Name: _____ **Class:** _____ **Date:** _____ **ID: A**

Physics Unit 1 Exam Review

Modified True/False
Indicate whether the statement is true or false. If false, change the identified word or phrase to make the statement true.

____ 1. *Matter* is exchanged any time something gets hotter, colder, faster, slower, or changes in any other observable way. _____

____ 2. *Control* variables are those that are changed in an experiment to test some aspect of a physical system. _____

____ 3. Generally, as more energy is added to a system it becomes *less* stable. _____

____ 4. The distance an object travels may be calculated by *dividing* the speed of an object by the time of travel. _____

____ 5. *Force* is the ability to change motion. _____

____ 6. Newton's *second* law is often called the law of inertia. _____

____ 7. The acceleration of an object is equal to the force *multiplied* by the mass. _____

____ 8. The rate of change of the *distance* of an object is called its acceleration. _____

____ 9. The *area under the line* of a speed versus time graph represents the distance traveled by a moving object. _____

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 10. All of these are very important parts of studying physics EXCEPT:
a. describing the organization of the universe.
b. understanding natural laws.
c. memorizing complicated explanations.
d. deducing and applying natural laws.

____ 11. System variables can be observed and measured directly in a ____ scale.
a. time
b. microscopic
c. macroscopic
d. mass

____ 12. A carefully designed test done under controlled conditions is called a(n):
a. natural law.
b. experiment.
c. common law.
d. analysis.

____ 13. The mass of an object is determined by:
a. finding the amount of matter it contains.
b. measuring its weight.
c. identifying the substance from which the object is made.
d. finding its dimensions.

____ 14. A factor that affects the behavior of a system is called a(n):
a. natural law.
b. experiment.
c. analysis.
d. variable.

____ 15. The scientific method is a process used to solve many problems. One of the first steps is:
a. collecting data.
b. analyzing data.
c. asking a question.
d. drawing a conclusion.

____ 16. A variable that remains unchanged throughout an experiment is called the:
a. control variable.
b. experimental variable.
c. independent variable.
d. dependent variable.

____ 17. Compared to a laboratory cart at the top of a ramp, a cart at the bottom of the ramp has:
a. more energy and less stability.
b. less energy and more stability.
c. more energy and more stability.
d. less energy and less stability.

____ 18. Of the following objects, the one which has the most mass is:
a. the Goodyear blimp.
b. a silver dollar.
c. a piece of notebook paper.
d. a physics textbook.

____ 19. Robin measures the force needed to pull a wagon up an incline as more weight is added. In this investigation, weight is the ____ variable.
a. control
b. dependent
c. independent
d. natural

____ 20. The unit of time used most commonly by physicists and other scientists is the:
a. second.
b. minute.
c. hour.
d. light year.

____ 21. The independent variable on a graph can be described as the variable:
a. represented on the *x*-axis.
b. causing the change in the experimental system.
c. over which a scientist has direct control when designing the experiment.
d. defined by all of the statements above.

____ 22. The conversion factor for changing one unit of length to another in the metric system is a multiple of:
a. 3.
b. 10.
c. 12.
d. 5,280.

____ 23. Because it is based on factors of 10 and is easy to work with, scientists prefer to use the ____ system.
a. metric
b. English
c. scientific
d. control

____ 24. A graph may be described as all of the following EXCEPT:
a. a tool to be interpreted ONLY by trained scientists and mathematicians.
b. used to describe the data collected from an experiment.
c. a picture showing how two variables are related.
d. easier to read than a table of numbers.

