Date _____ Period _____ Name _____

CHAPTER 1

Study Guide

A Physics Toolkit

Vocabulary Review

Write the term that correctly completes the statement. Use each term once.

accuracy	**independent variable**	**measurement**	**significant digits**
dependent variable	**inverse relationship**	**physics**	**scientific law**
dimensional analysis	**line of best fit**	**precision**	**scientific method**
hypothesis	**linear relationship**	**quadratic relationship**	**scientific theory**

1. _____ The study of matter and energy is _____.

2. _____ The _____ is a systematic way to observe, experiment, and analyze the world.

3. _____ The valid digits in a measurement are called the _____.

4. _____ A(n) _____ describes the relationship between two variables in which an increase in one variable results in the decrease of another variable.

5. _____ On a graph, the _____ is the line drawn as close as possible to all of the data points.

6. _____ A(n) _____ is an educated guess about how variables are related.

7. _____ The _____ is the factor that is changed or manipulated during an experiment.

8. _____ A(n) _____ is description of a rule of nature.

9. _____ A(n) _____ is a comparison between an unknown quantity and a standard.

10. _____ A straight line on a graph shows that there is a(n) _____ between the two variables.

11. _____ A(n) _____ is an explanation supported by experimental results.

12. _____ _____ describes how well the results of a measurement agree with the real value.

13. _____ The _____ is the factor that depends on the independent variable.

14. _____ The method of treating units as algebraic quantities, which can be cancelled, is called _____.

15. _____ A(n) _____ exists when one variable depends on the square of another.

16. _____ The degree of exactness of a measurement is called _____.

Section 1.1 Mathematics and Physics

In your textbook, read about mathematics in physics on pages 4–5.
Write the term that correctly completes the statement. Use each term once.

dimensional analysis	**experiments**	**theories**
equations	**graphs**	**units**
experimental data	**results**	

Physicists do (**1**) _____, make observations, and collect (**2**) _____. They predict the (**3**) _____ using different models. They create (**4**) _____ to describe their observations. Due to the mathematical nature of their work, physicists can enter numbers into (**5**) _____ to model observations and make predictions. The numerical values in an equation are also described by (**6**) _____, such as amperes, ohms, and volts. (**7**) _____ is the method of treating the units as algebraic quantities, which can be cancelled. Varying numerical results from equations can be plotted as (**8**) _____.

In your textbook, read about SI units on pages 5–6.
For each term on the left, write the letter of the matching item on the right.

_____ **9.** base quantity of temperature

_____ **10.** base quantity of electric current

_____ **11.** base quantity of length

_____ **12.** base quantity of time

_____ **13.** base amount of a substance

_____ **14.** pico

_____ **15.** centi

_____ **16.** micro

_____ **17.** mega

a. meter
b. 10^{-2}
c. kelvin
d. 10^{-12}
e. ampere
f. second
g. 10^{6}
h. mole
i. 10^{-6}

In your textbook, read about significant digits on page 7.
For each of the statements below, write* true *or rewrite the italicized part to make the statement true.

18. _____ When you perform any arithmetic operation and round off the last digit, this is the *most* precise part of the measurement.

19. _____ The figure 0.0730 has *two* significant digits.

20. _____ Answers derived with a calculator should be written *exactly as they appear on the calculator*.

In your textbook, read about scientific methods on pages 8–10.
Number the following steps in the order in which scientists study problems.

_____ **21.** Draw a conclusion.

_____ **22.** Compare experimentation with careful measurements and analyses of results.

_____ **23.** Test deductions to determine if they are valid.

Indicate which step in the scientific method best describes the statements in questions 24–29. Explain your answers. Use complete sentences.

24. A basketball is rolling on the ground. It continues to move even though no one is pushing it.

25. The velocity of the rolling basketball is 0.5 m/s.

26. In an isolated system, momentum does not change. For example, when a bowling ball hits a rolling basketball, the bowling ball slows down and the basketball speeds up. The increase in momentum of the basketball equals the decrease in momentum of the bowling ball.

27. There are two tracks that you can roll the basketball on. One track is very steep and the other is nearly flat. You guess that the basketball will travel faster down the steep track.

28. After recording the speeds of a basketball rolling down a steep track and on a flat track, you repeat the experiment, timing the ball a second time.

29. You observe multiple collisions between a basketball and a bowling ball and record data on their post collision velocities and directions. You explain your idea that since the bowling ball has a greater mass and is moving at greater velocity, it can always change the direction of the basketball that has a smaller mass and is moving at a slower velocity.

_____

_____

Section 1.2 Measurement

In your textbook, read about measurement on pages 11–14.

Circle the letter of the choice that best completes the statement.

