Chapter 3: Falling Objects and Projectile Motion

1. Neglecting friction, if a Cadillac and Volkswagen start rolling down a hill together, the heavier Cadillac will get to the bottom
A. before the Volkswagen.
B. after the Volkswagen.
C. at the same time as the Volkswagen.
Answer: C

2. 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.
Answer: B

3. Suppose you throw a ball vertically upward with a speed of 49 m/s. Neglecting air friction, what would be the speed of the ball one second later?
A. 49 m/s.
B. 39.2 m/s.
C. 32 ft/s².
D. 18 m/s.
E. 10 m/s.
Answer: B

4. Which of the curves in the figure best shows the speed of an object falling from rest without air friction?

Answer: A
5. If you drop a ball in the absence of air resistance, it accelerates downward at 9.8 m/s². If instead you throw the ball upward, then its acceleration after release is
   A. less than 9.8 m/s².
   B. equal to 9.8 m/s².
   C. greater than 9.8 m/s².
   Answer: B

6. A person standing at the edge of a cliff throws one ball straight up and another ball straight down at the same initial speed. Neglecting air resistance, the ball which hits the ground at the base of the cliff with the greater speed is the one initially thrown
   A. upward.
   B. downward.
   C. both hit with the same speed.
   Answer: C

7. You toss a ball straight up in the air. At the highest point, the ball’s
   A. velocity and acceleration are zero.
   B. acceleration is zero but not its velocity.
   C. velocity is zero and the acceleration is upward.
   D. velocity is zero and the acceleration is downward.
   Answer: D

8. (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. the acceleration of ball A is greater than that of ball B.
   D. velocity of ball A is 9.8 m/sec².
   E. acceleration of both balls is zero.
   Answer: B

9. A football is thrown upward at some angle above the horizontal. If we neglect air friction, then we can conclude that the acceleration vector of the football is
   A. opposite to the velocity vector.
   B. zero.
   C. along the direction of motion.
   D. down.
   Answer: D
10. An iron vise falls from rest at a great height. Neglecting air resistance, what is its speed after it has fallen for 5 seconds?
   A. 49 m/s.
   B. 49 m/s².
   C. 9.8 m/s.
   D. 9.8 m/s².
   Answer: A

11. An iron vise falls from rest at a great height. Neglecting air resistance, what distance has it fallen in the first 5 seconds?
   A. 245 m.
   B. 122 m.
   C. 98 m.
   D. 49 m.
   Answer: B

12. The acceleration due to the Earth’s gravity, in English units, is 32 ft/s². In the absence of air friction, a ball is dropped from rest. Its speed on striking the ground is exactly 60 miles/hr. For what time interval was the ball falling? (There are 5280 feet in one mile.)
   A. 5 s.
   B. 6.1 s.
   C. 1.875 s.
   D. 2.75 s.
   Answer: D

13. The acceleration due to the Earth’s gravity, in English units, is 32 ft/s². In the absence of air friction, a ball is dropped from rest. Its speed on striking the ground is exactly 88 ft/s. From what height was the ball dropped?
   A. 121 ft.
   B. 242 ft.
   C. 88 ft.
   D. 165 ft.
   Answer: A

14. 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?
   A. Both objects float weightless inside the tube.
   B. Both objects fall and hit the bottom at the same time.
   C. The feather falls and hits the bottom before the steel ball.
   D. The steel ball falls and hits the bottom before the feather.
   Answer: B
15. 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 2 s. The depth of the well is about
   A. 2 m.
   B. 10 m.
   C. 20 m.
   D. 40 m.
   Answer: C

16. A stone is thrown upward from a bridge at a speed of 10 m/s. It narrowly misses the bridge on the way back down, and hits the water at 30 m/s. The bridge is about
   A. 3 m high.
   B. 10 m high.
   C. 30 m high.
   D. 40 m high.
   Answer: D

17. A 10-kg object dropped from a certain window strikes the ground in 2.0 s. Neglecting air resistance, a 5-kg object dropped from the same window strikes the ground in
   A. 1.0 s.
   B. 2.0 s.
   C. 4.0 s.
   D. 8.0 s.
   Answer: B

18. An object rises at 5 m/s under the influence of gravity only. One second later the object is
   A. rising at 5 m/s.
   B. rising at 4 m/s.
   C. neither rising nor falling.
   D. falling at 5 m/s.
   Answer: D

19. 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?
   A. The bullet from the rifle.
   B. The bullet allowed to drop.
   C. Both strike at the same instant.
   Answer: C
20. A ball is thrown straight up. It reaches its highest point and then falls back. Which of the following is the correct statement?
A. At the highest point in its motion, the ball’s velocity is zero.
B. At the highest point in its motion, the ball’s acceleration is zero
C. Throughout its motion, the ball’s velocity is zero.
D. Throughout its motion, the ball’s acceleration is zero.
E. At the highest point in its motion, the ball's velocity and acceleration are zero.
Answer: A

