

DO YOU HAVE ROCKS IN YOUR HEAD?

Grade Level: First Grade
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Length of Unit: Eight to Twelve Days (5 Lessons)

I. ABSTRACT

This unit introduces the geological topic of rocks and minerals as found in the Core Knowledge Sequence for the First Grade. It utilizes a variety of auditory, visual and kinesthetic activities to explore both the formation and characteristics of minerals and the three kinds of rock – igneous, sedimentary, and metamorphic. The formation and historical importance of fossils will be addressed through exploration and investigation in the sedimentary rock portion of the unit. The content areas of measurement in math, and texture in art are woven into the unit and culminating activity. Students will complete this exciting unit with a strong knowledge of minerals and the different kinds of rock that make up the earth's crust and a basic understanding of the everyday uses of their geological products.

I. OVERVIEW

- A. Concept Objectives for this unit:
1. Understand that there are many structures in the natural world particularly in geological forms.
 2. Recognize that energy appears in different forms and affects and transforms geological forms.
 3. Understand the inter-relationships between geology and human activity.
- B. Content covered from Core Knowledge Sequence
1. Rocks and Minerals – formation and characteristics of different kinds of rocks: metamorphic, igneous, and sedimentary
 2. Important minerals in the earth (such as quartz, gold, sulfur, coal, diamond, iron ore)
 3. Measurement – Weight – compare weights of objects using a balance scale
 4. Texture – describe qualities of texture (as, for example, rough, smooth, bumpy, scratchy, slippery, etc.)
- C. Skills
1. The student will ask questions and state predictions that can be addressed through scientific investigation. [**Colorado State Std. Science 1.1**]
 2. The student will compare through observation the affects of energy on geological forms. [**CSS Science 2.2(1)**]
 3. The student will describe different types and uses of earth materials. [**CSS Science 4.1(1) and Geography 6.1**]
 4. The student will identify the resources provided by the earth. [**CSS Science 5.1**]
 5. The student will identify the characteristics of igneous, sedimentary and metamorphic rocks. [**CSS Geography 2.1 & 3.1**]
 6. The students will compare the weights of various kinds of rocks. [**CSS Math 5**]
 7. The students will describe and illustrate the qualities of texture.
 8. The students will identify important minerals of the earth.

II. BACKGROUND KNOWLEDGE

- A. For Teachers:

1. Lambert, David. *Rocks and Minerals*. New York: Franklin Watts Inc., 1986. ISBN 0-531-10165-7 (Out of print but available in many libraries)
 2. Ortleb, E. P. & Cadice, R. *Geology – Rocks and Minerals*. St. Louis, MO: Milliken Publishing Co., 1986. ISBN 1-55863-091-0
 3. Podendorf, Illa. *A New True Book – Rocks and Minerals*. Chicago: Children’s Press, 1982. ISBN 0-516-01648-2
 4. Snedden, Robert. *The Super Science Book of Rocks and Soils*. New York: Thomson Learning, 1994. ISBN 1-56847-224-2
- B. For Students:
1. The students will have a basic understanding of the Earth’s crust, mantle and core plus a basic knowledge of the structure of a volcano.

III. RESOURCES

- A. Aiki. *Fossils Tell of Long Ago*.
- B. Cerbus, Deborah Plona & Rice, Cheryl Feichtenbiner. *Rocks are Everywhere*.
- C. Cohen, Laura. *Our Earth*. (Frank Schaeffer Reproducibles)
- D. Fowler, Allan. *It Could Still Be A Rock*.
- E. Fowler, Allan. *They Could Still Be Mountains*.
- F. Llewellyn, Claire. *Why Do We Have? Rocks & Mountains*.
- G. Moore, Jo Ellen & Supanich, Jo. *Learning About the Earth*. (Evan Moor Reproducibles)
- H. Ortleb, E. P. & Cadice, R. *Geology–Rocks and Minerals*. (Optional color transparencies)
- I. Podendorf, Illa. *A New True Book – Rocks and Minerals*.
- J. Spero, Daniel. *Geology*. (Evan Moor Reproducibles)
- K. Copies of Appendices A through J

IV. LESSONS

Lesson One: Let’s get ROCKS in our head and MINERALS on our mind

- A. Daily Objectives
 1. Lesson Content
 - a. Rocks and Minerals-formation and characteristics of different kinds of rocks: metamorphic, igneous, and sedimentary
 - b. Important minerals in the earth (such as quartz, gold, sulfur, coal, diamond, iron ore)
 - c. Measurement – Weight – compare weights of objects
 - d. Texture-describe qualities of texture (as, for example, rough, smooth, bumpy, scratchy, slippery, etc.)
 2. Concept Objectives
 - a. Understand that there are many structures in the natural world particularly in geological forms.
 - b. Understand the inter-relationships between geology and human activity.
 3. Skill Objectives
 - a. The student will ask questions and state predictions that can be addressed through scientific investigation.
 - b. The student will compare through observation the affects of energy on geological forms.
 - c. The student will describe different types and uses of earth materials.
 - d. The students will compare the weights of various kinds of rocks.
 - e. The students will describe and illustrate the qualities of texture.
 - f. The students will identify important minerals of the earth.

