Chapter 02
Describing Motion

Multiple Choice Questions

1. An auto moves 10 meters in the first second of travel, 10 more meters in the next second, and 10 meters during the third second. Explain why the acceleration is zero.

2. What is the quantity that is a measure of how the velocity of a body changes with time? .

3. A student releases a ball from rest on an inclined plane and measures that it travels a distance of 0.5 m in a time of 2.0 s. Find the average speed of the ball.

4. A student releases a ball from rest on an inclined plane and measures that it travels a distance of 0.5 m in a time of 2.0 s. Find the acceleration of the ball.

5. A car travels a distance of 80 km. For the first 30 minutes it is driven at a constant speed of 80 km/hr. Then the driver reduces the speed to 40 km/hr for the rest of the trip. Find the average speed for the entire trip is

6. If you come to rest in 7.5 s while traveling 450 ft, what is your average speed?

7. If your average speed for a 3-hr trip is 45 mi/hr, find the distance traveled.

8. You travel 2640 feet in thirty seconds while in a 55 mi/hr zone. Is your average speed bigger, smaller, or equal to the speed limit?

9. If your car can accelerate at 6.8 m/s^2, w\how long soes it take for you to go from zero to 60 mi/hr?

10. What acceleration is needed for a jet to go from rest to 100 m/s in 20 s?

11. A student plots data for the velocity of a body versus the time on a graph. What does the area under the curve on the graph represent?

12. Suppose a graph of displacement of a body versus time is constructed. What does the slope of the graph at any point represent?

13. A car starts from rest and reaches 20 m/s in 10 seconds. Find the average acceleration of the car in m/s^2.

14. A graph of position versus time is made for a motion. What does the slope of this graph represent?

15. A car is traveling at the velocity of 20 m/s on a flat road when it reaches the bottom of a hill. It coasts up the hill, coming to rest in 4 seconds. Find the average acceleration of the car. while on the hill is

16. Which of the following quantities relating to motion is a vector and which one is a scalar? a vector?
Displacement, speed, velocity, acceleration.

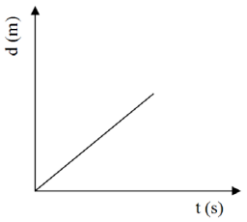
17. The velocity of a body is graphed as a function of time. What does the slope of the graph at any point represent?

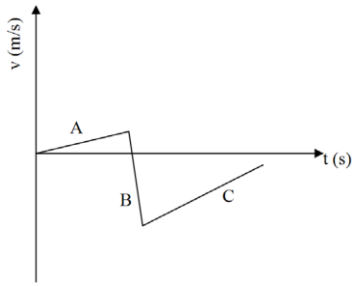
18. A body travels at an initial speed of 1.5 m/s. Given a constant acceleration of 0.2 m/s^2, what is the speed of the body at time 25 seconds later?

19. A car is decelerating at the rate of 3 km/s^2. If its initial speed is 66 km/s, how long will it take the car to come to a complete stop?

20. A sprinter moving at 10 m/s slows down at a rate of 1.4 m/s^2. How fast is the runner moving after 3 seconds?

21. The displacement of an object is shown in the graph on the right. The graph shows
A. an object with increasing speed.
B. an object experiencing an acceleration.
C. an object moving forward.with a constant speed
D. an object turning in a circle.

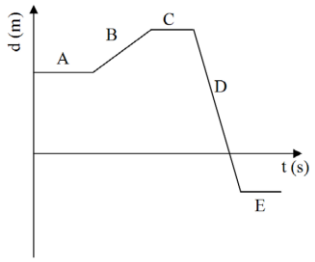




22. Refer to the graph above. The object moves forward
A. in region A.
B. in region B.
C. in regions A and C.
D. It always moves forward.
E. It never moves forward.

23. Refer to the graph above. The acceleration of the object is equal to zero
A. in region A.
B. in region B.
C. in region C.
D. in regions A and C.
E. The acceleration is never equal to zero.

24. Refer to the graph above. The magnitude of the acceleration of the object is largest
A. in region A.
B. in region B.
C. in region C.
D. The object does not accelerate.



25. Refer to the graph above. The velocity of this object at the start of the motion is
A. negative.
B. positive.
C. It is not moving.
D. It is not possible to tell from the graph.

26. Refer to the graph above. The speed of the object is largest
A. in region A.
B. in region B.
C. in region C.
D. in region D.
E. in region E.

