MATCHING
In the space provided, write the letter of the description that best matches the term or phrase.

1. control group  a. a logical statement about what will happen in an experiment
2. prediction b. a verbal or graphical explanation for how a system works or how it is organized
3. physical model c. in an experiment, that which does not receive the experimental treatment
4. risk d. a three-dimensional model you can touch
5. conceptual model e. principles or standards considered to be important
6. value f. the probability of an unwanted outcome
7. experiment g. information gathered during an experiment
8. statistics h. procedure designed to test a hypothesis
9. data i. collection and classification of data

MULTIPLE CHOICE
Choose the best response. Write the letter of that choice in the space provided.

10. When it is not possible to conduct an experiment, scientists test their predictions by
   a. examining correlations. c. testing for one variable.
   b. using a control. d. remaining skeptical.

11. An essential feature of every good experiment is that it should
   a. use a control. c. graph data.
   b. test a single variable. d. Both (a) and (b)

12. The experimental method includes which of the following steps?
   a. remaining skeptical, organizing data, and analyzing data
   b. drawing conclusions, being open to new ideas, and communicating results
   c. observing, hypothesizing, predicting, experimenting, and communicating results
   d. being curious, imagining, being able to see patterns, observing, and predicting

13. What is not a description of a good hypothesis?
   a. It makes logical sense.
   b. It is a testable explanation of an observation.
   c. It follows from what you already know about a situation.
   d. It is a guess based on previous experiments.
14. One of the key habits of mind of scientists is ________, which allows scientists to expand the boundaries of what we know.
   a. intellectual honesty
   b. imagination
   c. replication
   d. correlation

15. A road map is an example of a
   a. graphical model.
   b. mathematical model.
   c. conceptual model.
   d. physical model.

16. Statistics are not used by scientists to
   a. compare data.
   b. analyze data.
   c. gather data.
   d. All of the above

17. In a scientific investigation, the size of the sample population should be large enough to
   a. reflect the probability of an unwanted outcome.
   b. give an accurate estimate of the whole population.
   c. closely resemble the system they represent.
   d. All of the above

18. If you consider what will add to our understanding of the natural world in making an environmental decision, you are examining a(n) ________ value.
   a. ethical/moral
   b. aesthetic
   c. environmental
   d. scientific

19. What is the first step in an environmental decision-making model?
   a. Explore the consequences of each option.
   b. Consider which values apply to the issue.
   c. Make a decision.
   d. Gather information.

20. When you examine a scientific value in making an environmental decision, you
   a. consider what is right or wrong.
   b. consider what will maintain human health.
   c. use your understanding of the natural world.
   d. think about what will promote learning.

21. Which of the following is a possible short-term consequence of creating a nature preserve?
   a. decrease in habitat destruction
   b. an increase in property values near the preserve
   c. a restriction of recreational activities on private land within the preserve by state officials
   d. all of the above
ANALOGIES

In the space provided, write the letter of the pair of terms or phrases that best completes the analogy shown. An analogy is a relationship between two pairs of words or phrases written as a : b :: c : d. The symbol : is read “is to,” and the symbol :: is read “as.”

_____ 1. gathering information : decision-making model ::
   a. variable : experimental model
   b. experimental model : correlations
   c. observing : experimental model
   d. map : graphical model

_____ 2. mathematical formula : mathematical model ::
   a. mass = density/volume : equation
   b. flow chart : conceptual model
   c. risk : probability
   d. statistics : probability

_____ 3. curiosity : imagination ::
   a. sample size : number of objects
   b. ability : inability
   c. creativity : art
   d. creativity : intellectual honesty

_____ 4. values : principles ::
   a. models : representations
   b. noise : airplanes
   c. silence : noise
   d. airplanes : models

_____ 5. positive short-term consequence : slowing of habitat destruction ::
   a. positive long-term consequence : population increase
   b. geology : environmental science
   c. slowing of habitat destruction : no consequence
   d. short-term consequence : negative short-term consequence

_____ 6. good scientists : scientific habits of mind ::
   a. hypothesis : prediction
   b. bad experiments : one variable and a control
   c. good experiments : one variable and a control
   d. good decisions : models

_____ 7. mean : average ::
   a. distribution : normal
   b. hypothesis : guess
   c. data : graph
   d. sample : group of individuals

_____ 8. experimenting : correlating ::
   a. directly counting : estimating
   b. reflecting : mirror
   c. observing : drawing conclusions
   d. guessing : estimating
INTERPRETING OBSERVATIONS

Read the following paragraph, and answer the questions below.

Students noticed that, since the time that grass began to grow on a barren hillside, less soil and water seemed to wash down the slope into the school yard during a rainstorm. The students thought that the grass helped hold the soil in place on the slope. The students predicted that more soil would wash down a slope without grass than a slope covered with grass. To find out if they were correct, the students conducted an experiment with three identical rectangular pans of soil. In pan 1, they planted grass seed and allowed it to grow to several centimeters tall. The students filled pan 2 with only soil. Then they took pan 1 and pan 2, and propped up at one end of each pan 15 cm high to create a slope. Pan 3, also filled with only soil, was propped up at one end 5 cm at one end to create a slope. Students poured equal amounts of water on the raised end of each pan and the students recorded their observations.