B. Materials

1. Child's rock and/or teacher rock collection
2. Student Crayons and pencil
3. Overhead Projector
4. Magnifying glasses (enough for class if possible)
5. Chart paper, markers (List six common minerals and uses)
6. *Rocks are Everywhere*, by Cerbus and Rice
7. Appendix A
8. Appendix B (Make into an overhead transparency)
9. List of minerals and rocks and their uses (see Appendix C)
10. *It Could Still Be a Rock*, by Fowler
11. *A New True Book-Rocks and Minerals*, Illa Podendorf
12. Appendix D: Directions for Crystal Experiment: spoon, bowl, food coloring, bluing, ammonia, salt, charcoal or rocks, tablespoon

C. Background Notes

Minerals are the building blocks from which the earth is made. Minerals are made up of 1 or more elements that are found naturally in the earth. Every rock is made up of 1 or more minerals. (Example: The elements of silicon and oxygen combine to form the mineral of quartz. The minerals of quartz, feldspar and mica combine to form the rock of granite.) Some simple chemical and physical tests such as Acid Test, Crystal Shape, Streak Test and Hardness Test can identify minerals. The six most common occurring minerals are feldspar, quartz, mica, hornblende, calcite and olivine. Familiar minerals to us are quartz, gold, sulfur, coal, diamond and iron ore.

D. Key Vocabulary

1. Mineral-any solid elements or compounds found naturally in the earth
2. Mineralogist-mineral scientist
3. Crystal-solids with regular shapes formed by many minerals

E. Procedures/Activities

DAY ONE

1. Teacher asks students to retrieve "pet" rocks or that they brought from home or the teacher's collection of rocks.
2. Read the book *Rocks are Everywhere*.
3. Ask students to use magnifying glass to examine rock. Instruct them to look at the color, texture, weight and other characteristics of the rock's appearance.
4. Use Appendix A as a guide for the students to choose words to describe their rock in each of the above mentioned areas (color, texture, weight, etc.). Record responses on the Appendix A, *Pet Rock*.

DAY TWO

5. Students will be introduced to minerals and the three different kinds of rocks: Igneous, Sedimentary, and Metamorphic. Teacher will read the book *It Could Still Be a Rock*, by Allan Fowler.
6. Teacher will use an overhead made from Appendix B, and show students where the different rock forms originate in the earth.
7. Students will predict what rock identification category their rock is found. Record prediction on the *Pet Rock* worksheet.

DAY THREE

8. Teachers will give a brief overview of what minerals are and read from the *New True Book of Rocks and Minerals*, page 26-33.
9. Teacher will help students to recognize different common minerals-gold, quartz, etc. (Appendix C) Teacher will use the pictures in the book and samples of each rock if possible.

10. Teacher should have the six common minerals and some of their uses listed on the chart paper previous to this activity. Students will brainstorm different uses for these minerals to be added to the chart. Then have students do worksheet, page 22, from Frank Schaffer's *Our Earth*, "What Comes From Rocks?"
 11. Teacher and students will make a crystal garden, and begin watching it grow throughout the course of this unit. (directions-Appendix D).
- F. Evaluation/Assessment
1. Teacher will read description of pet rocks, looking for appropriate color, texture, and weight terminology from the information given. Teacher will also make note of the prediction made by the student as to the classification of his/her rock.

Lesson Two: "Fire up" your knowledge of IGNEOUS ROCKS

- A. Daily Objectives
1. Lesson Content
 - a. Rocks and Minerals-formation and characteristics of different kinds of rocks: igneous
 - b. Texture-describe qualities of texture (as, for example, rough, smooth, bumpy, scratchy, slippery, etc.)
 2. Concept Objectives
 - a. Understand that there are many structures in the natural world particularly in geological forms.
 - b. Recognize that energy appears in different forms and affects and transforms geological forms.
 - c. Understand the inter-relationships between geology and human activity.
 3. Skill Objectives
 - a. The student will ask questions and state predictions that can be addressed through scientific investigation.
 - b. The student will compare through observation the affects of energy on geological forms.
 - c. The student will describe different types and uses of earth materials.
 - d. The student will identify the resources provided by the earth.
 - e. The student will identify the characteristics of igneous rocks.
 - f. The students will describe and illustrate the qualities of texture.
- B. Materials
1. Student Crayons and pencil
 2. Overhead Projector
 3. Chart paper and markers (list igneous rocks and their uses)
 4. List of minerals and rocks and their uses (see Appendix C)
 5. *They Could Still Be Mountains* by Allan Fowler
 6. *The New True Book-Rocks and Minerals*, by Illa Podendorf.
 7. Appendix B. (Optional-Color overhead transparency-Milliken Product-*Geology-Rocks and Minerals*, page 3.)
 8. Appendix E
 9. "Pet" rock or rock collection, should be with student, and magnifying glass
 10. Igneous rock samples or pictures
 11. Water Experiment: glass bowl or jar, water, samples of obsidian, pumice, and granite
 12. Optional-Frank Schaeffer publication, *Our Earth*, pg. 19
- C. Background Notes
- Igneous rocks or "fire" rocks are formed from hot, molten material called magma. Magma that is blocked from reaching the earth's surface cools slowly below the land

surface. These are called intrusive rocks and the slow-cooling process produces large crystals and appear coarse-grained. Some examples of this type of rock are granites, gabbro, quartz and diabase. Lava is the name for liquid magma that reaches the earth's surface by flowing out of volcanoes. The lava cools rapidly forming extrusive rocks which have small, fine-grained crystals or glassy appearances. Some examples of this type of igneous rock are basalt, pumice and obsidian.

D. Key Vocabulary

1. Igneous rocks- rocks formed when magma from inside the earth cools and solidifies on the earth's surface.
2. Lava-magma that has reached the surface of the earth.
3. Magma-hot, liquid rock formed deep inside the earth.