27. Refer to the graph above. For the entire motion, the average velocity is
A. negative.
B. positive.
C. It is not moving.
D. It is not possible to tell from the graph.

Chapter 03
Falling Objects and Projectile Motion

1. A bullet is fired straight down from a hovering helicopter. If we neglect air friction, then the velocity of the bullet
A. is a constant.
B. increases at 9.8 m/s each second.
C. decreases at 9.8 ft/s during the flight.
D. is zero.

2. Suppose you throw a ball vertically downward with a speed of 15 m/s. Neglecting air friction, what would be the speed of the ball one second later?

3. If you drop a ball in the absence of air resistance, it accelerates downward at 9.8 m/s^2. If instead you throw the ball upward, then is its acceleration after release less than 9.8 m/s^2, equal to 9.8 m/s^2, or greater than 9.8 m/s^2?

4. You toss a ball straight up in the air. What is the velocity and acceleration of tha ball at the highest point?

5. (Ignore air friction for this problem.) Two identical balls are thrown simultaneously from the top of a very tall cliff. Ball A is thrown downward with an initial velocity of 6 m/s, while ball B is thrown straight upward with an initial velocity of 9.8 m/s. After one second has elapsed, the
A. acceleration of ball A is upward.
B. velocity of ball B is zero.
C. acceleration of ball A is greater than that of ball B.
D. velocity of ball A is 9.8 m/sec^2.
E. acceleration of both balls is zero.

6. An iron robot falls from rest at a great height. Neglecting air resistance, what is its speed after it has fallen for 2.5 seconds? What distance has it fallen in the first 2.5 seconds?

7. The acceleration due to the Earth's gravity, in English units, is 32 ft/s^2. In the absence of air friction, a ball is dropped from rest. Its speed on striking the ground is exactly 60 ft/s .For what time interval was the ball falling? From what height was the ball dropped?

8. In a laboratory on Earth, all the air is pumped from a large tube. A feather and a steel ball are simultaneously released from rest inside the tube. What happens next?

9. In order to find the depth of a well, you drop a stone into it and time its fall. It hits the water after falling for 1.7 s. What is the depth of the well?

10. A 10-kg object dropped from a certain window strikes the ground in 2.0 s. How long does a 5-kg object takes to strike the ground?

11. A rifle bullet is fired horizontally at the same instant another bullet is allowed to drop from rest at the same height. Which bullet strikes the earth first? .

12. A ball is thrown straight up. It reaches its highest point and then falls back. What can you say about its velocity at the highest point?

13. A body released from rest falls with an acceleration of 9.8 m/s^2. If the same body is thrown upward at an angle, and air resistance is negligible, the which of the following is true about its acceleration?
A. downward and equal to 9.8 m/s^2.
B. downward and greater than 9.8 m/s^2.
C. upward and greater than 9.8 m/s^2.
D. upward and equal to 9.8 m/s^2. how long does strikes the ground in
E. downward and less than 9.8 m/s^2.

14. A ball is allowed to drop from rest. If the upward direction is positive, what is its velocity after 1 second? What distance does it drop during this time perio?

15. A ball is projected straight up with an initial velocity of 20 m/s. Find the velocity after 3 seconds.

16. A bullet is fired horizontally at a target 20 m away. The velocity of the bullet as it leaves the gun is 100 m/s. How much, approximately, will the bullet drop on its way to the target?

17. During the first 10 seconds after a ball is dropped from rest, how far will it fall?

18. A man standing on a bridge throws a stone horizontally with a speed of 20 m/s. The stone hits the water below 3 s later. What is the bridge?

19. A ball is thrown across the street. During its flight, the ball's speed is lowest at
A. the beginning of its flight.
B. the end of its flight.
C. the highest point of its flight.
D. The speed is constant throughout the flight.

20. Which of the following does not move like a projectile?
A. A monkey jumping from a tree.
B. An airplane flying at a constant altitude.
C. The seeds at a watermelon seed spitting contest.
D. A rock kicked up by a truck wheel.

21. The acceleration due to gravity near the surface of the Moon is about one-sixth of the value near the Earth's surface. If two rocks were dropped from equal heights, one on the Moon and one on the Earth, which ball will hit the ground first? By how long?

