Grade 4 Program: Rocks, Minerals, and Erosion

"Our Lessons Really Rock!"

Scenic Caves Nature Adventures

Scenic Caves Nature Adventures Education Program

2002

Scenic Caves Nature Adventures

Welcome to our Education Program!

Teachers of students from grade 4 - 8 are provided with a lot of very useful, classroom- ready materials including:

Program Introduction and Overview
Background Information about each topic,
Worksheets (and answer sheets),
an **Internet Scavenger Hunt** for the Caves' website,
40 Quick- Questions
and some very practical and current **Student Demonstration** activities.

The guide also contains some administrative forms to help you get you class organized for the trip:

Your Rock Groups
Guidelines for Conduct

Also, we would like to hear your responses to the program. So, we included an:

Evaluation Form

The guide was written and compiled by Stacey LePage, an intermediate teacher from Collingwood, Ontario who has also written curriculum for The Simcoe County District School Board, the United Nations, the Toronto Star (classroom connection and Aboriginal Pride), CBC Radio - Quirks and Quarks, and The Canadian Electricity Association. Contributing writers include Taresa Matchett (Habitats and Communities and Diversity of Living Things), Marg Moran (Cells, Tissues, Organs, and Systems), Bill Ironside (Rocks, Minerals, and Erosion), Joanne Fleming (Water Systems) Donna Langman (promotional packages and Scavenger Hunt), and Gwen Kistemaker (a ton of student worksheets throughout the program).

"Our lessons really rock!"
.... and some are more petrified than others.

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Teaching Strategies and Learning Activities

Lesson #1

- ✓ Introduce the topic of rocks by inviting students to bring in their rock collections.
- ✓ Discuss the similarities and differences of the rocks they brought.
- ✓ Discuss the difference between rocks and minerals.
- ✓ Classify the rocks using a variety of criteria, relying on their observations.
- ✓ Graph the results of one or more of the classification exercises - using a pictograph or a bar graph.

Lesson #2

- ✓ Recognize and introduce the classifications used in geology (igneous, sedimentary and metamorphic).
- ✓ Complete a note on types of rocks (from background information).
- ✓ Have students write predictions about the kind of rock that is found in their own school yard.
- ✓ Compare different rocks and minerals from the local environment.

Lesson #3

- ✓ Use a variety of sources (encyclopaedia, CD-ROMs, library books, etc.) to generate names and classifications of rocks.
- ✓ Collect the names and classifications of class charts.
- ✓ Assign classification worksheet (included in package).

Lesson #4

- ✓ Correct worksheet.
- ✓ Divide class into work groups and divide the vocabulary word among those groups.
- ✓ Have students search the meanings of the words to present to the class.
- ✓ Record the meanings on chart paper at the front of the room.
- ✓ Identify and describe rocks that contain records of the earth's history and explain how they were formed.

Lesson #5

- ✓ Review the vocabulary.
- ✓ Divide students into groups of no more than 4 or 5.
- ✓ Give a sample of the sedimentary rock to each group along with a microscope.
- ✓ Have students sketch what forms they see in the rock or/
- ✓ Have students do a rubbing of the rock on a small piece of paper.
- ✓ Discuss what they may be looking at and the age of the fossil (review sedimentary work).
- ✓ Have students discuss what life may have been like in their own school yard, millions of years ago.

Lesson #6

- ✓ Review vocabulary.
- ✓ Discuss the uses of fossil fuels and where we get our fossil fuels from today. (Use an atlas to locate these areas)
- ✓ Find articles about Alberta's "Badlands" (there are many of these articles in National Geographic magazine, for example). There are many interesting theories about why the dinosaurs became extinct. Brainstorm with the students some ideas about what happened to the dinosaurs.

- ✓ *Bill Nye the Science Guy* has produced an excellent segment on dinosaurs and the meteor that is speculated to have hit the earth to cause their extinction.
- ✓ Have students search the INTERNET for theories of extinction.

Lesson #7

- ✓ Assign the vocabulary worksheet included in this package.
- ✓ Discuss erosion (take notes from background information section).
- ✓ Describe the effects of wind, water and ice on the landscape.
- ✓ Understand the history of glaciers in Southern Ontario.
- ✓ Describe any ways that their own landscape has been affected by erosion.

