Chapter 11 Test

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

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**Figure 11-1**

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1. Examine Figure 11-1. If you were standing under the tree, which object would appear to be moving?
   - a. the tree
   - b. the airplane
   - c. the boy
   - d. the building

2. Which distance can be most accurately measured with a ruler?
   - a. the length of a river
   - b. the width of a book
   - c. the distance between two cities
   - d. the size of an object under a microscope

3. A person walks 1 mile every day for exercise, leaving her front porch at 9:00 am. and returning to her front porch at 9:25 am. What is the total displacement of her daily walk?
   - a. 1 mile
   - b. 0
   - c. 25 minutes
   - d. none of the above

4. A person drives north 6 blocks, then turns west, and drives 6 blocks. The driver then turns south and drives 6 blocks. How could the driver have made the distance shorter while maintaining the same displacement?
   - a. by driving west 6 blocks from the starting point
   - b. by driving north 4 block and west 7 blocks
   - c. by driving south 6 blocks from the starting point
   - d. by driving back to the starting point by the same route

5. A ball is rolled uphill a distance of 5 meters before it slows, stops, and begins to roll back. The ball rolls downhill 9 meters before coming to rest against a tree. What is the magnitude of the ball’s displacement?
   - a. 4 meters
   - b. 9 meters
   - c. 14 meters
   - d. 45 meters
6. Displacement vectors of 4 km south, 2 km north, 5 km south, and 5 km north combine to a total displacement of
   a. 16 km north  
   b. 11 km west 
   c. 6 km south  
   d. 2 km south

7. Speed is the ratio of the distance an object moves to
   a. the amount of time needed to travel the distance.  
   b. the direction the object moves. 
   c. the displacement of the object.  
   d. the motion of the object.

8. Instantaneous speed is measured
   a. at the starting point.  
   b. when the object reaches its destination.  
   c. at a particular instant.  
   d. over the duration of the trip.

9. A distance-time graph indicates that an object moves 100 m in 4 s and then remains at rest for 6 s. What is the average speed of the object?
   a. 50 m/s  
   b. 25 m/s  
   c. 10 m/s  
   d. 100 m/s

10. A river current has a velocity of 5 km/h relative to the shore, and a boat moves in the same direction as the current at 5 km/h relative to the river. How can the velocity of the boat relative to the shore be calculated?
    a. by subtracting the river current vector from the boat’s velocity vector  
    b. by dividing the river current vector by the boat’s velocity vector 
    c. by multiplying the vectors  
    d. by adding the vectors

11. The rate at which velocity changes is called
    a. speed.  
    b. vectors.  
    c. acceleration.  
    d. motion.

12. Which example identifies a change in motion that produces acceleration?
    a. a speed skater moving at a constant speed on a straight track  
    b. a ball moving at a constant speed around a circular track  
    c. a particle moving in a vacuum at constant velocity  
    d. a vehicle moving down the street at a steady speed

13. Objects in free fall near the surface of the Earth experience
    a. constant speed.  
    b. constant velocity.  
    c. constant acceleration.  
    d. constant distance.

14. Which example describes constant acceleration due ONLY to a change in direction?
    a. increasing speed while traveling around a curve  
    b. an object at rest  
    c. traveling around a circular track  
    d. an object in free fall
15. Suppose you increase your walking speed from 1 m/s to 3 m/s in a period of 1 s. What is your acceleration?
   a. 2 m/s²
   b. 5 m/s²
   c. 4 m/s²
   d. 3 m/s²

16. An object moving at 30 m/s takes 5 s to come to a stop. What is the object’s acceleration?
   a. 30 m/s²
   b. −30 m/s²
   c. −6 m/s²
   d. 6 m/s²

17. A speed-time graph shows that a car moves at 10 m/s for 10 s. The car’s speed then steadily decreases until it comes to a stop at 30 s. Which of the following describes the slope of the speed-time graph from 10 s to 30 s?
   a. linear, horizontal
   b. curved, upward
   c. linear, sloping downward
   d. linear, sloping upward

18. An object that is accelerating may be
   a. slowing down.
   b. gaining speed.
   c. changing direction.
   d. all of the above

19. A train approaching a crossing changes speed from 25 m/s to 10 m/s in 240 s. How can the train’s acceleration be described?
   a. The train’s acceleration is positive.
   b. The train is not accelerating.
   c. The train will come to rest in 6 minutes.
   d. The train’s acceleration is negative.

