Chapter 1 Study Guide

Study Tip

Divide the class into pairs, and have each pair make a list of review questions that incorporates all the Key Concepts and Vocabulary terms from the four sections. Ask that they answer the questions on separate sheets of paper. Then, have pairs of students exchange lists of questions. Once students have had time to answer the questions, have the same pairs exchange answer keys.

Thinking Visually

1. Hypotheses
2. Observations
3. Field studies

Chapter 1 Assessment

Reviewing Content

1. c	**5.** a	**9.** d
2. a	**6.** b	**10.** a
3. b	**7.** b	
4. c	**8.** d	

Understanding Concepts

11. The goal of science is to investigate and understand the natural world, to explain events in the natural world, and to use those explanations to make useful predictions.

12. An observation uses senses to gather information; an inference is a logical interpretation based on prior knowledge and experience.

13. Hypotheses help scientists by suggesting testable explanations for a set of observations. Hypotheses are starting points for discovering new information.

14. A hypothesis may arise from prior knowledge; logical inferences; or informed, creative imagination.

15. Scientists should test only one variable at a time so that only one observable factor affects the observed results of the experiment.

Chapter 1 Study Guide

1–1 What Is Science?

Key Concept

- The goal of science is to investigate and understand the natural world, to explain events in the natural world, and to use those explanations to make useful predictions.

Vocabulary

science, p. 3 • observation, p. 4 • data, p. 4
inference, p. 4 • hypothesis, p. 5

1–2 How Scientists Work

Key Concepts

- Whenever possible, a hypothesis should be tested by an experiment in which only one variable is changed at a time. All other variables should be kept unchanged, or controlled.
- In science, the word *theory* applies to a well-tested explanation that unifies a broad range of observations.

Vocabulary

spontaneous generation, p. 8
controlled experiment, p. 9
manipulated variable, p. 9
responding variable, p. 9 • theory, p. 14

1–3 Studying Life

Key Concepts

- Living things share characteristics including cellular organization, reproduction, a universal genetic code, growth and development, use of materials and energy, response to their environment, maintaining an internal stability, and, as a group, change over time.
- Some of the levels at which life can be studied include molecules, cells, organisms, populations of a single kind of organism, communities of populations living in the same area, and the biosphere. At all these levels, smaller living systems are found within larger systems.

Vocabulary

biology, p. 16 • cell, p. 17
sexual reproduction, p. 17
asexual reproduction, p. 17
metabolism, p. 18 • stimulus, p. 19
homeostasis, p. 19
evolution, p. 20

1–4 Tools and Procedures

Key Concepts

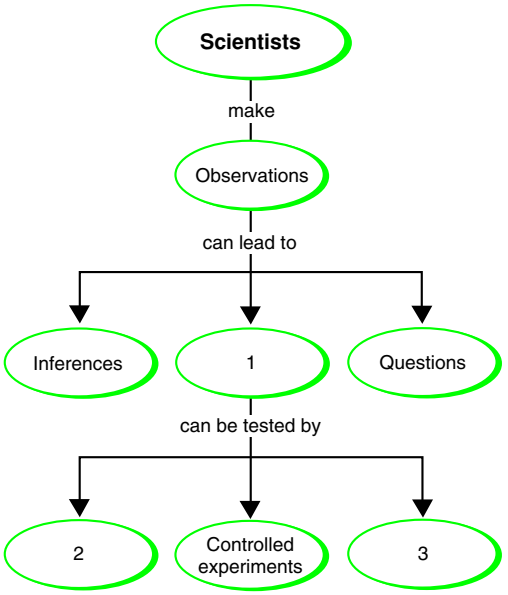
- Most scientists use the metric system when collecting data and performing experiments.
- Light microscopes produce magnified images by focusing visible light rays. Electron microscopes produce magnified images by focusing beams of electrons.

Vocabulary

metric system, p. 24
microscope, p. 25
compound light microscope, p. 26
electron microscope, p. 26
cell culture, p. 27
cell fractionation, p. 27

Thinking Visually

Make a concept map that shows some ways scientists think and work. You can start with the partial concept map shown below or create your own. Recalling how scientists investigated spontaneous generation may help you identify important ideas to include.



