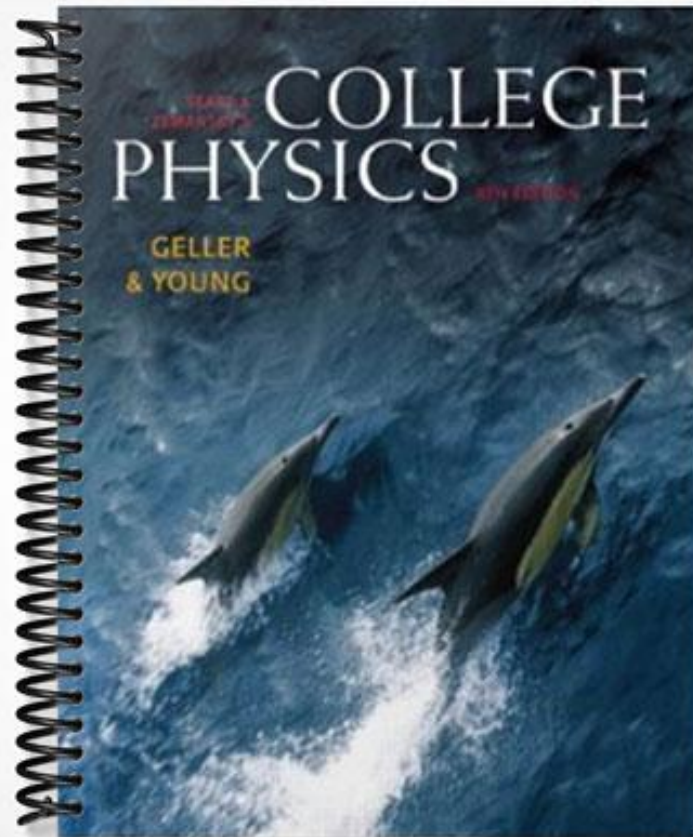


TEST BANK



Multiple Choice Questions

1) Shown here are the velocity and acceleration vectors for an object in several different types of motion. In which case is the object slowing down and turning to its right?

A)



B)



C)



D)



E)



Answer: B

Var: 1

2) Shown here are the velocity and acceleration vectors for an object in several different types of motion. In which case is the object's velocity changing while its speed is not changing?

A)



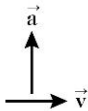
B)



C)



D)



E) None of these cases.

Answer: D

Var: 1

3) Which of the following ideas is true about projectile motion with no air drag?

A) $v_x^2 + v_y^2 = \text{constant}$.

B) The acceleration is +g when the object is rising and -g when falling.

C) The velocity of the object is zero at the point of maximum elevation.

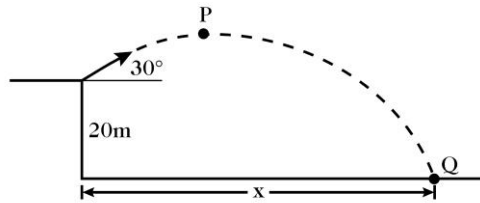
D) The trajectory will depend on the object's mass as well as its initial velocity and launch angle.

E) The horizontal motion is independent of the vertical motion.

Answer: E

Var: 1

Figure 3.1



4) A projectile is fired from the origin (at $y = 0$ m) as shown in Figure 3.1. The initial velocity components are $V_{0x} = 940$ m/s and $V_{0y} = 96$ m/s. The projectile reaches maximum height at point P, then it falls and strikes the ground at point Q. In Figure 3.1, the y-coordinate of point P is closest to:

- A) 470 m
- B) 45,550 m
- C) 45,080 m
- D) 940 m
- E) 90,160 m

Answer: A

Var: 1

5) A projectile is fired from the origin (at $y = 0$ m) as shown in Figure 3.1. The initial velocity components are $V_{0x} = 690$ m/s and $V_{0y} = 18$ m/s. The projectile reaches maximum height at point P, then it falls and strikes the ground at point Q. In Figure 3.1, the y-component of the velocity of the shell at point P is closest to:

- A) zero
- B) +20 m/s
- C) +40 m/s
- D) -20 m/s
- E) -40 m/s

Answer: A

Var: 50+

6) A projectile is fired from the origin (at $y = 0$ m) as shown in Figure 3.1. The initial velocity components are $V_{0x} = 740$ m/s and $V_{0y} = 65$ m/s. The projectile reaches maximum height at point P, then it falls and strikes the ground at point Q. In Figure 3.1, the y-component of the acceleration of the shell at point P is closest to:

