

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) Consider a deer that runs from point A to point B. The distance the deer runs can be greater than the magnitude of its displacement, but the magnitude of the displacement can never be greater than the distance it runs. 1) _____
- A) True B) False

Answer: A

- 2) Which of the following quantities has units of a displacement? (There could be more than one correct choice.) 2) _____
- A) 40 km southwest
B) 186,000 mi
C) 9.8 m/s^2
D) -120 m/s
E) 32 ft/s^2 vertically downward

Answer: A, B

- 3) Suppose that an object travels from one point in space to another. Make a comparison between the magnitude of the displacement and the distance traveled by this object. 3) _____
- A) The displacement is either greater than or equal to the distance traveled.
B) The displacement is always equal to the distance traveled.
C) The displacement can be either greater than, smaller than, or equal to the distance traveled.
D) The displacement is either less than or equal to the distance traveled.

Answer: D

- 4) Consider a car that travels between points A and B. The car's average speed can be greater than the magnitude of its average velocity, but the magnitude of its average velocity can never be greater than its average speed. 4) _____
- A) True B) False

Answer: A

- 5) Which of the following quantities has units of a velocity? (There could be more than one correct choice.) 5) _____
- A) -120 m/s
B) 186,000 mi
C) 9.8 m/s^2 downward
D) 40 km southwest
E) 9.8 m/s downward

Answer: A, E

- 6) When is the average velocity of an object equal to the instantaneous velocity? 6) _____
- A) when the velocity is constant
B) only when the velocity is increasing at a constant rate
C) never
D) always
E) only when the velocity is decreasing at a constant rate

Answer: A

- 7) You drive 6.0 km at 50 km/h and then another 6.0 km at 90 km/h. Your average speed over the 12 km drive will be 7) _____
- A) greater than 70 km/h.
 - B) less than 70 km/h.
 - C) exactly 38 km/h.
 - D) equal to 70 km/h.
 - E) It cannot be determined from the information given because we must also know directions traveled.

Answer: B

- 8) If the velocity of an object is zero at some point, then its acceleration must also be zero at that point. 8) _____
- A) True
 - B) False

Answer: B

- 9) Which of the following situations is *impossible*? 9) _____
- A) An object has velocity directed east and acceleration directed west.
 - B) An object has constant non-zero velocity and changing acceleration.
 - C) An object has velocity directed east and acceleration directed east.
 - D) An object has zero velocity but non-zero acceleration.
 - E) An object has constant non-zero acceleration and changing velocity.

Answer: B

- 10) If the acceleration of an object is zero, then that object cannot be moving. 10) _____
- A) True
 - B) False

Answer: B

- 11) If the velocity of an object is zero, then that object cannot be accelerating. 11) _____
- A) True
 - B) False

Answer: B

- 12) Suppose that a car traveling to the west begins to slow down as it approaches a traffic light. Which of the following statements about its acceleration is correct? 12) _____
- A) Since the car is slowing down, its acceleration must be negative.
 - B) The acceleration is toward the west.
 - C) The acceleration is zero.
 - D) The acceleration is toward the east.

Answer: D

- 13) An auto manufacturer advertises that their car can go "from zero to sixty in eight seconds." This is a description of what characteristic of the car's motion? 13) _____
- A) average acceleration
 - B) instantaneous speed
 - C) instantaneous acceleration
 - D) average speed
 - E) displacement

Answer: A

- 14) An object moving in the $+x$ direction experiences an acceleration of $+2.0 \text{ m/s}^2$. This means the object 14) _____
- A) is decreasing its velocity by 2.0 m/s every second.
 - B) is traveling at 2.0 m/s .
 - C) is increasing its velocity by 2.0 m/s every second.
 - D) travels 2.0 m in every second.

Answer: C

- 15) Suppose that a car traveling to the east ($+x$ direction) begins to slow down as it approaches a traffic light. Which statement concerning its acceleration must be correct? 15) _____
- A) Its acceleration is zero.
 - B) Its acceleration is in the $-x$ direction.
 - C) Its acceleration is in the $+x$ direction.
 - D) Its acceleration is decreasing in magnitude as the car slows down.

Answer: B

- 16) Suppose that a car traveling to the west ($-x$ direction) begins to slow down as it approaches a traffic light. Which statement concerning its acceleration must be correct? 16) _____
- A) Its acceleration is zero.
 - B) Its acceleration is negative.
 - C) Its acceleration is decreasing in magnitude as the car slows down.
 - D) Its acceleration is positive.

