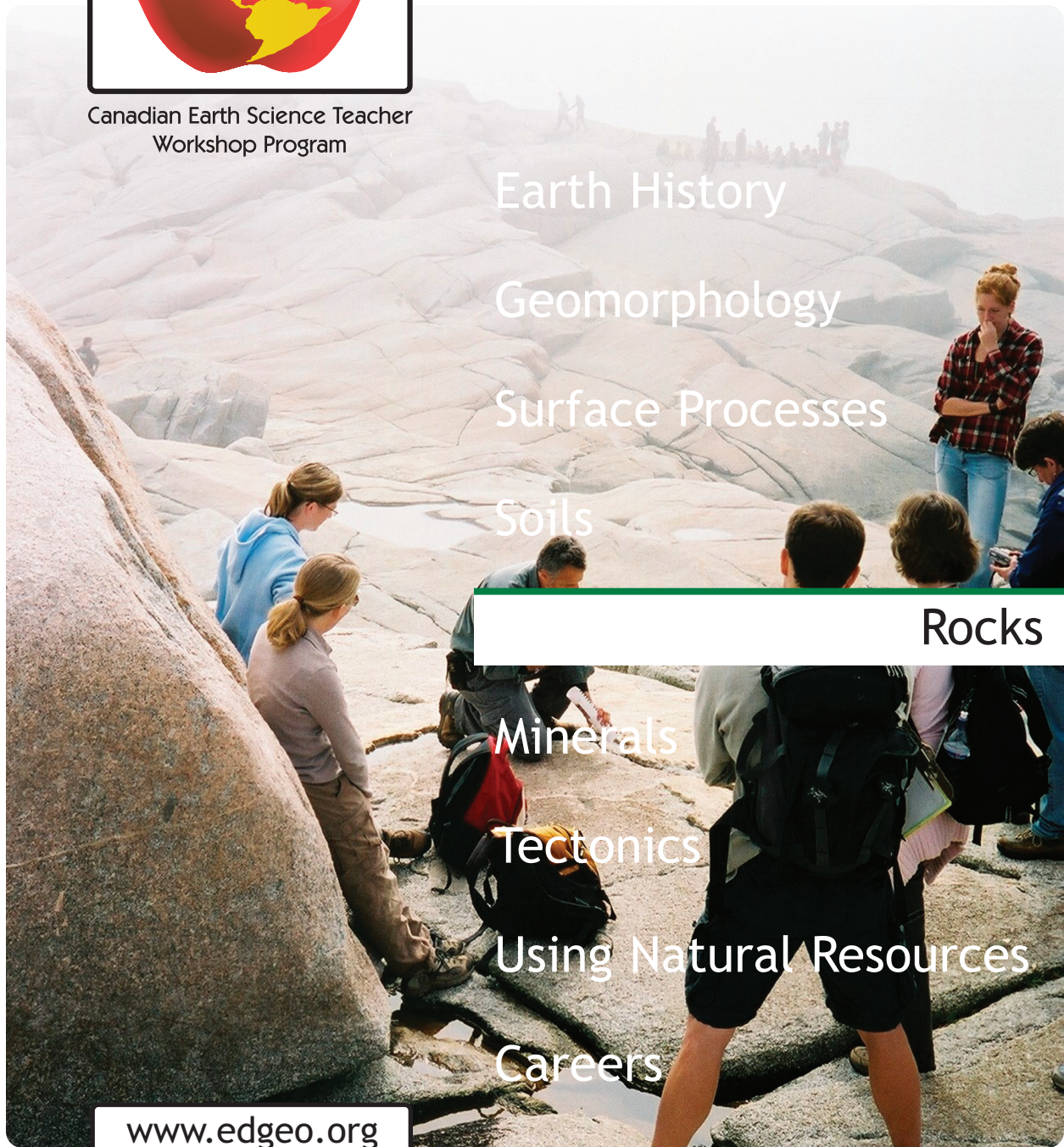




Canadian Earth Science Teacher
Workshop Program

Bringing Earth Science to Life



Earth History

Geomorphology

Surface Processes

Soils

Rocks

Minerals

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Collecting and Observing Rocks

Students collect rocks from their local environment and make observations of their samples.

Explanation

Scientific classification schemes are based on the observable or measurable physical properties of specimens.

Materials

For the field trip, each student will need:

Gloves
Magnifying glass (hand lens)
Newspaper
Strong backpack
Masking tape
Marker
Optional: rock hammer, safety goggles, plastic bag, cloth rag
Teacher should take first aid kit

In class:

White acrylic paint or gesso (acrylic canvas preparer, available from craft stores)
Small paint brush
Fine-tip permanent marker
Egg box for each student
Index cards
Magnifying glass (hand lens)

Caution

For the field trip, ensure that everyone is wearing appropriate clothing and be prepared for hot, wet or cold conditions depending on the season. Tell someone else where you are going.