22. Two projectiles are launched 50° above horizontal but with different initial speeds. Which of the following must be true while the projectiles are in the air?
A. The horizontal speeds of both projectiles are the same.
B. The horizontal accelerations of both projectiles are the same: zero.
C. The projectiles will reach the same maximum height.
D. The one with larger initial speed will experience a larger vertical acceleration.

Chapter 04
Newton's Laws: Explaining Motion

1. The force that accelerates a car on a level road is exerted by the
A. road.
B. gears.
C. tires.
D. gasoline.
E. motor.

2. A 10-pound sack of potatoes falls from an airplane. As the velocity of the falling sack increases, so does the air resistance on it. When the air resistance equals 10 pounds, the acceleration of the sack will be
A. zero.
B. 9.8 m/s.
C. 9.8 m/s^2.
D. 100 ft/s^2.

3. A single constant 10-pound force F_1 acts on a body, causing it to accelerate. Then, while F_1 continues to act, a second constant force F_2 is applied to the body, which comes to a momentary stop. The magnitude of F_2 is
A. zero.
B. a bit less than 10 pounds.
C. exactly 10 pounds.
D. larger than 10 pounds.
E. There is not enough information to tell.

4. The frictional force, due to air resistance, acting on an object is always
A. in the direction of the object's motion.
B. in the opposite direction to the object's motion.
C. greater than the net force.
D. in the upward direction.
E. smaller than object's weight.

5. An elevator is being lifted upward at a constant speed by a steel cable. All frictional forces are neglected. In this situation, forces on the elevator are such that
A. the upward force by the cable is greater than the downward force of gravity.
B. the upward force by the cable is equal to the downward force of gravity.
C. the upward force by the cable is smaller than the downward force of gravity.
D. none of the above. (The elevator goes up because the cable is being shortened, not because an upward force is exerted on the elevator by the cable.)

6. The erroneous idea that an object needs a force on it to keep moving even at constant velocity was held by
A. Galileo.
B. Aristotle.
C. Newton.

7. Two pieces of kryptonite, #1 and #2, have identical masses, but the net force applied to #1 is 20 N and to #2 is 400 N. Which piece has a larger acceleration?

8. A body sliding on a table is observed to gradually slow down. Is there a net force acting on the body? If yes, what force is it?

9. A car rounds a curve while maintaining constant speed. The correct statement is:
A. The acceleration of the car is zero.
B. The velocity of the car is zero.
C. No net force acts on the car.
D. The velocity of the car is constant.
E. A net force acts upon the car.

10. The acceleration of gravity on the Moon's surface is about 1/6 of that on the Earth's surface. An object on the Earth is to be taken to the Moon. We can state that, compared to the Earth,
A. the object's mass and weight will be the same on the Moon.
B. the object's mass will be less but the weight will be the same on the Moon.
C. the object's mass will be the same but the weight will be less on the Moon.
D. the object's mass and weight will be less on the Moon.

11. A block, moving on a frictionless horizontal surface on Earth, requires a force if it is to be stopped. Now suppose that the same block, moving with the same speed on a frictionless horizontal surface on the Moon, where gravity is less, is to be stopped in the same time. We can say that, compared to the Earth,
A. less force is required to stop the block on the Moon.
B. greater force is required to stop the block on the Moon.
C. the force required would be the same.
D. the block could not be stopped.

12. A calculus book weighing 20 N is held on the floor of a classroom. What is the reaction to the force of the floor on the book

13. Suppose one's hand exerts a force of 12 N upward on a book weighing 10 N. What is the reaction to the force of the hand on the book ?

14. A block of mass 5.0 kg is acted upon by a single force, producing an acceleration of 2.0 m/s^2. Find the force.

15. A 10.0 kg block on a smooth horizontal surface is acted upon by two forces: a horizontal force of 70 N acting to the right and a horizontal force of 30 N to the left. Find the acceleration of the block.

16. A crate is acted upon by a net force of 100 N. An acceleration of 5.0 m/s^2 results. Find the weight of the crate..

17. A parachutist jumping from an airplane reaches a terminal velocity when the force of air resistance is 980 N. The mass of the parachutist is
A. 100 kg.
B. 100 lb.
C. 980 kg.
D. 980 lb.
E. 220 lb.

18. find the acceleration when a net horizontal force of 200 N acts on a 50-kg cart that is free to roll on a level surface.