**Completion**
*Complete each statement.*

20. The direction and length of a straight line from the starting point to the ending point of an object’s motion is _________________.

21. A car’s speedometer measures _________________.

22. \( v = \frac{d}{t} \) is the equation that defines _________________.

23. The difference between speed and velocity is that velocity indicates the _________________ of motion and speed does not.

24. Freely falling objects accelerate at 9.8 m/s² because the force of _________________ acts on them.

**Short Answer**

25. A child rolls a ball 6 m across a room. The ball hits the wall and rolls halfway back toward the child. Using vector addition, calculate the ball’s displacement.
26. \( a = \frac{v_f - v_i}{t} \) is the equation for calculating the acceleration of an object. Write out the relationship shown in the equation, using words.

**Problem**

27. During a race, a runner runs at a speed of 6 m/s. 2 seconds later, she is running at a speed of 10 m/s. What is the runner’s acceleration? Show your work.

28. If you ride your bike at an average speed of 4 km/h and need to travel a total distance of 28 km, how long will it take you to reach your destination? Show your work.

**Essay**

29. Picture a ball traveling at a constant speed around the inside of a circular structure. Is the ball accelerating? Explain your answer.

30. A girl walks from her home to a friend’s home 3 blocks north. She then walks 2 blocks east to the post office, 1 block north to the library, and 1 block east to the park. From the park, she walks 2 blocks west to the movie theater. After the movie, she walks 4 blocks south to the pet store. What is the girl’s displacement from her starting point to the pet store? Where is the location of the pet store in relation to her home? Calculate the distance she walked in blocks.
MULTIPLE CHOICE

1. ANS: B    PTS: 1    DIF: L1
OBJ: 11.1.1 Identify frames of reference and describe how they are used to measure motion.
STA: OHPS.9.IN.14

2. ANS: B    PTS: 1    DIF: L2
OBJ: 11.1.2 Identify appropriate SI units for measuring distances.
STA: OHPS.9.IN.21

3. ANS: B    PTS: 1    DIF: L1
OBJ: 11.1.3 Distinguish between distance and displacement.

4. ANS: A    PTS: 1    DIF: L2
OBJ: 11.1.3 Distinguish between distance and displacement.

5. ANS: A    PTS: 1    DIF: L1
OBJ: 11.1.4 Calculate displacement using vector addition.

6. ANS: D    PTS: 1    DIF: L2
OBJ: 11.1.4 Calculate displacement using vector addition.

7. ANS: A    PTS: 1    DIF: L2
OBJ: 11.2.1 Identify appropriate SI units for measuring speed. STA: OHPS.11.12.BM.D

8. ANS: C    PTS: 1    DIF: L1
OBJ: 11.2.2 Compare and contrast average speed and instantaneous speed.

9. ANS: C    PTS: 1    DIF: L2
OBJ: 11.2.4 Calculate the speed of the object using slopes.

10. ANS: D   PTS: 1    DIF: L1
OBJ: 11.2.5 Describe how velocities combine. STA: OHPS.11.12.BM.D

11. ANS: C   PTS: 1    DIF: L1
OBJ: 11.3.1 Identify changes in motion that produce acceleration.

12. ANS: B   PTS: 1    DIF: L2
OBJ: 11.3.1 Identify changes in motion that produce acceleration.

13. ANS: C   PTS: 1    DIF: L1
OBJ: 11.3.2 Describe examples of constant acceleration.

14. ANS: C   PTS: 1    DIF: L2
OBJ: 11.3.2 Describe examples of constant acceleration.

15. ANS: A   PTS: 1    DIF: L1
OBJ: 11.3.3 Calculate the acceleration of an object.

16. ANS: C   PTS: 1    DIF: L2
OBJ: 11.3.3 Calculate the acceleration of an object.

17. ANS: C   PTS: 1    DIF: L2

18. ANS: D   PTS: 1    DIF: L1
OBJ: 11.3.5 Classify acceleration as positive or negative.

19. ANS: D   PTS: 1    DIF: L2
OBJ: 11.3.5 Classify acceleration as positive or negative.
COMPLETION

20. ANS: displacement
   PTS: 1   DIF: L1   OBJ: 11.1.3 Distinguish between distance and displacement.
21. ANS: instantaneous speed
   PTS: 1   DIF: L1   OBJ: 11.2.2 Compare and contrast average speed and instantaneous speed.
22. ANS: average speed
   PTS: 1   DIF: L2   OBJ: 11.2.2 Compare and contrast average speed and instantaneous speed.
23. ANS: direction
   PTS: 1   DIF: L1   OBJ: 11.2.3 Interpret distance-time graphs.
24. ANS: gravity
   PTS: 1   DIF: L1   OBJ: 11.3.2 Describe examples of constant acceleration.