Answer: D

- 17) Suppose that an object is moving with a constant velocity. Which statement concerning its acceleration must be correct? 17) _____
- A) The acceleration is a constant non-zero value.
 - B) The acceleration is constantly increasing.
 - C) The acceleration is constantly decreasing.
 - D) The acceleration is equal to zero.

Answer: D

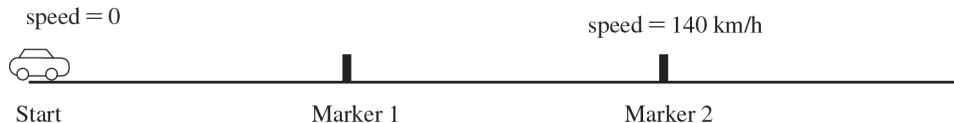
- 18) If the velocity of an object is zero at one instant, what is true about the acceleration of that object? (There could be more than one correct choice.) 18) _____
- A) The acceleration must be zero.
 - B) The acceleration could be negative.
 - C) The acceleration could be zero.
 - D) The acceleration could be positive.

Answer: B, C, D

- 19) Under what condition is average velocity equal to the average of the object's initial and final velocity? 19) _____
- A) The acceleration is constant.
 - B) The acceleration must be constantly increasing.
 - C) This can occur only when the velocity is zero.
 - D) This can only occur if there is no acceleration.
 - E) The acceleration must be constantly decreasing.

Answer: A

- 20) A racing car accelerates uniformly from rest along a straight track. This track has markers spaced at equal distances along it from the start, as shown in the figure. The car reaches a speed of 140 km/h as it passes marker 2. 20) _____



Where on the track was the car when it was traveling at half this speed, that is at 70 km/h?

- A) At marker 1
- B) Between marker 1 and marker 2
- C) Before marker 1

Answer: C

- 21) When a ball is thrown straight up with no air resistance, the acceleration at its highest point 21) _____
- A) reverses from downward to upward
 - B) is downward
 - C) reverses from upward to downward
 - D) is upward
 - E) is zero

Answer: B

- 22) A rock from a volcanic eruption is launched straight up into the air with no appreciable air resistance. Which one of the following statements about this rock while it is in the air is correct? 22) _____
- A) The acceleration is downward at all points in the motion except that is zero at the highest point.
 - B) On the way up, its acceleration is downward and its velocity is upward, and at the highest point both its velocity and acceleration are zero.
 - C) On the way down, both its velocity and acceleration are downward, and at the highest point both its velocity and acceleration are zero.
 - D) The acceleration is downward at all points in the motion.
 - E) Throughout the motion, the acceleration is downward, and the velocity is always in the same direction as the acceleration.

Answer: D

- 23) Suppose a ball is thrown straight up and experiences no appreciable air resistance. What is its acceleration just before it reaches its highest point? 23) _____
- A) exactly g
 - B) slightly less than g
 - C) slightly greater than g
 - D) zero

Answer: A

- 24) A ball is thrown straight up, reaches a maximum height, then falls to its initial height. Which of the following statements about the direction of the velocity and acceleration of the ball as it is *going up* is correct? 24) _____
- A) Its velocity points upward and its acceleration points downward.
 - B) Both its velocity and its acceleration point upward.
 - C) Its velocity points downward and its acceleration points upward.
 - D) Both its velocity and its acceleration points downward.