1. The apparent shift in position of an object when it is viewed from various angles is called _____.

a. parallax **c.** calibration

b. margin of error **d.** accuracy

2. A device with very small divisions on its scale can measure with _____.

a. scientific notation **c.** precision

b. agreement **d.** fundamental units

3. An atomic mass unit is measured at 1.660×10^{-27} kg, a number that has _____ significant digits.

a. 1 **c.** 3

b. 2 **d.** 4

4. The NIST-Fl Cesium Fountain clock in Colorado is our standard for _____.

a. significant digits **c.** measuring instruments

b. accuracy **d.** calculating errors

5. A comparison between an unknown quantity and a standard is referred to as a _____.

a. margin of error **c.** measurement

b. consistency **d.** variables

6. _____ is a technique used to assure the accuracy of a measuring instrument.

a. Two-point calibration **c.** Analysis

b. Precision **d.** Dimension

7. The degree of possible error in a measurement is called its _____.

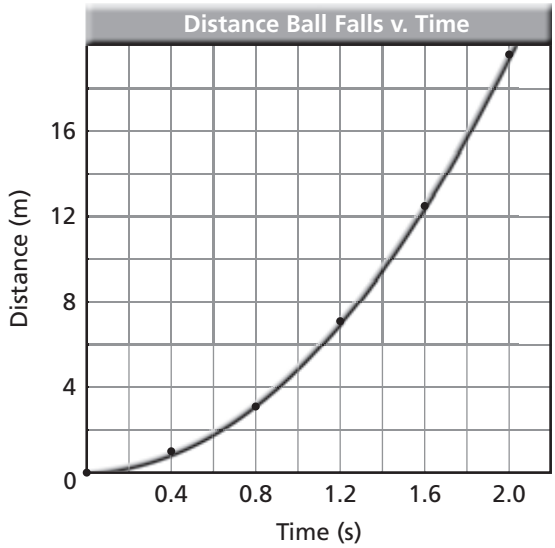
a. fundamental unit **c.** precision balance

b. mechanical quantity **d.** margin of uncertainty

Section 1.3 Graphing Data

In your textbook, read about nonlinear relationships on pages 17–18.

Refer to the graph to answer questions 1–7.



1. What sort of relationship is shown in this graph?

_____

2. Which variable is the independent variable? Which is the dependent variable?

_____

3. Is the slope of this graph positive or negative?

_____

4. What are the units of the slope?

_____

5. Explain why the slope at 2.0 s is greater than the slope at 1.0 s.

_____

_____

6. About how far does the ball fall in 1.8 s?

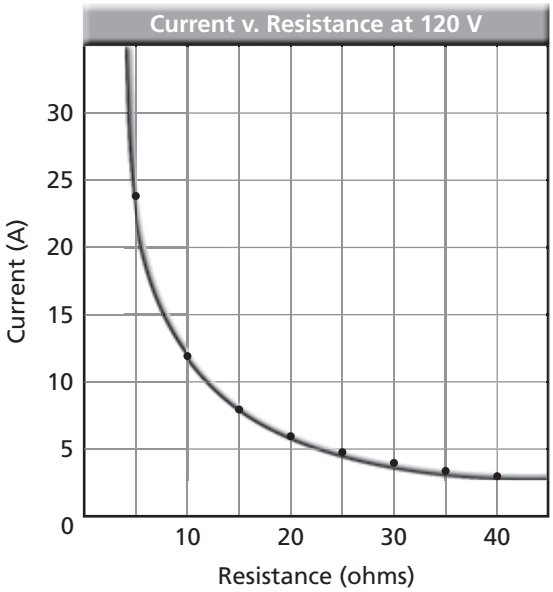
_____

7. The equation of the graph is $d = 5t^2$. How far would the ball fall in 2.4 s?

_____

_____

Refer to the graph to answer questions 8–12.



8. What sort of relationship is shown in this graph?

_____

9. Is the slope of this graph positive or negative?

_____

10. What are the units of the slope?

_____

11. What is the approximate current when the resistance is 25 ohms?

_____

12. Write an equation for this graph. (Hint: The equation takes the form $xy = a$, where x is resistance and y is current.)

_____

Read about linear and nonlinear relationships in your textbook on pages 16–18.
For each description on the left, write the letter of the matching term on the right.

_____ **13.**	the equation of a linear relationship	**a.** hyperbola
_____ **14.**	the shape of a graph of a linear relationship	**b.** parabola
_____ **15.**	the equation of an inverse relationship	**c.** straight line
_____ **16.**	the shape of the graph of an inverse relationship	**d.** $y = mx + b$
_____ **17.**	the equation of a quadratic relationship	**e.** $y = ax^2 + bx^2 + c$
_____ **18.**	the shape of the graph of a quadratic relationship	**f.** $y = \frac{a}{x}$