Lesson #8

- ✓ Correct the vocabulary worksheet.
- ✓ Introduce students to the concept of the Niagara Escarpment and Collingwood Scenic Caves (information included in this package).
- ✓ Predict what type(s) of rock students are likely to find at this site and explain their answers.
- ✓ Students may work through the Internet Scavenger Hunt worksheet. (www.sceniccaves.com)

Lesson #9

- ✓ Assign first set of research questions from the introductory package (20 questions...or so)
- ✓ Complete the erosion worksheet. (Don't let it wear you down!)

Lesson #10

- ✓ Correct 20 Questions worksheet and assign Day 2.

- ✓ Have students read through the material about the Niagara Escarpment and Scenic Caves Nature Adventures.
- ✓ Introduce the "Rock Groups" (optional)

Lesson #11

- ✓ Correct 20 Questions worksheet and assign Day 3.
- ✓ Discuss how soil is formed.
- ✓ Take a variety of soil samples from the school yard and using a microscope, check for any evidence of "life".
- ✓ Discuss what elements are in the soil that support this "life" that was found.

Lesson #12

- ✓ Correct 20 Questions worksheet and assign Day 4
- ✓ Assign the true / false worksheet (could be used as an evaluation)

Lesson #13

- ✓ Correct 20 Questions worksheet - Award winner for the Internet Scavenger Hunt.
- ✓ Prepare students for visit to Scenic Caves.

Lesson #14

- ✓ Trip to Scenic Caves Nature Adventures
- ✓ Remind students to bring the "Field Trip" kit with them (for hands-on activities at the Caves). You may wish to review the activities and routines before leaving.

Scenic Caves Nature Adventures

Earth and Space Systems: Grade 4

Rock, Minerals and Erosion

Introduction

Rock. There's not much about that word to stimulate any kind of mystery. We use the phrase, *"As solid as a rock"* when we wish to describe the immobility of an object. But, is this phrase really accurate? Looking at rock leads one to believe that it is stable - yet, over time, it is subject to dramatic change. Not only does it crumble, but it metamorphoses as well. It can change from one colour to another, from one look to another. Wind, water and ice have the power to change a seemingly *"solid as a rock"* landscape from a mountain to a hill. Humans have unwittingly aided the forces of nature - to some extent with tragic results. Further, how can rocks possibly be related to the beauties that sparkle and shine on our hands? Through this unit, students will be introduced to the basic of geology, erosion and the ever-appealing world of fossils.

Student Demonstration

Rocks

Students will locate and photograph, sketch, imprint or take a mould of a fossil found at Scenic Caves Nature Adventures. They will then conduct unobtrusive field studies to determine the environment in which the fossil lived, the geologic period of the fossil and the rock and determine which principles of geology apply.

Erosion

When walking along the Scenic Caves paths, students will identify document and map evidence of glaciation.

Soils

Students will make guided observations about the soil surrounding the scarp face at the Scenic Caves. (ie.) What evidence of life can they observe in the soil?

Program Areas
Geography, Science and Technology, Language

Keywords and Vocabulary
minerals, rocks, intrusive extrusive, dolostone, limestone, fossil, scarp face, erosion, igneous, sedimentary, metamorphic, quartz, diamond, magma, granite, obsidian, sandstone, parent rock, physical weathering, chemical weathering, carbon dioxide, glacier, topsoil, humus, bedrock, crystals, luster, soil

Background Information

Different rocks have different characteristics which allow us to tell them apart from one another. We have thousands of different classification systems: hard or smooth, rough, soft, shiny or dull. But what has caused them to be so different in the first place? Every rock is made from minerals. (Minerals are solid chemical substances) Rock is like cake in that it is *"baked"* from the combination of raw ingredients. In the case of a cake, the ingredients are flour, water, eggs. In the case of rock, the ingredients are minerals. What sets one type of cake apart from another is its distinctive additions - chocolate, bananas, nuts or cherries. What sets one type of rock apart from another are its distinctive array of minerals.

There are three basic types, or classes, of rock which are based on how the rocks were formed: **igneous, sedimentary and metamorphic**.