Stress safety at all times. Key points are to stay away from loose hillsides, rock cliffs and rivers. All participants should always be with a partner. To avoid excessive damage to rock outcrops and for safety, only the teacher should use a rock hammer to break up specimens. Use the following method to create suitable size specimens (2-10 cm) for the students to take back to the classroom:

1. Put on safety goggles and have students stand well back.
2. Place rock in plastic bag and squeeze out the air
3. Place in another plastic bag and cover with cloth



Collecting and Observing Rocks

4. Place on concrete or another large rock
5. Hit very firmly once with the hammer
6. Unwrap and check on the sample.
7. If necessary rewrap and repeat until fragments of a suitable size are created.

Always wash your hands after handling rocks.

Time

Long

Grouping

Pairs, small groups, whole group

Preparation

Before heading outside, review the safety rules and emergency procedures with students. Ensure students are properly dressed and equipped. They should each have water.

Prompt

Ask students to share any collections they may have at home. Have them tell the class why they collect those things.

Delivery

Field Trip

1. Have students collect 5 to 10 different rocks for their classroom collection. From 2 to 10 cm is a suitable size for carrying back to class and for making observations.
2. Look anywhere rocks may be exposed: mountains, stream beds, construction areas, beaches, road cuts, etc. Encourage students to look for freshly broken pieces of rock as weathered surfaces hide the rock's natural appearance.
3. Remind them to take only the best specimens they find, and keep to the number instructed.
4. When they find a specimen, students are to wrap it in a small piece of newspaper, and label where they found it using masking tape.

Back in Class

1. Have students paint a small spot of white paint or gesso on an unobtrusive part of each rock. Leave to dry, then



Collecting and Observing Rocks

- use marker to write a reference number on the paint. They could also put their initials on the paint.
2. Create an index card for each rock specimen including information such as its reference number, date collected, where collected, the name of collector.
 3. Make a storage box for their collection using egg cartons or other similar containers.
 4. Have students become familiar with their rocks. Ask them to use as many of their senses as possible (sight, touch, smell, sound when it's rubbed) to make their observations. Have them record the descriptions of their rocks on their index cards, paying particular attention to what makes one rock different from the others.

Questions for Discussion

What are some of the differences you have observed between your rock samples?

How are some of your rocks similar?



Classifying Rocks

Students observe a variety of rocks and sort them based on physical properties using a self-determined classification scheme.

Explanation

Earth scientists use easily observable physical characteristics to sort and classify rocks.

Materials

Selection of rocks for each group. Suggestions: granite, basalt, pumice, conglomerate, sandstone, shale, limestone, schist, gneiss, marble.
Paper
Markers

Cautions

Wash hands after handling rocks.

Time

Short

Grouping

Individual, pairs, small groups

Preparation

Ask students to bring in their own rock collections or collect enough for a set of 5 to 10 different rocks for each group. If the students are also to complete the “Naming Rocks” activity, use the same samples that they will be asked there to identify.

Prompt

Revisit or have students draw their immediate family tree (suggested as an extension of the “Collecting and Observing Rocks” activity). Ask them to identify any personality or physical characteristics they share with people in their family.

Delivery

1. Have students become familiar with their rocks, using as many of their senses as possible (sight, touch, smell, sound when it’s rubbed) to make careful observations. Ask them to focus on what makes each rock different or similar from the others.



Classifying Rocks

2. Ask students to decide how to sort their rocks into groups. They must be able to explain their reasoning. The groups of rocks do not have to be the same size.
3. Distribute paper and marker to each student or team of students.
4. On the paper, ask students to place the rocks into groups and label the group title, e.g. dark, light, rough, layered, shiny, etc.
5. Have 2 or 3 teams share their classification methods. Look for simple (e.g. colour) and innovative approaches, and any common approaches they have come up with.
6. Challenge students to sort their specimens in different ways, and to record each classification scheme on their paper.
7. Make a class list of the different physical properties used for classification.

Questions for Discussion

What is classification?

What other things in our lives are classified? Examples could include classes in school, types of car, food groups.

Extensions

Introduce the properties used by Earth scientists to classify rocks: the type of particles (grains or crystals), layering, and how the pieces are bound together. Challenge the students to sort their specimens using these criteria.



Making Rocks

Students make models of sandstone and conglomerate to demonstrate how sedimentary rocks form.

