Grade 6 Earth Materials

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Which of the following is an example of chemical weathering?
a. Water freezing in a crack
b. Acid rain wearing away a statue
c. An animal burrowing in the ground
d. Plant roots pushing apart a sidewalk

The photo below shows a part of the Grand Canyon

____ 2. What created the landform in this photo?
a. Wind, water and erosion
b. Wind, water and volcano
c. Wind, water and evaporation
d. Wind, water and condensation

____ 3. Which of the following **best** describes the components of soil?
a. Clay, silt and mud
b. Plants, animals, dirt and minerals
c. Layered sediment, sand particles and rocks
d. Eroded rock, organic material, water and air

____ 4. What is the smallest type of particle found in soil samples?
a. Silt
b. Clay
c. Sand
d. Pebble

____ 5. What is the source for the mineral material found in soil?
a. Rain water
b. Atmosphere
c. Eroded rock
d. Organic matter

____ 6. What is the major agent in chemical weathering?
a. Wind

b. Water
c. Erosion
d. Temperature

____ 7. Which of the following minerals is the hardest?
a. Biotite
b. Quartz
c. Calcite
d. Feldspar

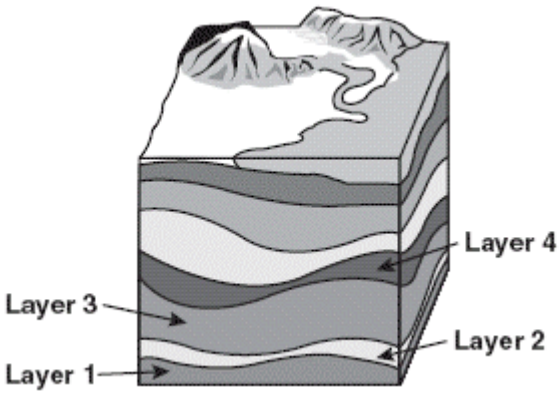
____ 8. What type of rock is formed when sediments are compacted and cemented together?
a. Fossil
b. Igneous
c. Sedimentary
d. Metamorphic

____ 9. A soil sample has living and nonliving parts. Which of the following was once living?
a. small pebbles
b. sand particles
c. water droplets
d. organic material

____ 10. Large holes often appear in our roads and highways. What is one major cause of these potholes?
a. air pollution
b. wind erosion
c. frozen water in the cracks
d. sand wearing down the surface

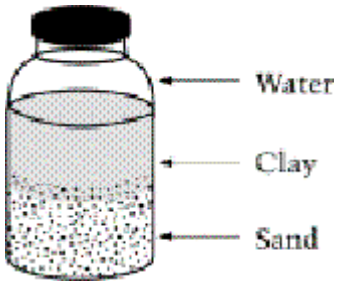
____ 11. Which of the following is an example of correctly using a scientific tool to classify an unknown rock sample?
a. A graduated cylinder to measure the mass of the rock sample.
b. A video camera to record the rock sample over a long period of time.
c. A spring scale to determine how fast the rock sample had weathered.
d. A hand lens to observe the size and shape of particles in the rock sample.

____ 12. Which of the following processes will produce igneous rocks?
a. volcanic action
b. earthquake activity
c. depositing of sediments
d. erosion of surface rocks



____ 13. According to the diagram above, which sedimentary rock layer is most likely the oldest?
a. 1
b. 2
c. 3
d. 4

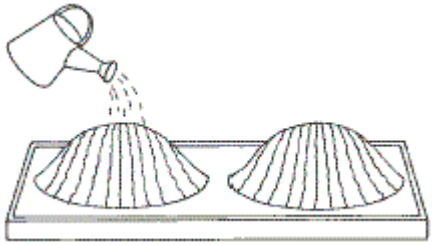
A student put some sand, clay, and water into a bottle and shook the bottle. Then he put the bottle down. After two hours, the bottle looked like the diagram below.



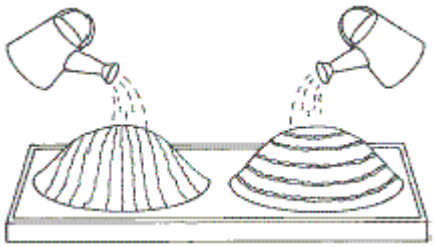
____ 14. What can the student conclude based on his observations of the bottle in the diagram above?
a. The water particles are larger than the grains of clay and the grains of sand.
b. The grains of clay are larger than the grains of sand and the water particles.
c. The grains of sand are larger than the water particles and the grains of clay.
d. The water particles, grains of clay and grains of sand are of equal size.