Igneous Rock

This rock forms from cooled and hardened magma or lava that has escaped through volcanic vents (holes) in the earth. If the magma from the volcano escapes to underground holes that exist, it will take longer to cool, allowing the mixture to

"settle". This type of eruption is called *"intrusive"*. The Canadian Shield was formed from intrusive eruptions. As a result, these rocks have large crystals. An eruption that occurs outside of the earth's crust, it is called *"extrusive"*. The lava is exposed to the outside atmospheric temperatures and is able to cool off quickly. The crystals that are formed as a result of rapid cooling are very quite small.

Have you ever noticed that sometimes ice- cubes are cloudy and sometimes they are clear? The difference is in the time that the water has taken to freeze. The longer the water takes to freeze, the more time the trapped air bubbles have to escape. A quick freeze traps the air inside the water (ice) and creates a cloudy appearance. This process is similar to the *"clarity"* of igneous rock. The word igneous means *"fire"* in Latin. Two common forms of this type of rock are granite and obsidian. Other examples include basalt and pumice.

Rocks are being continually worn down by wind and rain. Tiny grains of dirt, sand, mud and clay are worn off the rock and washed into streams, rivers, lakes and oceans where they settle to the bottom of the water. This is known as *sediment*. Minerals in the water mix with tiny sea animals and plants as they die and sink to the bottom of the water. These, then also become part of the sediment. Thus, sediment is composed of bones, leaves, teeth and other things that drop to the bottom of a lake or an ocean. The sediment builds up over years and finally after thousands and millions of years we end up with a really deep pile of sediment - to form the second type of rock.

Sedimentary Rock

This type of rock is usually found near rivers. Sandstone is sedimentary rock. Other examples include Limestone, Jasper, Gypsum, and Conglomerate.

Metamorphic Rock

The third type of rock is **metamorphic,** which means *"changed in form"*. These rocks were once a different kind of rock. Examples include Quartz, Amethyst, Marble, Slate, Gneiss, Graphite and Coal. The rock was somehow buried beneath

the surface of the earth where it was then exposed to heat and pressure for millions of years. Limestone (sedimentary rock) can be changed to marble, sandstone (sedimentary) can be changed into quartzite, and shale can be changed to slate. One type of rock "metamorphoses" into another type of rock.

Minerals

Minerals are inorganic (non-living) substances that are made from the same chemicals and have the same crystal shape. The colour of a particular mineral is determined by what is mixed in with the mineral. Some are mixed with a metal that has a luster - this causes the mineral to shine. Minerals that don't contain metals look dull. More than four thousand minerals have been discovered including gold, silver, platinum, copper and diamond.

Geologists use the physical properties of a mineral to identify it in the field. These properties include colour, streak, luster, cleavage, specific gravity, and hardness.

A scratch test developed by a German mineralogist named **Fredriech Mohs** in 1822 is used to determine hardness. Hardness is measured on a scale of 1-10 by how easily a mineral can be scratched. Soft minerals which are more easily scratched are given low numbers. Hard minerals are given higher numbers.

Another way minerals are classified is by doing a streak test. The streak of a mineral is the colour of its fine powder.

Fossils

Fossils are the remains of plants and animals that are found in rock. Some fossils are the actual plant or animal remains that have been mineralized. This process occurs when the original materials in an organism are replaced by minerals. Other

fossils are impressions made in soft sediment by organisms, such as the tracks of animals left in mud.

Fossils are found most often in sedimentary rocks. The processes that create igneous rock and metamorphic rock usually destroy any pre-existing fossils.

Coal, oil, and natural gas are fossil fuels that are the remains of prehistoric plants and animals. These organisms died and were trapped beneath layers of sedimentary rock and lost most of the minerals they contained, leaving mostly carbon. The remaining carbon was heated to form fossil fuels. We use fossil fuels for fuel, heat, and in the production of synthetic materials such as plastics and fibers such as nylon, orlon, and dacron.

Erosion

Our landscape appears stable, but in fact, is subject to massive changes. Rocks are slowly crumbling. Winds grind down rocks. Fields are losing their soil. Water carries away sediment and deposits it somewhere else. The earth's surface is changing all the time. Water, wind, and ice are constantly at work, wearing away and building up the land.