Explanation

Loose particles of eroded rocks, or **sediment**, is deposited by water, wind or ice. Over time, the sediment is compressed under the weight of new sediment deposited on top of it. To form a **sedimentary rock**, the sediment is cemented together, most often by quartz or calcite in solution.

Materials

125 ml water
Clear 500 ml plastic bottles
50 ml Epsom salts
Stirring spoon
Either:
125 ml dry sand to make sandstone
Or:
75 ml sand + 75 ml gravel to make conglomerate

Cautions

Do not ingest the mixture.

Time

Short + 1 week to dry.

Grouping

Individual, pairs

Preparation

Cut 10 cm up from the bottoms of the plastic bottles.

Prompt

Show students samples of coarse- and fine-grained sedimentary rocks, such as conglomerate and sandstone. Ask them to describe what they think the rock is made of. They should be able to observe sand and pebbles in the rock, and possibly layers.

Delivery

Direct students to:



Making a Rock

1. Pour water into bottom of cut-off pop bottle.
2. Add Epsom salts and stir until dissolved.
3. Add either sand, or sand and gravel mix.
4. Stir so that the dry materials are completely moistened.
5. Let this sit for several hours, periodically pouring off excess liquid from the top.
6. When there is no more excess liquid, set aside for at least a week until completely dry.
7. Remove from bottle bottom. You now have a cemented piece of sandstone or conglomerate.

Questions for Discussion

How long does this process take in nature?

What do you think the Epsom salts could be in real rocks?

Extensions

Look at samples of sedimentary rocks. Observe the grain sizes and types, and how they are glued together.



Edible Rocks

Students observe the appearance and changes in everyday food items that simulate sedimentary, igneous and metamorphic rocks.

Explanation

Geological processes that form rocks are remarkably similar to many of the things that we do in the kitchen every day to prepare the food that we eat. Many foods provide an excellent illustration of how some of the classification criteria that we use in rock identification are formed in nature, including grain size, sediment layering, mineral alteration and cementation.

Materials

See individual examples.

Cautions

Be alert and responsive to allergies, notably peanut butter.
Candy making uses high temperatures and is recommended as a demonstration by teachers only.
Ensure hygienic conditions are maintained if students are to eat the “rocks.”

Time

Short, medium

Grouping

Whole group

Preparation

None

Prompt

Have samples of layered sedimentary rocks, coarse- and fine-grained igneous rocks, and metamorphic rocks on display.

Delivery

Sedimentary Sandwich

Sedimentary rocks are formed when layer after layer of sediment is deposited and eventually hardens into rock. These layers are often different materials since this process happens



over thousands of years. Bread at the bottom and top of a sandwich can represent sandstone, the peanut butter could be clay, and jam with chunks of fruit could be conglomerate. It is very common to find these “sandwich-style” layers in natural sedimentary rock.

Igneous Chocolate

Heat some chocolate chips at low power in a microwave until they melt. Spoon some molten chocolate onto wax paper. Lay another piece of paper over the top and push gently. Observe the “rock” that forms. This is what happens when magma cools in fissures deep in the Earth to produce intrusive igneous rocks. Let the rest of the molten chocolate cool until a skin starts to form, and drop a large spoonful onto wax paper. This is what happens when lava erupts onto the surface of the Earth to produce extrusive igneous rocks.

Rice Crispy Squares Sandstone

These are a good example of cemented sandstone. The rice cereal grains are cemented together by the marshmallow. This is very much like sand grains being cemented together by mineral-rich water over time.

Puffed Rice Cake Metamorphosis

When rice grains are subjected to extreme heat and pressure conditions, as they are in the manufacture of rice cakes, they lose their original character altogether. The result is an amorphous mass where original grains are “smeared” and merge with neighbouring grains so that you can no longer easily distinguish distinct grains. This is analogous to sandstone being metamorphosed into quartzite.

Candy Granites and Basalts

Sugar candy in various forms is an excellent way to show students the difference between granite (coarse-grained intrusive igneous rock) and basalt (fine-grained extrusive igneous rock). Granite is coarser-grained because its crystals had a longer time to grow as the granite cooled slowly underground. This is why you can see the individual grains interlocked. Rock crystal candy is made using analogous methods and its crystals can easily be seen. Basalt cooled very rapidly because it was ejected from a volcano directly into cool air or water. The crystals did not have time to grow and are invisible, giving the rock a smooth texture. If there are no air bubbles, it will look like glass (obsidian). This is how



Edible Rocks

toffee or candy glass (toffee made without the butter) looks. If there are air bubbles or gases trapped during the rapid cooling, the rock will have lots of little holes (pumice). Spun sugar candy is a good example. It is very porous and much lighter in weight than other sugar candies.