Answer: A

- 25) A ball is thrown downward in the absence of air resistance. After it has been released, which statement(s) concerning its acceleration is correct? (There could be more than one correct choice.) 25) _____
A) Its acceleration is constant.
B) Its acceleration is greater than g .
C) Its acceleration is constantly decreasing.
D) Its acceleration is zero.
E) Its acceleration is constantly increasing.
Answer: A
- 26) A 10-kg rock and a 20-kg rock are thrown upward with the same initial speed v_0 and experience no significant air resistance. If the 10-kg rock reaches a maximum height h , what maximum height will the 20-kg ball reach? 26) _____
A) $h/2$ B) h C) $h/4$ D) $4h$ E) $2h$
Answer: B
- 27) A 10-kg rock and 20-kg rock are dropped from the same height and experience no significant air resistance. If it takes the 20-kg rock a time T to reach the ground, what time will it take the 10-kg rock to reach the ground? 27) _____
A) $2T$ B) $T/4$ C) T D) $4T$ E) $T/2$
Answer: C
- 28) A 10-kg rock and a 20-kg rock are dropped at the same time and experience no significant air resistance. If the 10-kg rock falls with acceleration a , what is the acceleration of the 20-kg rock? 28) _____
A) $4a$ B) $2a$ C) $a/4$ D) $a/2$ E) a
Answer: E
- 29) Two objects are dropped from a bridge, an interval of 1.0 s apart. Air resistance is negligible. During the time that both objects continue to fall, their separation 29) _____
A) stays constant.
B) increases at first, but then stays constant.
C) decreases.
D) decreases at first, but then stays constant.
E) increases.
Answer: E
- 30) From the edge of a roof top you toss a green ball upwards with initial speed v_0 and a blue ball downwards with the same initial speed. Air resistance is negligible. When they reach the ground below 30) _____
A) the two balls will have the same speed.
B) the blue ball will be moving faster than the green ball.
C) the green ball will be moving faster than the blue ball.
Answer: A
- 31) Ball A is dropped from the top of a building. One second later, ball B is dropped from the same building. Neglect air resistance. As time progresses, the difference in their speeds 31) _____
A) increases.
B) decreases.
C) remains constant.
D) cannot be determined from the information given.
Answer: C

- 32) Two objects are thrown from the top of a tall building. One is thrown up, and the other is thrown down, both with the same initial speed. What are their speeds when they hit the street? Neglect air resistance. 32) _____
- A) They are traveling at the same speed.
 - B) The one thrown up is traveling faster.
 - C) The one thrown down is traveling faster.
 - D) It is impossible to tell because the height of the building is not given.

Answer: A

- 33) Brick A is dropped from the top of a building. Brick B is thrown straight down from the same building, and neither one experiences appreciable air resistance. Which statement about their accelerations is correct? 33) _____
- A) The acceleration of A is greater than the acceleration of B.
 - B) Neither brick has any acceleration once it is released.
 - C) The acceleration of B is greater than the acceleration of A.
 - D) The two bricks have exactly the same acceleration.

Answer: D

- 34) An object is moving with constant non-zero velocity in the $+x$ direction. The position versus time graph of this object is 34) _____
- A) a horizontal straight line.
 - B) a vertical straight line.
 - C) a straight line making an angle with the time axis.
 - D) a parabolic curve.

Answer: C

- 35) An object is moving with constant non-zero acceleration in the $+x$ direction. The position versus time graph of this object is 35) _____
- A) a horizontal straight line.
 - B) a vertical straight line.
 - C) a straight line making an angle with the time axis.
 - D) a parabolic curve.

Answer: D

- 36) An object is moving with constant non-zero velocity in the $+x$ direction. The velocity versus time graph of this object is 36) _____
- A) a horizontal straight line.
 - B) a vertical straight line.
 - C) a straight line making an angle with the time axis.
 - D) a parabolic curve.

Answer: A

- 37) An object is moving with constant non-zero acceleration in the $+x$ direction. The velocity versus time graph of this object is 37) _____
- A) a horizontal straight line.
 - B) a vertical straight line.
 - C) a straight line making an angle with the time axis.
 - D) a parabolic curve.

Answer: C

38) The slope of a position versus time graph gives

A) acceleration.

C) the distance traveled.

B) velocity.

D) displacement.

38) _____

Answer: B

39) The slope of a velocity versus time graph gives

A) displacement.

C) the distance traveled.

B) acceleration.

D) velocity.

39) _____

Answer: B

40) If the position versus time graph of an object is a horizontal line, the object is

A) moving with constant non-zero speed.

B) moving with constant non-zero acceleration.

C) at rest.

D) moving with increasing speed.

40) _____

Answer: C

41) If the velocity versus time graph of an object is a horizontal line, the object is

A) moving with zero acceleration.

B) moving with constant non-zero acceleration.

C) at rest.

D) moving with increasing speed.

41) _____

Answer: A

42) If the velocity versus time graph of an object is a straight line making an angle of $+30^\circ$ (counter clockwise) with the time axis, the object is

A) moving with constant non-zero speed.

B) moving with constant non-zero acceleration.

C) at rest.