- A) zero
- B) +5 m/s²
- C) +10 m/s²
- D) -5 m/s²
- E) -10 m/s²

Answer: E

Var: 50+

7) A projectile is fired from the origin (at $y = 0$ m) as shown in Figure 3.1. The initial velocity components are $V_{0x} = 140$ m/s and $V_{0y} = 84$ m/s. The projectile reaches maximum height at point P, then it falls and strikes the ground at point Q. In Figure 3.1, the x-component of the velocity of the shell at point P is closest to:

- A) 140 m/s
- B) 35 m/s
- C) 70 m/s
- D) 105 m/s
- E) zero

Answer: A

Var: 1

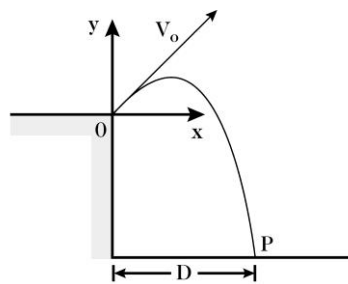
- 8) Two bullets are fired simultaneously parallel to a horizontal plane. The bullets have different masses and different initial velocities. Which one will strike the plane first?
- A) The fastest one.
 - B) The slowest one.
 - C) The heaviest one.
 - D) The lightest one.
 - E) They strike the plane at the same time.

Answer: E

Var: 1

- 9) A projectile is fired at time $t = 0.0\text{s}$, from point 0 at the edge of a cliff, with initial velocity components of $v_{0x} = 80\text{ m/s}$ and $v_{0y} = 100\text{ m/s}$. The projectile rises, then falls into the sea at point P. The time of flight of the projectile is 25.0s .

Figure 3.2a



In Figure 3.2a, the magnitude of the velocity at time $t = 15.0$ is closest to:

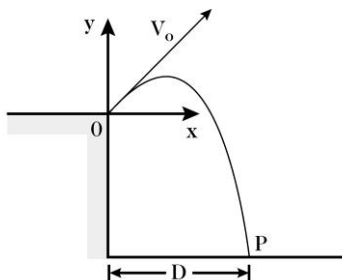
- A) 93 m/s
- B) 47 m/s
- C) 62 m/s
- D) 260 m/s
- E) 247 m/s

Answer: A

Var: 50+

- 10) A projectile is fired at time $t = 0.0\text{s}$, from point 0 at the edge of a cliff, with initial velocity components of $v_{0x} = 50\text{ m/s}$ and $v_{0y} = 200\text{ m/s}$. The projectile rises, then falls into the sea at point P. The time of flight of the projectile is 50.0 s .

Figure 3.2b



In Figure 3.2b, the x-coordinate of the projectile when its y-component of velocity equals 160 m/s upward is closest to:

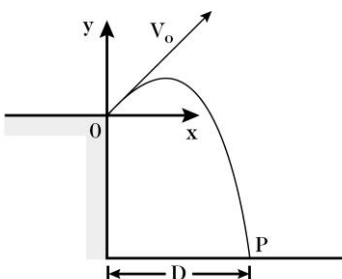
- A) 200 m
- B) 190 m
- C) 180 m
- D) 170 m
- E) 210 m

Answer: A

Var: 50+

- 11) A projectile is fired at time $t = 0.0\text{s}$, from point 0 at the edge of a cliff, with initial velocity components of $v_{0x} = 40\text{ m/s}$ and $v_{0y} = 300\text{ m/s}$. The projectile rises, then falls into the sea at point P. The time of flight of the projectile is 75.0 s .

Figure 3.2c



In Figure 3.2c, the height H of the cliff is closest to:

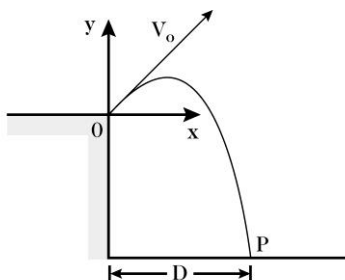
- A) 5060 m
- B) 4520 m
- C) 5600 m
- D) 6140 m
- E) 6680 m

Answer: A

Var: 50+

- 12) A projectile is fired at time $t = 0.0\text{s}$, from point 0 at the edge of a cliff, with initial velocity components of $v_{0x} = 80\text{ m/s}$ and $v_{0y} = 200\text{ m/s}$. The projectile rises, then falls into the sea at point P. The time of flight of the projectile is 50.0 s .