Question for Discussion

Have students match the food samples to the rock specimens.

Extension

Challenge students to find additional everyday examples of rock formation.



Wax Crayon Rock Cycle

Students simulate the products and processes of the rock cycle by eroding, compressing, melting and cooling wax crayons.

Explanation

Rocks are in a constant cycle of change. The forces that cause rocks to change include heat and pressure within the Earth, volcanoes that bring molten rock to the surface, and wind, ice and water that erode rocks.

Materials

Used wax crayons, many colours
Crayon sharpener or plastic knife
Heatproof plate
Aluminum foil
Safety goggles
Hot plate
Heatproof gloves
Popsicle stick
Samples of basalt, gneiss and sandstone

Cautions

Wear safety goggles throughout this activity.
Using a hot plate requires careful procedures to avoid burns.
Do not touch the molten wax.

Time

Medium

Grouping

Pairs, small groups

Preparation

Set up a safe work area for using the hot plate.

Prompt

Show the rock samples and observe the different textures. Ask students what may have caused these differences.



Wax Crayon Rock Cycle

Delivery

Direct students to:

1. Choose crayons of 3 colours; these will be their rocks.
2. Put on safety goggles.
3. Shave pieces of crayons onto the heatproof plate to represent rocks eroded into sediments.
4. Cover the pile of sediment with foil and push down hard on it to make sedimentary rock. Ask students to examine and record their observations of the rock.
5. Place the plate on low heat on a hot plate for 1 minute or until the sedimentary rock is just soft when pushed with a Popsicle stick.
6. Use heatproof gloves to remove the plate from the hot plate.
7. Place the piece of foil over the softened sedimentary rock and push down hard on the foil to make metamorphic rock. Record the appearance of this new rock.
8. Return the plate to the hot plate and heat until the crayons melt completely. This is magma.
9. Use heatproof gloves to remove the plate from the heat.
10. Once cooled, this is igneous rock. Record the appearance of this rock.

Questions for Discussion

How could you change the sequence of steps? What changes would that make to your rocks?

Share with students that somewhere in the world right now volcanoes are erupting, earthquakes are shaking people out of bed, mountains are being formed and others being eroded, rivers are carrying sand and mud then laying them down and huge sections of the Earth's surface are moving as fast as your fingernails grow. Ask them which part of the activity represented volcanoes? Rivers? Mountain forming?

Extension

Give students real rock samples and see if they can identify rock types based on their observations



Human Rock Cycle

Students follow card prompts to act out the various pathways in the rock cycle.

Explanation

The three rock types are connected to each other by how they are formed. Igneous, sedimentary and metamorphic rocks are constantly being recycled because the Earth is a very active planet going through constant change.

Materials

Rock Cycle Process cards
Rock Cycle Product Station Labels

Cautions

None

Time

Short

Grouping

Whole group

Preparation

Make one set of Rock Cycle Product Station Labels and Rock Cycle Process cards. There could be multiple sets of the process cards to make sufficient quantity for the whole group. Optional: create a large, floor-sized version of a rock cycle diagram (see information sheets).

Delivery

1. Place the Rock Cycle Product Station Labels at 5 locations around the room.
2. Position 2 or 3 students at each station.
3. Have another student, not at a station, take a Rock Cycle Process card and read out the instructions. One student who is at the product named must do the action that the process card describes.
4. Have students describe the processes that change one rock cycle product into another. For example, what must happen to change a sedimentary rock into a metamorphic one?



Human Rock Cycle

Question for Discussion

After playing the game for a while, ask the students whether there is the same amount of each product in the rock cycle?

Extension

Play the game, removing the “Go To” instructions and challenge students to make the correct move.

Resources



Human Rock Cycle

Rock Cycle Product Station Labels

Sediments

Sedimentary Rock

Metamorphic
Rock

Igneous Rock

Magma

THE ROCK CYCLE



Human Rock Cycle

Rock Cycle Process Cards

THE ROCK CYCLE

<p>Sediments Deposition, compression, cementing <i>Go to sedimentary rock</i></p>	<p>Metamorphic rock Melting <i>Go to magma</i></p>
<p><i>Sediments</i> <i>Stay as sediments</i></p>	<p><i>Metamorphic rock</i> Weathering and erosion <i>Go to sediments</i></p>
<p>Sedimentary rock Weathering and erosion <i>Go to sediments</i></p>	<p>Metamorphic rock <i>Stay as metamorphic rock</i></p>



Human Rock Cycle

THE ROCK CYCLE

<p>Sedimentary rock Heat and pressure <i>Go to metamorphic rock</i></p>	<p>Metamorphic rock Heat and pressure <i>Stay as metamorphic rock</i></p>
<p>Sedimentary rock <i>Stay as sedimentary rock</i></p>	<p>Igneous rock Heat and pressure <i>Go to metamorphic rock</i></p>
<p>Magma Cooling and crystallization <i>Go to Igneous Rock</i></p>	<p>Igneous rock Weathering and erosion <i>Go to sediments</i></p>
<p>Magma <i>Stay as magma</i></p>	<p>Igneous rock <i>Stay as igneous rock</i></p>



Story of a Rock

Students make up the story of a rock using a “fortunately, unfortunately” format.

