

Chapter 1 Science Skills

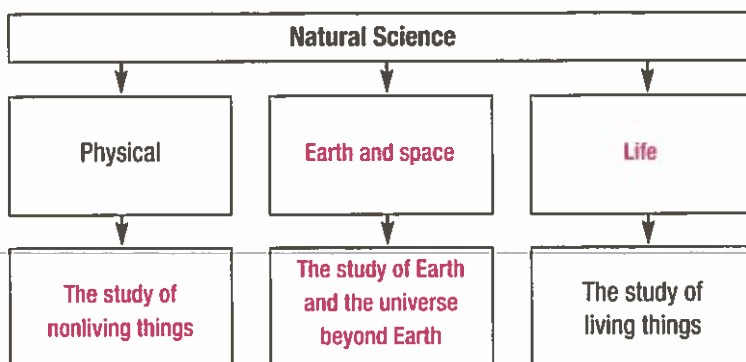
Section 1.1 What Is Science?

(pages 2–6)

This section describes the characteristics of science and technology. It also discusses the big ideas of physical science.

Reading Strategy (page 2)

Previewing Skim the section to find out what the main branches of natural science are. Complete the concept map based on what you have learned. For more information on this Reading Strategy, see the **Reading and Study Skills in the Skills and Reference Handbook** at the end of your textbook.

**Science From Curiosity (pages 2–3)**

1. Define science. Science is a system of knowledge and methods you use to find knowledge.

2. The questions that lead to scientific discovery are provided by curiosity.

3. Is the following sentence true or false? The results of every scientific experiment are quantitative. false

Science and Technology (page 3)

4. Is the following sentence true or false? The use of knowledge to solve practical problems is known as curiosity. false

5. How are science and technology related? They are interdependent. Advances in science lead to advances in technology and vice versa.

Branches of Science (page 4)

6. Name the two general categories that the study of science can be divided into.

a. Social science b. Natural science

7. Circle the letters of each branch of natural science.

- ☒ a. physical science ☒ b. Earth and space science
 c. social science ☒ d. life science

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8. Circle the letter of each sentence that is true about the field of chemistry.
 - ☒ a. Chemists study reactions involving matter.
 - ☒ b. Chemists study the composition of matter.
 - ☒ c. Chemists study the structure of matter.
 - ☒ d. Chemists study the properties of matter.
9. The study of matter, energy, and the interactions between the two through forces and motion is known as physics.
10. Identify the topics that are included in the science of geology.
The science of geology includes the origin, history, and structure of the Earth.
11. Is the following sentence true or false? The foundation of space science is astronomy. true
12. Scientists who study the origin and behavior of living things are called biologists, and the study of living things is known as biology.

The Big Ideas of Physical Science (pages 5–6)

13. Is the following sentence true or false? All of the important rules of nature have already been discovered. false
14. Circle the letter of each sentence that is true about the diameter of the observable universe.
 - a. It is one hundred million meters.
 - b. It is seven hundred billion meters.
 - c. It is seven hundred million billion meters.
 - ☒ d. It is seven hundred million billion billion meters.
15. Name the two characteristics of matter.
 - a. Mass
 - b. Volume
16. The basic building blocks of matter are called atoms.
17. Is the following sentence true or false? A force causes a change in time. false
18. Describe kinetic energy. Kinetic energy is the energy of motion.
19. Two general types of energy are kinetic energy and potential energy.

Science and Your Perspective (page 6)