Figure 3.2d



In Figure 3.2d, the horizontal distance D is closest to:

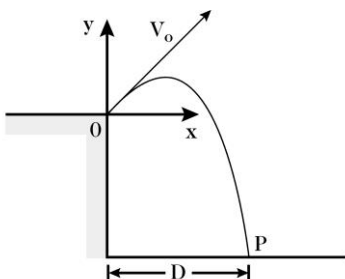
- A) 4000 m
- B) 4480 m
- C) 4960 m
- D) 5440 m
- E) 5920 m

Answer: A

Var: 50+

- 13) A projectile is fired at time $t = 0.0\text{s}$, from point 0 at the edge of a cliff, with initial velocity components of $v_{0x} = 40\text{ m/s}$ and $v_{0y} = 100\text{ m/s}$. The projectile rises, then falls into the sea at point P. The time of flight of the projectile is 25.0 s .

Figure 3.2e



In Figure 3.2e, the y-coordinate of the projectile when its x-coordinate is 400 m is closest to:

- A) +510 m
- B) 60 m
- C) -60 m
- D) +310 m
- E) +150 m

Answer: A

Var: 50+

14) A rescue plane spots a survivor 120 m directly below and releases an emergency kit with a parachute. If the package descends at a constant vertical acceleration of 6.44 m/s^2 and the initial plane horizontal speed was 70.2 m/s , how far away from the survivor will it hit the waves?

- A) 429 m
- B) 2.62 km
- C) 303 m
- D) 445 m

Answer: A
Var: 50+

15) A boy throws a rock with an initial velocity of 3.22 m/s at 30.0° above the horizontal. How long does it take for the rock to reach the maximum height of its trajectory?

- A) 0.164 s
- B) 0.290 s
- C) 0.322 s
- D) 0.454 s

Answer: A
Var: 50+

16) What is the maximum distance we can shoot a dart, provided our toy dart gun gives a maximum initial velocity of 9.35 m/s ?

- A) 8.91 m
- B) 17.82 m
- C) 4.67 m
- D) More information needed.

Answer: A
Var: 50+

17) A cat leaps to catch a bird. If the cat's jump was at 60.0° off the ground and its initial velocity was 4.96 m/s , what is the highest point of its trajectory?

- A) 0.94 m
- B) 1.88 m
- C) 19.84 m
- D) 0.62 m

Answer: A
Var: 50+

18) A fisherman casts his bait toward the river at an angle of 25° . As the line unravels, he notices that the bait and hook reach a maximum height of 1.5 m . What was the initial velocity he launched the bait with? Assume that the line exerts no appreciable drag force on the bait and hook.

- A) 13 m/s
- B) 5.7 m/s
- C) 3.9 m/s
- D) 3.2 m/s

Answer: A
Var: 30

19) A football kicker is attempting a field goal from 34 m out. The ball is kicked and just clears the lower bar with a time of flight of 3.5 s . If the angle of the kick was 45° , what was the initial speed of the ball?

- A) 13.7 m/s
- B) 46.3 m/s
- C) 1.7 m/s
- D) 58.3 m/s

Answer: A
Var: 50+

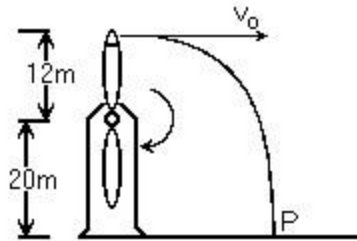
- 20) You throw a rock horizontally off a cliff with a speed of 20 m/s. After two seconds, the magnitude of the velocity of the rock is closest to
- A) 28 m/s
 - B) 20 m/s
 - C) 40 m/s
 - D) 37 m/s

Answer: A
Var: 1

- 21) A child is sitting on the outer edge of a merry-go-round that is 18 m in diameter. If the merry-go-round makes 5.5 rev/min. what is the velocity of the child in m/s?
- A) 5.2 m/s
 - B) 10.4 m/s
 - C) 0.8 m/s
 - D) 3.6 m/s

Answer: A
Var: 50+

Figure 3.3



A wind farm generator uses a two-bladed propeller mounted on a pylon at a height of 20 m. The length of each propeller blade is 12 m. A tip of the propeller breaks off when the propeller is vertical. The fragment flies off horizontally, falls, and strikes the ground at P. Just before the fragment broke off, the propeller was turning uniformly, taking 1.2 s for each rotation.