SHORT ANSWER

25. ANS:
   \(6 \text{ m} + (-3 \text{ m}) = 3 \text{ m}\)
   PTS: 1   DIF: L2   OBJ: 11.1.4 Calculate displacement using vector addition.
26. ANS:
   Acceleration equals the final velocity minus the initial velocity divided by the time.
   PTS: 1   DIF: L1   OBJ: 11.3.3 Calculate the acceleration of an object.

PROBLEM

27. ANS:
   \[a = \frac{v_f - v_i}{t} = \frac{10 \text{ m/s} - 6 \text{ m/s}}{2 \text{ s}} = 2 \text{ m/s}^2\]
   PTS: 1   DIF: L2   OBJ: 11.3.3 Calculate the acceleration of an object.
28. ANS:
\[ \bar{v} = \frac{d}{t} \]
\[ t \times \bar{v} = d \]
\[ t = \frac{d}{\bar{v}} \]
\[ t = \frac{28 \text{ km}}{4 \text{ km/h}} = 7 \text{ h} \]

PTS: 1  DIF: L2  OBJ: 11.2.2 Compare and contrast average speed and instantaneous speed.

ESSAY

29. ANS:
Acceleration can be described as changes in speed, direction, or both. The ball is moving at a constant speed, but its direction is changing continuously. Because its direction is changing, the ball is experiencing continuous acceleration.

PTS: 1  DIF: L2  OBJ: 11.3.2 Describe examples of constant acceleration.

30. ANS:
The girl’s displacement from home is 1 block east. The pet store is located 1 block east of her home. The girl walked a total distance of 13 blocks.

PTS: 1  DIF: L2  OBJ: 11.1.4 Calculate displacement using vector addition.
Chapter 11 Test

Multiple Choice

*Identify the choice that best completes the statement or answers the question.*

1. Which example describes constant acceleration due ONLY to a change in direction?
   a. traveling around a circular track
   b. an object at rest
   c. an object in free fall
   d. increasing speed while traveling around a curve

2. The rate at which velocity changes is called
   a. motion.
   b. vectors.
   c. acceleration.
   d. speed.

3. An object moving at 40 m/s takes 10 s to come to a stop. What is the object’s acceleration?
   a. 4 m/s²
   b. -4 m/s²
   c. -40 m/s²
   d. 40 m/s²

4. A speed-time graph shows that a car moves at 10 m/s for 10 s. The car’s speed then steadily decreases until it comes to a stop at 30 s. Which of the following describes the slope of the speed-time graph from 10 s to 30 s?
   a. linear, sloping upward
   b. linear, horizontal
   c. curved, upward
   d. linear, sloping downward

5. A distance-time graph indicates that an object moves 100 m in 4 s and then remains at rest for 6 s. What is the average speed of the object?
   a. 100 m/s
   b. 50 m/s
   c. 10 m/s
   d. 25 m/s

6. A train approaching a crossing changes speed from 25 m/s to 10 m/s in 240 s. How can the train’s acceleration be described?
   a. The train’s acceleration is negative.
   b. The train is not accelerating.
   c. The train’s acceleration is positive.
   d. The train will come to rest in 6 minutes.

7. A ball is rolled uphill a distance of 3 meters before it slows, stops, and begins to roll back. The ball rolls downhill 9 meters before coming to rest against a tree. What is the magnitude of the ball’s displacement?
   a. 27 meters
   b. 9 meters
   c. 12 meters
   d. 6 meters

8. Suppose you increase your walking speed from 2 m/s to 4 m/s in a period of 1 s. What is your acceleration?
   a. 7 m/s²
   b. 8 m/s²
   c. 2 m/s²
   d. 6 m/s²

9. Which distance can be most accurately measured with a ruler?
   a. the size of an object under a microscope
   b. the width of a book
   c. the length of a river
   d. the distance between two cities
10. Objects in free fall near the surface of the Earth experience
   a. constant acceleration. c. constant speed.
   b. constant velocity. d. constant distance.