E. Procedures/Activities

1. Students will begin the day by looking at the crystals and discuss changes for the previous day. Teacher and students will also review what was learned from the day one of this unit.
2. Teacher will read from *The New True Book-Rocks and Minerals*, page 9-14.
3. Show samples or pictures of igneous rocks
4. Discuss how igneous rocks are formed using the overhead transparency (either option).
5. Teacher will read and discuss the book, *They Could Still Be Mountains*, by Allan Fowler.
6. Teacher and students will do the "Float Experiment." The student will observe what happens when a piece of granite, obsidian, and pumice are dropped into a clear glass bowl. Discuss their observation. These observations may be recorded if the teacher wishes to do so.
7. Do the optional worksheet from the Frank Schaeffer publication, page 19, "Rocks are Different." Students will color in only the igneous rocks squares per the teacher's instruction. Crayons/colored pencils work better than markers.
8. Teacher and students will brainstorm the different items that can be made out of igneous rock. Teacher will record added responses on chart paper and place with the mineral chart made the previous day. (Appendix C)

F. Evaluation/Assessment

1. Students will fill in the blanks with words describing igneous rocks on middle section of Appendix E.

Lesson Three: "Layer" your brain with SEDIMENTARY ROCKS

A. Daily Objectives

1. Lesson Content
 - a. Rocks and Minerals-formation and characteristics of different kinds of rocks: sedimentary
 - b. Texture-describe qualities of texture (as, for example, rough, smooth, bumpy, scratchy, slippery, etc.)
2. Concept Objectives
 - a. Understand that there are many structures in the natural world particularly in geologic al forms.
 - b. Recognize that energy appears in different forms and affects and transforms geological forms.
 - c. Understand the inter-relationships between geology and human activity.
3. Skill Objective
 - a. The student will ask questions and state predictions that can be addressed through scientific investigation.

- b. The student will compare through observation the affects of energy on geological forms.
 - c. The student will describe different types and uses of earth materials.
 - d. The student will identify the resources provided by the earth.
 - e. The student will identify the characteristics of sedimentary rocks.
- B. Materials
 - 1. Student crayons and pencil
 - 2. Overhead Projector
 - 3. Chart paper and markers (list sedimentary rocks and their uses)
 - 4. List of minerals and rocks and their uses (see Appendix C)
 - 5. *The New True Book-Rocks and Minerals*, by Illa Podendorf
 - 6. Appendix B. (Optional-Color overhead transparency-Milliken Product-*Geology-Rocks and Minerals*, page 4.)
 - 7. Appendix E.
 - 8. Small baby food jars for each student or glass quart containers for small groups.
 - 9. Four-3 lb. Coffee cans full of each of these ingredients: fine sand, coarse sand, pea gravel, fine bark chips (try to get a variation in color)
 - 10. Instructions for making a sedimentary rock (see Appendix F)
 - 12. Optional-Frank Schaeffer publication, *Our Earth*, page 19
- C. Background Notes

Most sedimentary rocks are formed from layers of sediments that have been compressed under water for long periods of time. When streams empty into large bodies of water, the larger and heavier particles of sediment are deposited first and the smaller, lighter particles settle farther from the mouth of the stream. Chemicals found in the water are deposited between the particles of sediment to cement them into rock layers. Some common kinds of sedimentary rocks include conglomerates (formed by compressed mixtures of gravel), sandstone (formed by compressed sand grains), shale (formed by compressed clay and mud) and limestone (formed by compressed corals, plants, shells and dissolved chemicals). In time, the Earth's slowly moving crust may heave sedimentary rocks above the sea to form mountain ranges.
- D. Key Vocabulary
 - 1. Sedimentary rocks - Rocks formed from layers of the remains of older rocks that have been squeezed together.
 - 2. Sediments - Loose fragments of rock deposited in one place by wind, water or ice.
 - 3. Pressure – applying force to something by something else being in direct contact with it.
- E. Procedures/Activities
 - 1. Teacher will briefly review the information covered in the previous two lessons.
 - 2. Teacher will display the overhead transparency (either option) and discuss the formation and characteristics of conglomerate, sandstone, shale and limestone.
 - 3. Teacher will read from *The New True Book - Rocks and Minerals*, pgs. 15-21.
 - 4. Students will color the sedimentary rocks per the teacher's instructions that are on page 19 of Frank Schaeffer's *Our Earth*. (optional if unavailable)
 - 5. Students (individually or in small groups) will make a sedimentary rock. Teacher should explain that only huge pressure and thousands of years would truly turn the ingredients into a real rock. Instructions are on Appendix F.
 - 6. Chart the names and uses with class participation utilizing Appendix C.
- F. Evaluation/Assessment
 - 1. Students will make a sedimentary rock.
 - 2. Students will complete correctly top third of Appendix E on sedimentary rocks.