Explanation

Rocks are in a constant cycle of change. The forces that cause rocks to change include heat and pressure within the Earth, volcanoes that bring molten rock to the surface, and wind, ice and water that erode rocks.

Materials

Diagram of the rock cycle (various forms are available in the information sheet section)

Cautions

None

Time

Short

Grouping

Individual, pairs

Preparation

None

Prompt

Show students samples of the three rock types (sedimentary, igneous and metamorphic). Model the start of a story. For example, “The little quartz crystal was completely content as it slowly rode the convection currents in its molten magma home. Unfortunately...”

Delivery

Direct students to pick either one rock or one place on the rock cycle. They are to write a story of what will happen according to the rock cycle. They should think of what rock type they might become next, what pathways are available to them, and what processes will get them from one point in the cycle to another. These should all be incorporated into their story.

Allow 10 minutes to craft their story, and then share with the whole group.



Story of a Rock

Extension

Add drama and movement to the stories, in groups if necessary.

THE ROCK CYCLE



Obituary for a Rock

Students write an obituary for a rock, incorporating processes and products from the rock cycle.

Explanation

Rocks are in a constant cycle of change. The forces that cause rocks to change include heat and pressure within the Earth, volcanoes that bring molten rock to the surface, and wind, ice and water that erode rocks.

Materials

Rock samples
Diagram of the rock cycle (various forms are available in the information sheet section)

Cautions

None

Time

Short

Grouping

Individual, pairs

Preparation

Students will need to be familiar with the rock cycle and basic rock types to complete this activity.

Prompt

Show students samples of the three rock types (sedimentary, igneous and metamorphic). Share a sample obituary: "Sandy Sandstone was part of a lofty family of mountains. Dr. Jack Erosion was assisted by Nurse Windy Weathering at Sandy's birth. Sandy and his friends were carried along the birth canal canyons to the alluvial fan at the base of the mountain. Under intense pressure and heat from those above him, Sandy developed into a hardened, rough individual surviving on Earth for millions of years. Dr. Erosion assisted at Sandy's death. Sandy is survived by his son, Sammy who is following in his father's footsteps."



Obituary for a Rock

Delivery

1. Choose a rock sample and take 15 minutes to write its obituary. The rock needs a name, where it was “born” and something about its life. Refer to the rock cycle diagram for what may have happened to your rock, the possible changes and pathways that it could have experienced.
2. Share the obituary with the group.

Question for Discussion

What similarities are found in different obituaries from the whole group?

Extension

Add drama and visual arts to expand the obituaries.



Draw the Rock Cycle

Students create a diagram of the rock cycle, showing the relationship between the three rock types.

Explanation

Rocks are in a constant cycle of change. The forces that cause rocks to change include heat and pressure within the Earth, volcanoes that bring molten rock to the surface, and wind, ice and water that erode rocks.

Materials

Rock Cycle Vocabulary (see Resources)
Paper
Coloured pencils

Cautions

None

Time

Medium

Grouping

Individual, pairs

Preparation

Before doing this activity, give students the opportunity to investigate the products and processes in the rock cycle.

Prompt

Remind students of what they have seen in the rock cycle, the types of rocks and how they change from one to another.

Delivery

Provide students with the Rock Cycle Vocabulary. Ask them to draw a labelled diagram, incorporating all these terms, showing possible paths through the rock cycle. Suggest they use different colours to emphasize aspects of the diagram.

Question for Discussion

Are their diagrams complete?



Draw the Rock Cycle

Extension

Have students create visual or dramatic arts products that illustrate the rock cycle.

Resources

Rock Cycle Vocabulary

Sediment
Sedimentary rock
Metamorphic rock
Igneous rock
Magma
Melting
Heat and pressure
Cooling
Weathering and Erosion
Deposition
Compaction
Cementation



Clues to Rock Type

Students will use criteria to identify rocks as igneous, sedimentary or metamorphic.

Explanation

Igneous rocks are formed when molten rock cools and hardens. Sedimentary rocks are the compacted and cemented fragments of other rocks, minerals and surface materials. Metamorphic rocks are existing rocks changed by extremely high heat and pressure over long periods of time.

