Answer Key

Directed Reading A

SECTION: ASKING ABOUT LIFE

1. life science
2. diversity
3. Answers may vary. Sample answer: Where does it live?
4. anyone
5. anywhere—in a laboratory, on farms, in forests, on the ocean floor, in space, for business, hospitals, government agencies, universities, as teachers
6. his or her curiosity
7. AIDS
8. inherited
9. Many environmental problems are caused by people's misuse of natural resources.
10. By learning about the needs of Siberian tigers, scientists hope to develop a plan that will help them survive.

SECTION: SCIENTIFIC METHODS

1. making observations; forming a hypothesis
2. The order depends on what works best to answer their questions.
3. B
4. hypothesis
5. testable
6. prediction
7. an experiment that tests only one factor at a time by using a comparison of a control group with one or more experimental groups
8. a factor that differs between the control group and experimental groups
9. planning
10. The more organisms tested, the more certain scientists can be of the data they collect in an experiment.
11. Answers may vary. Sample answer: in a graph or a data table
12. Both are helpful. Either way, the scientist has learned something, which is the purpose of using scientific methods.
13. another investigation
14. Answers may vary. Sample answer: so other scientists may repeat the experiments to see if they get the same results; so scientists with similar interests can compare hypotheses and form consistent explanations

SECTION: SCIENTIFIC MODELS

1. C
2. C
3. B
4. A
5. D
6. theory
7. law
8. Scientific theories are used to explain observations and to predict what might happen. A scientific law is a summary of observations and tells us what will happen.
9. theories, facts, laws

SECTION: TOOLS, MEASUREMENT, AND SAFETY

1. Life scientists use tools to make observations and to gather, store, and analyze information.
2. the application of science for practical purposes
3. 1946
4. to create graphs, solve complex equations, analyze data, share data and ideas, and publish reports
5. B
6. D
7. C
8. A
9. C
10. It helps scientists share and compare observations and results. Almost all units are based on the number 10, which makes conversions easy.
11. millimeter
12. area
13. square
14. volume
15. liters, milliliters, cubic meters, cubic centimeters, and cubic millimeters
16. mass

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17. kilograms, metric tons, and grams
18. temperature
19. degrees Celsius, degrees Fahrenheit, and kelvins
20. Answers may vary. Sample answer: Ask teacher for permission and read the lab procedure carefully.
21. B
22. D
23. C
24. G
25. F
26. I
27. E
28. A
29. H

Directed Reading B

SECTION: ASKING ABOUT LIFE

1. B
2. A
3. D
4. D
5. C
6. B
7. diseases
8. inherited
9. tigers

SECTION: SCIENTIFIC METHODS

1. scientific methods
2. asking questions
3. counting
4. accurate
5. hypothesis
6. if-then
7. factor
8. controlled experiment
9. variable
10. A
11. A
12. A
13. C
14. A
15. B

SECTION: SCIENTIFIC MODELS

1. A
2. B
3. A
4. C
5. A
6. A
7. D
8. B
9. B
10. D
11. A

SECTION: TOOLS, MEASUREMENT, AND SAFETY

1. tools
2. technology
3. computer
4. analyze data
5. B
6. D
7. C
8. A
9. B
10. C
11. A
12. A
13. C
14. D
15. A
16. B
17. D
18. B
19. C
20. A

Vocabulary and Section Summary

SECTION: ASKING ABOUT LIFE

1. life science: the study of living things

SECTION: SCIENTIFIC METHODS

1. scientific methods: a series of steps followed to solve problems
2. hypothesis: an explanation that is based on prior scientific research or observations and that can be tested
3. controlled experiment: an experiment that tests only one factor at a time by using a comparison of a control group with an experimental group
4. variable: a factor that changes in an experiment in order to test a hypothesis

SECTION: SCIENTIFIC MODELS

1. model: a pattern, plan, representation, or description designed to show the structure or workings of an object, system, or concept
2. theory: an explanation that ties together many hypotheses and observations

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3. law: a summary of many experimental results and observations; a law tells how things work

SECTION: TOOLS, MEASUREMENT, AND SAFETY

1. technology: the application of science for practical purposes; the use of tools, machines, materials, and processes to meet human needs
2. compound light microscope: an instrument that magnifies small objects so that they can be seen easily by using two or more lenses
3. electron microscope: a microscope that focuses a beam of electrons to magnify objects
4. area: a measure of the size of a surface or a region
5. volume: a measure of the size of a body or region in three-dimensional space
6. mass: a measure of the amount of matter in an object
7. temperature: a measure of how hot (or cold) something is