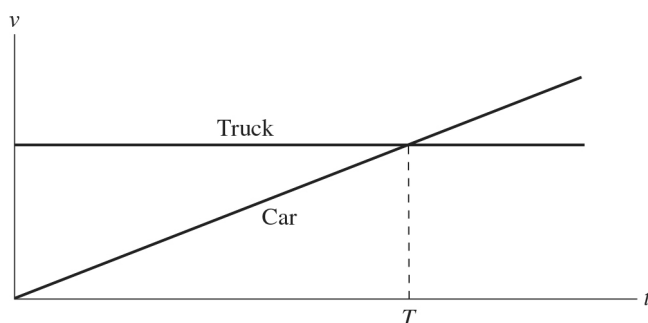
D) moving with increasing acceleration.

42) _____

Answer: B

43) The motions of a car and a truck along a straight road are represented by the velocity-time graphs in the figure. The two vehicles are initially alongside each other at time $t = 0$.

43) _____



At time T , what is true of the *distances* traveled by the vehicles since time $t = 0$?

A) The car will have travelled further than the truck.

B) The truck will have travelled further than the car.

C) The truck will not have moved.

D) They will have traveled the same distance.

Answer: B

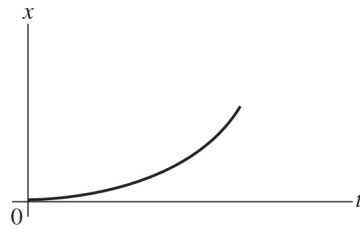
44) Which of the following graphs represent an object at rest? (There could be more than one correct choice.)

44) _____

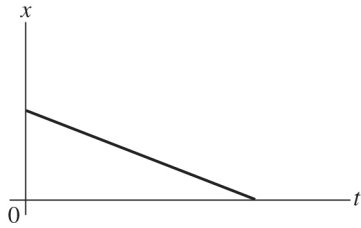
(a)



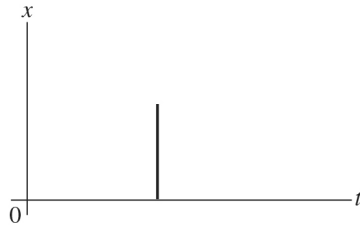
(b)



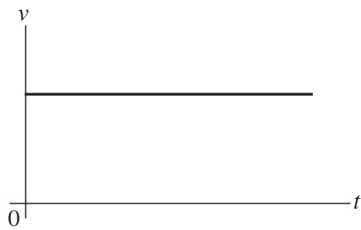
(c)



(d)



(e)



A) graph a

B) graph b

C) graph c

D) graph d

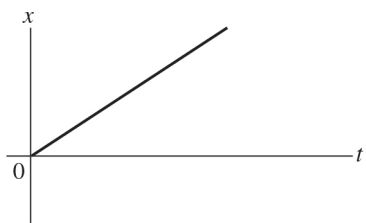
E) graph e

Answer: A

45) Which of the following graphs represent an object having zero acceleration?

45) _____

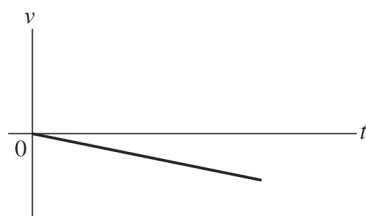
(a)



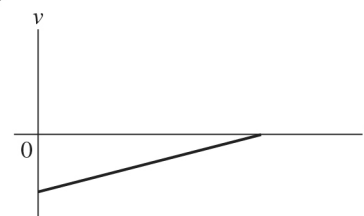
(b)



(c)



(d)

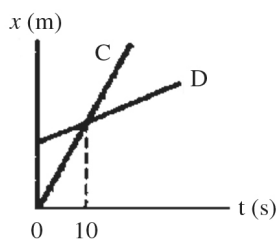


- A) only graph a
- B) only graph b
- C) graphs b and c
- D) graphs a and b
- E) graphs c and d

Answer: D

46) The figure shows a graph of the position x of two cars, C and D, as a function of time t .

46) _____



According to this graph, which statements about these cars must be true? (There could be more than one correct choice.)

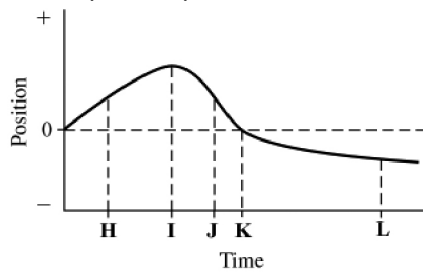
- A) At time $t = 10$ s, both cars have the same velocity.
- B) The cars meet at time $t = 10$ s.
- C) Both cars have the same acceleration.
- D) The magnitude of the acceleration of car C is less than the magnitude of the acceleration of car D.
- E) The magnitude of the acceleration of car C is greater than the magnitude of the acceleration of car D.