Materials

Selection of rock specimens. Suggestions: granite, basalt, pumice, conglomerate, sandstone, shale, limestone, schist, gneiss, marble.
Clues to Rock Type card (see Resources)
Rock Cycle diagram (see information sheets)

Cautions

Wash hands after this activity.

Time

Medium

Grouping

Pairs, small groups

Preparation

Produce a “Clues to Rock Type” card for each group.
Number the specimens for easy reference, by painting on each a spot of gesso (acrylic canvas preparer, available from craft stores), white acrylic paint, or correction fluid. When thoroughly dry, write the identifying number for the rock on the spot using a fine-tip permanent marker.

Prompt

Show the rock cycle diagram and have students name the different types of rocks.

Delivery

1. Pass around samples of sandstone and granite. Ask the students to rub each rock. They should observe that in one the grains are locked together and in the other the grains



Clues to Rock Type

can be broken apart. Ask students to speculate why this might be. Prompt them to consider how the rocks may have formed and what holds the grains together. Share with them that where grains fall apart, they have been cemented together and it is a sedimentary rock. Where grains are locked together, they have grown that way and the rock is either igneous or metamorphic. We have classified two groups of rocks based on how they are formed.

2. Now circulate the gneiss. Which group is this rock most like? It has interlocking grains. How is it different to the granite? The grains make stripes or coloured bands. When the rock was subjected to heat and pressure, the grains lined up. This is a metamorphic rock, the third group of rocks that includes those rocks that have been changed by high heat and pressure over a long period of time
3. Have the students study a selection of rocks, and classify them as sedimentary, igneous or metamorphic using the Clues to Rock Type card.

Questions for Discussion

Emphasize to students that it is very hard to distinguish the three rock types by simple observation. They are learning only some of the clues that Earth scientists use to identify rocks. In some cases, however, identification requires more complicated techniques.

Extension

Have students demonstrate how each rock type is formed using a dramatic arts performance or written display. They should show the process and characteristics of each type.

Resources



Clues to Rock Type

Clues to Rock Type

- 1.a. You can see mineral grains. Go to 2.
 - b. Grains are too fine to see. Go to 4.

- 2.a. Grains look melted together or interlocked. Go to 3.
 - b. Grains look glued together (not interlocked). Go to 5.

- 3.a. Grains are not lined up. They are randomly scattered. The rock is igneous (granite).
 - b. Grains are lined up and appear to be in rows. The rock is metamorphic (gneiss or schist).

- 4.a. Rock is glassy or bubbly. The rock is igneous (basalt or pumice).
 - b. Rock has hard, flat sheets that split off. The rock is metamorphic (slate).
 - c. Rock is soft and may be layered. The rock is sedimentary (shale).

- 5.a. Grains feel gritty and are silt, sand, or pebbles sized. The rock is sedimentary (siltstone, sandstone or conglomerate).
 - b. Rock fizzes when acid is poured on and may contain fossils. The rock is sedimentary (limestone) or metamorphic (marble).



Naming Rocks

Students will use a classification key to name rock specimens.

Explanation

Earth scientists classify rocks based on their method of formation, as well as by their physical and chemical characteristics. Igneous rocks are formed when molten rock cools and hardens. Sedimentary rocks are the compacted and cemented fragments of other rocks, minerals and surface materials. Metamorphic rocks are existing rocks changed by extremely high heat and pressure over long periods of time. Rocks within each type have variations in texture, e.g. grain size and chemistry and are given different identifying names.

Materials

Selection of rock specimens. Suggestions: granite, basalt, pumice, conglomerate, sandstone, shale, limestone, schist, gneiss, marble.
Identification of Rock Types Table (see Resources)
Rock Identification Worksheet (see Resources)
Clues to Rock Type card (see “Clues to Rock Type” activity)

Cautions

Wash hands after this activity.

Time

Long

Grouping

Individual, pairs, small groups

Preparation

Make copies of the resource cards (Identification of Rock Types Table and Clues to Rock Type) and worksheet for each student or team of students.

Collect sufficient rock specimens for 5 to 10 for each group.

Number the specimens for easy reference, by painting on each a spot of gesso (acrylic canvas preparer, available from craft stores), white acrylic paint, or correction fluid. When thoroughly dry, write the identifying number for the rock on the spot using a fine-tip permanent marker.



Naming Rocks

Prompt

Have students complete the “Button Game” to demonstrate how a classification key is constructed.

Delivery

Distribute rock samples and the reference cards. Have students make absolute and relative observations of their samples and aim to name each individual rock. Remind them of the clues to first establish the rock type.

