossil mold: youth make a plaster fossil mold.	Fossil, plaster of Paris, disposable cup, petroleum jelly, mixing cup and plastic spoon, 2 strips of cardboard	45-60
28-29	• Making a cast: youth make a cast from their plaster mold. The cast is a copy of the original fossil.	Plaster mold, rubber latex, paint	30 (& dry time)
44-45	***Glossary***: The geology glossary is included to help you with questions that may come up. Youth who seem very interested in beekeeping might like to have a copy of the glossary.		

The Rock Cycle

Igneous rocks are formed from magma that is cooled and hardened into rock. Magma moves toward the surface of the Earth filling in cracks, forcing its way between the layers of other rocks, and occupying large spaces as the surrounding rock is melted or pushed aside. All of this takes a long, long time. Sometimes magma finds a weak spot and flows slowly to the surface of the Earth where it cools. Sometimes magma blows violently out through a hole in the Earth, and we say a volcano has erupted. The magma that spills out of a **volcano** is called lava.



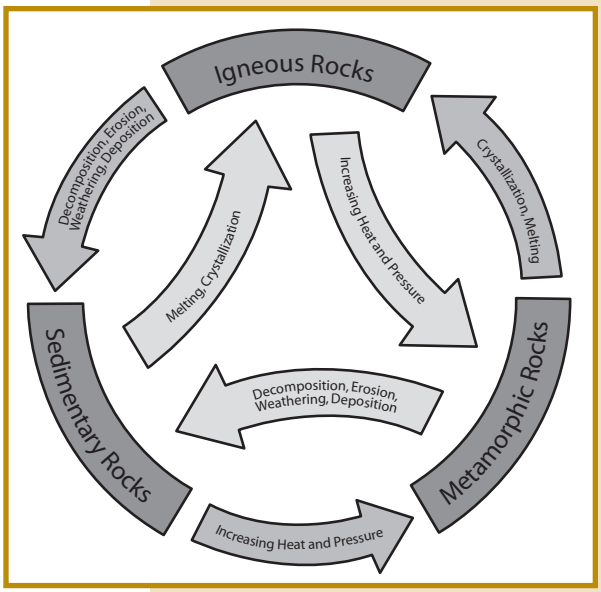
Once igneous rocks **crystallize** (harden) and are exposed at the surface of the Earth, they begin to wear down (decompose or weather). They may become exposed because the magma has been pushed to the Earth's surface or because of erosion. Rain pours down on mountains and washes away loose chunks and small particles on upper surfaces. Rivers carry the pieces along, bumping and scraping and banging



together, crushing some of them into **sand** and some into fine powder. Some of the minerals are decomposed into dissolved material or into clay minerals. Water may seep into the rocks, freeze, and split the rocks apart. Winds may carry the finer pieces. **Glaciers**, too, help form sedimentary rocks as they move over the Earth, pushing and grinding rocks together, until even the hard pebbles of quartz are ground to sand.

As time passes, great quantities of igneous rock wear away. These materials drop to the bottom, creating layers of **soil**. As layer after layer of sediment accumulates, it creates ever-increasing pressure on the lower layers. The lower layers containing organic material, mud, sand, silt, and clay begin to harden into sedimentary rock.

Metamorphic rocks are formed by high pressures and high temperatures that push and crumple rocks. This happens when mountains are created. When rocks are changed into metamorphic rocks, they may change the mineral makeup of the rock or recrystallize. The crystals may grow all in the same direction or separate into layers of crystals.



Activity 2. The Rock Cycle

The rock cycle is not a one-way street. Under certain conditions, each of the three types of rocks can change into any other type of rock. Study the diagram above and fill in the blanks below. Think about the processes that cause one type of rock to change into another.

Fill in the Blanks

- Igneous rocks become _____ rocks through increasing heat and pressure.
- Igneous rocks become _____ rocks through **decomposition**, erosion, and weathering.
- Metamorphic rocks become _____ rocks through **crystallization** and melting.
- Metamorphic rocks become _____ rocks through decomposition, erosion, and **weathering**.
- Sedimentary rocks become _____ rocks through heat and pressure.
- Sedimentary rocks become _____ rocks by melting and crystallization.

Activity 3. Rock Cycle Fill-in

Complete the rock cycle diagram using the following clues.

- Igneous rocks become metamorphic rocks through heat and pressure.
- Igneous rocks become sedimentary rocks through **decomposition**, **erosion**, and **weathering**.
- Metamorphic rocks become igneous rocks through **crystallization** and melting.
- Metamorphic rocks become sedimentary rocks through decomposition, erosion, and weathering.
- Sedimentary rocks become metamorphic rocks through heat and pressure.
- Sedimentary rocks become igneous rocks by melting and crystallization.

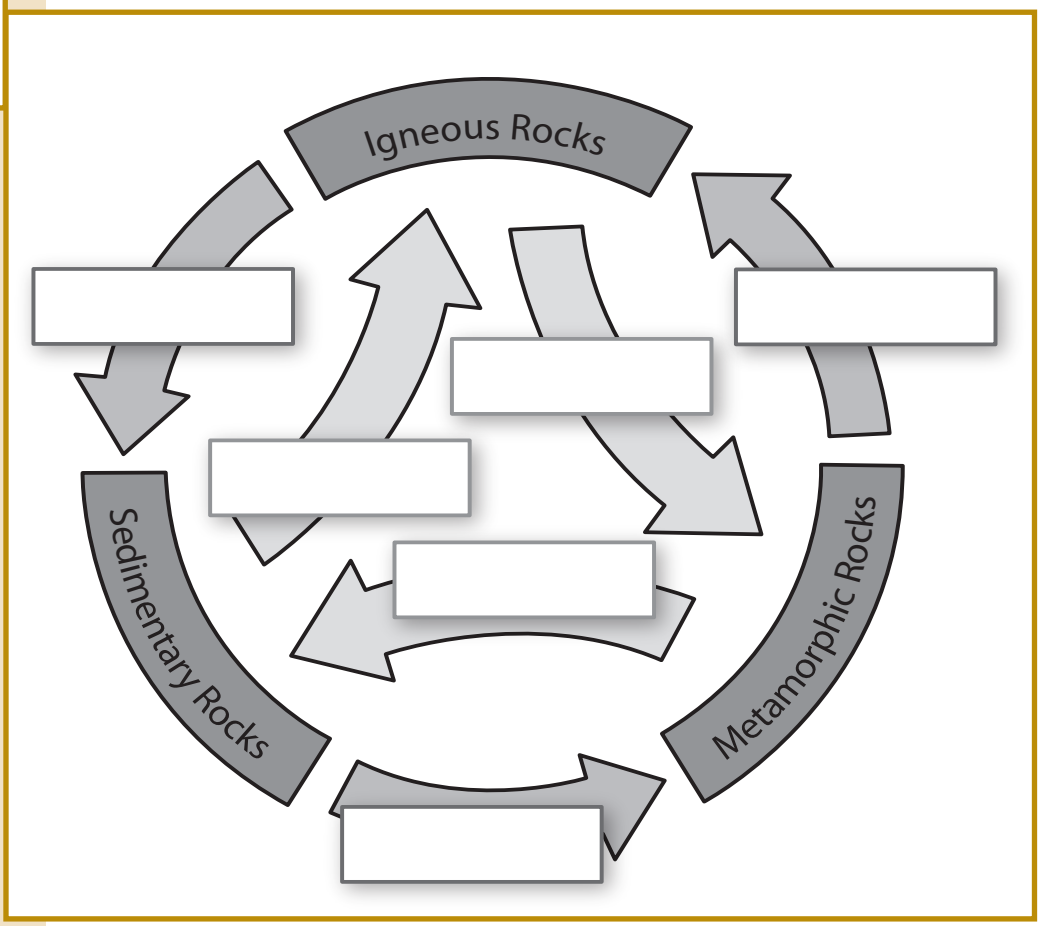
Fill in the boxes with words that describe processes that change one type of rock into another type.