Answer: B, C

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 47) The graph in the figure shows the position of an object as a function of time. The letters H-L represent particular moments of time.

47) _____

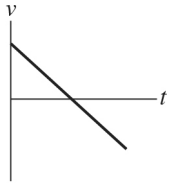


- (a) At which moment in time is the speed of the object the greatest?
(b) At which moment in time is the speed of the object equal to zero?

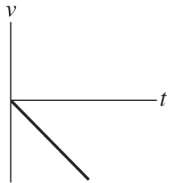
Answer: (a) J (b) I

48) A child standing on a bridge throws a rock straight down. The rock leaves the child's hand at time $t = 0$ s. If we take upward as the positive direction, which of the graphs shown below best represents the velocity of the stone as a function of time? 48) _____

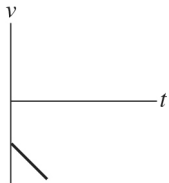
A)



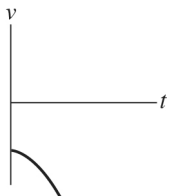
B)



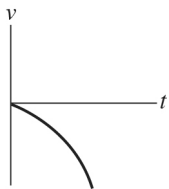
C)



D)



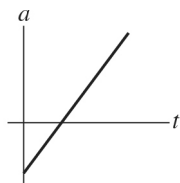
E)



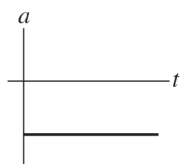
Answer: C

- 49) A child standing on a bridge throws a rock straight down. The rock leaves the child's hand at time $t = 0$ s. If we take upward as the positive direction, which of the graphs shown below best represents the acceleration of the stone as a function of time? 49) _____

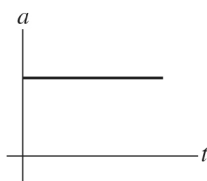
A)



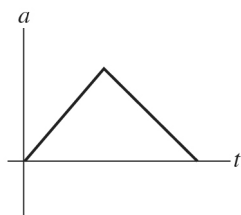
B)



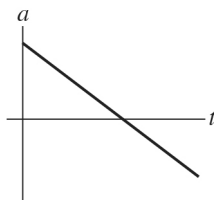
D)



C)



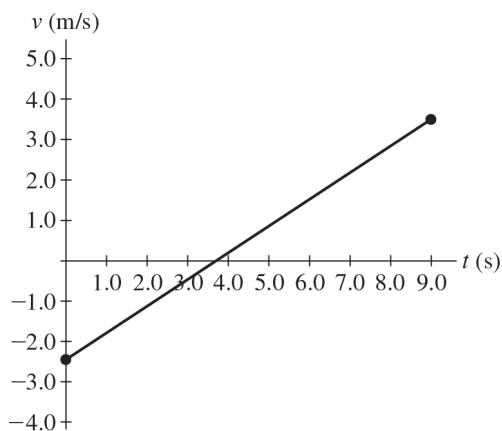
E)



Answer: B

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 50) The motion of a particle is described in the velocity vs. time graph shown in the figure. 50) _____



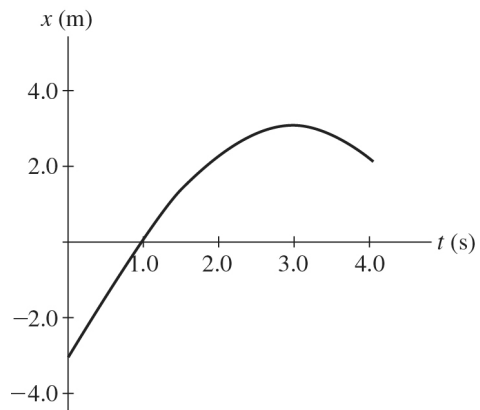
Over the nine-second interval shown, we can say that the *speed* of the particle

- A) only decreases.
- B) increases and then decreases.
- C) remains constant.
- D) decreases and then increases.
- E) only increases.

Answer: D

51) The graph in the figure shows the position of a particle as it travels along the x -axis.

51) _____



At what value of t is the speed of the particle equal to 0 m/s?

A) 4 s

B) 0 s

C) 2 s

D) 3 s

E) 1 s

Answer: D