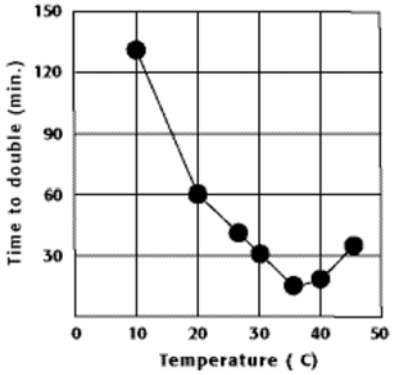
Section Review

SECTION: ASKING ABOUT LIFE

1. Sample answer: Life science is the study of living things.
2. C
3. Scientific investigations usually start with a question.
4. anywhere; anything having to do with living things
5. 15/50 = 30%
6. Sample answer: eat lunch —how digestion works; play with the dog —how animals behave; drive to school —environmental problems; play soccer —how muscles work; play chess—how the brain works
7. Sample answer: How does the scientist get close to the tiger? Where do Siberian tigers live? What do Siberian tigers eat? Do Siberian tigers get cold? Are Siberian tigers the same as other tigers?

SECTION: SCIENTIFIC METHODS

1. Sample answer: A good controlled experiment will test a single hypothesis and a single variable at a time.
2. C
3. a control group and one or more experimental groups that differ by only one factor—the variable
4. Scientific knowledge changes because scientists conduct new experiments to test new hypotheses, then share their results and build upon existing knowledge.
5. $[(4 + 5 + 6 + 6 + 9) \div 5] = [30 \div 5] = 6$
6. Sample answer: Because the scientists were trying to test the hypothesis that UV light causes deformities, UV light was the factor that needed to be varied —the variable.
7. Sample answer: because sometimes scientists need to go back and change a step or they may be able to skip a step if someone else has already done it
8. Sample answer: In addition to the variable being tested, other factors for the control group and the experimental group were not the same.
9. Sample answer: Observations are limited to our human senses or to what we have the technology to observe.
10. See sample graph below. The temperature that allows the bacteria to multiply most quickly is 37°C.



SECTION: SCIENTIFIC MODELS

1. A theory is an explanation that matches many hypotheses but may still change.
2. A law tells you exactly what to expect in certain situations.
3. B
4. Sample answer: physical model: a plastic human body; mathematical model: a Punnett square; conceptual model: cell theory

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5. Sample answer: Scientists use laws to predict what will happen under specific conditions but not to explain why Scientists use theories to make general predictions and explain why they think something happens.
6. 0.21 m or 21 cm
7. Sample answer: The plant model could be used to determine if a certain prehistoric animal was tall enough to reach the leaves of the plant or to show what the environment of a certain prehistoric area looked like. A limitation of the model is that it might not smell or taste like the real plant did.

SECTION: TOOLS, MEASUREMENT, AND SAFETY

1. area
2. mass
3. volume
4. B
5. Temperature is an indication of the amount of energy within matter.
6. the gram or the milligram
7. 3.0 L = 3000 mL = 3000 cm^3
8. 2194.5 cm^3 or about 2,195 cm^3
9. a SEM; You can tell by the magnification and by the visible three-dimensional features.
10. Sample answer: You could get hurt by an unknown chemical.