Word Bank (may use abreviations)

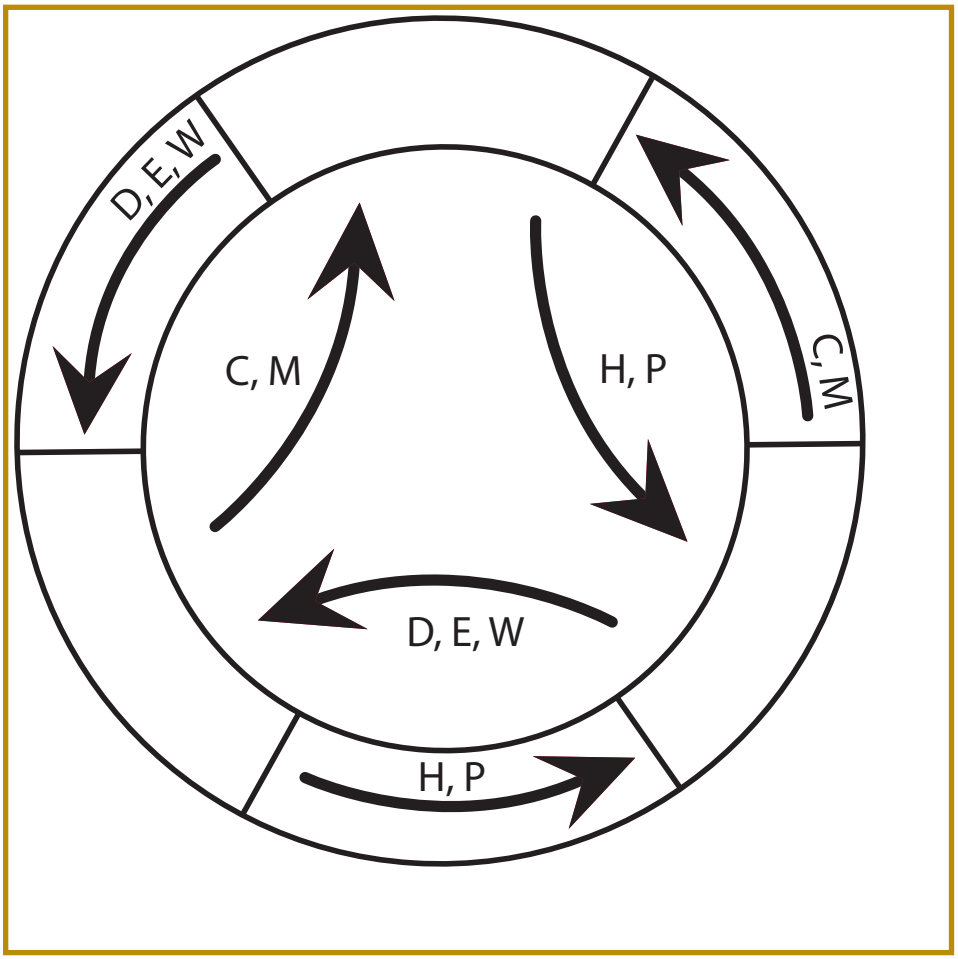
H, P : heat, pressure

D, E, W : decomposition, erosion, weathering

C, M : crystallization, melting



Fill in the empty sections with the names of the three kinds of rocks.



Word Bank

Igneous

Metamorphic

Sedimentary

For more information about the rock cycle, see the Rock Cycle Activities, Handy Handouts (MI41). This publication is available from the Indiana Geological Survey (see "Resources" section).

Think about It!

Did completing the rock cycle help you understand how rocks are formed?

Describe another natural cycle.

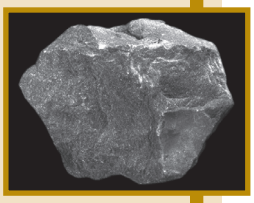
Make a board game using the rock cycle.

Collecting Rocks

The preceding pages introduced you to some basic geology concepts. You can learn much more by collecting and identifying rocks. Collecting and studying rocks can be a life-long hobby and career. Begin to collect special rocks that you find, if you have not already. Why do you like them? Can you think of ways to use or exhibit your rocks? One of the best ways to learn about geology is to work with your 4-H leader, your parents, or an interested friend. Visiting a rock shop or show is a great place to find many rocks and knowledgeable people to help you learn.

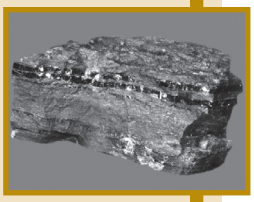
When you begin to collect rocks it can be very difficult to classify and identify them. You will get better at this as you practice and gain experience.

The rocks shown below are the common ones that you are likely to find as a first-time collector.



Basalt (*Igneous*)

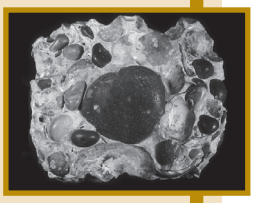
Minerals are not easily seen with unaided eye. Cannot be split into layers. Does not **fizz** in acid. **Color**: black. Mineral content: pyroxene, olivine, and feldspar.



Coal (*Sedimentary*)

Organic textured rock: minerals are not easily seen with unaided eye. Color: black. Soft, easily scratched. Does not fizz in acid. Regarded as a sedimentary rock because it is found in layers.

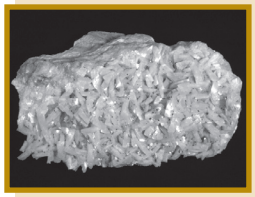
Note: Coal, while commonly found in most Indiana counties, is usually not native except in southwest Indiana. There are other areas in the United States and the world where coal is extensively mined because of the very large deposits.



Conglomerate (*Sedimentary*)

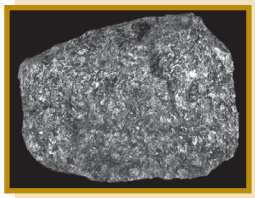
Minerals and rounded rock fragments are easily seen with unaided eye. Color: variable. Appearance: like a **coarse,** pebbly sandstone. Mineral content: quartz, feldspar, and different rock types as pebbles.

Dolomite (*Sedimentary*)



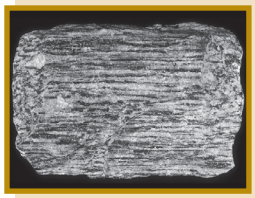
Minerals may or may not be seen easily with the unaided eye. Dense to granular. Color: gray to tan-pink. Dolomite fizzes slightly in acid. Powdered dolomite will fizz more rapidly. Minerals: dolomite (a mineral similar to calcite). Often contains poorly preserved fossils.

Gabbro *(Igneous)*



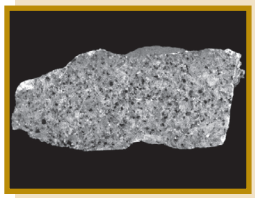
Minerals are easily seen with unaided eye. Minerals mutually intergrown (like a jigsaw puzzle). Dark color; heavy weight. Does not fizz in acid. Mineral content: feldspar, pyroxene, hornblende, and olivine.

Gneiss (*Metamorphic*)



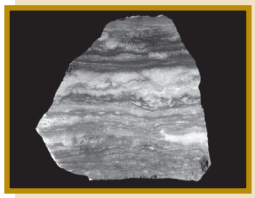
Minerals are easily seen with unaided eye. Minerals in layers or bands. Color: variable. Does not fizz in acid. Mineral content: feldspar, quartz, biotite, hornblende. Except for the banded appearance, gneiss looks like granite.

