

What Is Science? ▪ Section Summary

Scientific Inquiry**Key Concepts**

- What is scientific inquiry?
- What makes a hypothesis testable?
- How do scientific theories differ from scientific laws?

Thinking and questioning can be the start of the **scientific inquiry** process. **Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on evidence they gather.** Scientific inquiry often begins with a problem or questions about an observation. Questions come from experiences you have and from observations and inferences you make. A scientific question is one that can be answered by making observations and gathering evidence.

A **hypothesis** (plural: *hypotheses*) is a possible explanation for a set of observations or answer to a scientific question. **In science, a hypothesis must be testable. This means that researchers must be able to carry out investigations and gather evidence that will either support or disprove the hypothesis.**

A scientist designs an experiment to test a hypothesis. All factors that can change in an experiment are called **variables**. The variable that is purposely changed to test a hypothesis is called the **manipulated variable** (also called the independent variable). The factor that may change in response to the manipulated variable is called the **responding variable** (also called the dependent variable). All other variables must be exactly the same. An experiment in which only one variable is manipulated at a time is called a **controlled experiment**. A well-designed experiment has clear operational definitions. An **operational definition** is a statement that describes how to measure a particular variable or define a particular term.

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. After gathering and interpreting data, a scientist draws conclusions about the hypothesis. A **conclusion** is a summary of what you have learned from an experiment.

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.

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. Future testing can prove a theory incorrect. A **scientific law** is a statement that describes what scientists expect to happen every time under a particular set of conditions. **Unlike a scientific theory, a scientific law describes an observed pattern in nature without attempting to explain it.**

due date: _____

Each
Question
about 3.3
points.
Do not
leave any
blank. ①

This will be
graded. See
me at lunch
or break if
you need
help.

What Is Science? ▪ *Guided Reading and Study*

Designing an Experiment (pp. 16–17)

7. To test a hypothesis, a scientist designs a(n) _____.

Match the term with its definition.

- | | |
|---------------------------------|--|
| _____ 8. responding variable | a. a statement that describes how to measure a particular variable or define a particular term |
| _____ 9. operational definition | b. the one variable that is purposely changed to test a hypothesis |
| _____ 10. manipulated variable | c. a factor that can change in an experiment |
| _____ 11. controlled experiment | d. the factor that may change in response to the manipulated variable |
| _____ 12. variable | e. an experiment in which only one variable is manipulated at a time |

13. Is the following sentence true or false? If you did not control variables in an experiment, there would be no way to know which variable explained your results. _____

Collecting and Interpreting Data (p. 18)

14. The facts, figures, and other evidence gathered through observations are called _____.

15. In carrying out a controlled experiment, what does a data table help you do?

16. Circle the letter of each sentence that is true about graphs.

- a. A graph can reveal a trend in data.
- b. Graphs help scientists interpret data.
- c. Graphs are the only way to organize data.
- d. A graph can reveal a pattern in data.

Drawing Conclusions (pp. 19–20)

17. A(n) _____ is a summary of what you have learned from an experiment.

18. What might you ask yourself in drawing a conclusion about an experiment?

What Is Science? • Guided Reading and Study

Scientific Inquiry (pp. 13–22)

This section explains what a process called scientific inquiry is and 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

A definition states the meaning of a word or phrase by telling about its most important feature or function. 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.~~ *To get full credit: Define + Underline the answer + put the number beside the answer on the front sheet.*

1. scientific inquiry

the diverse ways in which scientist study the natural world and propose explanations based

2. hypothesis

on evidence they gather.

3. variable

4. manipulated variable

5. responding variable

6. controlled experiment

7. operational definition

8. data

~~communicating~~

What Is Science? ▪ Guided Reading and Study

Scientific Inquiry *(continued)*

9 • scientific theory

10 • scientific law

Introduction (p. 13)

1. What does scientific inquiry refer to?

Posing Questions (p. 14)

2. Is the following sentence true or false? Scientific inquiry often begins with developing a hypothesis. _____

3. Circle the letter of each sentence that is a scientific question.

- a. At what temperature does water boil?
b. When does the sun rise on April 3?
c. How can my team work better together?
d. Why does she like science more than he does?

May have more than one answer. Circle all correct answers.

Developing a Hypothesis (p. 15)

4. A(n) _____ is a possible explanation for a set of observations or answer to a scientific question.
5. Is the following sentence true or false? Scientists consider a hypothesis to be a fact. _____
6. What is a testable hypothesis?