CHAPTER RESOURCES

Print:

- ***Teaching Resources,*** Chapter Vocabulary Review, Graphic Organizer
- ***Chapter Tests: Levels A and B,*** Chapter 1 Test

Technology:

- ***iText,*** Chapter 1 Assessment
- ***Computer Test Bank,*** Chapter 1 Test

Chapter 1 Assessment

Interactive textbook with assessment at PHSchool.com

Reviewing Content

Choose the letter that best answers the question or completes the statement.

1. Which of the following statements about the image shown below is NOT an observation?
   a. The insect has three legs on the left side.
   b. The insect has a pattern on its back.
   c. The insect's pattern shows that it is poisonous.
   d. The insect is green, white, and black.

2. The statement "the worm is 2 cm long" is a(an)
   a. quantitative observation.
   b. qualitative observation.
   c. inference.
   d. hypothesis.

3. An inference is
   a. the same as an observation.
   b. a logical interpretation of an observation.
   c. a statement involving numbers.
   d. a way to avoid bias.

4. To be useful in science, a hypothesis must be
   a. measurable. **c.** testable.
   b. observable. **d.** correct.

5. The term *spontaneous generation* means that
   a. living things can arise from nonliving matter.
   b. living things arise from other living things.
   c. a maggot is part of the life cycle of a fly.
   d. living things evolve over time.

6. Which of the following statements about a controlled experiment is true?
   a. All the variables must be kept the same.
   b. Only one variable is tested at a time.
   c. Scientists always use controlled experiments.
   d. Controlled experiments cannot be performed on living things.

7. A scientific theory is
   a. another word for hypothesis.
   b. a well-tested explanation that unifies a broad range of observations.
   c. the same as the conclusion of an experiment.
   d. the first step in a controlled experiment.

8. The process in which two cells from different parents unite to produce the first cell of a new organism is called
   a. homeostasis. **c.** asexual reproduction.
   b. development. **d.** sexual reproduction.

9. The process by which organisms keep their internal conditions relatively stable is called
   a. metabolism. **c.** evolution.
   b. a genome. **d.** homeostasis.

10. An instrument that produces images by focusing light rays is called a(an)
    a. light microscope.
    b. transmission electron microscope.
    c. scanning electron microscope.
    d. electronic balance.

Understanding Concepts

11. What is the goal of science?

12. How does an observation about an object differ from an inference about that object?

13. How does a hypothesis help scientists understand the natural world?

14. Describe three possible ways in which a hypothesis may arise.

15. Why is it advantageous for scientists to test only one variable at a time during an experiment?

16. Distinguish between a variable and a control.

17. What steps are involved in making a valid conclusion?

18. What equipment did Redi use in his experiment? Why was the gauze important?

19. What question was Spallanzani's experiment designed to answer?

20. What must happen for a hypothesis to become a theory?

21. How are unicellular and multicellular organisms alike? How are they different?

22. Give an example of changes that occur during differentiation in a multicellular organism.

23. Distinguish between external and internal stimuli. Give an example of each.

24. How can a graph of data be more informative than a table of the same data?

25. What is a cell culture? How can a cell culture be useful to biologists?

HOMEWORK GUIDE

Section:	Questions:
Section 1–1	1–4, 11–14, 27
Section 1–2	5–7, 15–20, 29, 32, 33, 35
Section 1–3	8, 9, 21–23
Section 1–4	10, 24–27, 28, 30, 31, 34

Interactive Textbook

The iText provides an interactive version of the Student Edition and a self-test.

(Continued from page 30)

16. A variable is a factor in an experiment that can change. A control is a factor in an experiment that is kept unchanged.
17. Asking a question, forming a hypothesis, setting up a controlled experiment, and recording and analyzing results
18. Redi used jars, meat, and gauze. The gauze was important because he used it to cover some jars; the gauze was his manipulated variable.
19. Whether microorganisms would grow in gravy that was boiled and then left in covered containers
20. It must be well supported by observation and experimentation.
21. Unicellular and multicellular organisms are alike in that they all share eight characteristics of living things. They are different in that unicellular organisms are one-celled and multicellular organisms have more than one cell.
22. Example: During its life cycle, a fly goes through these stages: egg → larva → pupa → adult fly.
23. External stimuli come from the environment outside an organism, whereas internal stimuli come from within an organism. Hunger and thirst are internal stimuli. Sights and sounds are external stimuli.
24. A graph can make a pattern easier to recognize and understand.
25. A cell culture is a group of cells produced when a single cell is placed in a nutrient solution and allowed to reproduce. Scientists can use cell cultures to test cell responses under controlled conditions, to study interactions between cells, and to select specific cells for future study.