Granite (*Igneous*)



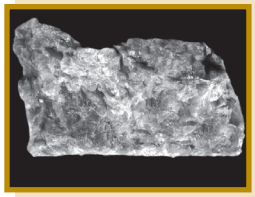
Minerals are easily seen with unaided eye. Minerals mutually intergrown. Light color; lightweight. Does not fizz in acid. Mineral content: feldspar, quartz, biotite, and hornblende.

Limestone (*Sedimentary*)



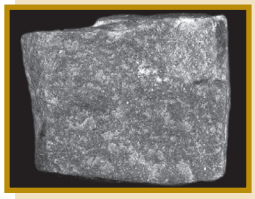
Minerals may or may not be seen easily with unaided eye. Dense rock. Cannot be split into layers. Fizzes in acid. Color: white, gray, black. Mineral content: calcite. Often contains fossils.

Marble *(Metamorphic)*



Minerals may or may not be seen with unaided eye. Cannot be split into layers. Fizzes in acid because it's metamorphosed limestone. Color: usually white. Mineral content: calcite, dolomite. Recrystallized limestone or dolomite.

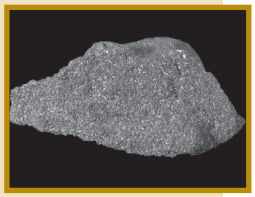
Quartzite *(Metamorphic)*



Minerals are usually seen with the unaided eye. Very hard, dense rock. Does not split into layers. Does not fizz in acid. Color: variable but usually light. Mineral content: quartz sand cemented lightly by quartz cement.

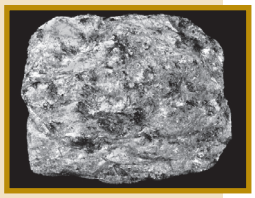
Rhyolite *(Igneous)*

Minerals are not seen easily with unaided eye. Cannot be split into layers. Does not fizz in acid. Dense but lightweight. Color: cream, tan, red, gray. Mineral content: quartz, feldspar.



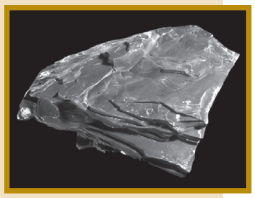
Sandstone *(Sedimentary)*

Sand-sized minerals may be seen with unaided eye. Cannot be split into layers. Usually does not fizz in acid. Color: variable. Mineral content: quartz, feldspar with different cementing material, some of which will fizz. May contain poorly preserved fossils.



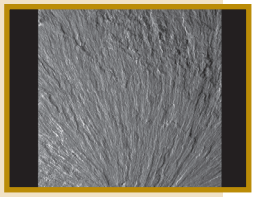
Schist *(Metamorphic)*

Minerals are usually seen with the unaided eye. Can be split along mica surfaces. Color: variable. Does not fizz in acid. Mineral content: variable but usually some variety of mica is predominant. The wavy, layered structure is typical.



Shale *(Sedimentary)*

Minerals are not easily seen with unaided eye. Usually soft. Can be split into irregular layers. Color: green, gray, black. May or may not fizz in acid. Mineral content: clay, silt-sized quartz. Often contains fossils.



Slate *(Metamorphic)*

Minerals are not easily seen with unaided eye. Metamorphosed shale. Dense, brittle, platy rock. Can be split in layers. Color: gray. Does not fizz in acid. Mineral content: clay and silt.

Activity 11. Rock Collection

Collect and display eight rocks using the cards in the back of this manual. Show at least one rock from each classification (igneous, sedimentary, and metamorphic) and identify the rock and its classification. Suggestions for your first collection are:

Igneous – granite, basalt, gabbro
Sedimentary – limestone, dolomite, shale
Metamorphic – quartzite, schist, basalt, granite

Think about It!

Did you enjoy collecting your own rocks?

Did you find it easier to find some types of rocks than others?

Can you find a rock that you could paint to look like a sleeping bunny or other animal?

Activity 12. Rock Artwork

Use sand, gravel, colored rocks, or a combination of these items to make a colorful, textured picture. On a separate sheet of paper, write a story about your picture.

Think about It!

Was it fun to use rocks in your artwork? Have you ever done that before?

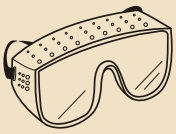
List some other ways to use rocks in artwork.

Collection Equipment and Safety

You will need some special tools and equipment to collect and identify rocks and rock material. Most of the equipment is quite simple and can be found around your home. Review the list given on the next page, then begin building your own equipment collection. You won't need all the items at first, but you will need them if you stick with this project. A four-gallon plastic milk crate, tool box, or old shoe box makes a good place to keep your equipment where you can always find it. You can divide the milk crate into sections by filling it with milk jugs with the tops cut off.

Fun Fact

The book *Let's Look at Rocks* shows pictures and descriptions of important equipment (pages 37-39).



Safety Reminder

When breaking a rock specimen, don't forget to:

1. Put on your safety glasses.
2. Put your rocks in a fabric sack or grain bag.
3. Put the sack in a vice, tighten as hard as you can, and hit the vice (not the rocks) with a hammer.

   This method breaks most rocks.

Common Geology Collection Equipment

Acid – used to test certain rocks for the presence of lime; usually very dilute hydrochoric acid

Chisel – a tool used for breaking out rock specimens (Always wear eye protection when using a chisel. Note that often fingertips are better than a chisel for extracting specimens.)

Collecting bag – used for carrying specimens [Buy collecting bags from an army surplus store. To make your own, cut the bottom part of jeans (knee down), sew closed, and add a handle.]

Gloves – used to protect your hands when you are trimming small specimens to size

Hammer – a tool used for breaking rock specimens

Journal – used to record information about your specimens (In your collecting bag, always have a small piece of paper and masking tape to mark where specimens came from. Roll specimens, especially minerals, in newspaper. Note the nearest city, or at least the county. Put information in your journal when you return home.)

Magnifying glass – used for looking at the grains in rocks

Microscope – used for looking at small details in rocks

Newspaper – used to prevent breakage and to separate specimens

Pocket knife – used for testing the hardness of rocks and rock materials

Protective glasses – used to protect your eyes

Safety kit – useful for small cuts

Specimen box – used for storing your collection at home

Activity 13. Geology Equipment Word Search

Find the 13 pieces of equipment listed in the Word Bank, hidden in the letters below. **(Note: two-word items in the Word Bank will be two separate words in the Word Search.)** Label the geology equipment shown.

Word Bank

Acid	Journal	Protective
Chisel	Magnifying	Safety kit
Collecting	Microscope	Specimen
Gloves	Newspaper	
Hammer	Pocket knife	

T C U P B G D G G C M O
I B H K O L V I O S E N
K A I I X O T L C G P E
D G V D S V L E N A O W
N E M I C E P S K T C S
H S I A C S L S V C S P
P R O T E C T I V E O A
G N I Y F I N G A M R P
X N J O U R N A L P C E
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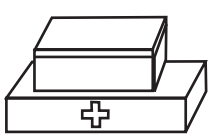
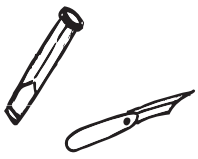
S A F E T Y U O N J M E
E F I N K G L A S S E S





Think about It!

How long did it take you to complete the word search?

Make your own word search, using other geology terms.

Minerals

What are minerals?

A mineral is a solid element or compound. All minerals are made of naturally occurring elements. Minerals are inorganic (nonliving) and have a definite chemical composition and internal structure. There are very few pure elements. For example, gold, silver, diamond, sulfur, and copper are found in pure form. Most minerals are compounds.

How are minerals formed?

Most minerals are found as crystals, which are formed when melted or dissolved minerals become solid.

Challenge!

Try growing other types of crystals using these same basic procedures and a variety of chemicals such as sugar, Epsom salts, or alum. You can add food coloring for a dramatic effect.