____ 25. The length of a new pencil is closest to:
a. 5 millimeters.
b. 20 centimeters.
c. 1.5 meters.
d. 2 kilometers.

____ 26. The number of seconds in one week is:
a. 86,400.
b. 604,800.
c. 31,557,600.
d. 3,155,760,000.

____ 27. Which of the lists show units arranged in order from smallest to largest?
a. Millimeter, centimeter, kilometer, meter
b. Centimeter, meter, kilometer, millimeter
c. Millimeter, centimeter, meter, kilometer
d. Meter, kilometer, millimeter, centimeter

____ 28. Which of the following lists of mass units are arranged in order from smallest to largest?
a. Gigagram, microgram, kilogram, megagram
b. Microgram, centigram, kilogram, gigagram
c. Milligram, microgram, centigram, kilogram
d. Megagram, kilogram, centigram, milligram

____ 29. How many seconds are in a stopwatch showing 1 hour, 3 minutes, and 5 seconds?
a. 68 seconds
b. 245 seconds
c. 7,385 seconds
d. 10,805 seconds

____ 30. A rectangular solid has dimensions of 27 millimeters × 6.8 centimeters × 0.00025 kilometers. The volume of the solid in cubic meters is ____ cubic centimeters.
a. 0.0459
b. 0.345
c. 33.8
d. 459

____ 31. Orlando measures the brightness of a flashlight bulb as he adds more batteries to the circuit. If he prepares a graph of the data:
a. the number of batteries should be represented on the *x*-axis.
b. the brightness of the flashlight bulb should be represented on the *x*-axis.
c. it doesn't matter which variable he places on the *x*-axis.
d. he will need more information before deciding where to place the variables.

____ 32. On his way to a concert, John stops at the mall to buy some camera film. If you divide the distance he travels to the concert by the amount of time it took to get from his home to his concert seat, you are calculating:
a. speed.
b. distance.
c. time interval.
d. mixed units.

____ 33. If you know the distance traveled and the amount of time it took, speed may be calculated by:
a. dividing time by distance.
b. multiplying time by distance.
c. dividing distance by time.
d. multiplying distance squared by time.

____ 34. Of the following, which equation does NOT correctly represent a relationship between distance, time and speed?
a. Distance equals speed multiplied by time.
b. Speed equals time multiplied by distance.
c. Time equals distance divided by speed.
d. Speed equals distance divided by time.

____ 35. The speed of a cheetah running 300 yards in 10 seconds is:
a. 30 yards per second.
b. 3,000 yards per minute.
c. 30,000 miles per hour.
d. None of the above

____ 36. Doug rides a motorcycle at an average speed of 42 miles per hour for 3.6 hours. The distance he travels is about ____ miles.
a. 11
b. 38
c. 47
d. 150

____ 37. Gwennen rides her bicycle 2.4 kilometers up a steep hill in 8 minutes. Her speed is ____ kilometers per minute.
a. 0.3
b. 0.6
c. 3.3
d. 19

____ 38. A professional LPGA golfer walks at an average rate of 3.20 feet per second on the golf course. The amount of time required for her to walk from the tee to a green 612 feet away is:
a. 0.544 minutes.
b. 1.91 minutes.
c. 1,958 seconds.
d. 191 seconds.

____ 39. A professional football quarterback throws a ball 32 yards down field to a receiver at a speed of 60 miles per hour. A mile equals 1,760 yards. Once the quarterback releases the ball, the football gets to the receiver in about ____ seconds.
a. 1.1
b. 0.53
c. 0.92
d. 1.9

____ 40. Of the following, the largest unit of speed is:
a. meters per second.
b. kilometers per hour.
c. miles per hour.
d. inches per second.

____ 41. The speed of a car traveling 200 meters in 10 seconds is equivalent to:
a. 20 yards per second.
b. 2000 meters per second.
c. 72 kilometers per hour.
d. 115 miles per hour.

____ 42. If an object is accelerated, all of the following may occur EXCEPT:
a. a change of speed.
b. a change of direction.
c. it remains motionless.
d. a change of direction and speed.

____ 43. The term that best describes the motion of an object that is slowing down is:
a. free fall.
b. gravity.
c. deceleration.
d. uniform.

____ 44. Units of measurement used to label a quantity of acceleration are:
a. cm^2/sec.
b. sec^2/cm.
c. cm/sec.
d. cm/sec^2.

____ 45. The rate of change in the speed of an object is known as:
a. velocity.
b. displacement.
c. acceleration.
d. equilibrium.

____ 46. Acceleration of an object **must** be caused by a force that is:
a. positive.
b. zero.
c. negative.
d. not zero.