____ 15. The state of Michigan is bordered by four of the five Great Lakes. Which process for forming these lakes is most widely accepted by scientists?
a. Meteors crashing into the Earth
b. Glacier movement causing erosion
c. Wave erosion making small lakes bigger
d. Rivers dumping melted snow from Canada

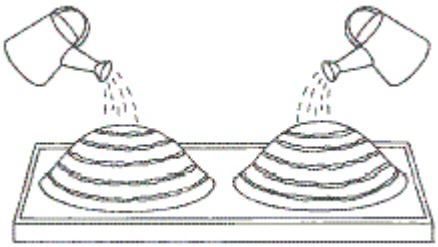
____ 16. Which experiment would best show how different methods of plowing fields on a hill affect erosion?
a.



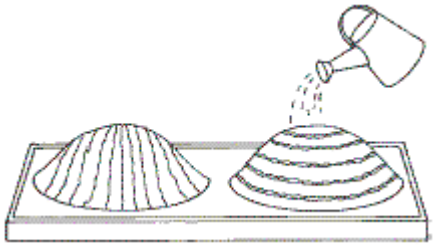
b.



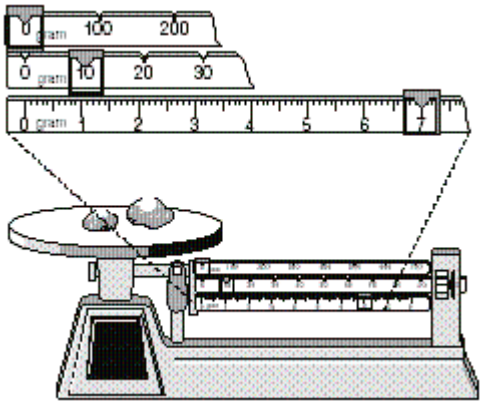
c.



d.



____ 17.

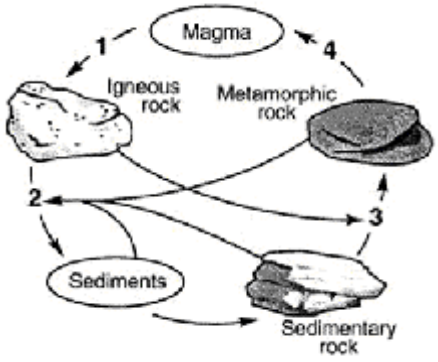


What is the mass of these rocks?

a. 7 grams
b. 10 grams
c. 17 grams
d. 20 grams

____ 18. Which of the following materials can be found in examples of most types of rock?

a. Sand
b. Minerals
c. Sediment
d. Organic material



____ 19. Which part of the rock cycle diagram above represents weathering, erosion, transportation and deposition?
   a. 1
   b. 2
   c. 3
   d. 4

____ 20. Which landform might have been caused by the depositing of sediment from erosion?
   a. A river valley
   b. A deep canyon
   c. A mountain range
   d. A line of rolling hills

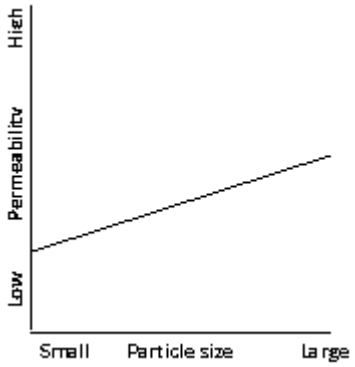
____ 21. Soil made of large rock particles is loosely packed and has large air pockets. Why would this be a problem for gardeners?
   a. It would be hard to dig
   b. It would not have minerals
   c. It would not contain organic material
   d. It would not hold water and nutrients well

Table 2: Permeability and water retention of various soil types.

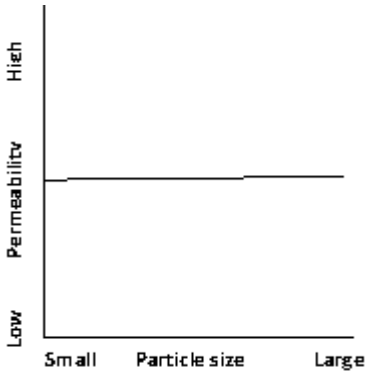
Soil Texture	Permeability	Water Retention
Sand	high	low
Loam	medium	medium
Silt	low	high
Clay	low	high

____ 22. Based on the table above, which of the following graphs best represents the relationship between particle size and soil permeability?