Some changes take place in a very short time. Floods can change the course of a river in a few days. Dust storms can carry huge amounts of soil away very rapidly. However, most of the big changes in the earth's surface take thousands of years. At various times, the earth is exposed to long periods of extreme cold followed by periods of intense heat.

Some of these erosive changes are chemical, while others are physical. Chemical weathering (acid rain) causes chemical changes in the minerals of a rock. It usually proceeds most rapidly in warm, moist climates.

Physical weathering occurs when rocks are reduced to smaller fragments without

being changed chemically and it is more likely to occur in cooler, more dry climates. Among the physical processes of weathering are ice, water, wind, and changes in temperature.

Collingwood Scenic Caves demonstrates excellent evidence of physical weathering. Cracks in the rocks allow in air and water. Weathering then goes on inside the rocks as well as on the outside. **Water** begins its eroding and dissolving action. When freezing occurs, the expansion of the water exerts tremendous pressure. This causes the rock mass to break into smaller pieces. This is the rock that is found at the bottom of the rock face.

Wind is a powerful erosive agent. Grains of blown sand can act like tiny chisels, scratching and scraping whatever surface they strike. In a sandstorm, cars can have their paint worn off in minutes.

Ice is another erosive element. The glaciers moved incredible amounts of rock and soil. Over much of the southern part of our country is a layer of soil and rock that was not formed there. In some places this layer is 500 feet deep. This soil came from somewhere else. Huge glaciers, moved down from the north and then melted. They brought with them many cubic miles of rock, sand, and clay. As these glaciers moved along, they picked up rocks and ground them into fragments against one another. Rock particles embedded in the lower levels and sides of the glaciers scoured rock powder from the bedrock of the glacier's path. When the ice melted, the rock fragments and powder were either immediately deposited or carried away many miles by water flowing from the glacier. As the glaciers moved they also smoothed off hilltops and filled in valleys. **Niagara Falls** has its present form because of them. They also formed the **Great Lakes** and countless smaller lakes.

Erosion can also be caused by non-natural forces. Agriculture, construction and logging remove ground cover, which speeds the process of soil erosion. This causes two types of problems. First, the loss of soil impacts the land's ability to support plant life. Without plants, animals will not move into the area, and those already in the area will starve. Second, the soil that is eroded away ends up in the water.

Millions of tons of sediment are added to bodies of water each year, as are the fertilizers, pesticides and other pollutants the sediment carries with it. This additional sediment changes the aquatic ecosystem, affecting the plants and animals in the water.

Landslides and mud slides are yet another form of disaster that has increased in frequency as a result of erosion due to the logging industry. Without trees to slow the flow of water down a hillside, the soil has nothing to hold it in place. In Bangladesh, a large amount of soil is lost to the ocean on a regular basis.

Soil

Soil is the result of the process of the gradual breakdown of rock - the solid geology that makes up the earth. As rock becomes broken down through a variety of processes, such as **weathering** and **erosion**, the particles become ground smaller and smaller. There are considered to be three main parts to soil; *'sand', 'silt'* and *'clay'.* These parts give the soil its mineral texture. In addition, as leaves and other organic material fall to the ground and decompose - there forms an *'organic'* layer.

Soil, like freshwater, is vital to many of Earth's ecosystems. Scientists estimate that each year the world loses about 11 million hectares of arable land (land that could be used for growing plants). Non-agricultural use of farmland, contaminants entering the soil, desertification and erosion are some of the causes. In the western province, erosion affects 12 percent of farmland. Loss of farmland in the United States may drastically reduce grain exports by the middle of the next century.

Nearly 90 percent of all trees harvested in Canada is done by *clear-cutting*, which exposes the soil to wind and water erosion.

Urban development replaces over one million hectares of farmland a year in North America. Today we need to learn how to reverse the damage that erosion has

caused in many countries as a result of human interferences.

Scenic Caves Nature Adventures

Name: _____

Types of Rocks

There are _____ types of rocks. They are _____, _____ and _____ rocks. Each type of rock has different _____.

Igneous Rock

Igneous rocks are formed from _____ and hardened _____. The magma is cooled through volcanic vents in the Earth's _____. When the cooling process is slow, the mixture _____ and is considered an _____ eruption. The _____ Shield is a great example of this type of eruption. If the eruption takes place outside of the Earth's crust, it cools much quicker and is an extrusive _____. Some examples of igneous rocks are: Granite, Obsidian, Basalt and Pumice.