____ 47. The metric unit of force preferred by scientists is the:
a. kilogram.
b. newton.
c. mima.
d. pound.

____ 48. Toby glances at the speedometer on his bicycle as he begins to roll downhill. It indicates he is traveling at 12 miles per hour when he initially looks at it and 20 miles per hour 4 seconds later. His acceleration is:
a. 2 mph/sec.
b. 3 mph/sec.
c. 5 mph/sec.
d. 8 mph/sec.

____ 49. When an object is accelerating due to the force of gravity with no other forces acting on it, it is:
a. changing direction.
b. motionless.
c. in free fall.
d. at terminal speed.

____ 50. The acceleration due to gravity is:
a. 9.8 m/sec^2 on Earth.
b. signified by the letter *g*.
c. a downward acceleration.
d. All of the above

____ 51. When you throw a ball up in the air, it travels up and then stops instantaneously before falling back down. At the point where it stops and changes direction to fall back down its:
a. acceleration is zero.
b. velocity is zero.
c. force is zero.
d. mass is zero.

____ 52. A bungee jumper falls off a tower and travels 2 seconds before the bungee cord starts to slow her down. What was her average velocity in free fall?
a. 4.9 m/sec
b. 9.8 m/sec
c. 14.5 m/sec
d. 19.6 m/sec

____ 53. A ball is dropped off the roof of a tall building. If the ball reaches the ground in 3 seconds, how tall is the building?
a. 9.8 meters
b. 14.7 meters
c. 29.4 meters
d. 44.1 meters

____ 54. Terminal speed occurs when:
a. the air resistance of an object increases.
b. an object starts to slow down due to air resistance.
c. the force of gravity is balanced by the air resistance of an object.
d. the acceleration due to gravity equals zero.

____ 55. An object is dropped from rest and falls downward for 3 seconds. What is its average speed?
a. 1.6 m/sec
b. 9.8 m/sec
c. 14.7 m/sec
d. 29.4 m/sec

____ 56. A skydiver reaches an instantaneous velocity of 88.2 meters per second before opening his parachute. How long was he in free fall?
a. 4.5 seconds
b. 8 seconds
c. 9 seconds
d. 864 seconds

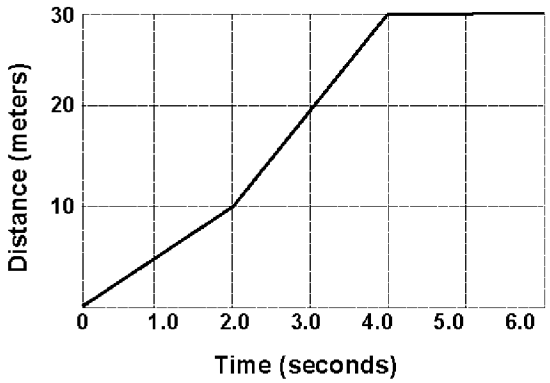
____ 57. The slope of a position versus time graph represents:
a. acceleration.
b. force.
c. position.
d. speed.

____ 58. If the *x*-axis of a graph has a value of zero, the area enclosed between the best-fit line and the horizontal axis of a speed versus time graph represents:
a. acceleration.
b. distance.
c. position.
d. speed.

____ 59. The slope of a speed versus time graph represents:
a. acceleration.
b. distance.
c. force.
d. velocity.

____ 60. The slope of the line of a graph is calculated by:
a. dividing the change in the horizontal values by the change in the vertical values.
b. multiplying the change in the horizontal values by the change in the vertical values.
c. dividing the change in the vertical values by the change in the horizontal values.
d. multiplying the change in the vertical values by the change in the horizontal values.

____ 61. The graph below represents the motion of a moving vehicle. What is the speed of the vehicle during the time interval from $t = 2.0$ seconds to $t = 4.0$ seconds?



a. 0.0 m/sec
b. 5.0 m/sec
c. 7.5 m/sec
d. 10. m/sec

The graph below represents the speed-time relationship for a 2.0-kilogram mass moving along a horizontal frictionless surface.

