

## Chapter 1 – Describing the Physical Universe

### Section Review 1.1

1. What are the main activities involved in studying physics?
2. You are doing an experiment to find out if expensive batteries will run your radio longer than cheaper batteries. List a question, a hypothesis, the independent and dependent variables, and the control variable(s) for this experiment. Then, write a step-by-step procedure to test your hypothesis.
3. Compare and contrast natural law, hypothesis, and scientific theory.

### Section Review 1.2

1. List two common systems of units and give examples of distance measurements for each.
  - a.
  - b.
2. What are significant digits, and how are they used when working with measured quantities?
3. Study Figure 1.10. Explain why each target-and-arrow examples was chosen for each of the labeled structures.

### Section Review 1.3

1. List three commonly-used units for speed.

- a.
- b.
- c.

2. State the steps used to solve physics problems.

- a.
- b.
- c.
- d.

3. Calculate the average speed of a car that drives 140 kilometers in 2 hours.

4. How long will it take if you swim 100 meters if you swim at a speed of 1.25 m/s?

5. How far will a dog travel if he runs for one minute at a constant speed of 5 m/s?

## Chapter 1 Review

### Understanding Vocabulary

Select the correct term in the term bank on page 24 to complete the sentences.

1. The measure of the inertia of a body is measured as \_\_\_\_\_.
2. Newton's description of the force needed to change the motion of an object is an example of a(n) \_\_\_\_\_.
3. In a system designed to measure the acceleration of a car on a ramp, the angle of the ramp would be treated as a(n) \_\_\_\_\_.

4. Units of inches, feet, centimeters, and meters may be used to measure \_\_\_\_\_.
5. An archer aiming at the center of a target hits the target with four arrows. If the arrows are 20 cm from the center but within 2 cm of each other, the archer's shooting would be considered \_\_\_\_\_ but not \_\_\_\_\_.
6. To calculate speed, \_\_\_\_\_ is divided by \_\_\_\_\_.

### **Reviewing Concepts**

#### ***Section 1.1***

1. List and define the two categories we use to classify everything in the universe.
  - a.
  - b.
2. How have physicists come to understand the natural laws?
3. Define the term *matter*.
4. Explain why light is not considered to be matter.
5. Define the term *system* as it relates to experiments.
6. When designing an experiment, how do you determine what to include in the system?
7. List the steps of the scientific method.

8. Explain the difference between a hypothesis and a theory.
  
9. Explain the difference between a control variable and an experimental variable.
  
10. You wish to do an experiment to determine how a ball's radius affects how fast it rolls down a ramp. List the independent and dependent variables in this experiment.
  
11. What is the goal of an experiment?
  
12. What are the characteristics of scientific evidence?
  
13. Define the term *model* and give three examples.
  - a.
  - b.
  - c.

***Section 1.2***

14. Why are units important when measuring quantities?
  
  
  
  
  
  
  
  
  
15. What is the current name given to the metric system? Name two reasons for using this system in place of the English System.
  - a.
  - b.

16. Define the word *time* as it is used in physics calculations.

17. On which axis of a graph is time generally placed?

18. What are the meanings of the following terms, as applied to science measurements?

*accuracy* –

*precision* –

*resolution* –

19. How is the correct number of significant figures determined in a science problem?

### ***Section 1.3***

20. Write the form of the speed equation that you would use in each of the following scenarios. Let  $v$  = speed,  $t$  = time, and  $d$  = distance.

a. You know distance and speed and want to find the time.

b. You know time and distance and want to find the speed.

c. You know speed and time and want to find the distance.

21. What is the speed of an object that is standing still?

22. Your friend rides her bicycle across town at a constant speed. Describe how you could determine her speed.

23. Fill in the missing information in the table showing common units for speed below:

Distance	Time	Speed	Abbreviation
meters	seconds		
			km/ h
		centimeters per second	

24. Summarize the four steps for solving physics problems as described in the text.

- a.
- b.
- c.
- d.

### Solving Problems

#### *Section 1.1*

1. You want to find out whether the birds near your school prefer thistle seed or sunflower seed. You have a bag of thistle seed, a bag of sunflower seed, and two bird feeders. Describe the experiment you would do to see which type of seeds birds prefer. Write down our question, your hypothesis, and the procedure you would follow when doing your experiment.