Lesson Four: “Imprint” your mind with FOSSILS

- A. Daily Objectives
1. Lesson Content
 - a. Rocks and Minerals-formation and characteristics of different kinds of rocks: metamorphic, igneous, and sedimentary
 2. Concept Objectives
 - a. Understand that there are many structures in the natural world particularly in geological forms.
 - b. Recognize that energy appears in different forms and affects and transforms geological forms.
 - c. Understand the inter-relationships between geology and human activity.
 3. Skill Objectives
 - a. The student will ask questions and state predictions that can be addressed through scientific investigation.
 - b. The student will compare through observation the affects of energy on geological forms.
 - c. The student will describe different types and uses of earth materials.
 - d. The student will identify the characteristics of sedimentary rocks.
- B. Materials
1. Student crayons and pencil
 2. Overhead Projector
 3. *The New True Book-Rocks and Minerals*, by Illa Podendorf.
 4. Appendix B. (Optional-Color overhead transparency-Milliken Product-*Geology-Rocks and Minerals*, page 4)
 5. *Fossils Tell of Long Ago* by Alike
 6. Directions for Making Fossils (Appendix G)
 7. One shallow container per student
 8. Soft modeling clay - enough for each student to have a slab in which to imprint a shell, bone or twig
 9. Shells, bones and twigs - enough for each student to have one to imprint into the clay
 10. Plaster of paris, measuring cup, and stirring stick
 11. Optional-Frank Schaeffer publication, *Our Earth*, pages 19
 12. Optional -One copy per student of page 37 of Evan Moor's *The Earth*
 13. Optional - Cut out and laminate the fossil matching cards on pgs. 46, 47 and 48 of Evan Moor's *The Earth*
- C. Background Notes
- Fossils are the traces left in rock of plants and animals that lived long ago. A fossil is the print or track of the plant or animal. Most fossils are found in sedimentary rocks. As the layers that make up the rock are laid down, the shells or skeletons of dead animals or the parts of plants may be trapped between the layers. Sometimes just an imprint creates the fossil and sometimes the fossil contains the parts of an animal that turned to stone. Minerals fill the spaces left by the creature or plant once it has dissolved. Studying fossils help us discover what plant and animal life was like in the past and ways it has changed.
- D. Key Vocabulary
1. Fossil - traces of plants and/or animals trapped in the layers of sedimentary rock.
 2. Imprint – a mark made by applying pressure

- E. Procedures/Activities
1. Teacher will briefly review information on sedimentary rock formation.
 2. Teacher will read *Fossils Tell of Long Ago* and *The New True Book - Rocks and Minerals*, pgs. 34-38.
 3. Students will share orally what they know about fossils.
 4. Students will use their clay to make many fossil imprints from the materials available.
 5. Student groups of 4 to 6 will make one fossil from one item following the directions on Appendix G or page 15 of *The Super Science Book of Rocks and Soil*.
 6. Optional - Students will complete the Fossil Match on page 37 of Evan Moor's *The Earth*.
 7. Optional - The teacher will show the students the fossil matching cards from pgs. 46, 47 and 48 of Evan Moor's *The Earth*. The teacher will explain that they can use these cards to plan matching games such as Go Fish and Concentration during center time.
- F. Evaluation/Assessment
1. Students will make their own fossil imprint and fossil.
 2. Optional - Students will complete correctly page 37 of Evan Moor's *The Earth*.

Lesson Five: “Change” your thoughts about METAMORPHIC ROCKS

- A. Daily Objectives
1. Lesson Content
 - a. Rocks and Minerals-formation and characteristics of different kinds of rocks: metamorphic
 2. Concept Objectives
 - a. Understand that there are many structures in the natural world particularly in geological forms.
 - b. Recognize that energy appears in different forms and affects and transforms geological forms.
 - c. Understand the inter-relationships between geology and human activity.
 3. Skill Objectives
 - a. The student will ask questions and state predictions that can be addressed through scientific investigation.
 - b. The student will compare through observation the affects of energy on geological forms.
 - c. The student will describe different types and uses of earth materials.
 - d. The student will identify the resources provided by the earth.
 - e. The student will identify the characteristics of metamorphic rocks.
- B. Materials
1. Student crayons and pencil
 2. Overhead Projector
 3. Chart paper and markers (list metamorphic rocks and their uses)
 4. List of minerals and rocks and their uses (see Appendix C)
 5. *The New True Book-Rocks and Minerals*, by Illa Podendorf
 6. Appendix B. (Optional-Color overhead transparency-Milliken Product-*Geology-Rocks and Minerals*, page 5)
 7. Appendix E
 8. Six to eight slices of fresh bread – different kinds to show layers (wheat, rye, pumpernickel, etc.) Cut off crusts to expose different bread color & texture

9. Three heavy books (like encyclopedias)
10. Two identical crayons
11. Wax Paper (12" square)
12. One shallow container
13. Hot plate and pan or a microwave and dish
14. Small amount of coarse and fine sand
15. Optional-Frank Schaeffer publication, *Our Earth*, pages 19

C. Background Notes

Metamorphic rocks are formed from igneous, sedimentary, and other metamorphic rocks that are changed by heat, pressure, and chemical action. Metamorphic means to change form. Metamorphic rocks are formed inside the earth. The great pressure of overlying rock strata causes a physical readjustment of the mineral particles. As one goes deeper into the earth's crust, there is a corresponding increase in temperature. New elements may be added or removed. These changes can alter the chemical composition of the rock. The change in their texture due to recrystallization or a change in their chemical composition characterizes metamorphic rocks. Some common examples are that limestone changes into marble, sandstone changes into quartzite, shale changes into slate, and granites change into gneiss.

D. Key Vocabulary

1. Metamorphic rock - rocks changed by heat or pressure inside the earth

E. Procedures/Activities

1. Student groups should get out their fossils and remove the plaster of paris fossil and discuss.
2. Teacher will briefly review igneous and sedimentary rocks.
3. Teacher will display the overhead transparency (either option) and discuss that heat and pressure are the two main causes of change.
4. Teacher will read from *The New True Book - Rocks and Minerals*, pgs. 22-25.
5. Teacher will give examples of rocks which have changed into a new type of rock. Examples are: limestone changes into marble, shale changes into slate, sandstone changes into quartzite, and granite changes into gneiss.
6. Optional - Students will color the metamorphic rocks per the teacher's instructions that are on page 19 of Frank Schaeffer's *Our Earth*.
7. Teacher will explain what pressure is and students will verbalize and illustrate their predictions of what will happen to the six slices of bread when three heavy books are stacked on them for one whole day. Students will use the bottom third of Appendix E.
8. Teacher will stack the six pieces of bread and put the three books on top in a place in the room that is visible to all the students.
9. Teacher will explain that some rocks underground get exposed to such intense heat that they melt and then other rocks and minerals mix with the original rock to form a new type of rock. The teacher shows the students two identical crayons with the paper peeled off. The teacher will then melt one of the crayons on a hot plate or in a microwave. When completely melted, pour into wax paper lined container and mix in some fine and coarse sand (or any other materials you like). Form into a rock-type shape and let cool.
10. Chart the names and uses with class participation utilizing Appendix C.
11. The following day observe and discuss what happened in the two experiments involving pressure and heat.