20. Is the following sentence true or false? The scientific facts of today will not change in the future. false

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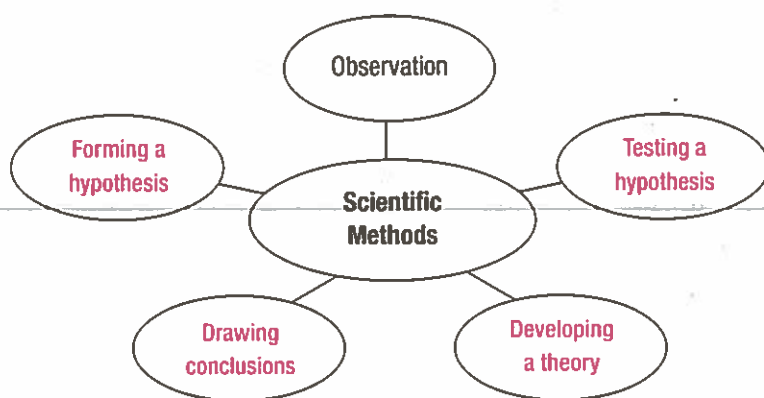
Section 1.2 Using a Scientific Approach

(pages 7–11)

This section describes scientific methods and how they are used to understand the world around you.

Reading Strategy (page 7)

Using Prior Knowledge Before you read, add to the web diagram what you already know about scientific methods. After you read the section, revise the diagram based on what you have learned. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.



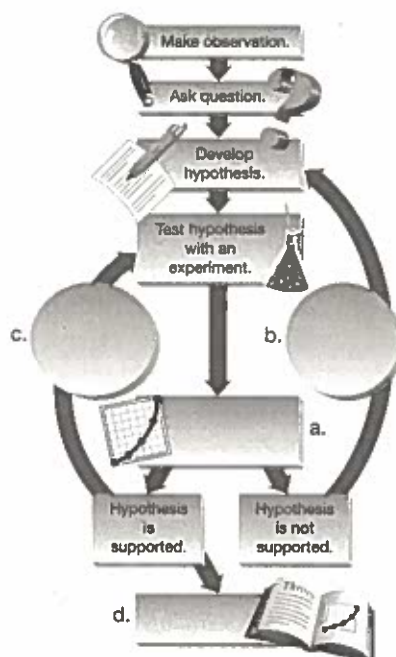
Scientific Methods (pages 7–9)

1. Identify the goal of any scientific method. The goal of any scientific method is to solve a problem or better understand an observed event.
2. Name three types of variables in an experiment.
a. Manipulated variable b. Responding variable c. Controlled variable
3. Is the following sentence true or false? If the data from an experiment do not support your hypothesis, you can revise the hypothesis or propose a new one. true
4. How does a scientific theory differ from a hypothesis? A hypothesis is an untested explanation for an observation while a theory is a well-tested explanation for a set of observations.

Match the following vocabulary terms to the correct definition.

Definition	Vocabulary Terms
<u>c</u> 5. Information that you obtain through your senses	a. theory
<u>a</u> 6. A well-tested explanation for a set of observations	b. hypothesis
<u>b</u> 7. A proposed answer to a question	c. observation

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8. Complete the model of a scientific method by filling in the missing steps.

- | | |
|--|-----------------------------|
| a. <u>Analyze data and draw conclusions</u> | b. <u>Revise hypothesis</u> |
| c. <u>Test hypothesis with further experiments</u> | d. <u>Develop theory</u> |

Scientific Laws (page 9)

9. Is the following sentence true or false? A scientific law attempts to explain an observed pattern in nature. false
10. All scientists may accept a given scientific law, but different scientists may have different scientific theories to explain it.

Scientific Models (page 10)

11. Why do scientists use scientific models? Scientists use scientific models to make it easier to understand things that might be too difficult to observe directly.
12. Circle the letters that correctly state what scientists do if data show that a model is wrong.
- | | |
|---|--|
| <input checked="" type="radio"/> a. Change the model. | <input checked="" type="radio"/> b. Replace the model. |
| <input type="radio"/> c. Ignore the data. | <input type="radio"/> d. Revise the data. |

Working Safely in Science (page 11)

13. Circle the letters of safety precautions to follow whenever you work in a science laboratory.
- | | |
|--|---|
| <input checked="" type="radio"/> a. Study safety rules. | <input type="radio"/> b. Never ask questions. |
| <input checked="" type="radio"/> c. Read all procedural steps. | <input checked="" type="radio"/> d. Understand the procedure. |
14. Why should you wash your hands after every experiment? You should wash your hands after experiments to remove chemicals that you may have touched.