Activity 14. Making Crystal Models

Use the diagrams in Appendix A to construct your own crystal models. Carefully cut the shapes and fold on the dotted lines.

Think about It!

What is your favorite shape to make? To look at?

Make a “piggy” bank from one of your geology shapes. What could you call it?

List two or three places where you can find these shapes in your home or school.

Activity 15. Growing Crystals

Crystals have interesting structures, and watching crystals grow can be fascinating. Use one of the methods listed on the following page to make your own crystals.

Sugar Crystals: Edible Crystals

Procedure

1. Attach one end of the string to the pencil and cut the string to fit inside the jar. Moisten the string with some water and then roll the moistened string in sugar.
2. Put the cup of water into a saucepan and heat until boiling. Add 2 cups of sugar to the water and stir until the sugar is dissolved. Remove from heat. Add flavoring and coloring as desired. Carefully pour the sugar mixture into the jar; the mixture will be very hot.
3. Leave the jar in a place where it will not be disturbed. Crystals will begin forming within 3 hours. Let the crystals grow for 3 to 10 days. The longer the crystals are allowed to grow, the larger they will be.
4. After the crystals are the desired size, remove string from the jar and break apart. Examine the shape of the crystals to understand the structure of the crystal. Then enjoy your edible crystals.

Adult Supervision Recommended

Supplies

- Measuring cup and spoon
- Large heavy metal saucepan
- Long wooden stirring spoon
- Clean glass jar (canning jar is recommended)
- Piece of cotton string (clean!)
- Pencil
- Thick pot holders
- 1 cup water
- 2 cups of granulated sugar
- A few drops of your favorite candy flavoring such as peppermint, cherry or lemon
- A few drops of food coloring, more drops = darker color (optional)

Adult Supervision Recommended

Supplies

- String
- Wide-mouth jar (pint)
- White pipe cleaners
- Borax (available in the laundry soap section, do not use Boraxo Soap) Note: borax is **not** edible!
- Pencil
- Boiling water
- Blue food coloring (optional)
- Scissors

Borax Snowflake: An Inedible Crystal

Create a long-lasting snowflake any time of the year.

Procedure

1. Use the pipe cleaners to form a snowflake that the crystals will grow on. The snowflake should fit inside the jar. Attach one end of the string to the snowflake. Attach the other end to the pencil. Make sure the string is long enough to suspend the snowflake in the jar.
2. Fill the jar three-quarters full with boiling water. Add the Borax one teaspoon at a time, making sure to stir after each teaspoon is added. Use three teaspoons of Borax per cup of water. You can add food coloring to create a colored snowflake.
3. Place the pipe cleaner snowflake in the Borax mixture by placing the pencil on top of the jar. Make sure the snowflake is covered but not touching the bottom of the jar.
4. Allow the snowflake to stay in the jar overnight. The next day you will see beautiful crystals that create a snowflake that will never melt.

Think about It!

How long did it take to make your crystals?

What could you change in this activity to make different crystals?

Fossils

What are fossils?

Fossils are the remains of plants or animals or evidence such as footprints, tracks, etc., that are preserved as imprints. They are usually found in sedimentary rock materials.

How fossils are preserved?

A common way fossils were formed is called *replacement*. This means that the minerals in the ground and water have filled the open spaces of the organism and actually turned it into stone. Petrified wood and petrified bone are some examples of common fossils which have been preserved this way.

Fossils can also be molds or casts. These are the most common types of fossils. Molds are formed around a fossil and show the outside. A cast comes out of the mold, showing the outside features of a plant or animal. A mold or cast is formed when the following steps occur:

- A plant or animal sinks to the seafloor, swamp, or other moist area.
- The specimen becomes covered with sediments.
- It decays and leaves a mold.
- The mold becomes filled with the sediments.
- The sediments harden, forming a cast.

In the scenario described above, there would be both a mold and a cast of the fossil. Fossils may also be formed as *carbon prints*. These are common in Indiana in coal mine overburden (what is taken off the top of coal). They are formed when a plant or animal decays and leaves a print of the carbon that was in the body. They are almost always found in shale.

Making Molds and Casts

You can make molds and casts of fossils that you want to copy or that you cannot remove from a large rock. A mold is made by pressing a fossil into a substance (like clay or plaster of Paris) so that it will take on the shape and show

the details of the fossil. A cast can then be made from your mold. The cast is a replica of the original fossil.

Activity 16. Quick Clay Mold

Make a mold using modeling clay. Work the clay a bit to make it pliable and divide it into two pieces. Find a small object (sea shell, chicken bone, penny, etc.) to press into one of the pieces of clay. You may find it helpful to cover the object with a thin coat of petroleum jelly to keep it from sticking to the clay. Gently press the other piece of clay over the top of your object. Carefully pull the clay away to see your mold. You should be able to see some of the details from your original object.

Think about It!

Can you see details from your original object in your mold?

How is the clay mold like mud or clay that was on the Earth millions of years ago?

Adult Supervision Recommended

Supplies

- Fossil, plastic dinosaur, or other object
- Plaster of Paris
- Form made from a disposable cup or milk carton, or a plastic container that is large enough to contain the fossil with some extra room
- Petroleum jelly (Vaseline)
- Mixing cup and spoon for plaster of Paris
- 2 strips of cardboard

Activity 17. Making a Plaster Fossil Mold

Procedure

1. Cover a fossil with a thin coat of petroleum jelly. Try to make the coat as smooth as possible. The petroleum jelly will prevent the plaster from sticking to the fossil.
2. Prepare plaster of Paris in a cup as directed from the package. Make enough plaster to fill the form with about 1 inch of plaster. The plaster should be the consistency of pancake batter. Pour the plaster into the form about 1 inch deep.
3. Place the fossil into the plaster and push until the widest part of the fossil is in the plaster.
4. Let the plaster harden for 15-25 minutes. Test the plaster in an area away from the fossil by using your finger. If the plaster feels firm, you are ready for the next step.
5. Coat the now-hardened plaster with a thin layer of petroleum jelly. Lay a cardboard strip on either side of the fossil, but do not touch the fossil itself.

6. Prepare another batch of plaster, then cover the fossil with more plaster. Let the plaster stand for 15-25 minutes.
7. Remove the plaster from the form; you may have to cut the form. Gently pry the two halves apart to remove the fossil.
8. Let the plaster mold dry completely. In the summer, the drying process can be hastened by placing the mold in the sun for 2-3 days. In the colder months, the plaster can be hardened by placing it in an oven set to 100°F for 24 hours.

Think about It!

How can you use your mold?

List two or three other things that you could make molds of and explain what they could be used for.

Activity 18. Making a Cast

Use your plaster mold to make plaster, rubber, or wax casts or half-casts (just the tops).

Procedure

1. The rubber latex should be creamy. If it is not, pour the latex into an empty jar and add water to the latex. Let stand overnight.
2. Pour a thin layer of latex into the plaster mold. The plaster will remove water from the latex causing the latex to harden.
3. Add a thin layer of latex as each layer hardens. Continue until the cast becomes about a quarter of an inch thick. It is not necessary to fill the entire mold. Make sure to pour excess latex into the container and cover it, or the latex will dry out.
4. Place the mold in a warm place and allow to dry for 24 hours.
5. Sprinkle talcum powder inside the cast and then remove the mold. Wash the cast off to remove any plaster grains. Using sharp scissors, cut off the excess latex from the cast.

Dig Deeper

How do molds and casts differ?

List why professionals, other than geologists, might make a mold (types of uses).

Adult Supervision Recommended

Supplies

- Plaster mold
- Rubber latex (available at craft supply stores)
- Paint

6. Dry the cast either for a few days in the sun, or bake it in an oven at 100°F. Check your cast from time to time. Drying time will depend upon many factors. The cast can then be painted to look like the original fossil.

Think about It!