2. You are doing an experiment to determine whether a dropped ball's mass affects the rate at which it falls. Describe the system you are studying. Write down your question, your hypothesis, and the procedure you would follow when doing your experiment.

**Section 1.2**

3. Order the following lengths from shortest to longest.

- a. 400 mm    b. 22 km    c. 170 m    d. 3.3 cm

4. Convert:

- a. 3 km = \_\_\_\_\_ m  
b. 1.5 m = \_\_\_\_\_ cm  
c. 110 cm = \_\_\_\_\_ m  
d. 2.5 cm = \_\_\_\_\_ mm

5. Convert:

- a. 3 min = \_\_\_\_\_ s  
b. 200 s = \_\_\_\_\_ min, \_\_\_\_\_ s.  
c. 2.00 days = \_\_\_\_\_ min  
d. 1,000 min = \_\_\_\_\_ hr

6. Determine your age in each of the following units.

- a. months  
b. days  
c. hours  
d. seconds

7. Luis rides his new bike while his brother records his position and time. They create the data table shown below.

Position (m)	0.00	105	270	400	540	600
Time (s)	0.00	30	60	90	120	150

- a. Name the dependent variable and the independent variable.  
b. On which axis would each variable be placed on a graph?

### **Section 1.3**

8. Use the data from Luis's bike ride in question 7 to answer the following:

- a. What was Luis's speed (in meters per second) for the entire ride from 0 to 150 s?
- b. What was Luis's speed (in meters per second) between 60 and 90 s?
- c. During which 30 s interval did Luis have the greatest speed?

Calculate his speed during this interval.

9. A bicyclist, traveling at 22 mph, rides a total of 44 mi. How much time (in hours) did it take?

10. A mouse travels in a straight line at a steady speed of 2 m/s for 10 seconds. How far (in meters) did the mouse travel?

11. The gray wolf is a threatened animal that is native to the United States. A wildlife biologist observes an adult wolf traveling 250 m in 100 s. What is the average speed (in meters per second) of the gray wolf over this interval?

12. It takes Brooke 10 min to walk 1 mi. What is her speed in miles per second?

13. If it takes 500 s for the light from the Sun to reach Earth, what is the distance to the Sun in meters? (*Note:* The speed of light is 300,000,000 m/s).

### **Test Practice**

#### **Section 1.1**

1. Scientific evidence must be

- a. objective    b. subjective    c. repeatable    d. both objective and repeatable

2. \_\_\_\_\_ is a measure of a system's ability to change or create change in other systems.

- a. Mmass                      b. A natural law                      c. Energy                      d. An experiment



3. A factor that affects the behavior of a system is known as a

- a. hypothesis                      b. natural law                      c. theory                      d. variable

**Section 1.2**

4. A rectangle is measured to be 14.2 cm long by 6.8 cm wide. The area of the rectangle should be reported as

- a. 96.56 cm<sup>2</sup>                      b. 96.5 cm<sup>2</sup>                      c. 96.6 cm<sup>2</sup>                      d. 96 cm<sup>2</sup>

5. The diagram on page 27 represents a centimeter scale placed next to a rectangle. The dimension of the rectangle adjacent to the centimeter scale would be *most* accurately given as

- a. 3.40 cm                      b. 3.48 cm                      c. 2.48 cm                      d. 2.5 cm

The diagram on page 27 represents a portion of a centimeter scale. Answer the following two questions about this diagram.

6. The greatest number of significant figures that should be reported when measuring with this scale is

- a. 1.                      b. 3.                      c. 5.                      d. 7.

7. The highest degree of resolution possible using this centimeter scale is

- a. 1.0 mm                      b. 0.5 mm                      c. 1.0 cm                      d. 0.5 cm

8. The number of seconds represented by an elapsed time of 3 h, 42 min, 3 s is

- a. 13,323 s                      b. 2,703 s                      c. 225 s                      d. 3 s

9. A 12-inch ruler compares most closely in length to

- a. 1.0 m                      b. 12 cm                      c. 300 mm                      d. 5 μm

10. On a graph, the \_\_\_\_\_ variable is normally plotted on the x-axis.

- a. control                      b. dependent                      c. experimental                      d. independent

**Section 1.3**

11. Traveling at an average speed of 55 mph, in 14 hr a driver will travel

- a. 770 mi                      b. 393 mi                      c. 69 mi                      d. 55 mi

**Applying Your Knowledge** – skip this section