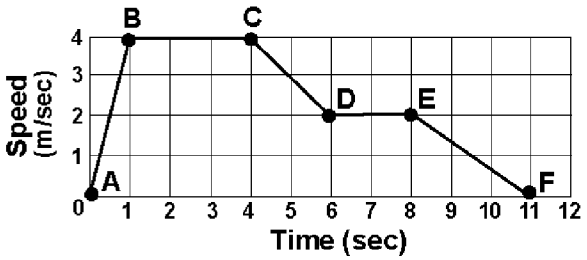


Figure 2-1

____ 62. According to Figure 2-1A, what is the speed of the 2.0-kilogram mass when the time equals 5 seconds?
a. 1 m/sec
b. 2 m/sec
c. 3 m/sec
d. 4 m/sec

____ 63. According to Figure 2-1A, during which interval is **no net force** being applied to the object?
a. A to B
b. B to C
c. C to D
d. E to F

____ 64. According to Figure 2-1A, during which interval is the object accelerating at the greatest rate?
a. A to B
b. B to C
c. C to D
d. E to F

____ 65. According to Figure 2-1A, during which time interval is the acceleration of the object zero?
a. A to B
b. C to D
c. D to E
d. E to F

____ 66. According to Figure 2-1A, what is the acceleration of the 2.0-kilogram mass during interval from C to D?
a. increasing at 1.0 m/sec^2
b. decreasing at 1.0 m/sec^2
c. increasing at 2.0 m/sec^2
d. decreasing at 2.0 m/sec^2

____ 67. According to Figure 2-1A, what distance does the mass move during interval A-D?
a. 12 meters
b. 18 meters
c. 20 meters
d. 24 meters

Completion
Complete each statement.

68. The amount of distance traveled in a given amount of time measures _____.

69. The amount of change in the speed of an object divided by the amount of time it took to change the speed represents _____.

70. An object accelerating toward Earth under only the influence of the force of gravity is said to be in _____ (two words).

71. The ratio of the "rise" (vertical change) to the "run" (horizontal change) of the best-fit line on a graph represents the _____ of the graph.

Short Answer

72. What two measurements do you need to know in order to determine the speed of something?

73. Describe the difference between a positive and a negative acceleration.

74. When you throw a ball up in the air, it travels up and then stops instantaneously before falling back down. Describe its velocity and acceleration at the point where it stops and changes direction to fall back down.

75. When you drop a sheet of crumpled paper and a sheet of flat paper off a table at the same time, why does the flat sheet of paper hit the ground later?

76. How can the distance a sprinter has run be determined from a graph of the sprinters's speed versus time? Assume the *x*-axis represents zero speed.

77. The motion of a car is represented by a speed versus time graph. The line of the graph slopes down from left to right. What is the car doing?

Problem

78. Calculate the number of millimeters in 2.13 kilometers.

79. How many centimeters tall is a person who is 1.65 meters tall?

80. Convert the following quantity of time to seconds.
3:45:12

81. A Canada goose flies 150 kilometers in 2.2 hours. What is the speed of the goose?

82. Arnold the astronaut sends a laser signal from his moon base headquarters to Earth. If the signal, traveling at 186,000 miles per second (the speed of light), is received on Earth 1.280 seconds after it is sent, what is the distance between Arnold's lunar headquarters and Earth?

83. Emma walks to school at a speed of 3 miles per hour. If it takes her 20 minutes to walk from home to school, how many miles away is the school from her house?

84. If Lynda can run 2 miles in 15 minutes, what is her speed in miles per hour?

85. A professional bicyclist rides a time trial in which he travels at 51.2 kilometers per hour for 55 minutes. How far does he travel?

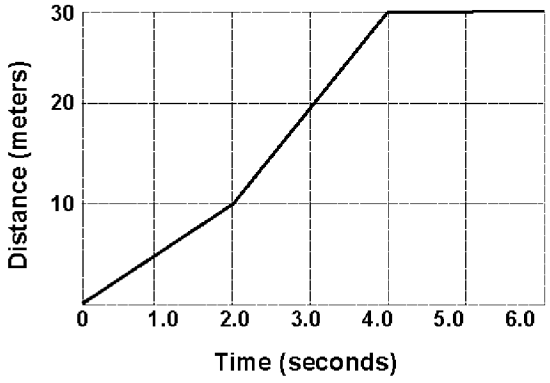
86. Recently, the speed limit between Utica and Rome, New York was raised from 55 miles per hour to 65 miles per hour. If the distance from Utica to Rome is 12 miles, how many minutes are saved by traveling at the new speed limit?