F. Evaluation/Assessment

1. Complete Appendix E (second page)

V. CULMINATING ACTIVITY

- A. This activity will require some parent volunteers, and the expected length is one hour. Teachers will have six centers prepared for the children. The recommended number of children in each group is four. The centers will be an assessment as well as a culminating activity.
- B. The centers will be as follows:
1. How does your rock compare in size?
 2. Scratch test
 3. Looking for Luster
 4. Give your rock the streak test
 5. Bubbles and Fizz
 6. How much does your rock weigh?
- C. Set up each center with the supplies listed on Appendix J. Have the children bring crayons plus their “pet” rocks for investigation. A parent volunteer should be placed at each center. The children will be given a *Rock Detective* booklet (Appendix H), to record their responses after visiting each center. Tag board would be a good durable choice for making these booklets. (Streak test may tear paper) Give children time to do as instructed at each center. They may decorate the front and backs of their booklets after their time at one center is completed and while waiting to move to the next center. Booklets may be used as the assessment and/or Appendix I may be used. Refer back to initial pet rock prediction and help each student determine the accuracy of that prediction.

VI. HANDOUTS/WORKSHEETS

Appendices A – J

VII. BIBLIOGRAPHY

Brandenberg, Aiki. Fossils Tell of Long Ago. New York, New York: Harper Collins, 1972,1990, ISBN 0-06-445093-7

Cerbus, Deborah Plona & Rice, Cheryl Feichtenbiner. Rocks are Everywhere. Huntington Beach, CA: Teacher Created Materials, Inc., 1995, ISBN 1-55734-927-4

Cohen, Laura. Our Earth. Torrence, CA: Frank Schaeffer Publications, Inc., 1991, CAT. NO. FS-2506

Cole, Joanna. The Magic School Bus Inside the Earth. New York: Scholastic Inc., 1987, ISBN 0-590-40760-0

Fowler, Allan. It Could Still Be A Rock. Chicago, IL: Children’s Press, 1993, ISBN 0-516-06010-4

Fowler, Allan. They Could Still Be Mountains. New York, New York: Children’s Press, 1997, ISBN 0-516-20320-7

Hirsch, Jr., E. D. Books to Build On. New York, New York: Dell Publishing, 1996, ISBN 0-385-31640-2

Hirsch, Jr., E. D. What Your First Grader Needs to Know: Fundamentals of a Good First Grade Education (*Revised Edition*). New York, New York: Doubleday, 1997, ISBN 0-385-48119-5

Kittinger, Jo S. A Look at Rocks from Coal to Kimberlite. New York: Franklin Watts, 1997, ISBN 0-531-15887-X

Lambert, David. Rocks and Minerals. New York: Franklin Watts Inc., 1986, ISBN 0-531-10165-7 (Out of print but available in many libraries)

Llewellyn, Claire. Why Do We Have? Rocks & Mountains. Hauppauge, New York: Barron's Educational Series, Inc., 1995, ISBN 0-8120-9394-1

Moore, Jo Ellen & Supanich, Jo. Learning About the Earth. Monterey, CA: Evan Moor, 1994, ISBN 1-55799-306-8

Ortleb, E. P. & Cadice, R. Geology – Rocks and Minerals. St. Louis, MO: Milliken Publishing Co., 1986, ISBN 1-55863-091-0

Podendorf, Illa. A New True Book – Rocks and Minerals. Chicago: Children's Press, 1982. ISBN 0-516-01648-2

Rhodes, Frank H. T. Geology – A Golden Guide. New York, New York: Western Publishing Co. (Golden Press), 1991. ISBN 00-307-24349-4

Spero, Daniel. Geology. Monterey, CA: Evan Moor, 1994. ISBN 1-55799-289-4

Snedden, Robert. The Super Science Book of Rocks and Soils. New York: Thomson Learning, 1994, ISBN 1-56847-224-2

Taylor, Barbara. Young Discoverers Mountains and Volcanoes. New York, New York: Kingfisher Books, 1993, ISBN 1-85697-938-5

Appendix A

PET ROCKS

Name _____

Draw a picture of your rock in the space below.

PREDICTION OF PET ROCK TYPE _____

ROCK DETECTIVES

Use the following words to help you describe your pet rock:

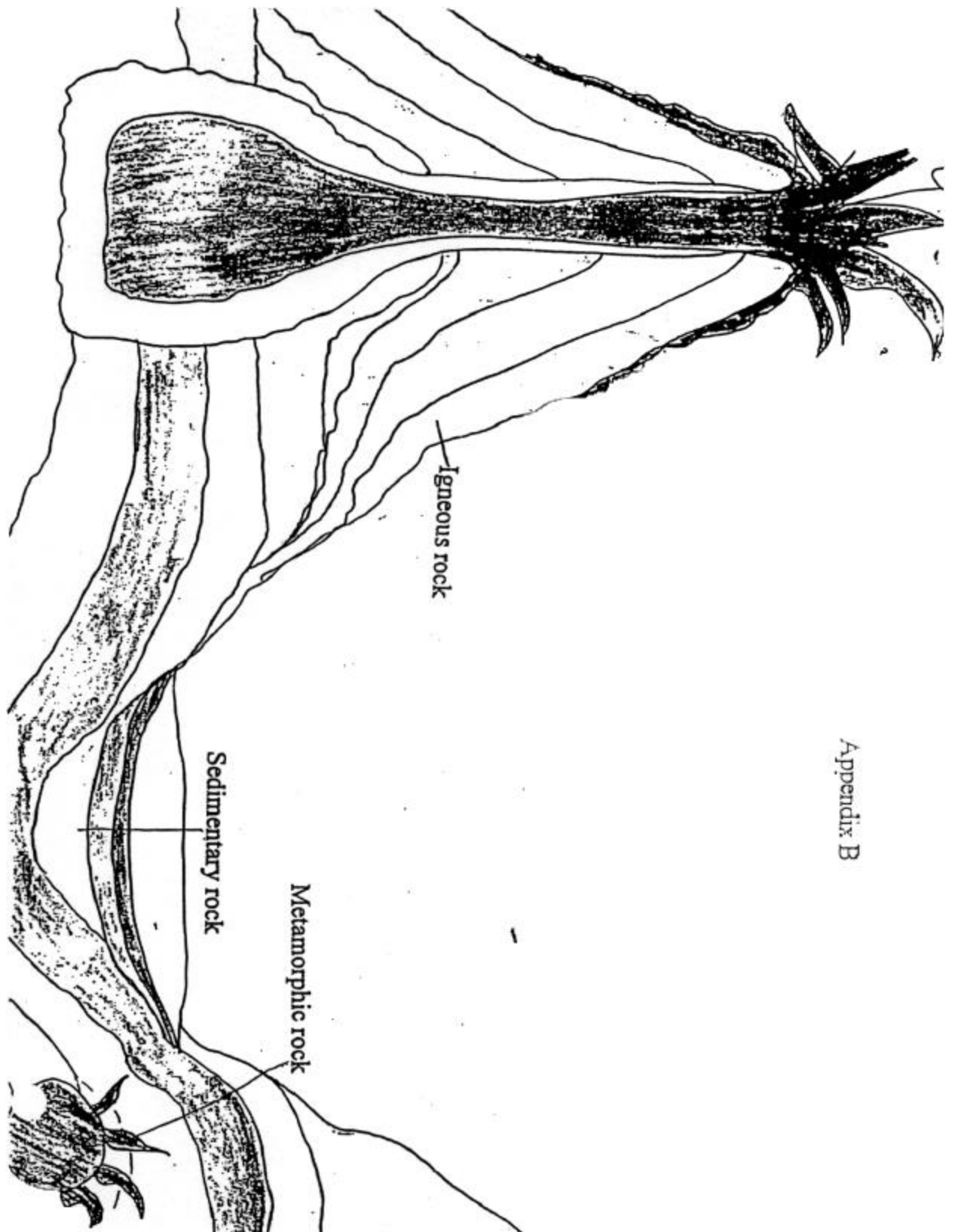
COLOR:

pink gray white black silver gold

brown tan yellow turquoise blue green

orange red purple clear shiny dull

striped spotted



Appendix B

Appendix C

Geology Review

There are three types of rocks:

1. Sedimentary
2. Igneous
3. Metamorphic

SEDIMENTARY ROCKS are made when sand, mud, shells, or any small (or large) pieces of rocks (sediments) are moved to a new place and harden into new rocks.

IGNEOUS ROCKS are rocks formed by cooling and hardening (solidification) of magma (hot molten rock) -- for example from a volcano. Sometimes when rocks melt they cool off slowly underground before reaching the surface of the ground -- an example of this might be granite.

METAMORPHIC ROCKS are rocks which have a "changed-form" due to very high heat and pressure applied after the original formation of the rock.

FOSSILS are the remains or imprint of any plant or animal that is preserved within rocks from some past geologic or prehistoric time.

Minerals: gold, quartz, sulfur, coal, diamond, iron ore, copper, feldspar, calcite, graphite, gypsum, silver, pyrite, talc, mica

Uses: jewelry, aluminum foil, soda cans, scissors, glass, china, money, electrical wire, cooking pans, sand paper, fuel (coal)

Igneous: granite, pumice, obsidian, and basalt

Uses: monuments or tombstones, cleaning products, polishing products, road building (basalt), arrowheads, decorations
The inside walls of the pyramids were made of granite.

Appendix C cont.

Sedimentary: limestone, sandstone, conglomerate, shale, agate

Uses: building cement, building supplies, fertilizer
The pyramids were made of limestone.

**** Fossils** usually found in limestone. Fossils are used to tell us about the past.

Metamorphic: slate (comes from shale), schist (conglomerate), marble (limestone), gneiss (granite)

Uses: building materials, roofing tiles, sculptures/statues, chalkboards, mill stone (grinding stone), flooring

Appendix D

Crystal Garden

Materials:

6-7 charcoal briquettes or stones
shallow bowl
6 tablespoons salt
6 tablespoons of laundry bluing
6 tablespoons of water
1 tablespoon of ammonia
Food coloring

Place briquettes or stones in the bowl. Mix other ingredients, except the food coloring. Pour mixture over the briquettes or stones with a spoon. You will probably have some extra mixture. Just save it in a covered container, and add to the garden over the next couple of days. Drop food coloring over the coated stones or briquettes. Crystals will begin to form in about twenty minutes. Pour extra solution over crystals and add more food coloring every day, and the garden will continue to change and grow.

Appendix E
ROCKS

NAME- _____

Sedimentary rocks are formed from pieces of old rock, mud, and sand that pile up in layers under the water.



Fill in the blanks to find out how.

