Physics for the Life Sciences (Canadian) 3rd edition Zinke-Allmang Test Bank

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TRUE/FALSE

1 : A fly crawls in a zigzag pattern along a line where the angle that successive straight-line segments of its path make with the general direction of motion is 60 degrees. The total distance the fly crawls is twice the distance between the end points of its path.
A : true
B : false

Correct Answer : A

2 : At some point on the graph of displacement versus time, between two points, the instantaneous velocity equals the average velocity between those points.
A : true
B : false

Correct Answer : A

3 : For an object moving along a straight line, in order to return to its starting point it does not necessarily have a speed of zero during the time lapse of its motion.
A : true
B : false

Correct Answer : B

4 : For a car braking with constant deceleration, the time to stop is doubled when the speed of the car before braking is doubled.
A : true
B : false

Correct Answer : A

5 : A train travelling at 200 km/hr has to brake due to an obstruction on the track 1 km ahead. The maximum braking deceleration that can be applied is 0.2g. The train will be able to stop before hitting the obstruction.
A : true
B : false

Correct Answer : A

6 : If a car brakes at constant deceleration, the stopping distance is doubled when the initial speed is twice as great.
A : true
B : false

Correct Answer : B

7 : Neglecting air resistance, a ball thrown horizontally with a certain velocity from 10 floors up a building will hit the ground at twice the distance from the building as if it were thrown from 5 floors up.
A : true
B : false

Correct Answer : B

8 : A ball thrown upward at a given speed will reach the ground with the same speed as the initial speed, regardless of the angle at which it is thrown.
A : true
B : false

Correct Answer : A

9 : One centrifuge has twice the diameter of a second one, and half its number of revolutions per minute. Particles in suspension in the two centrifuges will feel the same centripetal acceleration.
A : true
B : false

Correct Answer : B

10 : A weight is swung on the end of a string in a horizontal plane, with a certain period of revolution. If the string is shortened to half its length, and the revolution period is kept the same, the centripetal acceleration of the weight is halved.
A : true
B : false

Correct Answer : A

11 : Meissner's corpuscles, the mechanism for physiological detection of velocity in humans, detect how fast the body is moving with respect to its surroundings.
A : true
B : false

Correct Answer : B

12 : The mechanism for physiological detection of acceleration of the body in humans is called Meissner's corpuscles.
A : true
B : false

Correct Answer : B

MULTIPLE CHOICE

13 : A bee caught inside a window walks along the bottom ledge. Starting at the left corner, it walks 50 cm to the right, then 20 cm to the left, then 8 cm to the right, and 10 cm to the left. At this time, how far is the bee from the corner?
A : 28 cm
B : 40 cm
C : 50 cm
D : 88 cm

