Moraine Lake
Glenbow Archives NA-4346-11

# The Rock Cycle

## Teacher's Program Guide

TeacherResources AtGlenbow

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# Teacher's Program Guide for School Visits

What are rocks? How are they formed? Where do they come from? In *The Rocky* Cycle, students will examine the three rock types: sedimentary, metamorphic and igneous in an attempt to understand the similarities and differences in each. We will also look at differences between rocks and minerals while we learn about some important uses for minerals found in rocks.

This guide will assist you in preparing for your visit to Glenbow Museum. It contains pre-visit lessons, vocabulary terms as well as follow up activities. Engaging in the suggested activities before and after your visit will reinforce the ideas in the program and link classroom learning to the Museum experience. The activities require few materials and can be adjusted to meet the age and needs of your students.

# CURRICULUM CONNECTIONS

**Grade 3**

Science:

Topic A: Rocks and Minerals

3–5 Demonstrate knowledge of materials that comprise Earth's crust, and demonstrate skill in classifying these materials.

Students will:

1. Compare samples of various kinds of rock, and identify similarities and differences.
2. Given a description of the properties of a particular rock or mineral, identify a sample rock or mineral that matches those properties. Properties that students should be able to describe and interpret include:
    - Colour
    - lustre or "shininess"; e.g., shiny, dull, glassy, metallic, earthy
    - texture; e.g., rough, smooth, uneven
    - hardness, based on scratch tests with available materials
    - presence of carbonates. Note that the presence of carbonates can be tested with vinegar or another mild acid
    - crystal shape for minerals, or overall pattern of rocks.
3. Describe and classify a group of rocks and minerals, based upon the above properties.
4. Recognize that rocks are composed of a variety of materials; and given a coursegrained rock and magnifier, describe some of the component materials.
5. Recognize and describe the various components within a sample of soil; e.g., clay, sand, pebbles, decaying plants; and describe differences between two different soil samples.
6. Describe ways in which rocks break down to become soil, and demonstrate one or more of these ways; e.g., by shaking a group of small, soft rocks in a jar of water; by striking rocks together. Note: Safety goggles should be used.
7. Describe some common uses of rocks and minerals; and identify examples of those uses within the school, home or local community.

**Grade 7**

Science:

Unit E: Planet Earth (Nature of Science Emphasis)

Outcomes for Science, Technology and Society (STS) and Knowledge

Students will:

1. Describe and demonstrate methods used in the scientific study of Earth and in observing and interpreting its component materials
    - investigate and interpret evidence that Earth's surface undergoes both gradual and sudden change (e.g., recognize earthquakes, volcanoes and landslides as examples of sudden change; recognize glacial erosion and river erosion as examples of gradual/incremental change)
    - interpret models that show a layered structure for Earth's interior; and describe, in general terms, evidence for such models
    - identify and explain the purpose of different tools and techniques used in the study of Earth (e.g., describe and explain the use of seismographs and coring drills, as well as tools and techniques for the close examination of rocks; describe methods used in oil and gas exploration)
    - explain the need for common terminology and conventions in describing rocks and minerals, and apply suitable terms and conventions in describing sample materials (e.g., use common terms in describing the lustre, transparency, cleavage and fracture of rocks and minerals; apply the Mohs' scale in describing mineral hardness)
2. Identify evidence for the rock cycle, and use the rock cycle concept to interpret and explain the characteristics of particular rocks
    - distinguish between rocks and minerals
    - describe characteristics of the three main classes of rocks—igneous, sedimentary and metamorphic—and describe evidence of their formation (e.g., describe evidence of igneous rock formation, based on the study of rocks found in and around volcanoes; describe the role of fossil evidence in interpreting sedimentary rock)
    - describe local rocks and sediments, and interpret ways they may have formed
    - investigate and interpret examples of weathering, erosion and sedimentation
4. Describe, interpret and evaluate evidence from the fossil record
    - describe the nature of different kinds of fossils, and identify hypotheses about their formation (e.g., identify the kinds of rocks where fossils are likely to be found; identify the portions of living things most likely to be preserved; identify possible means of preservation, including replacement of one material by another and formation of molds and casts)
    - explain and apply methods used to interpret fossils (e.g., identify techniques used for fossil reconstruction, based on knowledge of current living things and findings of related fossils; identify examples of petrified wood and bone)
    - describe patterns in the appearance of different life forms, as indicated by the fossil record (e.g., construct and interpret a geological time scale; and describe, in general terms, the evidence that has led to its development)

- identify uncertainties in interpreting individual items of fossil evidence; and explain the role of accumulated evidence in developing accepted scientific ideas, theories and explanations

Skill Outcomes (focus on scientific inquiry)
Initiating and Planning
Students will:
Ask questions about the relationships between and among observable variables, and plan investigations to address those questions

- identify questions to investigate (e.g., How are rocks formed?)
- define and delimit questions to facilitate investigation (e.g., ask a question about a sample group of rocks from a specific region, or about a specific type of rock or rock formation)
- state a prediction and a hypothesis based on background information or an observed pattern of events (e.g., predict where an outcrop of a given rock will appear, based on observations at nearby sites)
- formulate operational definitions of major variables and other aspects of their investigations (e.g., define hardness by reference to a set of mineral samples, or by reference to the Mohs' scale of hardness)

Performing and Recording
Students will:
Conduct investigations into the relationships between and among observations, and gather and record qualitative and quantitative data

