Chapter 04 Multi-format Test

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. Speed is a variable that tells you how fast something is going and in what direction. ________________

___ 2. The slope of a line is the ratio of rise to run. ________________

___ 3. In general, the independent variable is plotted on the x-axis of a graph. ________________

___ 4. A steeper line on position vs. time graph means a slower speed. ________________

___ 5. When there is acceleration, a position vs. time graph is a curve. ________________

___ 6. A projectile is an object moving in a curved path under the influence of gravity only. ________________

Completion
Complete each statement.

Select the correct term to complete each sentence. There are extra terms in the list.

constant independent dependent
average acceleration velocity
free fall projectile axis
origin distance position

7. The place where a position has a value of zero is called the ___________________.

8. The total distance traveled divided by the total time of a trip is called ___________________ speed.

9. Speed that stays the same is called ___________________ speed.

10. In an experiment, the variable that causes change in another variable is called the ___________________ variable.

11. The rate of change in the velocity of an object is called ___________________.

12. An object falling only under the force of gravity is said to be in ___________________.

Matching
Choose the type of acceleration from the list below that would BEST describe the motion of the objects described. Types of acceleration may be used once, more than once, or not at all.

a. positive acceleration
b. negative acceleration
c. no acceleration

___ 13. A car traveling on a highway at 60 mph using cruise control
14. A motorcycle slowing down  
15. A baseball dropped from the roof of a building  
16. A girl on a skateboard going around a corner at a speed of 3 m/s  
17. A truck parked at a rest area

**Short Answer**

A toy car travels along the centimeter ruler from position 1 to position 2 in 2.0 seconds.

![Position 1 and Position 2](image)

**Figure 4-1**

18. What was the **speed** of the car in **Figure 4-1**?  
19. What was the **velocity** of the car in **Figure 4-1**?  
20. Think about the relationship between the amount of gas you have in your car and how far you can travel on it.  
   a. Which is the dependent variable and where would you plot it on a graph?  
   b. Which is the independent variable and where would you plot it on a graph?  
21. Becca and Sam each walk a 100-meter course on their school’s track. Each of their walks are plotted on a single position vs. time graph. If you didn’t have a chance to watch them in person, how could you use the position vs. time graph to figure out who walked faster?  
22.  

![Ice skater](image)

As shown in the picture above, an ice skater is skating at a constant speed in a circle. Is she accelerating? Explain your answer.
23. Describe the difference between a positive and a negative acceleration.

Problem

24. Jordan takes his bicycle out for 5 hours. For the first 3 hours, he rides his bicycle at 10 miles per hour. He stops to rest for 1 hour and then continues his ride. For the last hour he rides at a speed of 20 miles per hour. What was Jordan’s average speed for the entire 5 hour period?

The students in Mr. Malio’s class worked on an investigation to measure the time it took the energy car to travel to different positions on a straight, level track. Using their data, they drew the position vs. time graph shown above. Use this graph to answer the following questions.

![Position vs. Time Graph](image)

25. Describe how you would find the speed of the energy car from the graph in Figure 4-2.

26. According to the graph in Figure 4-2, how long did it take the energy car to travel 30. cm?

27. Describe the speed vs. time graph that shows the same motion as the position vs. time graph that Mr. Malio’s class created in Figure 4-2.

Essay

28. Describe the difference between constant speed and constant velocity. Give an example of an object traveling at constant speed that doesn’t have constant velocity.
The diagram represents the position of a butterfly that has hatched from a cocoon at the origin and flown to the position shown on the $x$-$y$ grid.

Notes: units on the grid are in meters; the positive direction on the $x$-axis is east; the positive direction on the $y$-axis is north.

**Figure 4-3**

29. According to Figure 4-3, what are the coordinates of the butterfly at its current location?

30. On the grid in Figure 4-3, mark the location of the butterfly and give its coordinates if it flies 14 meters north and 12 meters west.
Chapter 04 Multi-format Test
Answer Section