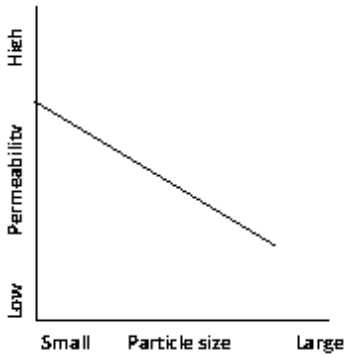
a.



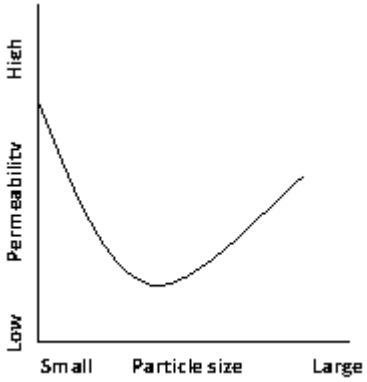
c.



b.



d.



Essay

23. A student wants to find out which type of soil mixture would be best for holding moisture in a garden.

    a. What is an example of a hypothesis that this student test to answer this question? 1 point

    b. What materials would be needed to test this hypothesis? 2 points

24. You have been given an unknown sample of an earth material. You do not know if it is a rock or a mineral.

    1. What type of tests and observations will you use to help identify this sample?

    2. What resources will you use to find out if your identification is accurate?

25. Describe two ways that humans add to the natural processes of land erosion and one example of how this type of damage can be prevented.

Grade 6 Earth Materials
Answer Section

MULTIPLE CHOICE

1. ANS: B PTS: 1 DIF: 1 REF: 6
   STA: E.SE.06.11 LOC: Weathering and Erosion TOP: Earth Materials
2. ANS: A PTS: 1 DIF: 2 REF: 6
   STA: E.SE.06.12 LOC: Weathering and Erosion TOP: Earth Materials
   KEY: Erosion
3. ANS: D PTS: 1 DIF: 1 REF: 6
   STA: E.SE.06.13 LOC: Soil Composition TOP: Earth Materials
   KEY: Soil
4. ANS: B PTS: 1 DIF: 1 REF: 6
   STA: E.SE.06.13 LOC: Soil Composition TOP: Earth Materials
   KEY: Soil
5. ANS: C PTS: 1 DIF: 1 REF: 6
   STA: E.SE.06.13 LOC: Soil Composition TOP: Earth Materials
   KEY: Soil
6. ANS: B PTS: 1 DIF: 2 REF: 6
   STA: E.SE.06.11 LOC: Weathering and Erosion TOP: Earth Materials
   KEY: Water
7. ANS: B PTS: 1 DIF: 1 REF: 6
   STA: None LOC: Rocks and Minerals TOP: Earth Materials
   KEY: Hardness NOT: RR
8. ANS: C PTS: 1 DIF: 1 REF: 6
   STA: E.SE.06.41 LOC: Rock Cycle TOP: Earth Materials
   KEY: Rocks MSC: Sedimentary
9. ANS: D PTS: 1 DIF: 1 REF: 6
   STA: E.SE.06.13 LOC: Soil Composition TOP: Earth Materials
   KEY: Organic
10. ANS: C PTS: 1 DIF: 2 REF: 6
    STA: E.ES.06.11 LOC: Weathering and Erosion TOP: Earth Materials
    KEY: Potholes
11. ANS: D PTS: 1 DIF: 1 REF: 6
    STA: S.IP.06.13 LOC: Inquiry TOP: Earth Materials
    KEY: Tools
12. ANS: A PTS: 1 DIF: 1 REF: 6
    STA: E.ES.06.41 LOC: Rock Cycle TOP: Earth Materials
    KEY: Igneous
13. ANS: A PTS: 1 DIF: 1 REF: 6
    STA: E.ES.06.41 LOC: Rock Cycle TOP: Earth Materials
    KEY: Sedimentary
14. ANS: C PTS: 1 DIF: 2 REF: 6