87. Tom pushes on a 50-kilogram box with a force of 25 newtons. Assuming the surface on which the box moves is frictionless, at what rate does the box accelerate?

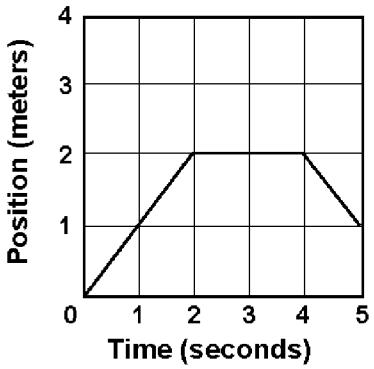
88. An acorn falls from the top of an oak tree. If it takes 2 seconds for the acorn to fall, how tall is the tree?

89. What is the average speed of a ball thrown downward with an initial speed of 4.9 m/sec that falls for 0.5 seconds? How far does the ball fall?

90. Use the graph representing the distance versus time for a car moving in a straight line to find the speed of the car from time = 2.0 seconds to time = 4.0 seconds.



91. Below is a graph representing the distance versus time for an object moving in a straight line. Identify the interval during which the car is not moving.



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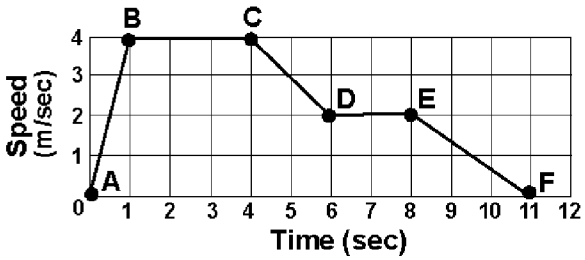

Figure 2-1

92. According to Figure 2-1, how far does the object move from time = 0 seconds to time = 6 seconds?

93. Use Figure 2-1 to identify the intervals during which the mass is increasing in speed, decreasing in speed, and moving with constant speed.

Essay

94. Tell why it is important to include units whenever you describe a measurement.

Physics Unit 1 Exam Review
Answer Section

MODIFIED TRUE/FALSE

1. ANS: F, Energy

   PTS: 1 DIF: basic REF: section 1.1
2. ANS: F, Experimental

   PTS: 1 DIF: basic REF: section 1.1
3. ANS: T PTS: 1 DIF: basic
   REF: section 1.1
4. ANS: F, multiplying

   PTS: 1 DIF: intermediate REF: section 1.3
5. ANS: T PTS: 1 DIF: basic
   REF: section 2.1
6. ANS: F, first

   PTS: 1 DIF: basic REF: section 2.1
7. ANS: F, divided

   PTS: 1 DIF: basic REF: section 2.2
8. ANS: F
   speed
   velocity

   PTS: 1 DIF: basic REF: section 2.2
9. ANS: T PTS: 1 DIF: basic
   REF: section 2.4

MULTIPLE CHOICE

10. ANS: C PTS: 1 DIF: basic REF: section 1.1
11. ANS: C PTS: 1 DIF: basic REF: section 1.1
12. ANS: B PTS: 1 DIF: basic REF: section 1.1
13. ANS: A PTS: 1 DIF: basic REF: section 1.1
14. ANS: D PTS: 1 DIF: basic REF: section 1.1
15. ANS: C PTS: 1 DIF: basic REF: section 1.1
16. ANS: A PTS: 1 DIF: basic REF: section 1.1
17. ANS: B PTS: 1 DIF: intermediate REF: section 1.1
18. ANS: A PTS: 1 DIF: intermediate REF: section 1.1
19. ANS: C PTS: 1 DIF: intermediate REF: section 1.1
20. ANS: A PTS: 1 DIF: basic REF: section 1.2