21. A body released from rest falls with an acceleration of 9.8 m/s². If the same body is thrown upward at an angle, and air resistance is negligible, its acceleration will be
A. downward, and equal to 9.8 m/s².
B. downward, and greater than 9.8 m/s².
C. upward, and greater than 9.8 m/s².
D. upward, and equal to 9.8 m/s².
E. downward, and less than 9.8 m/s².
Answer: A

22. The acceleration of a body is given by the slope of a graph plotting:
A. displacement versus time.
B. time versus velocity.
C. velocity versus displacement.
D. time versus displacement.
E. velocity versus time.
Answer: E

23. For a body moving with constant acceleration, which of the following graphs will be a straight line?
A. Displacement versus time.
B. Velocity versus time.
C. Displacement versus velocity.
D. Time versus displacement.
E. Velocity versus displacement.
Answer: B

24. A ball is allowed to drop from rest. After 1 second its velocity will be:
A. 1.0 m/s.
B. 2.45 m/s.
C. 4.9 m/s.
D. 7.35 m/s.
E. 9.8 m/s.
Answer: E
25. After 1 second, a ball dropped from rest will have fallen
A. 1.0 m.
B. 2.45 m.
C. 4.9 m.
D. 9.8 m.
E. 19.6 m.
Answer: C

26. A ball is projected straight up with an initial velocity of 20 m/s. After 1 second, its velocity will be
A. 29.8 m/s.
B. 20.0 m/s.
C. 14.2 m/s.
D. 10.2 m/s.
E. 6.6 m/s.
Answer: D

27. A ball is projected upward with an initial velocity of 20 m/s. It will reach its maximum height in approximately
A. 1 s.
B. 1.5 s.
C. 2 s.
D. 2.5 s.
E. 3 s.
Answer: C

28. A ball thrown upward reaches its maximum height, and then falls back. If air resistance is negligible, its acceleration is:
A. less on the way up than on the way down.
B. less on the way down than on the way up.
C. the same up and down but zero at the top.
D. the same at all points in the motion.
Answer: D

29. Ball A is thrown upward with a velocity of 19.6 m/s. Two seconds later ball B is thrown upward with a velocity of 9.8 m/s. Which ball is first to return to the thrower’s hand?
A. A will arrive first.
B. B will arrive first.
C. A and B will arrive at the same time.
Answer: C

30. 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?
A. 0.1 m.
B. 0.2 m.
C. 0.3 m.
D. 0.4 m.
E. 0.5 m.
Answer: B

31. During the first 10 seconds after a ball is dropped from rest, how far will it fall?
A. 100 m.
B. 245 m.
C. 490 m.
D. 980 m.
E. 1960.0 m.
Answer: C

32. A 10 pound iron ball and a 2 pound iron ball are dropped simultaneously from a height of 100 meters. Neglecting air resistance, which ball will reach the ground first?
A. The 10 lb ball.
B. The 2 lb ball.
C. They will reach the ground at the same time.
Answer: C

33. 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. The bridge is
A. 45 m high.
B. 60 m high.
C. 30 m high.
D. 20 m high.
Answer: A

34. The motion of a falling object is commonly investigated with the aid of a
A. stroboscope.
B. microscope.
C. kaleidoscope.
D. stethoscope.
Answer: A

35. A ball rolls off a shelf and hits the floor below 0.25 seconds later. To find the speed of the ball as it left the shelf, we would need
A. the distance measured along the floor to the point of impact.
B. to repeat the experiment.
C. the height of the table.
D. the weight of the ball.
Answer: A

36. Assuming g = 10 m/s² and that air resistance is negligible, in ½ second a ball dropped from rest will fall
A. ½ meter.
B. one meter.
C. 1.25 meters.  
D. 5 meters.  
Answer: C

37. One day while measuring acceleration with his pulse as a timing source, Galileo became so excited that his pulse rate increased. His results for acceleration that day were probably  
A. lower than usual.  
B. higher than usual.  
C. more accurate than usual.  
D. unchanged.  
Answer: A

38. 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.  
Answer: C

39. A body whose velocity increases by a constant amount each second is exhibiting motion for which the _______________ is constant.  
Answer: acceleration

40. For a bullet fired horizontally, its horizontal __________ will retain a constant non-zero value until it is stopped.  
Answer: velocity

41. The time of flight of a projectile, fired horizontally over level ground, is independent of its horizontal ______________.  
Answer: velocity

42. A football is kicked at an angle giving it a horizontal velocity of 20 m/s. At the highest point in its path, the football will have a velocity of ________ m/s and a horizontal acceleration of ________ m/s².  
Answer: 20 and zero