- 22) In Figure 3.3, the distance from the base of the pylon to the point where the fragment strikes the ground is closest to:
- A) 120 m
 - B) 130 m
 - C) 140 m
 - D) 150 m
 - E) 160 m

Answer: E
Var: 1

- 23) In Figure 3.3, the angle with respect to the vertical at which the fragment strikes the ground is closest to:
- A) 58°
 - B) 63°
 - C) 68°
 - D) 73°
 - E) 78°

Answer: C
Var: 1

- 24) Two particles, A and B, are in uniform circular motion about a common center. The acceleration of particle A is 3.6 times that of particle B. Particle B takes 2.1 times as long for a rotation as particle A. The ratio of the radius of the motion of particle A to that of particle B is closest to:
- A) 0.82
 - B) 1.7
 - C) 2.9
 - D) 0.58
 - E) 8

Answer: A

Var: 50+

- 25) You are taking a turn at 30.0 m/s on a ramp of radius 21.0 m. What is your acceleration?
- A) 42.9 m/s²
 - B) 1.43 m/s²
 - C) 14.7 m/s²
 - D) 0.700 m/s²

Answer: A

Var: 50+

- 26) An aircraft performs a maneuver called an aileron roll. During this maneuver, the plane turns like a screw as it maintains a straight flight path, by using its ailerons to set the wings in circular motion. If it takes the plane 26 s to complete the circle and each wing length is 5.9 m, what is the acceleration of the wing tip?
- A) 0.34 m/s²
 - B) 2.0 m/s²
 - C) 2.9 m/s²
 - D) 0.50 m/s²

Answer: A

Var: 50+

- 27) An aircraft performs a maneuver called an aileron roll. During this maneuver, the plane turns like a screw as it maintains a straight flight path, by using its ailerons to set the wings in circular motion. Due to structural strength, the airplane can only withstand an acceleration of 6.1 m/s² on its wing tips. If the wing span is 7.5 m, what is the shortest time it can make a full turn when it performs an aileron roll?
- A) 4.9 s
 - B) 6.8 s
 - C) 0.80 s
 - D) 7.0 s

Answer: A

Var: 50+

Short Answer Questions

- 1) A projectile returns to its original height after 4.08 seconds, during which time it travels 76.2 meters horizontally. If air resistance can be neglected, what was the projectile's initial speed?

(Use $g = 9.80 \text{ m/s}^2$)

Answer: 27.4 m/s

Var: 1

- 2) A rock is thrown from the roof of a building, with an initial velocity of 10.0 m/s at an angle of 30.0° above the horizontal. The rock is observed to strike the ground 43.0 m from the base of the building. What is the height of the building assuming no air drag?

Answer: 96.0 meters

Var: 1

- 3) A child sits on a merry-go-round, 1.5 meters from the center. The merry-go-round is turning at a constant rate, and the child is observed to have a radial acceleration of 2.3 m/s^2 . How long does it take for the merry-go-round to make one revolution?

Answer: 5.1 seconds

Var: 1

- 4) A disk-shaped space station 125 m in diameter spins at a uniform rate about an axis through its center and perpendicular to the plane of the disk. If the acceleration of a point on the rim of the disk is to be equal to g , how long does it take for the station to make one revolution?

Answer: 15.9 s

Var: 1

- 5) A 5.00 kg stone is thrown upward at 7.50 m/s at an angle of 51.0° above the horizontal from the upper edge of a cliff, and it hits the ground 1.50 s later with no air drag. Find the magnitude of its velocity vector just as it reaches the ground.

Answer: 10.0 m/s

Var: 1

- 6) A projectile is thrown upward at 24.0° with the *vertical* and returns to the horizontal ground 12.5 s later with no air drag. (a) How fast was it thrown? (b) How far from its original position did it land? (c) How high above its original position did it go?

Answer: (a) 67.0 m/s, (b) 341 m, (c) 191 m

Var: 1