Correct Answer : A

14 : Figure 2.1

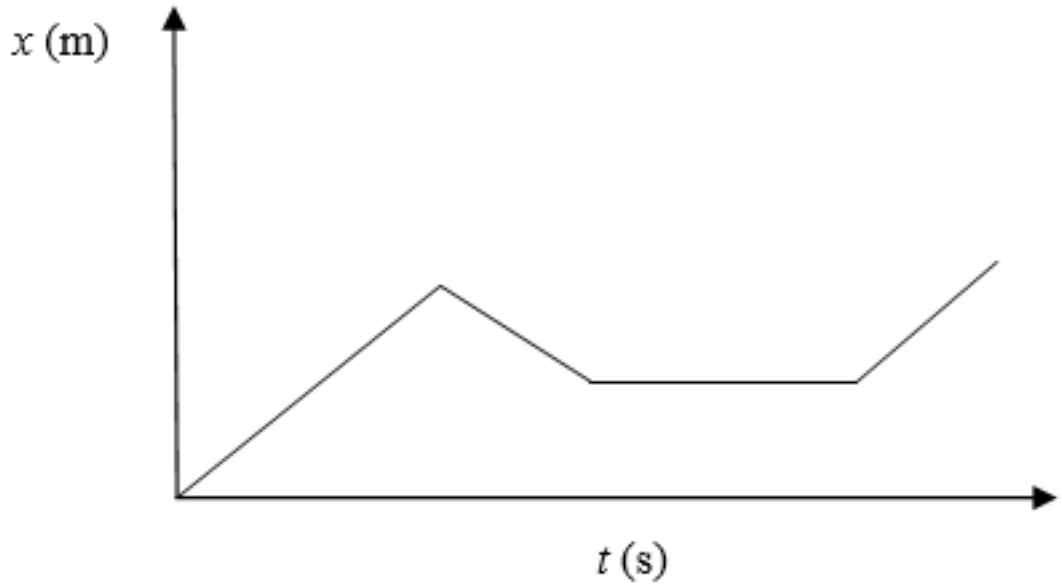


Figure 2.1 shows the x-position of an object as a function of time. Which of the following best describes the motion of the object?

A : The object moves to the right, then down, then moves to the right, then up.
B : The object moves up, falls down, stops for some time, and moves up again.
C : The object moves to the right, moves to the left, stops for a while, and again moves to the right.
D : The object moves up and to the right, then straight to the right, then up again.

Correct Answer : C

15 : A man is chased by a jaguar. The man's top speed is 20 km/hr and the jaguar's top speed is 100 km/hr. If they are 400 m apart, how many seconds elapse until the man is caught?

A : 5 s
B : 14.4 s
C : 18 s
D : 72 s

Correct Answer : C

16 : A boy runs around a neighbourhood block in 10 minutes for a total distance of 2 km. What are his average velocity and speed in km/s?

A : 12, 12
B : 12, 0
C : 0, 12
D : not enough information provided

Correct Answer : C

17 : A migrating bird will travel nonstop at a fixed speed of 40 km/hr (in still air) over a distance of 2000 km due south of its present position; however, there is a west wind of 30 km/hr. What is the time required for the bird to reach its destination?

A : 37.8 hours
B : 53.5 hours
C : 75.6 hours
D : 106.9 hours

Correct Answer : C

18 : Which of these statements tells you that, from a graph of displacement versus time, the velocity at point (t2, x2) is greater than the velocity at another point, (t1, x1)?
A : The vertical coordinate at point (t_2, x_2) is greater.
B : The slope of the tangent is greater.
C : The slope at (t_2, x_2) is increasing.
D : The slope at (t_1, x_1) is decreasing.

Correct Answer : B

19 : In a graph of velocity versus time, which of these statements correctly describes the total displacement from time t1 to time t2?
A : the slope of the line passing through the graph at time points t_1 and t_2
B : the area under the curve between t_1 and t_2
C : the maximum slope of the graph between t_1 and t_2
D : insufficient information provided

Correct Answer : B

20 : A bird flies north at 60 km/hr for 2 minutes, then east at 70 km/hr for 5 minutes, and finally lands after flying south at 80 km/hr for 3 minutes. What is the displacement of the landing point from the take-off point?
A : 2.04 km, 19 degrees north of east
B : 2.04 km, 19 degrees south of east
C : 11.83 km, 20 degrees north of east
D : 11.83 km, 45 degrees south of east

Correct Answer : B

21 : Blood in the aorta accelerates from rest to 0.4 m/s over a distance of 2 cm. What is the average acceleration?
A : 4 m/s^2
B : 4 m^2/s^2
C : 8 m^2/s
D : 8 m/s^2

Correct Answer : D

22 :