Alternatively, for more structure, first provide students with the blank Rock Identification Worksheet and have them make detailed observations of each specimen. After their observations are complete, provide the Identification of Rock Types Table for them to name their samples.

Question for Discussion

Which classification criteria were hardest to apply?

Extension

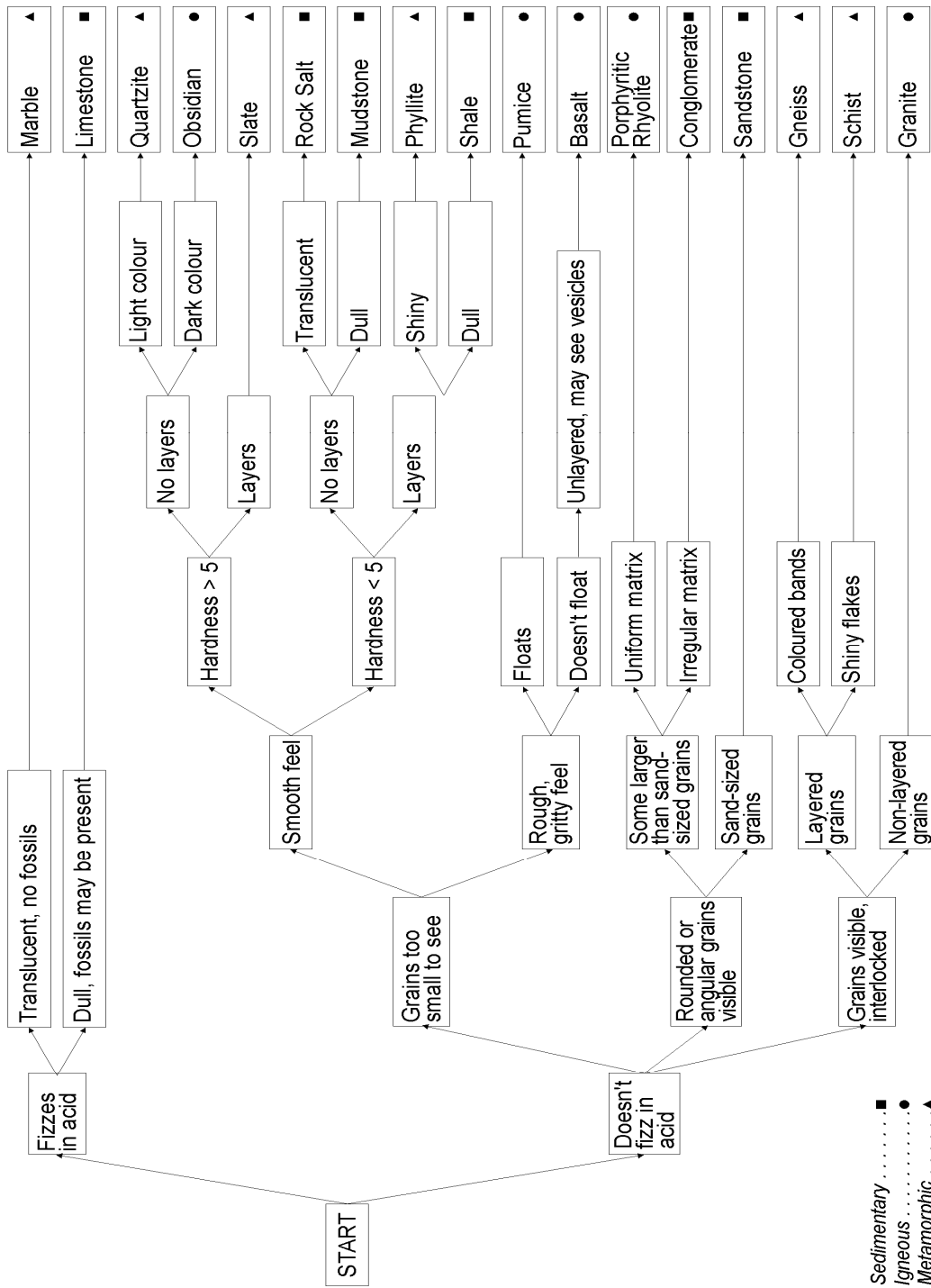
Provide students with descriptions of each rock (see information sheets) and have them compare their specimens to the given examples.