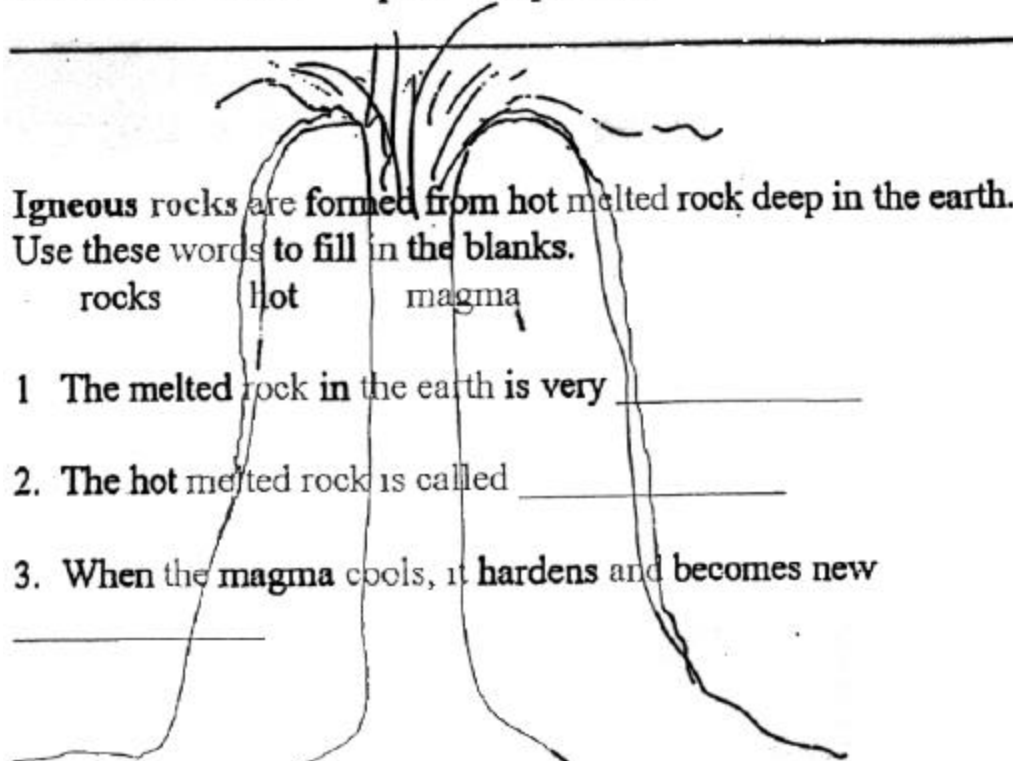
1. Mud, sand, and rock pieces _____ up, they form layers.
2. The layers toward the bottom get _____ together.
3. The lower layers then get squeezed together to form new _____

Word Bank: rocks pile squeezed

Igneous rocks are formed from hot melted rock deep in the earth. Use these words to fill in the blanks.

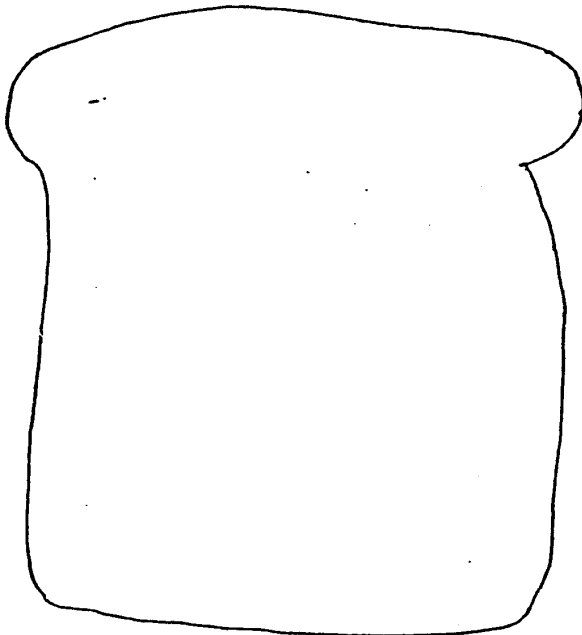
rocks hot magma

1. The melted rock in the earth is very _____
2. The hot melted rock is called _____
3. When the magma cools, it hardens and becomes new _____

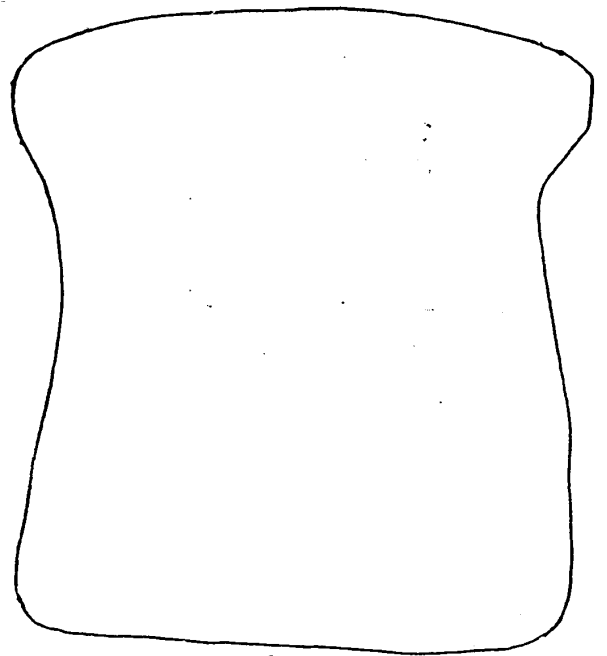


Appendix E cont.

Sometimes rocks deep inside the earth are changed by heat and pressure. Rocks such as igneous and sedimentary rocks then become **metamorphic rocks**. Try this experiment with some slices of bread. Stack the slices of bread and place several books upon the slices. Draw a picture of what you think will happen. Then draw a picture of what the slices of bread look like tomorrow.



