

Introduction to Physical Science ▪ Section Summary

Scientific Inquiry

Key Concepts

- How do scientists investigate the natural world?
- What role do models, laws, and theories play in science?

Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on evidence they gather. The processes that scientists use in inquiry include posing questions, developing hypotheses, designing experiments, collecting and interpreting data, drawing conclusions, and communicating ideas and results.

Scientific inquiry often begins with a problem or questions about an observation. A scientific question is one that can be answered by making observations and gathering evidence. A **hypothesis** is a possible explanation for a set of observations or answer to a scientific question. In science, a hypothesis must be testable.

Any factor that can change in an experiment is called a **variable**. The variable that is purposely changed to test a hypothesis is called the **manipulated variable** (or independent variable). The factor that may change in response to the manipulated variable is called the **responding variable** (or dependent variable). All other variables should be held constant. An experiment in which only one variable is manipulated at a time is called a **controlled experiment**.

A controlled experiment produces data. **Data** are facts, figures, and other evidence gathered through observations. A data table provides an organized way to collect and record observations. One useful tool in interpreting data is a graph. Graphs can reveal trends or patterns in the data. After gathering and interpreting data, a scientist draws conclusions about the hypothesis.

An important part of the scientific inquiry process is communicating the results. **Communicating** is the sharing of ideas and experimental findings with others through writing and speaking.

Scientists use models and develop laws and theories to increase people's understanding of the natural world. A **scientific law** is a statement that describes what scientists expect to happen every time under a particular set of conditions. A scientific law describes an observed pattern in nature without attempting to explain it. Sometimes, a large set of related observations can be connected by a single explanation. A **scientific theory** is a well-tested explanation for a wide range of observations or experimental results.

Scientific Inquiry (pp. 10–16)

This section explains the process of scientific inquiry and describes what makes an explanation called a hypothesis testable. It also explains the difference between a scientific theory and a scientific law.

Use Target Reading Skills

After you read this section, reread the paragraphs that contain the definitions of the Key Terms. Use all the information you have learned to write a definition of each Key Term in your own words on the lines below.

scientific inquiry

hypothesis

variable

manipulated variable

responding variable

controlled experiment

data

communicating



Observation or Inference?

Name _____ Date _____

Key Vocabulary

observation

observe

infer

inference

Part I. Observation or Inference?

Directions: Read each statement and decide whether it is an *observation* or an *inference*. Did the person making each statement *observe* or *infer* what he or she stated? Circle your answers.

1. The container is filled to the 350 mL mark with water.

observation inference

2. The Sun rose at 6:54 this morning.

observation inference

3. The caterpillar did not eat the moth because it is not a carnivore.

observation inference

4. Sound traveled faster through the desk than through the air.

observation inference

5. The plant on the left is growing more because it has been receiving more water.

observation inference

6. When the Sun came out, it made the rain stop.

observation inference

7. I can jump high in tennis shoes because they have rubber on the bottom.

observation inference

8. When the power is turned on, the game lights up and plays a song.

observation inference

9. Dinosaurs died out when they could not adapt to the changing climate.

observation inference

10. Water can fall as precipitation, which may include rain, snow, or hail.

observation inference

Name _____ Date _____

Part II. Make Observations and Inferences

Directions: Look at the picture below. Then write three observations and two inferences, based on the picture.

1. (observation) _____

2. (observation) _____

3. (observation) _____

4. (inference) _____

5. (inference) _____