11. Instantaneous speed is measured
   a. at a particular instant.
   b. at the starting point.
   c. over the duration of the trip.
   d. when the object reaches its destination.

12. Displacement vectors of 5 km south, 3 km north, 6 km south, and 6 km north combine to a total displacement of
   a. 8 km south
   b. 2 km south
   c. 20 km north
   d. 14 km west

13. Speed is the ratio of the distance an object moves to
   a. the displacement of the object.
   b. the direction the object moves.
   c. the motion of the object.
   d. the amount of time needed to travel the distance.

14. A river current has a velocity of 5 km/h relative to the shore, and a boat moves in the same direction as the current at 5 km/h relative to the river. How can the velocity of the boat relative to the shore be calculated?
   a. by subtracting the river current vector from the boat’s velocity vector
   b. by multiplying the vectors
   c. by adding the vectors
   d. by dividing the river current vector by the boat’s velocity vector

15. An object that is accelerating may be
   a. changing direction.
   b. slowing down.
   c. gaining speed.
   d. all of the above

16. Which example identifies a change in motion that produces acceleration?
   a. a speed skater moving at a constant speed on a straight track
   b. a vehicle moving down the street at a steady speed
   c. a ball moving at a constant speed around a circular track
   d. a particle moving in a vacuum at constant velocity

17. A person walks 1 mile every day for exercise, leaving her front porch at 9:00 am. and returning to her front porch at 9:25 am. What is the total displacement of her daily walk?
   a. 25 minutes
   b. 1 mile
   c. 0
   d. none of the above

18. A person drives east 8 blocks, then turns south, and drives 8 blocks. The driver then turns west and drives 8 blocks. How could the driver have made the distance shorter while maintaining the same displacement?
   a. by driving south 8 blocks from the starting point
   b. by driving east 6 block and south 9 blocks
   c. by driving back to the starting point by the same route
   d. by driving west 8 blocks from the starting point
19. Examine Figure 11-1. If you were standing under the tree, which object would appear to be moving?
   a. the boy  c. the tree
   b. the airplane  d. the building

**Completion**

*Complete each statement.*

20. The direction and length of a straight line from the starting point to the ending point of an object’s motion is
   ____________________________.

21. \( \vec{v} = \frac{d}{t} \) is the equation that defines ________________________.

22. Freely falling objects accelerate at 9.8 m/s\(^2\) because the force of __________________ acts on them.

23. The difference between speed and velocity is that velocity indicates the __________________ of motion
   and speed does not.

24. A car’s speedometer measures ________________________.

**Short Answer**

25. A child rolls a ball 4 m across a room. The ball hits the wall and rolls halfway back toward the child. Using
   vector addition, calculate the ball’s displacement.

26. \( a = \frac{v_f - v_i}{t} \) is the equation for calculating the acceleration of an object. Write out the relationship shown in
   the equation, using words.
Problem

27. During a race, a runner runs at a speed of 5 m/s. 2 seconds later, she is running at a speed of 7 m/s. What is the runner’s acceleration? Show your work.

28. If you ride your bike at an average speed of 2 km/h and need to travel a total distance of 18 km, how long will it take you to reach your destination? Show your work.

Essay

29. Picture a ball traveling at a constant speed around the inside of a circular structure. Is the ball accelerating? Explain your answer.

30. A girl walks from her home to a friend’s home 3 blocks north. She then walks 2 blocks east to the post office, 1 block north to the library, and 1 block east to the park. From the park, she walks 2 blocks west to the movie theater. After the movie, she walks 4 blocks south to the pet store. What is the girl’s displacement from her starting point to the pet store? Where is the location of the pet store in relation to her home? Calculate the distance she walked in blocks.
MULTIPLE CHOICE

1. ANS: A  PTS: 1  DIF: L2
   OBJ: 11.3.2 Describe examples of constant acceleration.

2. ANS: C  PTS: 1  DIF: L1
   OBJ: 11.3.1 Identify changes in motion that produce acceleration.

3. ANS: B  PTS: 1  DIF: L2
   OBJ: 11.3.3 Calculate the acceleration of an object.

4. ANS: D  PTS: 1  DIF: L2
   OBJ: 11.3.4 Interpret speed-time and distance-time graphs.
   STA: OHPS.9.IN.23 | OHPS.11.12.BM.D