Sedimentary Rock

_____ rocks are formed from the tiny grains of dirt, sand, mud and clay that is worn off other rocks by wind and rain. The tiny grains are _____ into rivers, streams, lakes and oceans. The grains settle on the

_____ of the water and are mixed with dead plant and animals. These slowly harden with the _____ of more sediment on top of them to create a different type of rock. Some examples of sedimentary rocks are:

_____, Limestone, Jasper and Gypsum.

Metamorphic Rock

Metamorphic rocks are rocks that were once a _____ type of rock.

The rocks are changed when they are exposed to _____ and

_____. Some examples of metamorphic rocks are: Marble, Quartzite,

Slate and Gneiss.

Scenic Caves Nature Adventures

Name: *Answer Guide*

Types of Rocks

There are *three* types of rocks. They are *igneous, sedimentary,* and *metamorphic* rocks. Each type of rock has different *characteristics.*

Igneous Rock

Igneous rocks are formed from *cooled* and hardened *magma.* The magma is cooled through volcanic vents in the Earth's *crust.* When the cooling process is slow, the mixture *settles* and is considered an *intrusive* eruption. The *Canadian* Shield is a great example of this type of eruption. If the eruption takes place outside of the Earth's crust, it cools much quicker and is an extrusive *eruption.* Some examples of igneous rocks are: Granite, Obsidian, Basalt and Pumice.

Sedimentary Rock

Sedimentary rocks are formed from the tiny grains of dirt, sand, mud and clay that is worn off other rocks by wind and rain. The tiny grains are *washed* into rivers, streams, lakes and oceans. The grains settle on the *bottom* of the water and are mixed with dead plant and animals. These slowly harden with the *pressure* of more

sediment on top of them to create a different type of rock. Some examples of sedimentary rocks are: *Sandstone*, Limestone, Jasper and Gypsum.

Metamorphic Rock

Metamorphic rocks are rocks that were once a *different* type of rock. The rocks are changed when they are exposed to *heat* and *pressure.* Some examples of metamorphic rocks are: Marble, Quartzite, Slate and Gneiss.

Scenic Caves Nature Adventures

Name: _____

Rocks and Minerals

Using a variety of sources, classify the following types of rocks and minerals.

Granite	Quartzite	Jasper	Obsidian	Gold
Shale	Gypsum	Conglomerate	Amethyst	Coal
Diamond	Limestone	Sandstone	Slate	Graphite
Pumice	Platinum	Basalt	Quartz	Gneiss

Rocks and Minerals

Igneous ***Sedimentary*** ***Metamorphic*** ***Mineral***

_____

_____

_____

_____

_____

_____

Name: Answer Guide

Rocks and Minerals

Using a variety of sources, classify the following types of rocks and minerals.

Granite	Quartzite	Jasper	Obsidian	Gold
Shale	Gypsum	Conglomerate	Amethyst	Coal
Diamond	Limestone	Sandstone	Slate	Graphite
Pumice	Platinum	Basalt	Quartz	Gneiss

Rocks and Minerals

Igneous	***Sedimentary***	***Metamorphic***	***Minerals***
Granite	*Jasper*	*Quartzite*	*Gold*
Obsidian	*Shale*	*Amethyst*	*Diamond*
Pumice	*Gypsum*	*Coal*	*Platinum*
Basalt	*Conglomerate*	*Slate*	
	Limestone	*Graphite*	
	Sandstone	*Quartz*	
		Gneiss	

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Name:

_____

Rock, Minerals and Erosion Vocabulary

Complete the following vocabulary activity by placing the letter of the correct definition beside the corresponding term.