Chapter Review

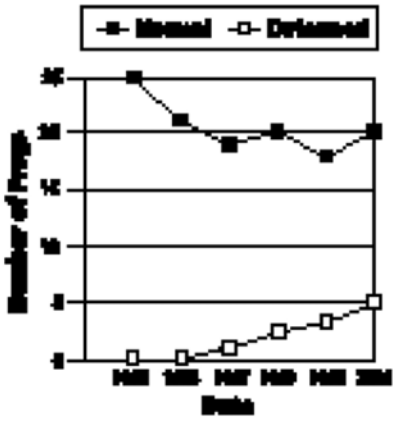
1. Sample answer: You can use scientific methods to study life science.
2. Sample answer: A variable is a part of a controlled experiment.
3. Sample answer: A theory is an explanation for a broad range of observations and hypotheses. A hypothesis is an explanation of a specific set of observations and can be tested.
4. Sample answer: A compound light microscope uses light to create an image of an object. An electron microscope uses electrons.
5. Sample answer: Area is a measure of a surface. Volume is a measure of space or size in three-dimensions.
6. C
7. A
8. B
9. B
10. B
11. D
12. Sample answer: Science can be used to find cures for diseases, to understand animal behavior, and to solve environmental problems.
13. Hypotheses need to be testable in order to be useful. If no information can be gathered to either support or disprove a hypothesis, then it is merely an idea that cannot be built upon scientifically.
14. Sample answer: A life scientist studying animals might use a radio collar to track the animal's location, a computer database program to record data, and a computer mapping program to draw maps.
15. Sample answer: Physical models include toys and a model of a cell or a human body. Mathematical models include a Punnett square and equations to calculate physical forces. Conceptual models include theories about how the solar system formed or how life evolved on Earth.
16. Sample answer: advantages of models: they are easier to see and manipulate than the real thing might be, they can simplify concepts; limitations: models do not behave exactly like the real thing, so they may not accurately predict results.
17. The SI units used to describe volume are liters (L), units based on the liter, and units based on the cubic meter (m^3, cm^3, mm^3). The SI units used to describe the mass of an object are kilograms (kg) and other units based on the gram.
18. The more individuals there are in the groups, the more confident scientists can be that differences between the groups were caused by the variable and not by natural differences between individual organisms.
19. An answer to this exercise can be found at the end of the Teacher Edition.
20. Sample answer: Observations are limited by human senses or by technology. Things may exist that cannot be observed.

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21. Sample answer: Vitamins help the mice remember the maze.
22. D
23. A

(200 mL – 125 mL = 75 mL = 75 cm^3)

24. See graph below.



Reinforcement

THE MYSTERY OF THE BUBBLING TOP

6. Answers may vary. Sample answer: The plastic disk began to move on top of the bottle's neck.
7. Accept all reasonable responses. Sample starred answer: I think the plastic disk moved because the hot water warmed the air inside the bottle.
8. Answers may vary. Sample answer: I could try placing the bottle in a beaker of cold water to see if the plastic disk moves.
9. Answers may vary. Sample answer: The disk did not move.
10. Answers may vary. Sample answer: I think that the disk does not move because the cold water cannot heat up the air inside the bottle.
11. Sample answer: Yes; if the disk had started moving as soon as it did before, I would have known that the temperature of the water had nothing to do with the movement of the disk.
12. Sample answer: Yes; there are more factors that I could change. Next, I could change the temperature of the water inside the bottle to see what happens.

Critical Thinking

1. Citizens may get botulism by eating contaminated food from cans.
2. Answers may vary. Sample answer: The Health Department could provide a record of the number of bulging cans, the dates when the problem occurred, and whether *Clostridium botulinum* has been found in any cans.
3. Answers may vary. Sample answer: The bulging cans are a result of local canneries using a new canning process that allows the growth of bacteria.
4. Answers may vary. Sample answer: Collect two groups of cans from the local canneries. The groups will be identical except that only one group of cans will be processed using the new method. Observe the cans at the end the summer. Count the number of cans that have bulged in each group. Analyze the data, and determine whether the cans processed using the new method were significantly more likely to bulge.
5. Answers may vary. Answers should show a knowledge of the scientific methods and of the case. The proposed results should be consistent with the experiment and the original hypothesis.

Section Quizzes

SECTION: ASKING ABOUT LIFE

1. B
2. B
3. D
4. C
5. B
6. D

SECTION: SCIENTIFIC METHODS

1. B
2. A
3. A
4. C
5. D

SECTION: SCIENTIFIC MODELS

1. B
2. A
3. C
4. C
5. A
6. C
7. B
8. A
9. C
10. D

SECTION: TOOLS, MEASUREMENT, AND SAFETY

1. E
2. B
3. A
4. D
5. C
6. D
7. B
8. B
9. B
10. A

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Chapter Test A

1. I
2. B
3. J
4. G
5. A
6. E
7. D
8. C
9. F
10. H
11. B
12. C
13. D
14. C
15. C
16. B
17. F
18. A
19. B
20. D
21. E
22. C
23. A
24. D