21. ANS: D PTS: 1 DIF: basic REF: section 1.2
22. ANS: B PTS: 1 DIF: basic REF: section 1.2
23. ANS: A PTS: 1 DIF: basic REF: section 1.2
24. ANS: A PTS: 1 DIF: basic REF: section 1.2
25. ANS: B PTS: 1 DIF: intermediate REF: section 1.2
26. ANS: B PTS: 1 DIF: intermediate REF: section 1.2
27. ANS: C PTS: 1 DIF: intermediate REF: section 1.2
28. ANS: B PTS: 1 DIF: intermediate REF: section 1.2
29. ANS: C PTS: 1 DIF: intermediate REF: section 1.2
30. ANS: D PTS: 1 DIF: advanced REF: section 1.2
31. ANS: A PTS: 1 DIF: advanced REF: section 1.2
32. ANS: C PTS: 1 DIF: basic REF: section 1.3
33. ANS: C PTS: 1 DIF: basic REF: section 1.3
34. ANS: B PTS: 1 DIF: basic REF: section 1.3
35. ANS: A PTS: 1 DIF: intermediate REF: section 1.3
36. ANS: D PTS: 1 DIF: intermediate REF: section 1.3
37. ANS: A PTS: 1 DIF: intermediate REF: section 1.3
38. ANS: D PTS: 1 DIF: intermediate REF: section 1.3
39. ANS: A PTS: 1 DIF: advanced REF: section 1.3
40. ANS: A
    1 meter per second = 2.24 miles per hour , 3.60 kilometers per hour, 39.4 inches per second
    These values may be calculated by the student using conversion factors discussed in class
    e.g. 1 hour = 3600 seconds, 1 mile = 1.61 kilometers, 1 meter = 39.4 inches

    PTS: 1 DIF: advanced REF: section 1.3
41. ANS: C PTS: 1 DIF: advanced REF: section 1.3
42. ANS: C PTS: 1 DIF: basic REF: section 2.2
43. ANS: C PTS: 1 DIF: basic REF: section 2.2
44. ANS: D PTS: 1 DIF: basic REF: section 2.2
45. ANS: C PTS: 1 DIF: basic REF: section 2.2
46. ANS: D PTS: 1 DIF: basic REF: section 2.2
47. ANS: B PTS: 1 DIF: basic REF: section 2.2
48. ANS: A PTS: 1 DIF: intermediate REF: section 2.2
49. ANS: C PTS: 1 DIF: basic REF: section 2.3
50. ANS: D PTS: 1 DIF: basic REF: section 2.3
51. ANS: B PTS: 1 DIF: intermediate REF: section 2.3
52. ANS: B PTS: 1 DIF: intermediate REF: section 2.3
53. ANS: D PTS: 1 DIF: intermediate REF: section 2.3
54. ANS: C PTS: 1 DIF: intermediate REF: section 2.3
55. ANS: C PTS: 1 DIF: intermediate REF: section 2.3
56. ANS: C PTS: 1 DIF: intermediate REF: section 2.3
57. ANS: D PTS: 1 DIF: basic REF: section 2.4
58. ANS: B PTS: 1 DIF: basic REF: section 2.4
59. ANS: A PTS: 1 DIF: basic REF: section 2.4

60. ANS: C PTS: 1 DIF: intermediate REF: section 2.4
61. ANS: D PTS: 1 DIF: intermediate REF: section 2.4
62. ANS: C PTS: 1 DIF: basic REF: section 2.4
63. ANS: B PTS: 1 DIF: intermediate REF: section 2.4
64. ANS: A PTS: 1 DIF: intermediate REF: section 2.4
65. ANS: C PTS: 1 DIF: intermediate REF: section 2.4
66. ANS: B PTS: 1 DIF: advanced REF: section 2.4
67. ANS: C PTS: 1 DIF: advanced REF: section 2.4

COMPLETION

68. ANS:
speed
velocity

PTS: 1 DIF: basic REF: section 1.3
69. ANS: acceleration

PTS: 1 DIF: basic REF: section 2.2
70. ANS: free fall

PTS: 1 DIF: basic REF: section 2.3
71. ANS: slope

PTS: 1 DIF: basic REF: section 2.4

SHORT ANSWER

72. ANS:
distance and time

PTS: 1 DIF: basic REF: section 1.3
73. ANS:
An object with a positive acceleration is speeding up and an object with a negative acceleration is slowing down.