Critical Thinking

26. Check to be sure that students' measurements are in millimeters.

27. Because science is a process rather than unchanging knowledge

28. The magnification is greater with an electron microscope, but an electron microscope cannot be used to study organisms while they are alive. A light microscope produces magnified images by focusing a readily available source—visible light.

29. The strengths of the biogenesis theory include the fact that it is supported by numerous experiments and accounts for all known observations. At this time, there are no known weaknesses.

30. Student answers should reflect the idea that the number of organisms depends upon the lapsed time. Graph 1: As the time changed, the number of organisms increased. Graph 2: There was an increase in the number of individuals, then a decline. Graph 3: There were spikes in the population, followed by declines. The second spike was the most noticeable. Graph 4: The number of organisms remained constant.

31. Students' possible answers include: Graph 1 could be a chemical reaction in which product accumulates. Graph 2 could be an enzyme reaction in which heat is increased, affecting the rate of product formation, and then showing where the enzyme is deactivated by the diminishing heat and rate.

32. Check to be sure the experiment has one manipulated variable and a control. Sample experiment: Find two young animals of the same kind whose weight is approximately the same. Feed each animal a different food, and weigh the animals at intervals.

33. The other key variables may be responsible for the observed outcome of the experiment.

34. (1) Safety goggles; (2) Animal safety; (3) Breakage; (4) Electric shock; (5) Sharp object; (6) Heat-resistant gloves.

35. Check students' writing for an understanding of a scientific attitude.

Chapter 1 Assessment

Critical Thinking

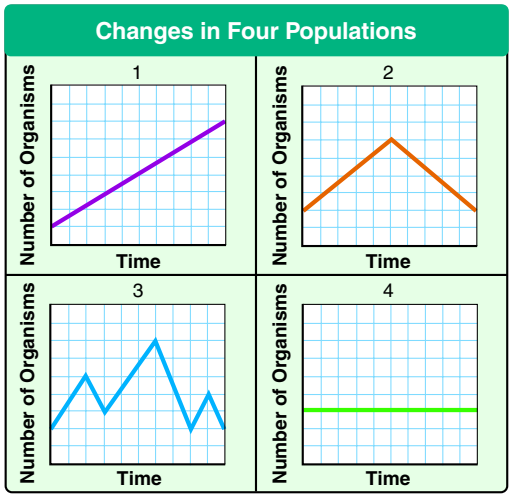
26. Measuring Use a ruler to find the precise length and width of this book in millimeters.

27. Evaluating Why is it misleading to describe science as a collection of facts?

28. Comparing and Contrasting What are some advantages and disadvantages of light microscopes and electron microscopes?

29. Evaluating Analyze and critique the theory of biogenesis. What are the strengths of the theory? Does it have any weaknesses?

30. Analyzing Data The following graphs show the sizes of four different populations over a period of time. Write a sentence summarizing what each graph shows.



31. Comparing and Contrasting Graphs of completely different events can have the same appearance. Select one of the graphs from question 30 and explain how the shape of the graph could apply to a different set of events.

32. Designing Experiments Suggest an experiment that would show whether one type of food was better than another at helping an animal to grow faster.

33. Controlling Variables Explain why you cannot draw a conclusion about the effect of one variable in an investigation when the other key variables are not controlled.

34. Interpreting Graphics Each of the following safety symbols might appear in a laboratory activity in this book. Describe what each symbol stands for. (*Hint:* Refer to Appendix B.)

35. Connecting Concepts Use the information in Section 1–2 to explain how having a scientific attitude might help you in everyday activities, for example, in trying to learn a new skill. Describe your ideas in your journal.

Writing in Science

Suppose you have a pet cat and want to determine which type of cat food it prefers. Write an explanation of how you might use scientific thinking, including making observations and inferences, to determine this. (*Hint:* To prepare to write, list the steps you might take, and then arrange them in order beginning with the first step.)

Performance-Based Assessment

Planning an Experiment Many people add fertilizers to house or garden plants. Make a hypothesis about whether you think these fertilizers really help plants grow. Next, design an experiment to test your hypothesis. Include in your plan what variable you will test and what variables you will control. Then, listen to other students' plans. Which plans would properly test their hypotheses?

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