STA: S.IA.06.13 LOC: Inquiry TOP: Earth Materials
KEY: Conclusion

15. ANS: B PTS: 1 DIF: 2 REF: 6
STA: E.SE.06.12 LOC: Weathering and Erosion TOP: Earth Materials
KEY: Glacier

16. ANS: B PTS: 1 DIF: 2 REF: 6
STA: S.IP.06.12 LOC: Inquiry TOP: Earth Materials
KEY: Soil

17. ANS: B PTS: 1 DIF: 1 REF: 6
STA: I.IP.06.12 LOC: Inquiry TOP: Earth Materials
KEY: Measure

18. ANS: B PTS: 1 DIF: 1 REF: 6
STA: E.ES.06.41 LOC: Rock Cycle TOP: Earth Materials
KEY: Minerals NOT: RR

19. ANS: B PTS: 1 DIF: 2 REF: 6
STA: E.SE.06.41 LOC: Rock Cycle TOP: Earth Materials
KEY: Sediment NOT: Macomb bank

20. ANS: D PTS: 1 DIF: 2 REF: 6
STA: E.SE.06.11 LOC: Weathering and Erosion TOP: Earth Materials
KEY: Physical Weathering NOT: RR

21. ANS: D PTS: 1 DIF: 2 REF: 6
STA: E.ES.06.14 LOC: Soil Composition TOP: Earth Materials
KEY: Water retention NOT: RR

22. ANS: A PTS: 1 DIF: 2 REF: 6
STA: S.ip.06.16 LOC: Inquiry TOP: Earth Materials
KEY: Patterns NOT: RR

ESSAY

23. ANS:
a. Any appropriate hypothesis: i.e. Soil that is half sand and half clay will hold the most water (1 point)

b. List should match the hypothesis: Must include **different types of soil** or soil components, water and a **way to measure** the water retained in each mixture (2 points).

PTS: 3 DIF: 3 REF: 6 STA: S.IP.06.12
LOC: Inquiry TOP: Earth Material KEY: Investigation

24. ANS:
3 points: Includes at least three of the following:

Acid test; Luster, Cleavage, Hardness, Observations of composition (types of crystals if any); color and patterns, Texture. Resources include one of the following: Talking to an expert; using the Internet for a reference, using a rock and mineral book with pictures for comparison.

2 points: Includes three appropriate tests but no appropriate reference source

1 point: Includes appropriate reference source, but does not include appropriate tests.

PTS: 3 DIF: 2 REF: 6 STA: S.IP.06.12
LOC: Investigating TOP: Earth Materials KEY: Identification
NOT: RR

25. ANS:
2 points: Includes two appropriate examples and an appropriate plan for soil conservation
1 points: Includes one appropriate example and plan for soil conservation

Sample answers:
Causes: highway and construction, destruction of forests (clear-cutting), set forest fires, poor landfill projects, farming on slopes

.

PTS: 2 DIF: 3 REF: 6 STA: E.SE.06.11
LOC: Weathering and Erosion TOP: Earth Materials
KEY: Soil conservation NOT: RR

Performance Assessment for Grade 6: Earth Materials

Soil Erosion Investigation

Student Directions:

You are a soil conservation scientist and you are investigating how soil affects erosion in your local area. You will be sharing your results with fellow soil conservation scientists in the form of a team oral presentation and an individual written report.

You will be evaluated on how well you:

e. plan and conduct this investigation
f. analyze the information collected
g. connect your findings with your recommendations
h. communicate to your fellow scientists

Directions

1. Using the materials given to you in class, your team's task is to use scientific inquiry to compare the erosion of different types of soil. The scientific question that we will design an investigation to answer is: *"How does soil type affect erosion?"*
2. You need to conduct your scientific investigation as a team, using your stream tables or a model of your own. As you design your investigation, think about:

    - Which factors will you vary in your study? Which will you keep the same?
    - How can you be sure that the rate of water flow is even and constant?
    - How will you measure erosion?
    - List, in order, the steps you will use. You may include a diagram to help illustrate your plans for the investigation. Include any safety procedures you would follow. Make your procedure detailed enough, so someone else could follow it easily.
    - Construct a data table or chart to record your observations and results.
    - Perform the investigation by following the steps outlined in your procedure. Be sure to note any change you have to make to your listed procedures and tell why.
    - Record your observations and measurements. Write statements or paragraphs and/or use tables where appropriate. Now transform your data into a graph.

3. Individually, complete an investigation report that includes the following:
    - A summary of your investigation
    - An interpretation and analysis of your results.
    - A list of any limitations to your investigation.

- A question that you can answer using materials that are similar to those you had in the classroom.
- An additional experiment or questions suggested by your investigation that would require materials beyond what you have available (include a possible procedure for this question.