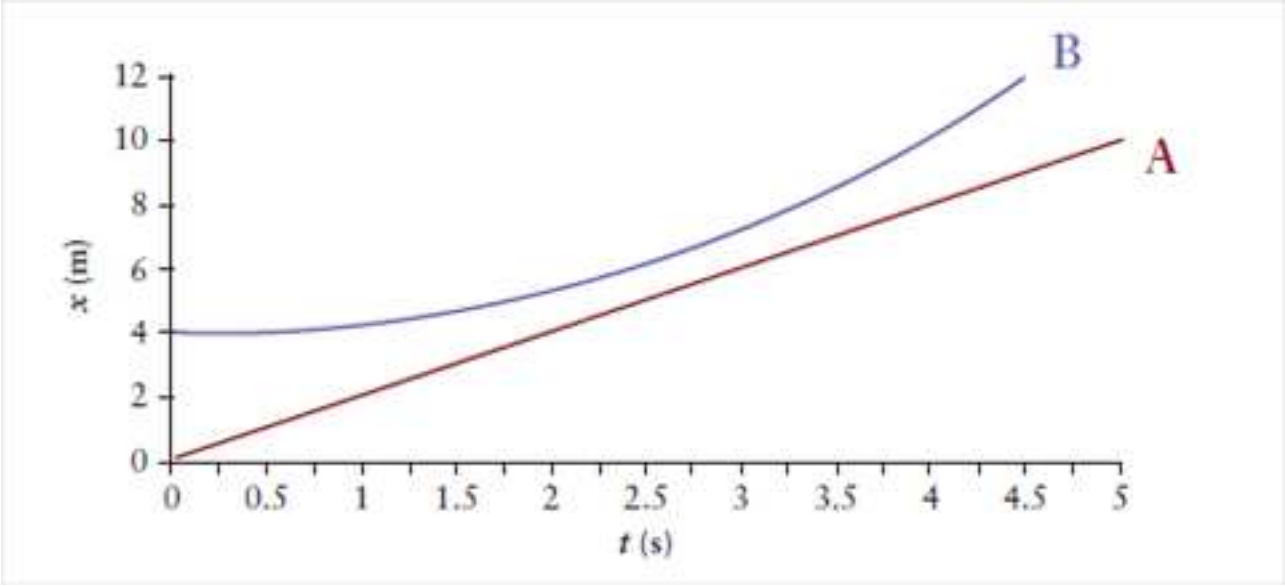


Figure 2.2Figure 2.2 represents position as a function of time for object A and object B. Which of the following statements correctly describes a comparison of the velocity and the acceleration of objects A and B?
A : The velocity of B is always larger than the velocity of A.
B : The acceleration of A is larger than the acceleration of B at time 1.5 s.
C : The velocity of A is larger than the velocity of B at time 1.5 s.
D : The acceleration of A is always larger than the acceleration of B.

Correct Answer : C

23 : What is the stopping distance for a car braking at constant deceleration of 0.5g from a speed of 120 km/hr?
A : 56 m
B : 70 m
C : 113 m
D : 140 m

Correct Answer : C

24 : A ball is thrown vertically upward at 10 m/s. How high does the ball rise?
A : 2.5 m
B : 5.1 m
C : 10.2 m
D : 15.3 m

Correct Answer : B

25 : A stone is dropped from a bridge 50 m above a river. How long does it take the stone to reach the water?
A : 2.26 seconds
B : 3.19 seconds
C : 4.52 seconds
D : 4.78 seconds

Correct Answer : B

26 : A person on the ground wishes to throw a ball up to her friend on the third floor balcony, 10.0 m above, from a position 1.0 m away from the side of the building. The friend on the balcony catches the ball while it is moving horizontally. To achieve this, with what speed must the friend on the ground throw the ball?
A : 7.0 m/s
B : 9.9 m/s
C : 14.0 m/s
D : 19.8 m/s

Correct Answer : C

27 : While flying horizontally at a speed of 5.0 m/s, an owl accidentally drops a mouse it is carrying. The mouse drops to the ground, 10.0 m below. What is the impact velocity with which the mouse hits the ground?
A : 14.9 m/s, at angle of 70.35 degrees below the horizontal
B : 14.9 m/s, at angle of 70.35 degrees above the horizontal
C : 20.0 m/s, at angle of 70.35 degrees below the horizontal

D : 20.0 m/s, at angle of 70.35 degrees above the horizontal

Correct Answer : A

28 : A shot putter can throw the shot with an initial velocity of 20 m/s from a height of 1.8 m at an angle of 30 degrees to the horizontal. With what speed does the shot hit the ground?
A : 10 m/s
B : 11.63 m/s
C : 20 m/s
D : 20.86 m/s

Correct Answer : D

29 : A ball is thrown from a building at an angle of 45 degrees above the horizontal. If the ball were thrown in the same way from a floor at twice the height, by what factor does the distance from the building at which the ball reaches the ground increase?