PTS: 1 DIF: advanced REF: section 2.2
74. ANS:
Its velocity is zero and its acceleration remains -9.8 m/sec^2.

PTS: 1 DIF: intermediate REF: section 2.3

75. ANS:
Because of its shape, the flat sheet of paper has more force due to air resistance than the crumpled paper. Because the air resistance on the flat sheet of paper is more, the net force down (equal to force due to gravity minus force due to air resistance) is lower, causing it to accelerate more slowly than the flat sheet and reach the ground later.

PTS: 1 DIF: intermediate REF: section 2.3

76. ANS:
By finding the area under the best-fit line of the graph.

PTS: 1 DIF: basic REF: section 2.4

77. ANS:
Decelerating or negatively accelerating or slowing down.

PTS: 1 DIF: intermediate REF: section 2.4

PROBLEM

78. ANS:

$$2.13 \text{ kilometers} \times \frac{1{,}000 \text{ meters}}{1 \text{ kilometer}} \times \frac{1000 \text{ millimeters}}{1 \text{ meter}} = 2{,}130{,}000 \text{ millimeters, or } 2.13 \times 10^6 \text{ millimeters}$$

PTS: 1 DIF: intermediate REF: section 1.2

79. ANS:

$$1.65 \text{ meters} \times \frac{100 \text{ centimeters}}{1 \text{ meter}} = 165 \text{ centimeters}$$

PTS: 1 DIF: intermediate REF: section 1.2

80. ANS:

$$3 \text{ hours} \times \left(\frac{3600 \text{ seconds}}{1 \text{ hour}} \right) + 45 \text{ minutes} \times \left(\frac{60 \text{ seconds}}{1 \text{ minute}} \right) + 12 \text{ seconds}$$

$$= 10{,}800 \text{ seconds} + 2{,}700 \text{ seconds} + 12 \text{ seconds}$$

$$= 13{,}512 \text{ seconds}$$

PTS: 1 DIF: intermediate REF: section 1.2

81. ANS:
68 kph

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{150 \text{ kilometers}}{2.2 \text{ hours}} = 68 \frac{\text{kilometers}}{\text{hour}}$$

PTS: 1 DIF: intermediate REF: section 1.3

82. ANS:

$\text{distance} = \text{speed} \times \text{time}$

$\text{distance (moon to Earth)} = \dfrac{186{,}000 \text{ miles}}{\text{second}} \times 1.280 \text{ seconds} = 238{,}000 \text{ miles}$

PTS: 1 DIF: intermediate REF: section 1.3

83. ANS:

$20 \text{ minutes} \times \dfrac{1 \text{ hour}}{60 \text{ minutes}} = 0.33 \text{ hours}$

$\text{distance} = \text{speed} \times \text{time} = \dfrac{3 \text{ miles}}{\text{hour}} \times 0.33 \text{ hours} = 1 \text{ mile}$

PTS: 1 DIF: intermediate REF: section 1.3

84. ANS:

First, convert minutes to hours: $15 \text{ min} \times \dfrac{1 \text{ hour}}{60 \text{ min}} = 0.25 \text{ hours}$

time = 0.25 hours; distance = 2 miles

$\text{speed} = \dfrac{\text{distance}}{\text{time}} = \dfrac{2 \text{ miles}}{0.25 \text{ hours}} = 8 \text{ miles per hour}$

PTS: 1 DIF: intermediate REF: section 1.3

85. ANS:

$\text{distance} = \text{speed} \times \text{time} = 51.2 \dfrac{\text{kilometers}}{\text{hour}} \times 55 \text{ minutes} \times \dfrac{1 \text{ hour}}{60 \text{ minutes}} = 46.9 \text{ kilometers}$