1.



2.

Appendix F

MAKING A SEDIMENTARY ROCK

Materials: Fine sand
Coarse sand
Pea gravel
Fine bark chips
Individual baby food jars or several glass quart jars

Procedure:

1. Pass out a jar to each student or to each group of students.
2. Have materials set up in a central location where a few students or one group at a time can come up to “build” their rock.
3. Place a layer of each of the following in the baby food jars or glass jars: pea gravel, fine sand, coarse sand, and fine bark chips.
4. Students may vary the order of the materials and the thickness of the layers.
5. Discuss the various size and weights of the different materials. Brainstorm which might settle out first when entering into a large body of water, when carried by wind, and when dragged by ice. Explain that pressure would cement the layers together over time.

Appendix G

MAKING FOSSILS

Materials: modeling clay
shallow container
shell
plaster of paris

Procedure:

1. Put a layer of modeling clay in a shallow container (Styrofoam meat tray works well). Find a shell or a twig and press it into the clay so it leaves a shape.
2. Take the shell or twig away, then carefully pour plaster of Paris into the space in the clay.
3. When the plaster is dry, remove carefully. Then you should have a cast or fossil of your original object.

Appendix H

ROCK DETECTIVE

A Book of Rock Discoveries

NAME _____

How do rocks compare in size?

Draw pictures of your rocks according to size. Begin with the smallest, and go to the largest.

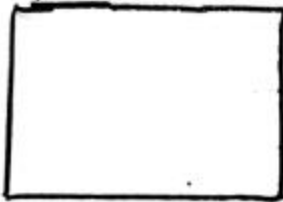
^

Using a ruler measure the length of the largest rock in inches and centimeters.

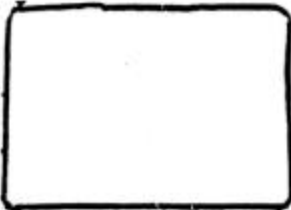
Inches _____ Centimeters _____

Appendix H cont.

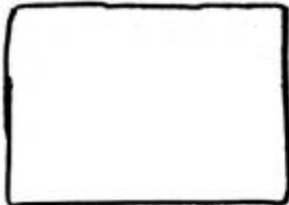
The Streak Test



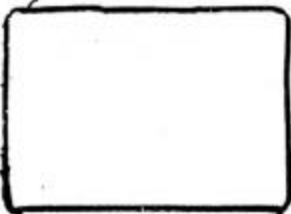
Igneous Rock



Sedimentary Rock



Metamorphic Rock



Minerals



This is what I have learned about the streak test:

Appendix H cont.

How much does a rock weigh?

Which rock was the heaviest in weight? _____

Which rock was the lightest in weight? _____

Fizz and Bubbles

This is what the chalk looks like after
A few drops of vinegar are put on it.

This is what the rock looks like after
A few drops of vinegar are put on it.

Appendix H cont.

Looking for Luster

This is what I saw when I shined the flashlight on the rock.

The rock does or does not have luster. (Circle one)

The Scratch Test

Fill in the circle that tells what happened to your rock when scratched.

- I scratched the rock with my fingernail.
 - I scratched the rock with the penny.
 - I scratched the rock with the end of the paper clip or nail.
 - I used the rock to scratch the paper clip or nail.
 - I learned this about scratching the rock:
-

Appendix I

ROCKS AND MINERALS ASSESSMENT

Name- _____

sedimentary igneous minerals metamorphic Fossils

1. All rocks are made from _____
2. The _____ rocks are formed from melted rock deep in the earth.
3. The _____ rocks are formed when mud, sand, and bits of rock pile up in layers under water.
4. The _____ rocks are changed into new rocks by heat and pressure.
5. _____ are the plants or animals that are trapped between layers of rock.

Appendix J

MATERIALS FOR CULMINATING ACTIVITY

Students will need *Rock Detective* booklet (Appendix H), crayons and a pencil for this activity.

CENTER #1 – MEASURING SIZE OF ROCKS

Student's pet rocks or teacher's choice of a variety of sizes of rocks

Ruler(s) that show both inches and centimeters

Have children compare size by placing rocks in a row, longest to shortest, and then draw the rocks. Take the longest rock and record its measurements in both inches and centimeters.

CENTER #2 – STREAK TEST

Student's pet rocks

Teacher sample set(s) of igneous, sedimentary, metamorphic rocks and a mineral
(try to find samples with unique streaks ahead of time, if possible)

Streak plates (if available)

Have children scratch the different rocks and mineral on the page of their booklet then on the streak plates (if available). Have students record what they learned at the end of the activity as an entire group since the writing takes a long time.

CENTER #3 – WEIGHING ROCKS

Student's pet rocks and/or a teacher selection of various rocks (i.e. large, lightweight rocks or small, heavy rocks)

Balanced scale

Have children compare all of the rocks, and then record.

CENTER #4 – FIZZ AND BUBBLES

Student's pet rock and a limestone rock or sea shell that will fizz

Piece of chalk Eye dropper(s) Vinegar

Paper towel and a plate or tray to work on

Have children first drop vinegar on chalk and then drop vinegar on the various rocks or shell. Record the results.

CENTER #5 – LOOKING FOR LUSTER

Student's pet rocks plus a selection of high and low luster rocks from the teacher
Flashlight(s)

Magnifying glass(es) (optional)

Have children record what they see.

CENTER #6 – SCRATCH TEST

Student's pet rocks plus a very soft and a very hard rock from the teacher

Pennies Paper clips and/or nails (one per student)

Have each child do their own rock and record what happens when scratching the rock with their fingernail, penny, and paperclip or nail.