A :

B : 2

C : 2

D : insufficient information

Correct Answer : D

30 : A boy throws a ball at an angle of 60 degrees above the horizontal with a speed of 12.00 m/s. After 2 s, what is the distance of the ball from the boy?
A : 1.18 m
B : 10.82 m
C : 12.06 m
D : 24.0 m

Correct Answer : C

31 : A top with a diameter of 5.00 cm is spinning at 200.00 revolutions per minute. What is the centripetal acceleration at the rim?
A : 1.97 m/s^2
B : 3.95 m/s^2
C : 5.59 m/s^2
D : 7.90 m/s^2

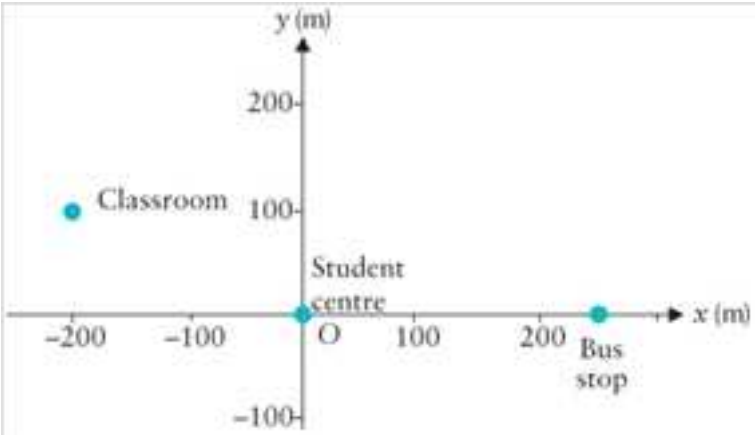
Correct Answer : B

32 : The Moon orbits Earth in an approximately circular orbit at a distance of 380000 km in 27.3216 days. What is the centripetal acceleration of the Moon?
A : 0.0272 m/s^2
B : 0.0068 m/s^2
C : 0.0027 m/s^2
D : 0.0014 m/s^2

Correct Answer : C

ESSAY

33 :



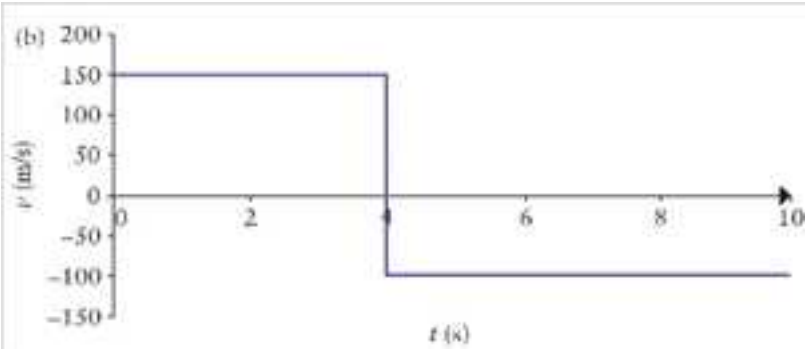
A student drew the coordinate system below to plot major points of interest on the university campus.(a) What are the coordinates of the classroom, the student centre, and the bus stop in this system?(b) If the student set up a coordinate system with the origin in the classroom, what would then be the coordinates of the student centre and the bus stop?(c) How would the distance between the student centre and the bus stop change with the change of a coordinate system?

Correct Answer : (a) coordinates in metres: classroom (–200, 100); student centre (0.0); bus stop (250, 0)(b) coordinates in metres: classroom (0, 0); student centre (200, –100); bus stop (450, –100)(c) The distance is retained. A change of coordinate system retains the relative distances between objects.RAT: Shifting the coordinate system changes the coordinates of objects in a setup; however, relative distance and motion are retained.

34 : A bird flies in a straight line at 50 km/hr for 2 minutes, and after taking off again flies in a straight line at 40 km/hr for 3 minutes before landing a second time. What are the maximum and minimum distances that the bird can be from its initial position after the second landing?