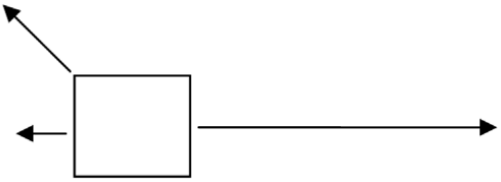
19. A child, whose weight is 150 newtons, lifts a pumpkin from the ground with a force of 50 newtons. The force the pumpkin exerts on the child is
A. zero.
B. greater than zero but less than 50 newtons.
C. 50 newtons.
D. more than 50 newtons.

20. A certain force causes a 50 kg person to accelerate at 1.0 m/s^2. The same force applied to a 75-kg person would cause
A. a smaller acceleration.
B. the same acceleration.
C. a greater acceleration.

21. A dog weighs 250 N. What is his approximate weight in pounds (lb)?

22. Your weight is 100 lb. Suppose you are standing on a scale in an elevator moving up with a constant speed of 3 m/s. What would be the reading on the scale?

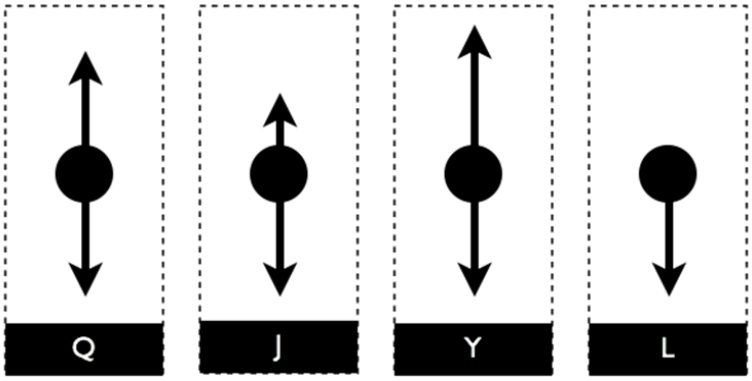
23. Three forces act on the object in the sketch. In what direction will the object move?



24. The acceleration due to gravity is smaller on Mars than the Earth, so the Mars rovers that explore the surface are lighter on Mars than they are on Earth. If the rovers roll across a flat plain, then the force required to accelerate the rovers is
A. less than would be required on Earth.
B. the same as would be required on Earth.
C. more than would be required on Earth.

25. A father and his young daughter are on very clean ice, so there is very little friction (the father has more mass than the daughter). The father pushes his daughter forward and she slides away at a speed of 3 m/s. The father's velocity is
A. zero.
B. smaller than 3 m/s in the same direction as his daughter.
C. smaller than 3 m/s in the opposite direction as his daughter.
D. 3 m/s in the same direction as his daughter.
E. 3 m/s in the opposite direction as his daughter.

26. An object is acted upon by the three forces shown above. If the mass of the object is 12 kg, find the acceleration of the object.



27. This diagram shows a few of the snapshots, but they are out of order. Place them in order, from the instant it jumps out of the plane and begins free-fall until the time it attains terminal velocity.
A. L, Y, J, Q
B. J, Y, L, J
C. L, Q, J
D. Q, Y
E. L, J, Q

28. Refer to the set of snapshots Q, J, Y, and L. Which snapshot is impossible for an object in free-fall?

29. A physics professor places a soda pop can on the table and asks a student to identify the forces acting upon the can and the directions of each force. The two forces acting on the soda pop can are

Fill in the Blank Questions

30. A blob of green cheese at the Cheese Institute on the Earth has a mass of 7.2 kg. The same cheese blob in outer space will have a mass of _____.

31. A light body and a heavy body are both given identical accelerations. The body acted upon by the larger force is the _____ body.

32. A light body sliding on a smooth horizontal surface collides with a heavy body. During the instant of contact the force exerted by the light body on the heavy body is _____ (equal to, greater than, less than) the force exerted by the heavy body on the light body.

33. A body of mass 1 kg is pushed across a horizontal table by a force of 1 N. The observed acceleration is 0.8 m/s^2. The force of friction opposing the motion is _____.

34. The net force acting on a body gives the direction of the _____ of the body.

35. The amount of inertia a body has can be measured by finding its _____.

36. The force of the floor pushing up on you to counter your weight is an example of a _____ _____.

37. Newton's Law states that no force is required to keep a moving object in motion. Why, then, do you have to pedal continuously to ride a bicycle along a flat road?
_____ _____