PTS: 1 DIF: advanced REF: section 1.3

86. ANS:

$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

$$\text{old time (Utica to Rome)} = \frac{12 \text{ miles}}{55 \text{ miles per hour}}$$

$$= 0.218 \text{ hour} \times \frac{60 \text{ minutes}}{1 \text{ hour}}$$

$$= 13.1 \text{ minutes}$$

$$\text{new time (Utica to Rome)} = \frac{12 \text{ miles}}{65 \text{ miles per hour}}$$

$$= 0.185 \text{ hour} \times \frac{60 \text{ minutes}}{1 \text{ hour}}$$

$$= 11.1 \text{ minutes}$$

$$\text{time savings} = 13.1 \text{ minutes} - 11.1 \text{ minutes}$$

$$= 2 \text{ minutes}$$

PTS: 1 DIF: advanced REF: section 1.3

87. ANS:

$\text{force} = \text{mass} \times \text{acceleration}$

$$\text{acceleration} = \frac{\text{force}}{\text{mass}} = \frac{25 \text{ newtons}}{50 \text{ kilograms}}$$

acceleration = 0.5 N/kg or 0.5 m/sec^2

PTS: 1 DIF: intermediate REF: section 2.2

88. ANS:

19.6 meters

$$v_f = g \times \text{time} = \left(9.8 \text{ m/sec}^2\right)(2 \text{ sec}) = 19.6 \text{ m/sec}$$

$$v_{avg} = \frac{v_i + v_f}{2} = \frac{0 + 19.6 \text{ m/sec}}{2} = 9.8 \text{ m/sec}$$

$$\text{distance} = v_{avg} \times \text{time} = (9.8 \text{ m/sec})(2 \text{ sec}) = 19.6 \text{ meters}$$

PTS: 1 DIF: intermediate REF: section 2.3

89. ANS:

$v_f = g \times \text{time} = (9.8\ \text{m/sec}^2)(0.5\ \text{sec}) = 4.9\ \text{m/sec}$

$v_{avg} = \dfrac{v_i + v_f}{2} = \dfrac{4.9\ \text{m/sec} + 4.9\ \text{m/sec}}{2} = 4.9\ \text{m/sec}$

$\text{distance} = v_{avg} \times \text{time} = (4.9\ \text{m/sec})(0.5\ \text{sec}) = 2.45\ \text{meters}$

PTS: 1 DIF: intermediate REF: section 2.3

90. ANS:

10 m/s

Speed = the slope of the graph from t = 2 sec to t = 4 sec

$\text{slope} = \dfrac{\Delta x}{\Delta y} = \dfrac{30\ \text{m} - 10\ \text{m}}{4\ \text{sec} - 2\ \text{sec}} = \dfrac{20\ \text{m}}{2\ \text{sec}}$

slope = 10 m/sec

PTS: 1 DIF: intermediate REF: section 2.4

91. ANS:

The speed is zero from time = 2.0 seconds to time = 4.0 seconds.
The slope of the best-fit line of a distance versus time graph represents the speed. Speed is zero when the slope is zero. The slope is zero from t =2 seconds to t = 4 seconds.

PTS: 1 DIF: intermediate REF: section 2.4

92. ANS:

20 meters
The distance traveled equals the area under the graph for the time interval in question.
The area under the graph
for 0 seconds to 1 seconds = 2 meters,
for 1 seconds to 4 seconds = 12 meters,
for 4 seconds to 6 seconds = 6 meters
for a total of 20 meters.

PTS: 1 DIF: advanced REF: section 2.4

93. ANS:

Increasing in speed: 0 seconds to 1 second;
Decreasing in speed: 4 seconds to 6 seconds; and 8 seconds to 11 seconds
Moving with constant speed: 1 seconds to 4 seconds; and 6 seconds to 8 seconds.

PTS: 1 DIF: intermediate REF: section 2.4

ESSAY

94. ANS:
All measurements must include units in order for the measurement to be understood. All measurements are made by comparing one quantity with another. If a measurement is given only as a number it is impossible to tell which quantity is being used for comparison.Therefore, the size of the quantity which is being described cannot be determined.

PTS: 1 DIF: basic REF: section 1.2