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Section 1.3 Measurement**(pages 14–20)**

This section discusses units of measurement, making and evaluating measurements, and calculations with measurements.

Reading Strategy (page 14)

Previewing Before you read the section, rewrite the green and blue topic headings in this section as questions in the table below. As you read, write answers to the questions. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Measurement
Why is scientific notation useful? <i>It makes very large or very small numbers easier to work with.</i>
What is SI? <i>SI is a set of metric measuring units used by scientists.</i>
What are base units? <i>Base units are the fundamental units of SI. There are seven SI base units, including the meter, the kilogram, the kelvin, and the second.</i>

Using Scientific Notation (pages 14–15)

- Scientific notation expresses a value as the product of a number between 1 and 10 and a power of ten.
- Circle the letter of the value that is expressed as 3×10^5 .
 a. 300 b. 300,000
 c. 30,000,000 d. 300,000,000
- Why is scientific notation useful? It makes very large or very small numbers easier to work with.

SI Units of Measurement (pages 16–18)

- Circle the letters of elements that are required for a measurement to make sense.
 a. scientific notation b. numbers
 c. exponents d. units
- Is the following sentence true or false? Units in the SI system include feet, pounds, and degrees Fahrenheit. false

Match the SI base unit with the quantity that is used to measure.

SI Base Unit	Quantity
<u>c</u> 6. meter	a. Mass
<u>a</u> 7. kilogram	b. Time
<u>d</u> 8. kelvin	c. Length
<u>b</u> 9. second	d. Temperature

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SI Prefixes			
Prefix	Symbol	Meaning	Multiply Unit By
giga-	G	billion (10^9)	1,000,000,000
mega-	M	million (10^6)	1,000,000
kilo-	k	thousand (10^3)	1000
deci-	d	tenth (10^{-1})	0.1
centi-	c	hundredth (10^{-2})	0.01
milli-	m	thousandth (10^{-3})	0.001
micro-	μ	millionth (10^{-6})	0.000001
nano-	n	billionth (10^{-9})	0.000000001

10. Complete the table of SI prefixes by filling in the missing information.
11. A ratio of equivalent measurements that is used to convert a quantity expressed in one unit to another unit is called a(n) conversion factor.

Limits of Measurement (page 19)

12. Circle the letter of each expression that has four significant figures.
- a. 1.25×10^4 b. 12.51
 c. 0.0125 d. 0.1255
13. Is the following sentence true or false? The precision of a calculated answer is limited by the least precise measurement used in the calculation. true
14. Calculate the density if the mass of a solid material is measured as 15.00 grams and its volume is measured as 5.0 cm³? Round off your answer to the proper number of significant figures.
Density = $15.00 \text{ g} / 5.0 \text{ cm}^3 = 3.3 \text{ g/cm}^3$
15. Describe the difference between precision and accuracy. Precision refers to how exact a measurement is (the more significant figures, the more precise the measurement is), while accuracy refers to how close the measurement is to the actual value.

Measuring Temperature (page 20)

16. Circle the letter of the base unit of temperature in SI.
- a. degree Fahrenheit ($^{\circ}\text{F}$) b. degree Celsius ($^{\circ}\text{C}$)
 c. candela (cd) d. kelvin (K)
17. Write the formula used to convert degrees Celsius to kelvins.
 $\text{K} = ^{\circ}\text{C} + 273$

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Section 1.4 Presenting Scientific Data

(pages 22–25)

*This section describes how scientists organize and communicate data.***Reading Strategy (page 22)**

Comparing and Contrasting After you read this section, compare the types of graphs by completing the table. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Type of Graph	Description	Used For
Line graph	A graph in which a line is plotted to describe changes that occur in related variables	Showing how a variable responds to changes in another
Bar graph	A graph that uses scaled bars to represent various measurements	Comparing sets of measurements or changes
Circle graph	A graph consisting of a divided circle, with each "slice" representing a proportional fraction	Showing how a part or share of something relates to the whole