What are the differences between a plaster mold and a rubber cast?

How long did it take you to make your rubber cast?

How can you use your cast?

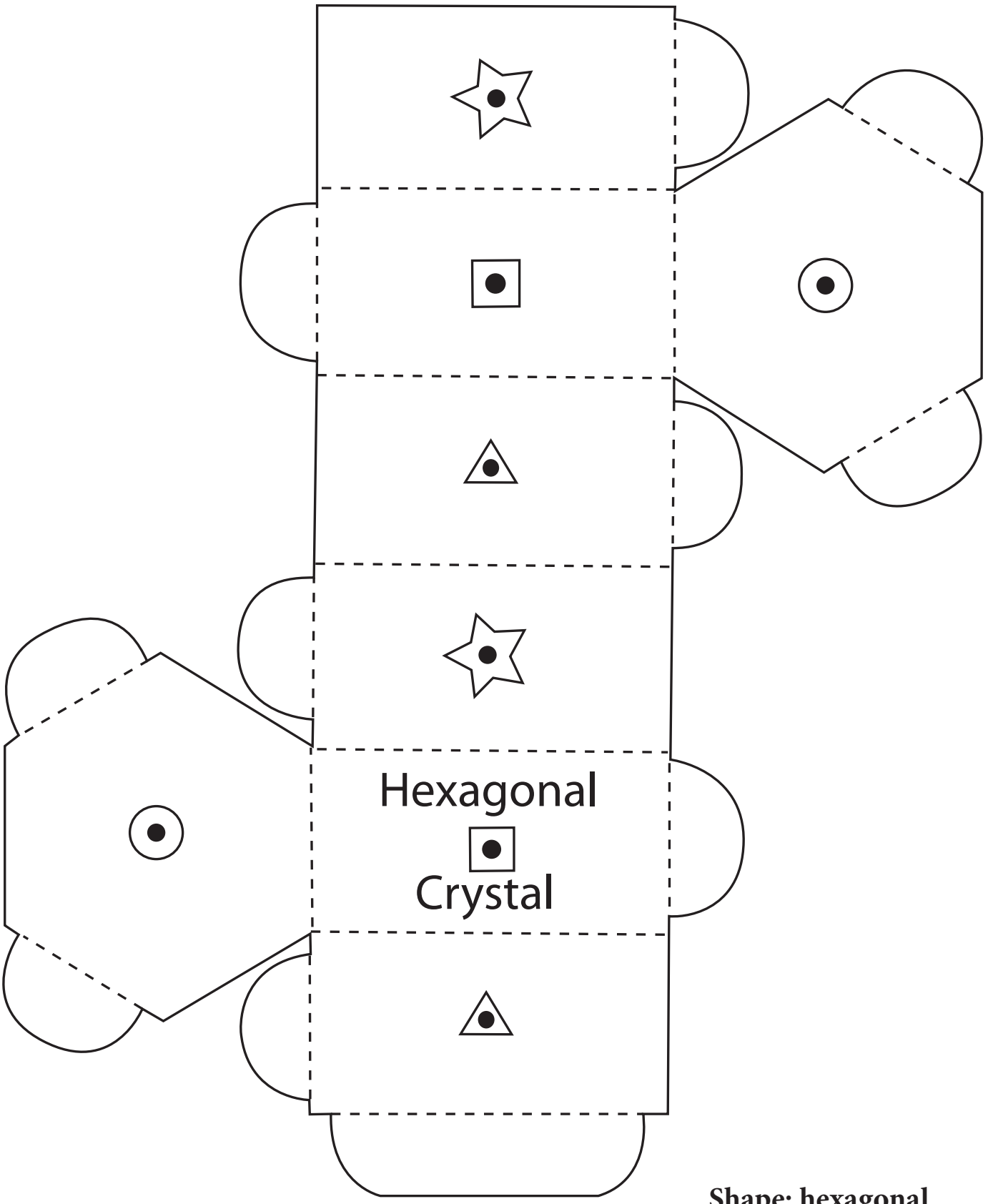
Resources

Required Publication: *Let's Look at Rocks*

Available from:

- Your local Purdue University Cooperative Extension office, ask for *Let's Look at Rocks*, 4-H-CIR5
- Purdue Agricultural Communication, Media Distribution Center, (888) 398-4636, www.ces.purdue.edu/new, ask for *Let's Look at Rocks*, 4-H-CIR5
- Indiana Geological Survey (IGS), (812) 855-7636, http://igs.indiana.edu
- The Indiana State Museum, www.in.gov/ism/

Apendix A. Shapes to Cut Out



Shape: hexagonal

Example: quartz

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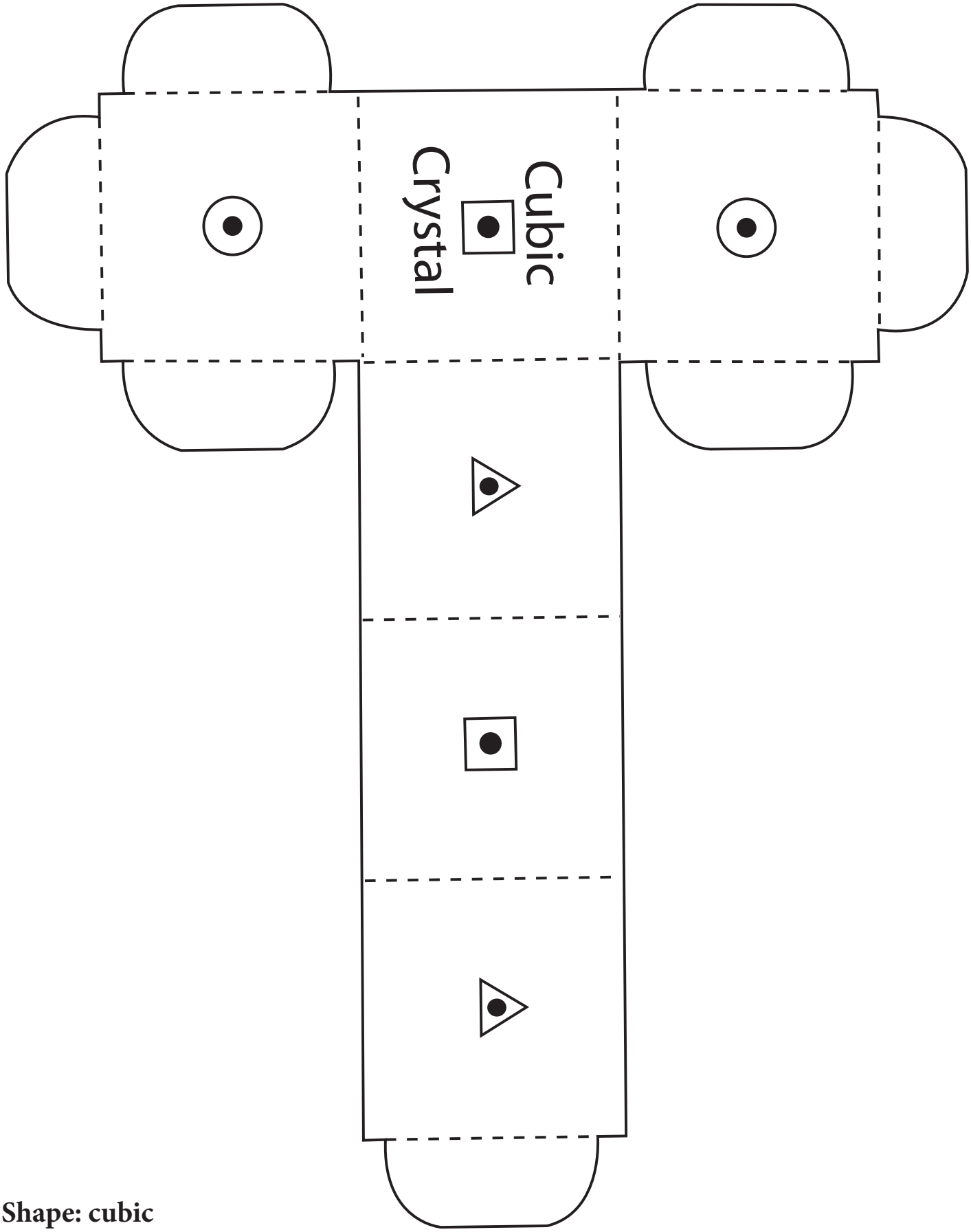

