GEOLAB

MEASUREMENT AND SI UNITS

Background: Suppose someone asked you to measure the area of your classroom in square cubits. What would you use? A cubit is an ancient unit of length equal to the distance from the elbow to the tip of the middle finger. Today, SI is used as a standard system of measurement.

Question: *Why are standard units of measure important?*

Materials

water
large graduated cylinder or beaker
graph paper
balance
pieces of string
spring scale
rock samples
ruler

Safety Precautions

Procedure

1. Read and complete the lab safety form.
2. Obtain a set of rock samples from your teacher.
3. Measure the weight and length of two rock samples using a nonstandard unit of measure. You might use your pinky, a paper clip, or anything you choose.
4. Record your measurements.
5. Working with a partner, explain your units of measure and which samples you measured. Ask your partner to measure the rocks using your units.
6. Record your partner's measurements.
7. Use the information in the *Skillbuilder Handbook* to design a data table in which to record the following measurements for each rock sample: area, volume, mass, weight, and density.
8. Carefully trace the outline of each rock onto a piece of graph paper. Determine the area of each sample and record the values in your data table.
9. Secure each rock with a piece of dry string. Place the string loop over the hook of the spring scale to determine the weight of each rock sample. Record the values in your data table.
10. Pour water into a large graduated cylinder until it is half full. Record this volume in the table. Slowly lower the sample by its string into the cylinder. Record the volume of the water. Subtract the two values to determine the volume of the rock sample.
11. Repeat Steps 9 and 10 for each rock. Make sure the original volume of water for each rock is the same as when you measured your first sample.
12. Follow your teacher's instructions about how to use the balance to determine the mass of each rock. Record the measurements in your table.

Analyze and Conclude

1. **Interpret** How did the results of your initial measurements (Step 4) compare with your lab partner's (Step 6)? If they were different, why were they?
2. **Propose** What does this tell you about the importance of standard units of measure?
3. **Compare** the area of each of your samples with the volumes determined for the same rock. Which method of measurement was more accurate? Explain.
4. **Calculate** the density of each sample using this formula: density = mass/volume. Record these values in your data table.
5. **Explain** Does mass depend on the size or shape of a rock? Explain.
6. **Identify** the variables you used to determine the volume of each sample.
7. **List** the standard units you used in this investigation and explain the standard unit advantages over your measurement units.

INQUIRY EXTENSION

Inquiry How could you find the volume of a rock, such as pumice, that floats in water? Design an investigation to test your prediction.

CHAPTER 1

Study Guide

STUDY TO GO — Download quizzes, key terms, and flash cards from glencoe.com.

BIG Idea Earth scientists use specific methods to investigate Earth and beyond.

Vocabulary	Key Concepts
Section 1.1 Earth Science	
• astronomy (p. 6) • atmosphere (p. 8) • biosphere (p. 9) • environmental science (p. 7) • geology (p. 7) • geosphere (p. 8) • hydrosphere (p. 8) • meteorology (p. 6) • oceanography (p. 7)	**MAIN Idea** Earth science encompasses five areas of study: astronomy, meteorology, geology, oceanography, and environmental science. • Earth is divided into four systems: the geosphere, hydrosphere, atmosphere, and biosphere. • Earth systems are all interdependent. • Identifying the interrelationships between Earth systems leads to specialties and subspecialties. • Technology is important, not only in science, but in everyday life. • Earth science has contributed to the development of many items used in everyday life.
Section 1.2 Methods of Scientists	
• control (p. 12) • dependent variable (p. 12) • hypothesis (p. 10) • independent variable (p. 12) • Le Système International d'Unités (SI) (p. 13) • scientific methods (p. 10) • scientific notation (p. 16)	**MAIN Idea** Scientists use scientific methods to structure their experiments and investigations. • Scientists work in many ways to gather data. • A good scientific experiment includes an independent variable, dependent variable, and control. An investigation, however, does not include a control. • Graphs, tables, and charts are three common ways to communicate data from an experiment. • SI, a modern version of the metric system, is a standard form of measurement that all scientists can use. • To express very large or very small numbers, scientists use scientific notation.
Section 1.3 Communication in Science	
• scientific law (p. 19) • scientific model (p. 18) • scientific theory (p. 19)	**MAIN Idea** Precise communication is crucial for scientists to share their results effectively with each other and with society. • Scientists communicate data so others can learn the results, verify the results, examine conclusions for bias, and conduct new experiments. • There are three main types of graphs scientists use to represent data: line graphs, circle graphs, and bar graphs. • A scientific model is an accurate representation of an idea or theory. • Scientific theories and scientific laws are sometimes discovered accidentally.