____ mineral	a) the effects of ice, water, wind & temperature
____ soil	b) the wearing down of the physical environment
____ fossil	c) composed of three parts: sand, silt and clay
____ glacier	d) an example of metamorphic rocks
____ luster	e) fiery; resulting from fire
____ chemical weathering	f) a slow moving mass of ice, rock, sand and clay
____ physical weathering	g) resulting from a volcanic eruption
____ erosion	h) clearness of rocks
____ igneous	i) recognizable remains of plants or animals
____ sedimentary	j) acid rain is a major contributor in this process
____ metamorphic	k) an example of igneous rocks
____ magma	i) type of stone that has changed in form
____ intrusive eruptions	m) gloss or shine

____ clarity	n) carbon based substances left behind and trapped under sedimentary rock
____ sandstone	o) an example of sedimentary rock
____ granite	p) slowly cooled magma that has "settled"
____ sediment	q) inorganic substance
____ coal	r) tiny grains of dirt, sand, mud and clay that is washed into bodies of water
____ fossil fuels	s) rock that is usually found near bodies of water

Scenic Caves Nature Adventures

Name: Answer Guide

Rock, Minerals and Erosion Vocabulary

Complete the following vocabulary activity by placing the letter of the correct definition beside the corresponding term.

_q_ mineral	a) the effects of ice, water, wind and temperature
_c_ soil	b) the wearing down of the physical environment
_i_ fossil	c) composed of three parts: sand, silt and clay
_f_ glacier	d) an example of metamorphic rocks
_h_ luster	e) fiery; resulting from fire
_j_ chemical weathering	f) a slow moving mass of ice, rock, sand and clay
_a_ physical weathering	g) resulting from a volcanic eruption
_b_ erosion	h) clearness of rocks
_e_ igneous	i) recognizable remains of plants or animals
_s_ sedimentary	j) acid rain is a major contributor in this process

_l_ metamorphic	k) an example of igneous rocks
_g_ magma	l) type of stone that has changed in form

_p_ intrusive eruptions	m) gloss or shine
_m_ clarity	n) carbon based substances left behind and trapped under sedimentary rock
_o_ sandstone	o) an example of sedimentary rock
_k_ granite	p) slowly cooled magma that has "settled"
_r_ sediment	q) inorganic substance
_d_ coal	r) tiny grains of dirt, sand, mud and clay that is washed into bodies of water
_n_ fossil fuels	s) rock that is usually found near bodies of water

Scenic Caves Nature Adventures

Erosion - Don't let it wear you down!

Name: _____

Choose the best answer for each question. Circle the corresponding letter.

1. **Rock**
   a) is very stable.
   b) never changes its form.
   c) is no different from minerals.
   d) changes all the time.

2. **Most of the changes in the earth's surface take:**
   a) millions of years.
   b) thousands of years.
   c) a very short time.
   d) none of the above

3. **Chemical Weathering**
   a) is a hypothesis
   b) only happens to metamorphic rock
   c) is caused by acid rain
   d) Usually proceeds more quickly in warm climates.

4. **Physical (mechanical) weathering occurs when.....**

a) rock is exposed to sun for long periods of time.
b) rocks are reduce to fragments by acid rain.
c) rocks are reduced to fragments by water or wind or ice.
d) sedimentary rocks change to granite.

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5. **Scenic Caves demonstrates excellent evidence of:**
   a) physical weathering
   b) chemical weathering
   c) tropical weathering
   d) None of the above

6. **Erosive elements include:**
   a) parents and siblings (just kidding)
   b) roots and root systems
   c) wind, water and ice
   d) wind, sun and rock

Scenic Caves Nature Adventures

Erosion - Don't let it wear you down!

Name: Answer Sheet

Choose the best answer for each question. Circle the corresponding letter.

1. **Rock**
   a) is very stable.
   b) never changes its form.
   c) is no different from minerals.
   _d) changes all the time.

2. **Most of the big changes in the earth's surface take:**
   _a) Millions of years.
   b) Thousands of years.
   c) A very short time.
   d) None of the above

3. **Chemical Weathering**
   a) is a hypothesis
   b) only happens to metamorphic rock
   _c) is caused by acid rain
   d) Usually proceeds more quickly in warm climates.

4. **Physical (mechanical) weathering occurs when:**
   a) Rock is exposed to sun for long periods of time.

b) Rocks are reduce to fragments by acid rain.
_c) Rocks are reduced to fragments by water or wind or ice.
d) sedimentary rocks change to granite

5. **Scenic Caves demonstrates excellent evidence of:**
_a) physical weathering
b) chemical weathering
c) tropical weathering
d) None of the above

6. **Erosive elements include:**
a) parents and siblings (just kidding)
b) roots and root systems
_c) wind, water and ice
d) wind, sun and rock

Collingwood Scenic Caves & Nature Preserve

Name:_____

Rocks, Minerals and Erosion

State whether the following statements are true or false.