Shape: cubic

Example: halite

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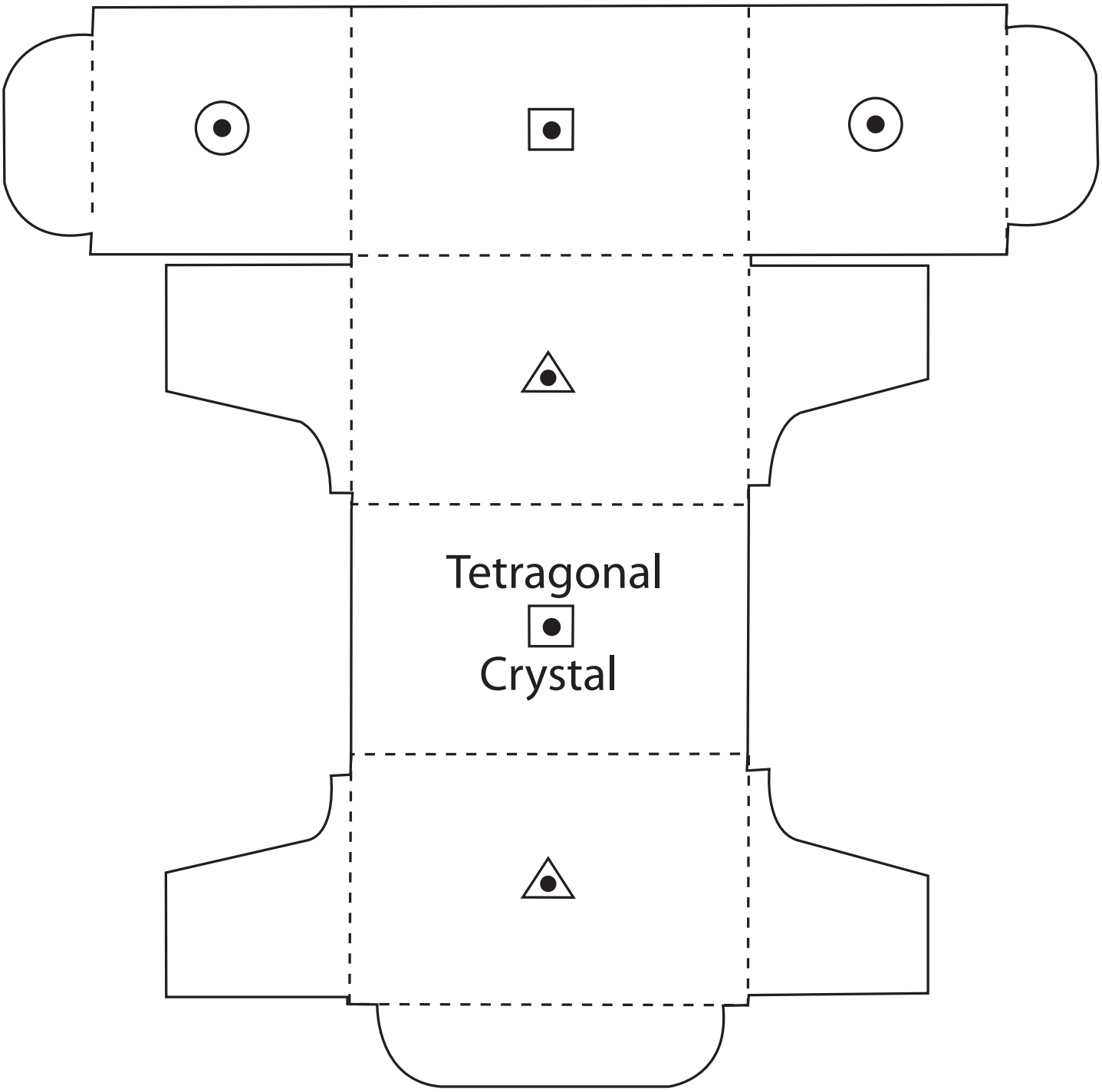

Shape: tetragonal

Examples: zircon, chalcopyrite, rutile

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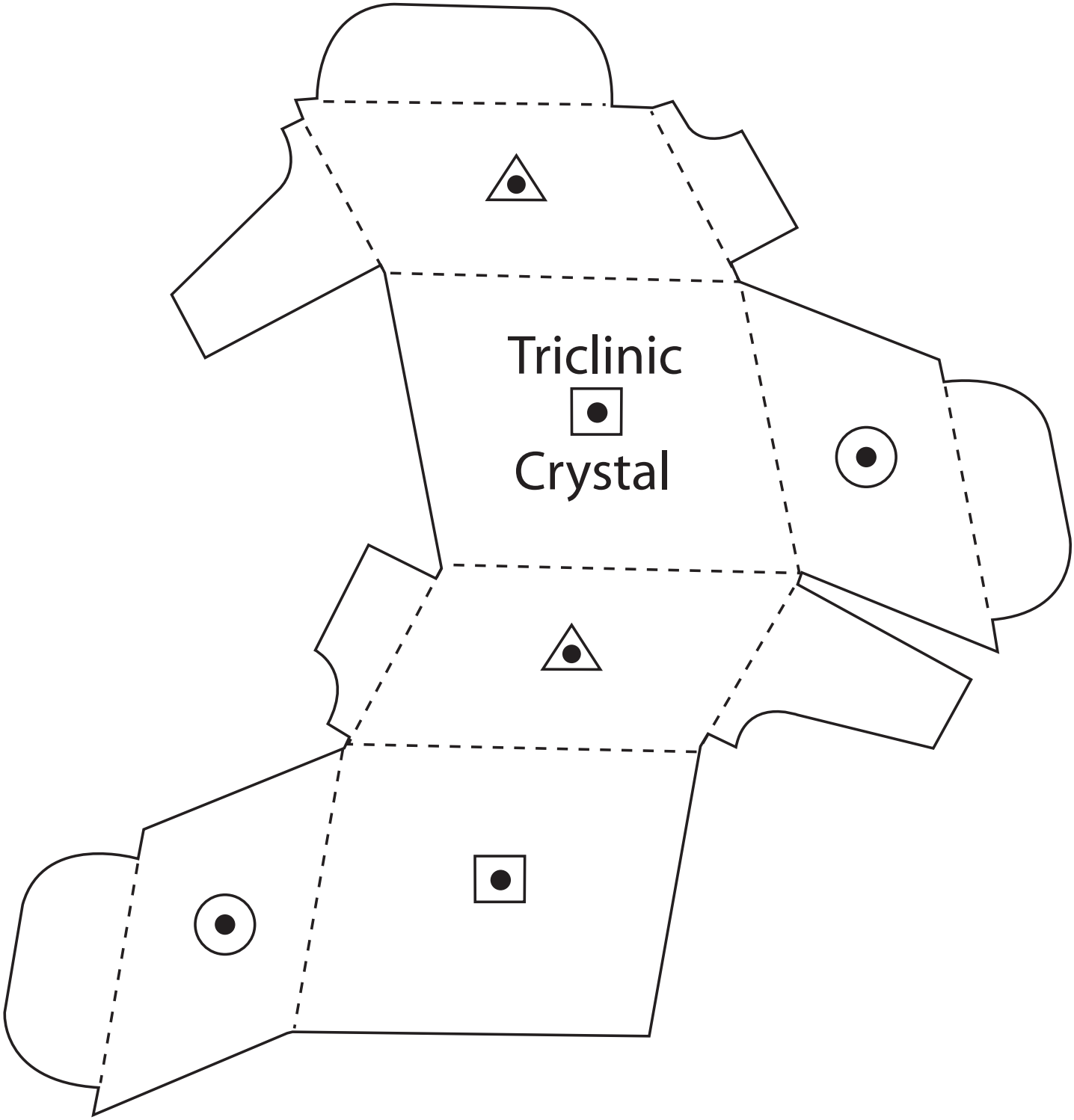