Teacher Directions:

State Expectations Targeted:

- **E.SE.06.13** Describe how soil is a mixture made up of weather-eroded rock and decomposed organic material, water, and air.

- **E.SE.06.14** Compare and contrast different soil samples based on particle size.

- **S.IP.06.11** Generate scientific questions based on observations, investigations, and research concerning earth materials.

- **S.IP.06.12** Design and conduct scientific investigations to understand earth materials

- **S.IP.06.13** Use tools and equipment (models, thermometers) appropriate to scientific investigations of earth materials.

- **S.IP.06.14** Use metric measurement devices in an investigation of earth materials and erosion.

- **S.IP.06.15** Construct charts and graphs from data and observations dealing with erosion and soil formation.

- **S.IP.06.16** Identify patterns in data dealing with erosion and soil formation.

- **S.IA.06.11** Analyze information from data tables and graphs to answer scientific questions on erosion, and soil formation.

- **S.IA.06.12** Evaluate data, claims, and personal knowledge through collaborative science discourse about erosion soil formation.

- **S.IA.06.13** Communicate and defend findings of observations and investigations about the earth materials and erosion using evidence.

- **S.IA.06.14** Draw conclusions from sets of data from multiple trials about earth materials and erosion using scientific investigation.

- **S.RS.06.13** Identify the need for evidence in making scientific decisions.

Depth of Knowledge: (DOK) 4

Materials for "Erosion":

The teacher will need:

- steam table per team (shallow pan-type containers can be used instead of stream tables)
- Earth materials (for example, loam, silt or clay), and gravel (e.g., aquarium gravel, pea gravel, 3/4 minus).
- water
- paper towels
- watering bottle
- obstructions such as stones, sticks
- plant materials (e.g. grass)

Advance Preparation:

- Introduce your students to stream tables.
- Students must understand that they need a container to collect runoff water and paper towels to absorb spills. They must understand how to prepare the various Earth materials and how to position the water source.
- With the students, spend some time running water through sand, soil, and gravel. Have them observe what happens and record their findings using words and pictures. Have the students discuss and compare their results in small groups and then as a whole class.
- After familiarizing your students with stream tables, a variety of earth materials, the process of erosion, you will ask your students to develop a procedure to answer a question using the scientific inquiry process and skills. Sample questions for investigation might include: Does sand erode as easily as gravel? How does the rate of water flow affect erosion? Will slope of the table affect erosion? How will obstructions or plants affect erosion?
- Include background information about set-up and use of stream tables. Include diagram of set-up.

Recommendations/Options/Variations

- Be sure that students have had ample modeling and practice designing and implementing and investigation prior to this assessment task. Perform whole class and small group investigations similar to this one prior to this assessment.
- Check student procedures/plans before allowing them to begin their investigation.
- Provide students with special needs a specific question or set of materials for their investigation (How does the erosion of sand compare with the erosion of gravel?)
- Scaffold the Investigation Report Form based on individual student needs (provide question stem, hypothesis stem, materials template, procedure suggestions, chart labels, graph labels, etc.)

Rock Collection Project

Project Timeline

Task	Due Date	Teacher's Initials
1. Plan where you'll collect rocks and review the plan with your teacher		
2. Gather materials needed for rock collecting		
3. Collect rocks at several locations		
4. Classify rocks into major groups		
5. Identify rocks using field guides (in class and on internet)		
6. Create rock collection display		
7. Present rock collection to class		

Project Rules

- Brainstorm a list of places in your neighborhood or community where you can safely and legally collect rocks. Discuss your list with your teacher before you begin collecting.
- Prepare to collect rocks by gathering the materials you will need. These include a strong bag, such as an old backpack. You'll also need re-sealable plastic sandwich bags to bag individual rock samples and paper and a pencil. A rock collector needs to wear gloves, too.
- Collect rock samples at neighborhood locations or other places agreed upon by you and your teacher. Be sure to get permission before collecting on private property. Keep a good record as you collect. Index cards will help you in this task.
- Bring your rock samples to class, where you can examine them closely and perform tests to help you classify and identify them.
- Classify each rock as sedimentary, igneous, or metamorphic. Support your classification with data you collected from your observations.
- Identify each rock sample using a field guide to rocks and minerals. Your teacher may provide such books, but you can also find resources in the library and on-line.
- Create a display of your rock collection that shows off your best rock samples and your best efforts at classification and identification. Use an index card to make an information card for each rock in your display. On this card include as much information about the rock as you can.
- Prepare a presentation to the class of your rock collection. As part of your presentation, describe each rock, including where you found it and how you classified and identified it.