Chapter Test B

1. hypothesis
2. volume
3. compound light microscope
4. theory
5. technology
6. scientific methods
7. B
8. C
9. D
10. C
11. B
12. Sample answer: When a hypothesis is rejected, scientists learn that the hypothesis is not the correct explanation for the problem they studied. They may then seek a different explanation, re-examine data, or ask new questions.
13. Sample answer: The purpose of the control group is to isolate one factor in an experiment so that the factor's effect can be seen. The factor being tested is left unchanged in the control group, but is changed in the variable group. This factor can influence the outcome of the experiment.
14. Sample answer: The advantages include: they help explain how something works or describe how something is structured; they can represent things that are too small or too large to work with; and they can represent things that no longer exist. The disadvantage is that they are never exactly like the real thing.
15. Sample answer: If classical music improves a person's ability to study, then on average, people who listen to such music will score higher on a given test than people who study in silence or study while listening to another type of music.
16. Sample answer: Pour exactly 1 mL of a liquid into a container that has a length of 1 cm, a width of 1 cm, and a height of 1 cm. The liquid should exactly fill the container.
17. Sample answer: Plant A produces the most flowers with 16 hours of light, and Plant B produces the most flowers with 10 hours of light. Different kinds of plants need different day lengths in order to produce flowers.
18. a. observations; b. hypothesis; c. technology; d. new questions; e. controlled experiments

Chapter Test C

1. B
2. B
3. B
4. C
5. A
6. C
7. C
8. A
9. D
10. B
11. A
12. C
13. D
14. B
15. A
16. C
17. D
18. model
19. scientific methods
20. controlled experiment
21. life science

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Standardized Test Preparation

READING

Passage 1

1. C
2. F
3. C

Passage 2

1. B
2. I

INTERPRETING GRAPHICS

1. D
2. G
3. A

MATH

1. C
2. F
3. B
4. I
5. B

Vocabulary Activity

1. technology
2. theory
3. area
4. volume
5. controlled experiment
6. life science
7. law
8. variable
9. scientific methods
10. temperature
11. mass
12. compound light microscope
13. hypothesis
14. electron microscope
15. model
16. phrase: the study of life science

SciLinks Activity

Answers may vary. Students should list 7 physical quantities, providing information on the quantities being measured as well as the name of the unit, its symbol, and a description.

Performance-Based Assessment

FORM A HYPOTHESIS

1. Sample answer: Older pennies are heavier because they are made of denser metals.

ANALYZE THE RESULTS

7. Sample answer: The volume of pennies has not changed significantly over thepast 30 years.
8. Newer pennies are less dense than older pennies
9. Sample answer: Pennies may be made of less dense metals than they used to be.

Does It All Add Up?

MAKE OBSERVATIONS

1. All answers to this lab are based on student observations and may vary.

FORM A HYPOTHESIS

3. All answers to this lab are based on student observations and may vary.
4. All answers to this lab are based on student observations and may vary.

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ANALYZE THE RESULTS

1. Students may make some unusual predictions. You may want to lead them into questions about volume. Encourage them to think of many ways to observe and characterize the two liquids. Avoid giving away the explanation too quickly.

DRAW CONCLUSIONS

2. Check that students are clear about whether or not their hypothesis was supported and in what ways their observations supported or disproved their hypothesis.
3. Incorrect predictions can lead to new questions and a new understanding of the way things work.

Measure Up!

SAFETY

1. Check that students record their observations accurately.
2. Check that student posters portray correct procedures.

Graphing Data

ANALYZE THE RESULTS

1. Answers may vary according to several factors, including altitude.
2. Answers may vary.

DRAW CONCLUSIONS

3. A list or a chart is organized information, and sometimes it is necessary to put collected data into one of these forms before graphing. Because a graph is like a picture, it can often help scientists to see what is happening when numbers alone would be confusing. A graph can show a trend or a pattern that may not be readily discernible in a list or chart.

A Window to a Hidden World

ANALYZE THE RESULTS

1. Answers may vary. Students should see a slightly larger image. It will be blurred, especially around the edges. The image may be distorted.

DRAW CONCLUSIONS

2. Some students may think their model could be improved by eliminating the wrinkles over the hole.

APPLYING YOUR DATA

Robert Hooke (1635–1703), one of the world's great inventors, is famous for his discovery of "cells" in cork tissue as seen through his improved microscope. Hooke was also a keen observer with an interest in fossils and geology. Zacharias Janssen, a Dutch lens grinder, mounted two lenses in a tube to produce the first compound microscope in 1590.

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