Shape: triclinic

Examples: feldspar, kaolinite

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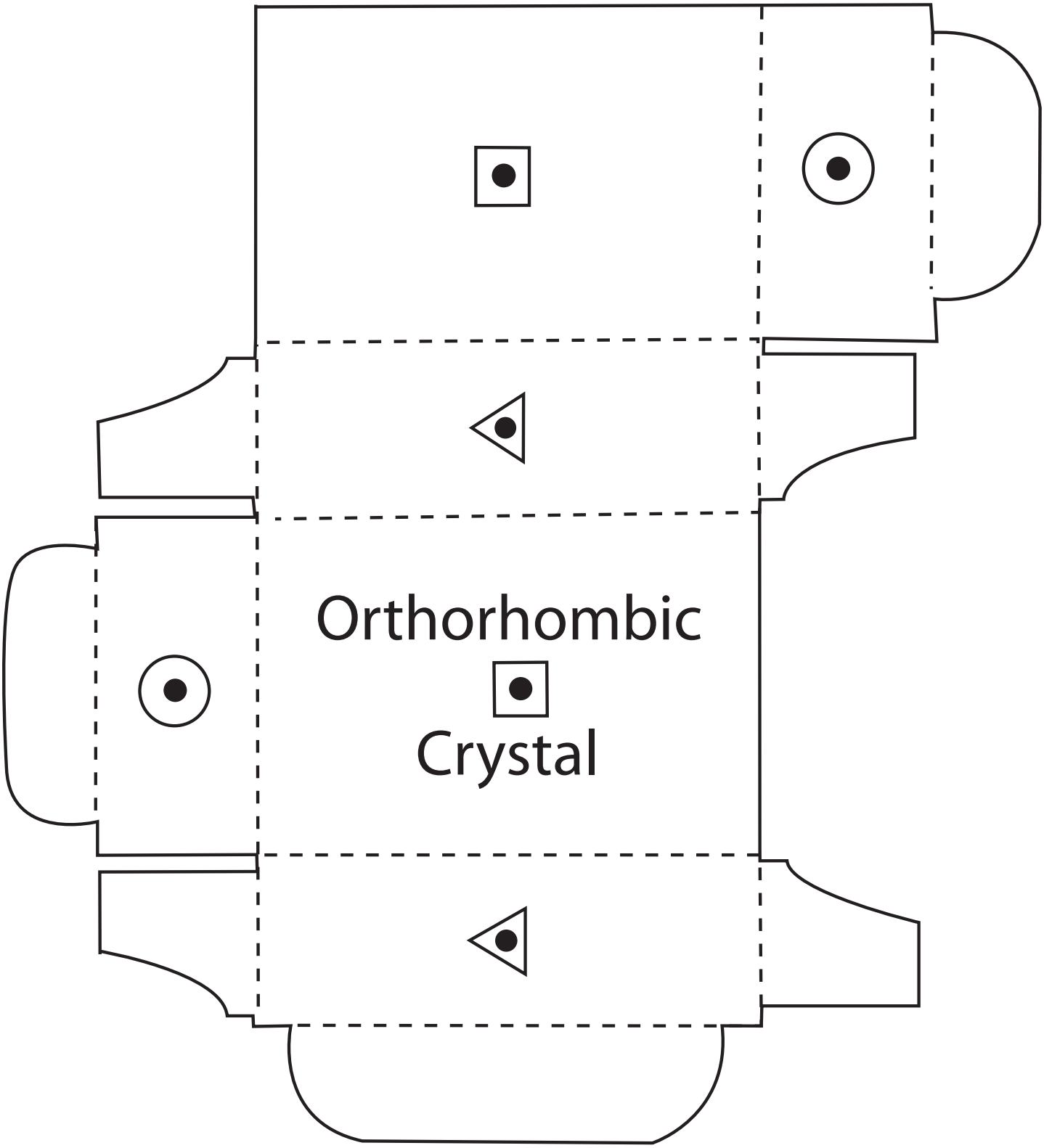

Shape: orthorhombic

Examples: barite, celestite, aragonite

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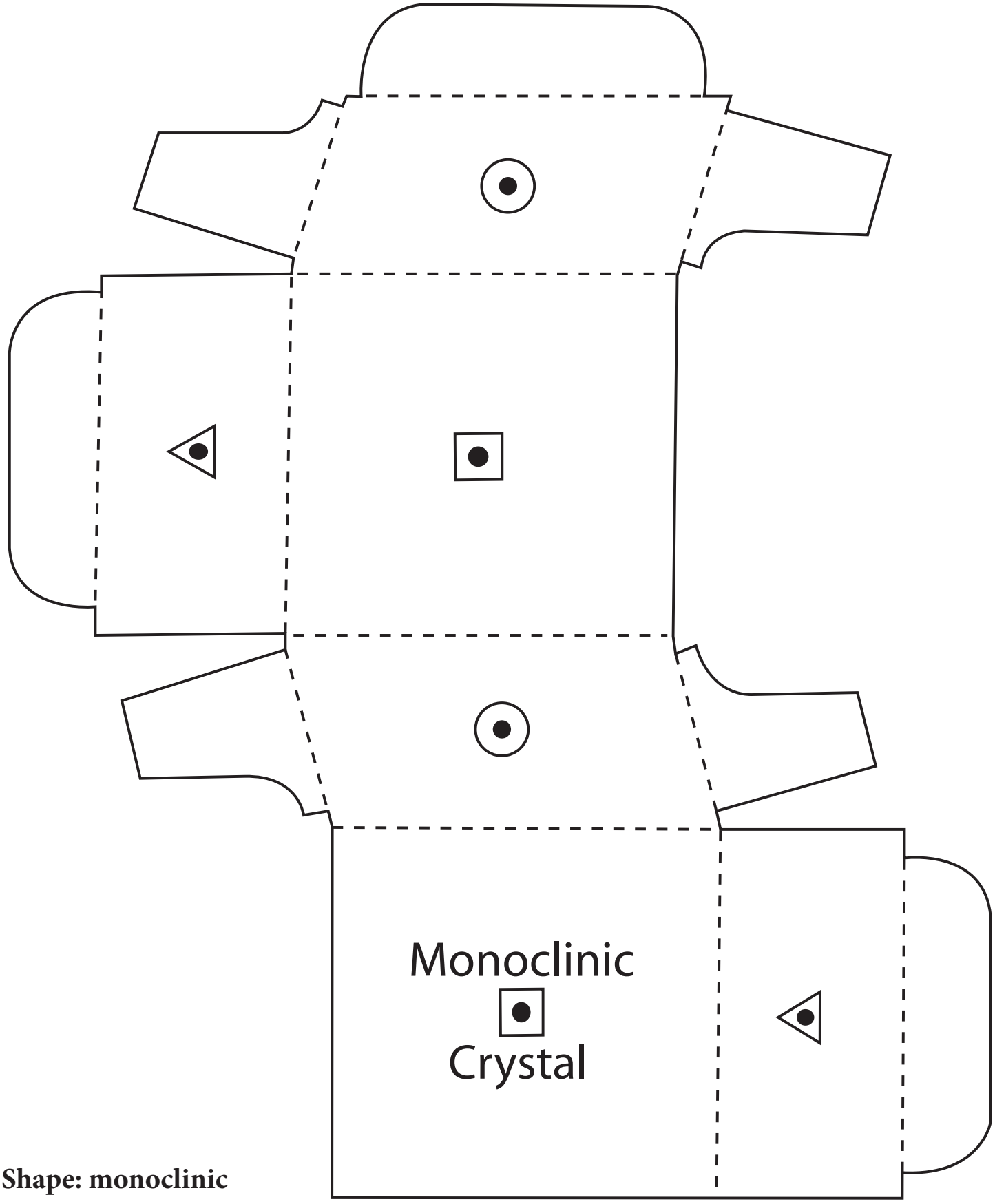