Correct Answer : The angle between the displacement vectors corresponding to the two successive flight paths is unknown, and the total distance travelled depends on this angle. The maximum distance is the sum of the two displacements; the minimum distance is the magnitude of the difference in the displacements.RAT: Displacement is a vector quantity. The angle between displacement vectors must be known in order to calculate final displacement. The maximum distance is 3.67 km; the minimum distance is 0.33 km.

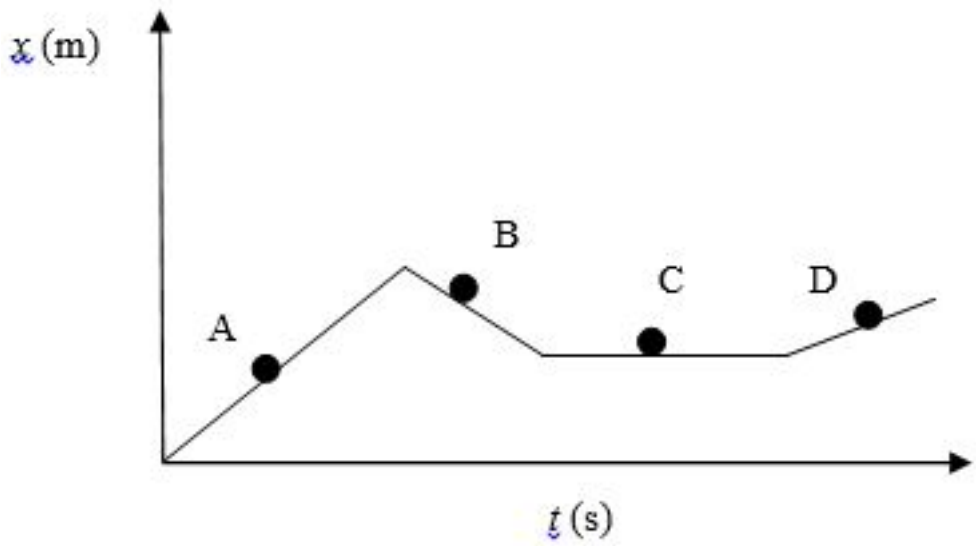
35 :



The figure below shows the velocity of an object as a function of time.(a) What is the average velocity from the start to the end at 10 s?(b) What is the displacement of an object from 2 s to 8 s?

Correct Answer : (a) –25 m/s, (b) –100 mRAT: Use Eq. [2.2] for velocity, displacement, and time.

36 :



The figure below shows the x-position of an object as a function of time.(a) At which point does the object have the smallest non-zero speed?(b) At which point does the object have the largest speed?(c) At which point is the object at rest?(d) At which point is the object moving to the left?

Correct Answer : (a) D, (b) A, (c) C, (d) BRAT: Motion to the right is shown by the increasing x-values. Motion in the left is shown by the decreasing x-values. Stopping produces constant x-

values.

37 : One athlete can accelerate to a maximum speed of 15 m/s in 2 s, but can maintain that speed for only 20 s. A second athlete reaches a maximum speed of 20 m/s in 2 s, but can maintain it for only 15 s. Which athlete runs the longer distance? Describe your reasoning.

Correct Answer : Calculate the distance travelled during the initial acceleration phase using Eq. [2.4] and Eq. [2.12], and the distance of the maximum speed phase using Eq. [2.2]. The second athlete runs a longer distance than the second.RAT: When considering the performance of an athlete, one must take into account both the acceleration and constant-speed phases, as well as the endurance of the athlete.

38 : One athlete can accelerate to a maximum speed of 15 m/s in 2 s, but can maintain that speed for only 20 s. A second athlete reaches a maximum speed of 20 m/s, but can maintain it for only 15 seconds. Which athlete will have run farther after 10 seconds?

Correct Answer : Calculate the distance travelled in the first 2 s using Eqs. [2.5] and [2.10]. Then calculate the distance travelled in the remaining 8 s using Eq. [2.2]. The second athlete runs the longer distance.RAT: When considering the performance of an athlete, one must take into account both the acceleration and constant-speed phases, as well as the endurance of the athlete.