Project Hints

- The best places to hunt for rocks are places where many rocks are exposed. These include dry stream beds, road cuts, and farm fields. Such places can be dangerous, though. Never go rock hunting without someone with you, such as an adult family member or a classmate. Be careful when collecting in places where loose rocks might fall.
- For many places, you need to get permission to collect rocks. This is especially true for national and state parks, as well as private property. Go to the rangers or other authorities and explain your project. If permission is denied, find other locations.
- When you go rock collecting, you should wear heavy shoes as well as long pants. Be prepared to hunt for rocks in places you might not normally walk.
- Sometimes rock samples are too big to display easily or are dirty or dull. Breaking apart such rocks provides smaller samples as well as cleaner surfaces for identification purposes. Your teacher will show you how to break apart rocks safely. Do this at school in a place designated for that purpose. And always wear goggles.
- Examine each rock with a hand lens. Notice its texture. Do a scratch test. Note its color and luster. Try to identify the minerals in it. Determine the rock's density or heft. In other words, do everything you can to correctly classify and identify the rocks you collect.
- As you begin to create your rock display, think of how you've seen other sorts of collections displayed, including jewels, leaves, or butterflies. Display each rock in a separate compartment, with numbers on the rocks (glue on numbers or paint on white-out and write the numbers on the white-out). Your information card can be part of the display, or you could make special labels. The figure below shows two rock collections and might give you some ideas.
- As you prepare your presentation, think of what you want to say and the order in which you want to present the information. You may want to make notes on index cards to help you remember what you want to say.

Classifying Rocks into Major Groups

Classifying rocks into the three major groups is not always easy—for some rocks it can be difficult for anyone but a geologist. But for many rocks, you can determine their classification if you know the important characteristics of each major group.

Study the characteristics below for each major group of rocks. Then examine the rocks you collect and use these characteristics to help you classify the rocks.

Characteristics of Igneous Rocks

Igneous rocks often contain grains that can be seen with the unaided eye. See Figure 1.

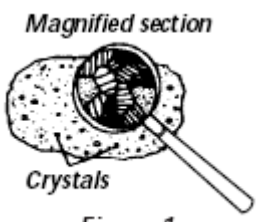


Figure 1


Figure 2


Figure 3

Figure 4


Figure 5


Figure 6


Figure 7

- Some igneous rocks have no visible grain and appear glassy. See Figure 2.
- Igneous rocks may be found in many different colors and often show different-colored grains that are not in bands.

Characteristics of Sedimentary Rocks

- Clastic sedimentary rocks are made up of fragments of other rocks and look very much like rocks or particles cemented together. Some sedimentary rocks have a range of grain sizes, while others consist mainly of one grain size. See Figure 3.
- Organic sedimentary rocks are made up of plant and animal products or remains. Such rocks may contain fossils. See Figure 4.
- Sedimentary rocks often have distinct parallel layers. See Figure 5.
- Many sedimentary rocks appear dull or earthy.

Characteristics of Metamorphic Rocks

- Metamorphic rocks often look like igneous rocks except that they are foliated, showing bands of different mineral grains. See Figure 6.
- Metamorphic rocks may show signs of bending or distortion. See Figure 7.
- The grains in metamorphic rocks generally appear to be flattened.

A Record for Each Rock

You will need to make a record card for each rock that you collect. Write the following information on a 3 x 5 index card, one for each rock. Either fill out the card as you collect rocks or use your field notes to fill out the sheet later.

Rock Number _____

Date found _____
Location where found _____
Description of location, including rocks near this rock _____
Description of rock _____
Classification (igneous, sedimentary, or metamorphic) _____
Reasons for Classification _____
Identification of Rock (specific kind of rock) _____
Reasons for identification _____
Source used for identification _____

Science Investigation Report: Erosion

What I already know about how soil type affects erosion:

Question to investigate:

My Hypothesis:

Materials:

Procedure:

Results:

	Trail 1	Trail 2	Trail 3	Average

Graph:

Summary of Results:

Conclusion:

Scientific Explanation:

What recommendations do you now make for soil conservation, based on your investigation results?

What is another scientific question you could investigate to learn more about how soil type affects erosion?