Resources



Naming Rocks

IDENTIFICATION OF ROCK TYPES TABLE



IDENTIFYING ROCKS



Naming Rocks

Rock Identification Worksheet

Rock ID	Reacts to Acid (yes/no)	Grains (yes/no)	Grains separate or interlocked	Layers (yes/no)	Grain Size (mm)	Hardness (hard/soft)	Feel (rough/smooth)	Lustre	Colour	Other (fossils, bubbles)

IDENTIFYING ROCKS



Looking Closer at Igneous Rocks

Students investigate the size of crystals grown from solutions cooled quickly and slowly. They relate their observations to rocks that cooled quickly (e.g. some extrusive volcanic rocks) and those that cooled slowly (e.g. some intrusive igneous rocks).

Explanation

As magma cools, it crystallizes, but the temperature at which it cools dictates the size of its crystals. Intrusive igneous rocks cool very slowly underground, so their crystals have a long time to grow. As a result intrusive igneous rocks have large crystals and are coarse-grained (e.g. granite). Extrusive igneous rocks are ejected into cold air or water so they crystallize almost immediately, giving the crystals very little time to grow. Extrusive rocks are fine-grained or glassy (e.g. basalt or obsidian).

In this activity, the iodine or salol represents magma. The glass slides that crystallize at room temperature and over hot water represent intrusive rocks. The glass slide that was cooled represents the rapid crystal formation of an extrusive rock.

Materials

Safety goggles
Iodine solution (1 N works well) or phenyl salicylate (salol)
Eyedropper
3 glass slides and cover slips
Cup of hot water
Cup of ice
Microscope or hand lens
Variety of extrusive and intrusive igneous rocks

Cautions

Both salol and iodine are harmful if ingested.
Wash hands after this activity.
Wear safety goggles while handling chemicals.

Time

Medium



Looking Closer at Igneous Rocks

Grouping

Pairs, small groups

Preparation

Collect a supply of ice and hot water. Set up a safe work area where the glass slides can be left to crystallize.

Prompt

Show a photograph of a volcano and ask students where rocks are being formed.

Delivery

Direct students to:

1. Put on safety goggles.
2. If using salol, melt the crystals by placing it over a hot water bath.
3. Place one slide on the ice to cool and one in the hot water to warm.
4. Dry the slides. Place one drop of solution on each slide and cover with a cover slip.
5. Leave one slide sitting on the table. Place one slide on the ice. Place the third slide over the cup of hot water. In a few minutes, crystals will have formed on each slide.
6. Look at the slides under the microscope. Compare the crystal sizes under the same magnification.
7. Ask the students to sketch the crystals using the same magnification.

Questions for Discussion

Did larger crystals grow when the liquid cooled slowly or quickly?

Have students compare what they saw on the slide with the igneous rock samples. What can they infer about the history of the sample igneous rocks when compared to what they have seen on the slides?

Extension

Students can grow crystals from many different solutions. Challenge them to find the optimum conditions for crystal growth.



Comparing Rocks and Minerals

Students observe the differences between rocks and minerals.

Explanation

Most rocks are mixtures of two or more different minerals, although this is not always the case. If the rock is too fine-grained, you will not be able to tell if there are different minerals or not because they are too small to distinguish from one another. In contrast, minerals are uniform substances each with a defined chemical composition.

Materials

Samples of rocks and minerals. Suggestions: granite, quartz, feldspar, mica.
Chocolate chip cookies

Cautions

Wash hands after this activity.

Time

Short

Grouping

Individual, pairs, small groups

Preparation

The best rock type to use in this activity is coarse-grained granite (igneous rock) and the minerals that it is made from: for example, quartz, feldspar and mica.

Prompt

Place a box of chocolate chip cookies on the table and ask students what similarities the cookies have to rocks.

Delivery

1. Direct students to look at the mineral samples and describe their characteristics.
2. Have them look at the granite and describe it in as much detail as possible, paying particular attention to differences or similarities that they observe in the minerals that make up the granite.



Comparing Rocks and Minerals

3. Ask them to share their observations as a whole group. The variety of colours in rock is the result of different minerals.
4. Have students count how many minerals are in the granite, and challenge them to pick out individual mineral grains. They should be able to recognize grains such as glassy quartz, white or pearly-pink feldspar, and shiny black flakes of mica.
5. If permitted, distribute a chocolate chip cookie to each student. Alternatively hold one up for all to see. The whole cookie represents the rock and the individual ingredients the minerals. Some minerals are easily recognizable, while others are not, i.e. the chocolate chips are clearly visible, but ingredients like flour and egg are not as they have been blended together. Students could make the cookies themselves and talk about how the flour, sugar, salt, baking powder and chocolate chips are all different minerals, each with its own special characteristics. Just as these ingredients are mixed together and formed into a “layer” to harden in the heat of the oven, the mineral grains become a recognizable rock.

Question for Discussion

Share a selection of other rocks and minerals and challenge students to classify them according to the criteria established.