39 : If a car accelerates from a stationary starting position, what difference would it make to the velocity of the car to gradually increase the amount of acceleration to some maximum value, rather than maintain the acceleration at this maximum value from the beginning?

Correct Answer : The velocity is the area under the acceleration-versus-time graph. If all the acceleration is given “at the beginning”—that is, over a short time interval—it would have to be much larger than if gradually increased from zero in order for the areas under the respective acceleration-versus-time graphs to be the same (and equal to the maximum velocity).RAT: High accelerations are undesirable, and dangerous to passengers.

40 : Compare the order of magnitude of the accelerations of a human being in a crowd where the average distance apart is 3 m and the speed of walking is 4 km/hr, to those of microscopic particles of the order of 5 ìm apart being jostled by their neighbours several hundreds of times every second.

Correct Answer : The numbers given allow an estimate of the average time between “collisions”; the average acceleration is calculated as the average speed of motion of individual people or particles divided by the average time between “collisions.”RAT: The smaller the objects, in general, the larger the accelerations they experience in their environment.

41 : If football is to be played on the Moon, describe the conditions that differ from those on Earth that you would need to take into consideration to design the playing field.

Correct Answer : Answers will vary.RAT: points that could be mentioned: smaller gravitational acceleration; no air friction; the larger range of travel for a given velocity; the longer time of flight of the ball (Eqs. [2.23])

42 : A ball is thrown parallel to the ground at a height of 1 m. Another ball is thrown at an angle of 45 degrees above the horizontal from ground level with the same speed. Which of these methods would result in the ball travelling further until its first bounce?

Correct Answer : Which ball travels further before the first bounce depends on the initial speed at which it is thrown. For the first case, the time to reach the ground is t1 = (2h/g), where h = 1 m is the height above ground, and the distance travelled is x1 = v0t1 = v0(2h/g), by Eq. [2.9] (for the y-component) and Eq. [2.2] (for the x-component). For the second case, the time to reach the maximum height is t2 = v0,y/g, where and v0,y = v0sin(45°). The time to hit the ground is 2t2, so the distance travelled is x2 = v0,xt2, where v0,x = v0cos(45°). The ratio of these distances is x2/x1 = v0/(2gh), which depends on the initial speed v0.RAT: This question is of interest in ballistics.

43 : An athlete throws a putt at an angle of 30 degrees to the horizontal. A second athlete throws a putt at 45 degrees to the horizontal but at 95% of the initial speed of the first athlete. Which athlete threw the putt further?

Correct Answer : The range of each putt is given by R = v02sin2è/g. Calculate the ratio of the ranges: R2/R1 = 1.04, so the second athlete threw the putt further.RAT: In addition to the speed, the angle at which an object is launched determines the range of the object's path.

44 : If the centripetal acceleration of a body revolving around a centre of attraction increased when its distance from the centre decreased, describe in general terms the shape that the path of the body looked like.

Correct Answer : Answers will vary.RAT: From Eq. [2.27], we see that the centripetal acceleration at any point depends on the radius of curvature of the path. Whether this increases or decreases depends on the radial component of velocity, which will either increase or decrease the distance of the body from the attracting centre. In the former case, the radius of curvature decreases, and in the latter case it increases. This is precisely what happens to bodies in orbit around each other, such as the planets around the Sun, or the Moon around Earth. The orbits are, in general, non-circular, resulting in increasing radius of curvature when approaching each other, and decreasing radius of curvature when receding from each other.

45 : Describe in general terms the advantages and disadvantages of building larger-diameter centrifuges spinning at a certain rate, as opposed to centrifuges of the same size but that spin faster.

Correct Answer : Answers will varyRAT: By Eq. [2.27], the centripetal acceleration is proportional to the diameter (or radius, r) of the path but proportional to the square of the rate of spin (= 1/T). Therefore, greater gains in centripetal acceleration may be achieved by spinning faster than by having a larger-diameter centrifuge.