9. What hypothesis did the students test in their experiment?

10. What prediction did the students use to test their hypothesis?

11. Which steps in the experimental method are missing from the description above?

12. Did the students conduct a good experiment? Explain your answer.
AGREED OR DISAGREE
Agree or disagree with the following statements, and support your answer.

13. You encounter or use statistics and probability often in your day-to-day life.

__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________

14. The positive long-term consequences of car pooling or taking a bus to school outweigh the negative short-term consequences of driving yourself to school.

__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________

15. In order to become a good scientist, a scientist should believe everything he or she is told by other scientists and should disregard the new ideas of nonscientists.

__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
Critical Thinking continued

REFINING CONCEPTS
The statements below challenge you to refine your understanding of concepts covered in the chapter. Think carefully, and answer the questions that follow.

16. What impact might the increasing worldwide use of the Internet have on the final step of the experimental method?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

17. Describe two ways in which you can benefit from applying scientific habits of mind in your everyday life.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

18. When lawmakers consider legislation concerning environmental disasters, how might they be able to use their knowledge of “risk?”

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Section: Scientific Methods

MATCHING
In the space provided, write the letter of the description that best matches the term or phrase.

_____ 1. observation a. logical statement about what will happen
_____ 2. hypothesis b. information gathered in an experiment
_____ 3. prediction c. testable explanation for an observation
_____ 4. experiment d. procedure used to test a hypothesis
_____ 5. data e. information gathered by using the senses

MULTIPLE CHOICE
In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.

_____ 6. One important scientific habit of mind is the ability to conceive of new ideas, called
   a. intellectual honesty. c. imagination.
   b. curiosity. d. skepticism.

_____ 7. Which of the following is not a habit of mind of a good scientist?
   a. skepticism
   b. creativity
   c. intellectual predictability
   d. openness to new ideas

_____ 8. By examining __________ , scientists can test predictions for situations in which it is impossible or unethical to use experiments.
   a. correlations c. control groups
   b. observations d. variables

_____ 9. In an experiment, the factor of interest is called the
   a. control group. c. hypothesis.
   b. experimental group. d. variable.

_____ 10. The group that does not receive the experimental treatment in an experiment is the
   a. control group. c. data.
   b. experimental group. d. variable.
Section: Statistics and Models

MATCHING

In the space provided, write the letter of the description that best matches the term or phrase.

_____ 1. physical model  
_____ 2. graphical model  
_____ 3. mathematical model  
_____ 4. conceptual model

MULTIPLE CHOICE

Choose the best response. Write the letter of that choice in the space provided.

_____ 5. Scientists use statistics to
   a. graph data.  
   b. analyze data.  
   c. communicate ideas to each other.  
   d. All of the above

_____ 6. To get an accurate result, a sample size must be
   a. small enough to give an accurate estimate for two or more populations.  
   b. large enough to give an accurate estimate for a whole population.  
   c. equal to the mean.  
   d. greater than the mean.

_____ 7. When studying a system, a conceptual model can help scientists understand
   a. what components a system contains.  
   b. how the system components affect each other.  
   c. Both (a) and (b)  
   d. None of the above

_____ 8. Which model is particularly useful in scientific cases with many variables?
   a. physical  
   b. graphical  
   c. conceptual  
   d. mathematical

_____ 9. Risk is
   a. the collection of numerical data.  
   b. the probability that something wanted will happen.  
   c. the probability that something unwanted will happen.  
   d. a group of similar things of interest to a scientist.

_____ 10. The classification and collection of data that are in the form of numbers is called
     a. statistics.  
     b. probability.  
     c. distribution.  
     d. mean.
Section: Making Informed Decisions

MATCHING

Match each value with its definition. Write the letter corresponding to the correct answer in the space provided.

_____  1. social/cultural value  a. the protection of natural resources  
_____  2. educational value  b. human leisure activities  
_____  3. environmental value  c. what is right or wrong  
_____  4. recreational value  d. the maintenance of human communities, their values, and their traditions  
_____  5. ethical/moral value  e. the accumulation, sharing of knowledge

MULTIPLE CHOICE

Write the letter of the description that best matches the term or phrase.

_____  6. When making an environmental decision, listing positive and negative long- and short-term consequences can help you to
   a. predict risks involved.  
   b. make observations.  
   c. weigh your values.  
   d. collect data for a graph.

_____  7. Principles or standards we consider important are known as
   a. values.  
   b. models.  
   c. morals.  
   d. data.

_____  8. The decision-making model
   a. provides a systematic process.  
   b. is a conceptual model.  
   c. helps you make decisions.  
   d. All of the above

_____  9. Which environmental decision-making model is in the correct order?
   b. Gather information. Consider values. Explore consequences. Make a decision.  

_____  10. Which step in the environmental decision-making model should include reading newspapers and listening to well-informed people on all sides of an issue?
   a. evaluating all the information  
   b. gathering information  
   c. considering values  
   d. exploring consequences