Shape: monoclinic

Examples: gypsum, mica, hornblende

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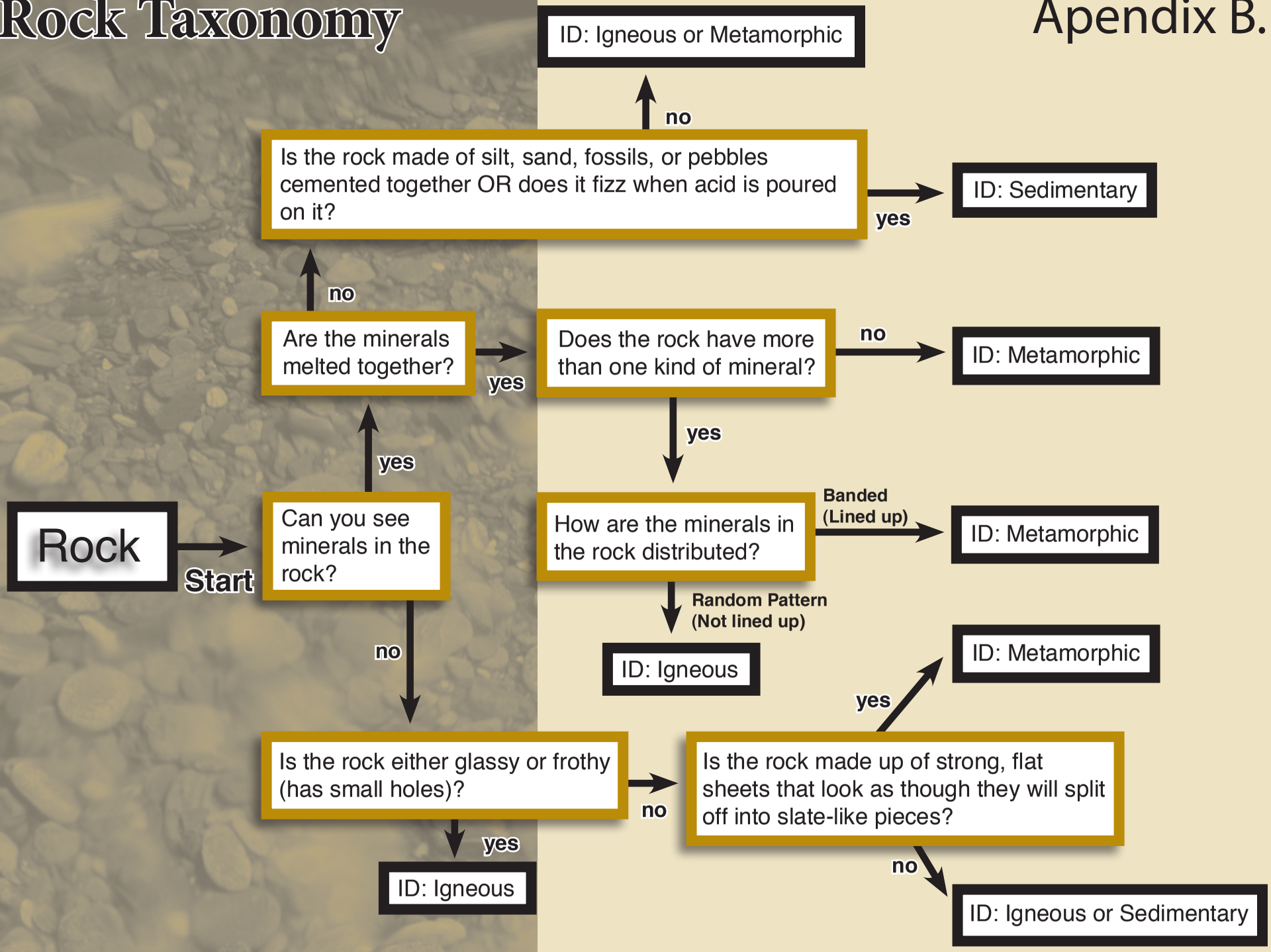
Rock Taxonomy

Apendix B.



Glossary

Bedrock – the solid rock that lies underneath weathered rock materials, soils, or tills

Coal – black sedimentary rock commonly mined to burn as fuel

Coarse grain – individual particles or grains that are as large as grains of salt or bigger

Color – a physical property of rocks, sometimes used for identification

Condensation – a process in which water changes from a gas to a liquid

Crystallization – the process that forms crystals from fluids or a dispersed state

Decomposition – the processes that decay and break up bedrock, by a combination of physically fracturing it or chemical decomposition

Deposition – a general term for the accumulation of sediments by either physical or chemical sedimentation

Erosion – the downward displacement (due to gravity) of soil and other solids by rain, wind, or ice

Extrusive rocks – igneous rocks that are cooled on the earth's surface, often from lava flows (Extrusive rocks have a fine texture, because they cool too quickly for minerals to grow.)

Evaporation – a process in which water changes from a liquid to a gas

Fizz – small bubbles made when a drop of dilute acid is used to test a rock containing lime or calcium carbonate

Fossil – preserved remains of animal and plant life, and traces of them (for example, dinosaur tracks), found only in sedimentary rocks

Glacier – moving sheets of ice that covered part of the world during the ice age (Glaciers still exist on mountain tops and in the Arctic and Antarctic.)

Gravel – loose, uncemented rock materials made of large (greater than 0.08 inch), worn, rounded pebbles with smaller grains between

Ground water – all water that is found below the surface of the Earth

Hardness – the resistance of a mineral to scratching

Igneous rocks – rocks formed from magma, when melted rock materials from deep beneath the Earth's surface cool, crystallize, and become solid

Infiltration – a process in which water enters into the soil

Intrusive rocks – igneous rocks that are cooled deep within the Earth (Intrusive rocks have a coarse texture because individual minerals have time to grow.)

Magma – melted rock that cools as it pushes towards the surface of the Earth and forms new rocks

Metamorphic rocks – rocks formed when other kinds of rocks change due to high pressures and temperatures; rocks formed by heat and pressure

Mineral – a naturally occurring, inorganic substance with a definite chemical composition and crystalline structure

Molten – heated enough to melt

Precipitation – water that falls from the sky as snow, rain, hail, or sleet

Rock – a solid made up of one or more minerals or earth materials

Sand – a sediment made of very small grains (0.0025 to 0.08 inches)

Sedimentary rocks – rocks that formed from particles that were eroded from previous rocks, transported, deposited, and lithified (compacted under pressure to gradually become solid rock) (This also includes rock that accumulated as chemical precipitates — a solid formed from a chemical reaction.)

Soil – the upper layer of the Earth in which plants grow

Structure – a physical property that describes how a rock is formed

Surface water – examples include lakes, streams, rivers, and oceans

Texture – a physical property describing the size and arrangement of the minerals in a rock (Texture is often used to classify rocks.)

Transpiration – a process where water is released from plants to keep them cool

Volcano – an opening in the Earth's surface that allows magma to escape from below the surface

Weathering – the breakdown of rocks in response to contact with water, air, or living matter