- carry out procedures, controlling the major variables
- estimate measurements (e.g., estimate the thickness of sedimentary layers)
- research information relevant to a given question (e.g., research information regarding the effect of acid rain on the rate of rock weathering)
- select and integrate information from various print and electronic sources or from several parts of the same source (e.g., demonstrate proficiency in uploading and downloading text, image, audio and video files)
- organize data, using a format that is appropriate to the task or experiment (e.g., use diagrams to show the shape and thickness of different layers in a rock outcrop)

Analyzing and Interpreting
Students will:
Analyze qualitative and quantitative data, and develop and assess possible explanations

- use or construct a classification key (e.g., apply a classification key to identify a group of rocks
- from a local gravel yard)
- interpret patterns and trends in data, and infer and explain relationships among the variables (e.g., interpret example graphs of seismic data, and explain the lag time between data received at different locations)
- predict the value of a variable, by interpolating or extrapolating from data (e.g., determine, in a stream table study, the quantity of sediment carried over a half-hour period, then extrapolate the amount that would be carried if the time were extended to a day, month, year or millennium)
- identify and suggest explanations for discrepancies in data (e.g., suggest explanations for an
- igneous rock being found in a sedimentary formation)
- identify new questions and problems that arise from what was learned (e.g., identify new
- questions that arise after learning about plate tectonics)

Communication and Teamwork
Students will:
Work collaboratively on problems; and use appropriate language and formats to communicate ideas, procedures and results

- work cooperatively with team members to develop and carry out a plan, and troubleshoot problems as they arise (e.g., each group member is assigned a task to investigate a particular mineral, and the results are pooled in a common data table)
- evaluate individual and group processes used in planning, problem solving, decision making and completing a task (e.g., evaluate the relative success and scientific merits of an Earth science field trip organized and guided by themselves)

## VOCABULARY

- **Rock** The solid mineral material forming part of the surface of the earth and other similar planets, exposed on the surface or underlying the soil or oceans.

- **Rock Cycle** A continuous process by which rocks are created, changed from one form to another, destroyed, and then formed again.

- **Igneous rock** Rocks formed by the cooling and solidifying of molten materials. Igneous rocks can form beneath the Earth's surface, or at its surface, as lava.

- **Sedimentary rock** Rock that has formed through the deposition and solidification of sediment, especially sediment transported by water (rivers, lakes, and oceans), ice (glaciers), and wind. Sedimentary rocks are often deposited in layers, and frequently contain fossils.

- **Metamorphic rock** Rock that was once one form of rock but has changed to another under the influence of heat, pressure, or some other agent without passing through a liquid phase.

- **Fossil** Any remains, impression, or trace of a living thing of a former geologic age, as a skeleton, footprint, etc.

- **Mineral** A naturally occurring inorganic substance with a definite chemical composition and a regular internal structure.

# LESSON PLANS

## PRE-VISIT ACTIVITY

*The Rock Cycle* is an introductory program that discusses the three types of rock, minerals, and fossils, showing samples, and quizzing students on how to identify these different types. It may be useful to review these basic concepts prior to the program.

# POST-VISIT ACTIVITY

## INSTRUCTIONS

1. Invite students to bring in specimens of rocks and minerals from their own collections at home. Challenge them to bring ones that haven't been able to identify.
2. Using the attached version of the same worksheet the students did during the program, give the students time to figure out 1) whether they have brought in a rock or a mineral, and 2) if it is a rock, what kind of rock it is. You may need to review the differences between rocks and minerals.
3. After they have completed the worksheet and narrowed down what their specimen might be, and if time and resources allow, allow students to narrow it down further with additional research. Rock and mineral books and websites may be used.
4. Have students share with the class what they figured out about their rock or mineral specimen.
5. An optional additional activity can be to have them give their "pet rock" a name, and to build a home for it with cardboard, construction paper, crayons, markers, etc.
6. You may also choose to go over further answers to the program worksheet in class, use the activity sheet, and read the story of the pebble, given by your educator at Glenbow.

# RESOURCES

### Websites

**Sandatlas:** http://www.sandatlas.org/rock-types/
Excellent photo references for a number of different common rock types. Links to good articles on other types of rocks and minerals.

# OUR COLLECTIONS

http://www.glenbow.org/collections/

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Your Name

Is your specimen a rock or a mineral? (circle your answer) ROCK MINERAL

If your specimen is a **rock**, answer these questions:

| | |
|---|---|
| 1. Is the rock made of SEDIMENT (clay, sand or pebbles)?<br>➪ If YES, it may be SEDIMENTARY.<br>➪ If NO, and it is made of CRYSTALS, it may be METAMORPHIC or IGNEOUS. | |
| 2. Is the rock made up of mineral grains that look MELTED together?<br>➪ If they look MELTED, it may be M or I.<br>➪ If they look cemented or pressed, it may be S. | |
| 3. Can you see crystals easily?<br>➪ If YES, it may be METAMORPHIC or IGNEOUS. | |
| 4. Is the entire rock mostly one colour?<br>➪ If YES, it may be SEDIMENTARY. | |
| 5. Are there different coloured grains scattered evenly throughout the sample?<br>➪ If YES, it may be IGNEOUS.<br>➪ If NO, and it is clumpy or mostly one colour, it may be METAMORPHIC or SEDIMENTARY. | |
| 6. Does the rock have holes or bubbles?<br>➪ If YES, it may be IGNEOUS. | |
| 7. Is the rock formed in layers?<br>➪ Straight lines may be SEDIMENTARY.<br>➪ Wavy lines may be METAMORPHIC. | |
| 8. Is the rock's surface shiny?<br>➪ If YES, it may be IGNEOUS or METAMORPHIC. | |
| 9. Count to find which rock type appears the most times:<br>➪ Write S, I, or M.<br>Use the hand signals to check the answer | |
| 10. What is your final answer? | |