Organizing Data (pages 22–24)

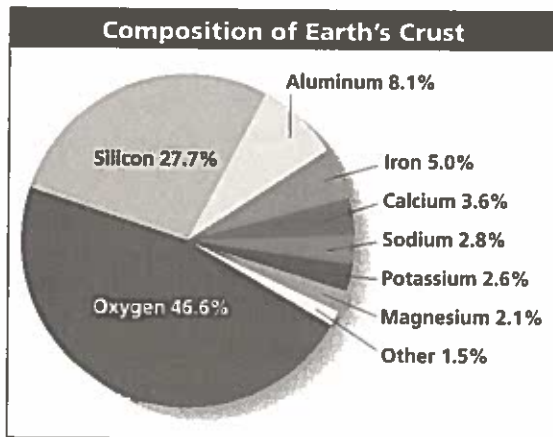
- Circle the letters of tools that scientists use to organize their data.
 - the Internet
 - newspapers
 - tables
 - graphs
- The simplest way to organize data is to present them in a(n) data table.
- Circle the letter of the place on a line graph where the manipulated variable is generally plotted.
 - the y -axis
 - the rise
 - the x -axis
 - the run
- On a line graph, the ratio of the change in the y -variable to the corresponding change in the x -variable is called the line's slope.
- Circle the letters of the relationships that are direct proportions.
 - distance traveled versus time at a constant speed
 - the mass of a substance versus its volume
 - the time to travel a given distance versus average speed
 - the number of fingers in your classroom versus the number of people

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6. Is the following sentence true or false? An inverse proportion is one in which the product of the two variables is constant.

true

7. Identify each data organizing tool shown below.

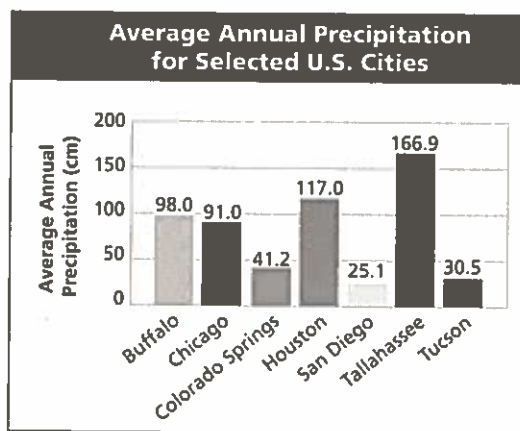


a.

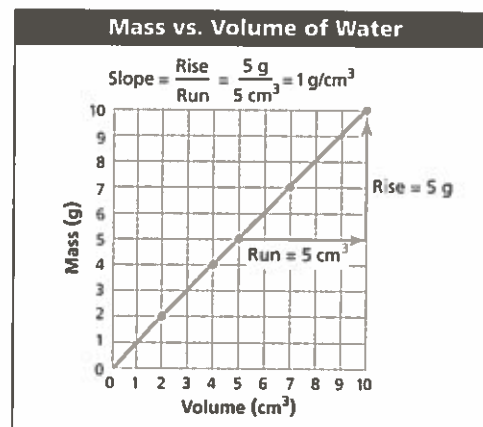
Average Annual Precipitation for Selected U.S. Cities

City	Average Annual Precipitation (cm)
Buffalo, N.Y.	98.0
Chicago, Ill.	91.0
Colorado Springs, Colo.	41.2
Houston, Tex.	117.0
San Diego, Calif.	25.1
Tallahassee, Fla.	166.9
Tucson, Ariz.	30.5

b.



c.



d.

a. Circle graph

b. Data table

c. Bar graph

d. Line graph

Communicating Data (page 25)

8. Name two ways that scientists can report results of their experiments.

a. By writing in scientific journals

b. By speaking at scientific conferences

9. Is the following statement true or false? Scientists always interpret a given set of data the same way. false

10. Why is peer review an important part of scientific research? It encourages feedback from other scientists and helps researchers to reevaluate their data.