_____ 1. All rocks are the same in luster.

_____ 2. Granite is an example of metamorphic rock.

_____ 3. The Canadian Shield was formed from intrusive eruptions.

_____ 4. Rocks are solid and never change their formation.

_____ 5. Sedimentary rock is formed from layers of dirt, sand, mud, clay, minerals, tiny sea animal and plants.

_____ 6. Sedimentary rocks can be changed into metamorphic rocks.

_____ 7. Minerals are organic (living) substances.

_____ 8. If a rock is rated at a 3 on the hardness scale, it is a hard mineral.

_____ 9. Fossils are often found in igneous rocks.

____ 10. We use fossil fuels for heat and the production of synthetic materials.

____ 11. Our landscape is constantly changing in appearance.

____ 12. The Collingwood Scenic Caves shows evidence of physical weathering.

____ 13. Wind and not ice is a powerful erosive agent.

____ 14. Niagara Falls is an example of the power of huge glaciers.

____ 15. The area east of the Niagara Escarpment used to be covered with water.

____ 16. Soil and fresh water are vital to many of the Earth's ecosystems.

____ 17. Clear-cutting is the best way to prepare an area for development.

____ 18. There are ten classes or types of rocks.

____ 19. Minerals are solid chemical substances.

____ 20. More than 50,000 minerals have been discovered to date.

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Scenic Caves Nature Adventures

Name: Answer Guide

Rocks, Minerals and Erosion

State whether the following statements are true or false.

false 1. All rocks are the same in luster.

false 2. Granite is an example of metamorphic rock.

true 3. The Canadian Shield was formed from intrusive eruptions.

false 4. Rocks are solid and never change their formation.

true 5. Sedimentary rock is formed from layers of dirt, sand, mud, clay, minerals, tiny sea animal and plants.

true 6. Sedimentary rocks can be changed into metamorphic rocks.

false 7. Minerals are organic (living) substances.

false 8. If a rock is rated at a 3 on the hardness scale, it is a hard mineral.

false 9. Fossils are often found in igneous rocks.

true 10. We use fossil fuels for heat and the production of synthetic materials.

true 11. Our landscape is constantly changing in appearance.

true 12. The Collingwood Scenic Caves shows evidence of physical weathering.

false 13. Wind and not ice is a powerful erosive agent.

true 14. Niagara Falls is an example of the power of huge glaciers.

false 15. The area east of the Niagara Escarpment used to be covered with water.

true 16. Soil and fresh water are vital to many of the Earth's ecosystems.

false 17. Clear-cutting is the best way to prepare an area for development.

false 18. There are ten classes or types of rocks.

true 19. Minerals are solid chemical substances.

false 20. More than 50,000 minerals have been discovered to date.

Scenic Caves Nature Adventures

Experiential Activities at Scenic Caves

Name: _____

Rocks and Minerals:

1. Find three different classes of rock (two are probable).
   Describe their location.

_____

_____

2. Distinguish dolostone from limestone by using the acid test. Describe what happened.

_____

_____

3. Locate and sketch a fossil.
   Try to do a field investigation of the fossil.
   Interpret the environment in which the fossil lived.

_____

_____

_____

Scenic Caves Nature Adventures

Erosion:

1. Describe the effects of wind, water and ice on the landscape.

_____

_____

2. What role would ground water and surface water play on the erosion of the Escarpment?

_____

_____

3. At the scarp face (cliff), identify and sketch evidence of mechanical weathering.

_____

_____

4. At the scarp face, explain and account for chemical weathering. Note: distinction between the soft lower layers and the hard, erosion - resistant "caprock" (rock on the top of the cliff)

_____

_____

5. Throughout the walk, identify, document and map evidence of glaciation.

Scenic Caves Nature Adventures

Soils:

1. What evidence of life in the soil can you observe? What is the name of the tree that grows in this soil?

_____

_____

2. Because this very same species actually grows out of the rock of the scarp face - what conclusions can you draw between the rock's relationship to the soil?

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