5. ANS: C  PTS: 1  DIF: L2
   OBJ: 11.2.4 Calculate the speed of the object using slopes.

6. ANS: A  PTS: 1  DIF: L2
   OBJ: 11.3.5 Classify acceleration as positive or negative.

7. ANS: D  PTS: 1  DIF: L1
   OBJ: 11.1.4 Calculate displacement using vector addition.

8. ANS: C  PTS: 1  DIF: L1
   OBJ: 11.3.3 Calculate the acceleration of an object.

9. ANS: B  PTS: 1  DIF: L2
   OBJ: 11.1.2 Identify appropriate SI units for measuring distances.
   STA: OHPS.9.IN.21

10. ANS: A  PTS: 1  DIF: L1
    OBJ: 11.3.2 Describe examples of constant acceleration.

11. ANS: A  PTS: 1  DIF: L1
    OBJ: 11.2.2 Compare and contrast average speed and instantaneous speed.

12. ANS: B  PTS: 1  DIF: L2
    OBJ: 11.1.4 Calculate displacement using vector addition.

13. ANS: D  PTS: 1  DIF: L2
    OBJ: 11.2.1 Identify appropriate SI units for measuring speed.
    STA: OHPS.11.12.BM.D

14. ANS: C  PTS: 1  DIF: L1
    OBJ: 11.2.5 Describe how velocities combine.
    STA: OHPS.11.12.BM.D

15. ANS: D  PTS: 1  DIF: L1
    OBJ: 11.3.5 Classify acceleration as positive or negative.

16. ANS: C  PTS: 1  DIF: L2
    OBJ: 11.3.1 Identify changes in motion that produce acceleration.

17. ANS: C  PTS: 1  DIF: L1
    OBJ: 11.1.3 Distinguish between distance and displacement.

18. ANS: A  PTS: 1  DIF: L2
    OBJ: 11.1.3 Distinguish between distance and displacement.

19. ANS: B  PTS: 1  DIF: L1
    OBJ: 11.1.1 Identify frames of reference and describe how they are used to measure motion.
    STA: OHPS.9.IN.14
COMPLETION

20. ANS: displacement
   PTS: 1   DIF: L1   OBJ: 11.1.3 Distinguish between distance and displacement.
21. ANS: average speed
   PTS: 1   DIF: L2   OBJ: 11.2.2 Compare and contrast average speed and instantaneous speed.
22. ANS: gravity
   PTS: 1   DIF: L1   OBJ: 11.3.2 Describe examples of constant acceleration.
23. ANS: direction
   PTS: 1   DIF: L1   OBJ: 11.2.3 Interpret distance-time graphs.
24. ANS: instantaneous speed
   PTS: 1   DIF: L1   OBJ: 11.2.2 Compare and contrast average speed and instantaneous speed.

SHORT ANSWER

25. ANS:
   4 m + (–2 m) = 2 m
   PTS: 1   DIF: L2   OBJ: 11.1.4 Calculate displacement using vector addition.
26. ANS:
   Acceleration equals the final velocity minus the initial velocity divided by the time.
   PTS: 1   DIF: L1   OBJ: 11.3.3 Calculate the acceleration of an object.

PROBLEM

27. ANS:
   \[ a = \frac{v_f - v_i}{t} = \frac{7 \text{ m/s} - 5 \text{ m/s}}{2 \text{ s}} = 1 \text{ m/s}^2 \]
   PTS: 1   DIF: L2   OBJ: 11.3.3 Calculate the acceleration of an object.
28. ANS:
\[ \bar{v} = \frac{d}{t} \]
\[ t \times \bar{v} = d \]
\[ t = \frac{d}{\bar{v}} \]
\[ t = \frac{18 \text{ km}}{2 \text{ km/h}} = 9 \text{ h} \]

PTS: 1  DIF: L2  OBJ: 11.2.2 Compare and contrast average speed and instantaneous speed.

ESSAY

29. ANS:
Acceleration can be described as changes in speed, direction, or both. The ball is moving at a constant speed, but its direction is changing continuously. Because its direction is changing, the ball is experiencing continuous acceleration.

PTS: 1  DIF: L2  OBJ: 11.3.2 Describe examples of constant acceleration.

30. ANS:
The girl’s displacement from home is 1 block east. The pet store is located 1 block east of her home. The girl walked a total distance of 13 blocks.

PTS: 1  DIF: L2  OBJ: 11.1.4 Calculate displacement using vector addition.