MODIFIED TRUE/FALSE

1. ANS: F, velocity
   DIF: basic   REF: section 4.1

2. ANS: T
   DIF: basic   REF: section 4.2

3. ANS: T
   DIF: basic   REF: section 4.2

4. ANS: F
   faster
greater
   DIF: basic   REF: section 4.2

5. ANS: T
   DIF: basic   REF: section 4.3

6. ANS: T
   DIF: basic   REF: section 4.3

COMPLETION

7. ANS: origin
   DIF: basic   REF: section 4.1

8. ANS: average
   DIF: basic   REF: section 4.1

9. ANS: constant
   DIF: basic   REF: section 4.1

10. ANS: independent
    DIF: basic   REF: section 4.2

11. ANS: acceleration
    DIF: basic   REF: section 4.3

12. ANS: free fall
    DIF: basic   REF: section 4.3

MATCHING

13. ANS: C
    DIF: intermediate   REF: section 4.3

14. ANS: B
    DIF: intermediate   REF: section 4.3

15. ANS: A
    DIF: intermediate   REF: section 4.3

16. ANS: A
    DIF: intermediate   REF: section 4.3
17. ANS: C  DIF: intermediate  REF: section 4.3

SHORT ANSWER

18. ANS:

\[ \text{speed} = \frac{d}{t} = \frac{(30 \text{ cm} - 80 \text{ cm})}{2 \text{ s}} = \frac{-50 \text{ cm}}{2 \text{ s}} \]

Speed is always positive, so:

\[ \text{speed} = 25 \text{ cm/s} \]

DIF: intermediate  REF: section 4.1

19. ANS:

Velocity is the speed of the car with its direction.

\[ \text{speed} = 25 \text{ cm/s} \]

direction is from right to left, shown as negative.

\[ \text{Velocity} = -25 \text{ cm} \]

DIF: intermediate  REF: section 4.2

20. ANS:

a. The distance you can travel is the dependent variable and is plotted on the \( y \)-axis.

b. The amount of gas in the car is the independent variable and is plotted on the \( x \)-axis.

DIF: intermediate  REF: section 4.2

21. ANS:

The steeper line will indicate the faster walker.

DIF: intermediate  REF: section 4.2

22. ANS:

Yes, she is accelerating because even though her speed is constant, her direction is changing. An acceleration occurs when the motion has a change in speed and/or direction.

DIF: intermediate  REF: section 4.3

23. ANS:

An object with a positive acceleration is speeding up and an object with a negative acceleration is slowing down.

DIF: advanced  REF: section 4.3
PROBLEM

24. ANS:
   \[
   \text{total distance} = (\text{first speed} \times 3 \text{ hours}) + (\text{second speed} \times 1 \text{ hour}) + (\text{third speed} \times 1 \text{ hour})
   \]
   \[
   \text{total distance} = (10 \text{ mph} \times 3 \text{ hours}) + (0 \text{ mph} \times 1 \text{ hour}) + (20 \text{ mph} \times 1 \text{ hour})
   \]
   \[
   \text{total distance} = 30 \text{ miles} + 20 \text{ miles} = 50 \text{ miles}
   \]
   \[
   \text{total time} = 5 \text{ hours}
   \]
   \[
   \text{average speed} = \frac{\text{total distance}}{\text{total time}}
   \]
   \[
   \text{average speed} = \frac{50 \text{ miles}}{5 \text{ hours}}
   \]
   \[
   \text{average speed} = 10 \text{ miles per hour}
   \]
   
   DIF: advanced       REF: section 4.1

25. ANS:
   The slope of the line on the position vs time graph equals the speed. The slope is the rise divided by the run.

   To calculate the speed, choose a position point on the graph, and divide by the time it took to travel to that position. An example point is:
   \[
   \text{speed} = \frac{\text{distance}}{\text{time}}
   \]
   \[
   \text{speed} = \frac{55 \text{ cm}}{0.6 \text{ seconds}}
   \]
   \[
   \text{speed} = 90 \text{ cm/s (to 1 significant digit)}
   \]
   
   DIF: intermediate       REF: section 4.2

26. ANS:
   approximately 0.35 s
   
   DIF: intermediate       REF: section 4.2

27. ANS:
   Since the speed is constant, the speed vs. time graph would show a horizontal, straight line at approximately 90 cm/s.
   
   DIF: advanced       REF: section 4.3

ESSAY

28. ANS:
   Constant speed refers to speed that stays the same for a whole trip. It doesn’t matter what the direction is. Constant velocity refers to a speed and direction that stay the same for a whole trip.

   Examples will vary. A sample answer would include an object traveling at a constant speed with a varying direction, with curved or circular motion. A race car traveling around a track at constant speed would not have constant velocity.
   
   DIF: advanced       REF: section 4.1
29. ANS: 
   (6, -6) or (6 m E, -6 m S)

   DIF: intermediate   REF: section 4.1

30. ANS: 

   (-6 m W, 8 m N)

   DIF: intermediate   REF: section 4.1
1. T
2. T
3. T
4. F
5. T
6. T

13. C
14. B
15. A
16. A
17. C