PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

MOTION IN A STRAIGHT LINE

Physics

1. A particle moving in a straight line covers half the distance with speed of $3m/s$. The half of the distance is covered in two equal intervals with speed of $4.5m/s$ and $7.5m/s$ respectively. The average speed of the particle during this motion is :

A. 4.0 m/s

B. 5.0 m/s

C. 5.5 m/s

D. 4.8 m/s

Answer:

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2. The acceleration of a particle is increasing linearly with time t as bt. The particle starts from the origin with an initial velocity v_0. The distance travelled by the particle in time t will be

A. $V_0 t + \frac{1}{3}bt^2$

B. $V_0 t + \frac{1}{3}bt^3$

C. $V_0 t + \frac{1}{6}bt^3$

D. $V_0 t + \frac{1}{2}bt^2)$

Answer:

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3. The motion of a body is given by the equation $dv/dt = 6 - 3v$, where v is in m//s. If the body was at rest at $t = 0$

(i) the terminal speed is $2m/s$

(ii) the magnitude of the initial acceleration is $6m/s^2$

(iii) The speed varies with time as $v = 2\left(1 - e^{-3t}\right)m/s$

(iv) The speed is $1m/s$, when the acceleration is half initial value

A. (a) The terminal speed is 4 m/s

B. (b) The speed varies with the time as v(t) = 2(1 – e–5t)m/s

C. (c) The speed is 0.1m/s when the acceleration is half the initial value

D. (d) The magnitude of the initial acceleration is 6.0 m/s^2

Answer:

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4. A particle of mass m moves on the $x - a\xi s$ as follows : it starts from rest at $t = 0$, from the point $x = 0$, and comes to rest at $t = l$ at the point $x = 1$. No other information is available about its motion at intermediate times $(0 < t < l)$. If α denotes the instantaneous accelartion of the particle , then :

A. (a) α cannot remain positive for all t in the interval 0 $\leq$ t $\leq$ 1

B. (b) | α | cannot exceed 2 at any point in its path

C. | α | must be $>$ 4 at some point or points in its path

D. | α | = 2 at any points in its path

Answer:

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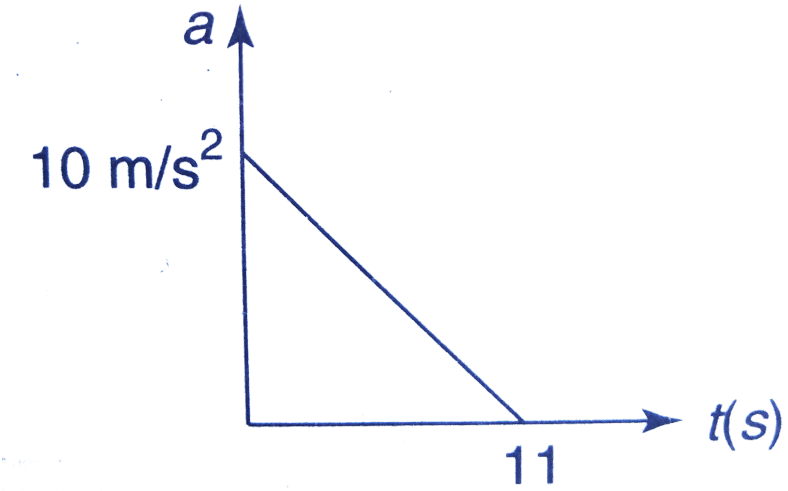
5. A particle starting from rest. Its acceleration (a) versus time (t) is as shown in the figure.

The maximum speed of the particle will be.



A. 110 m / s

B. 55 m / s

C. 550 m / s

D. 660m / s

Answer:

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6. A car accelerates from rest at a constant rate α for some time, after which it decelerates at a constant rate β, to come to rest. If the total time elapsed is t seconds. Then evalute (a) the maximum velocity reached and (b) the total distance travelled.

A. $\left(\alpha^2 + \frac{\beta^2}{\alpha\beta}\right)t$

B. $\left(\alpha^2 - \frac{\beta^2}{\alpha\beta}\right)t$

C. $\frac{\alpha^2 + \beta^2 t}{\alpha\beta}\Big)$

D. $\frac{\alpha + \beta t}{\alpha + \beta}$

Answer:

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7. A particle starts sliding down a frictionless inclined plane. If S_n is the distance travelled by it from time $t = n - 1\,\text{sec}$, to $t = n\,\text{sec}$, the ratio $\frac{S_n}{s_{n+1}}$ is

A. (2n-1)/(2n)`

B. $\frac{2n+1}{)}(2n-1)$

C. $\frac{2n-1}{2n+1}$

D. $\frac{2n}{2n+1}$

Answer:

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8. A particle starts moving from the position of rest under a constant acc. If it covers a distance x in t second, what distance will it travel in next t second?

A. x

B. 2 x

C. 3 x

D. 4 x

Answer:

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9. Find the ratio of the distance moved by a free-falling body from rest in fourth and fifth seconds of its journey.

A. $4:5$

B. $7:5$

C. $16:5$

D. $1:1$

Answer:

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10. If a ball is thrown vertically upwards with speed u, the distance covered during the last t second of its ascent is

A. $(u+\ >)t$

B. ut

C. $\left(\frac{1}{2}\right)g$t^(2)`

D. $ut-\frac{1}{2}>^{2}$

Answer:

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11. If the displacement of a particle is $\left(2t^{2}+t+5\right)$ meter then, what will be acceleration at $t=5\,\text{sec}.$

A. $21m/s^{2}$

B. $20m/s6(2)$

C. $4m/s^{2}$

D. $10m/s^{2}$

Answer:

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12. A particle moves along x-axis with acceleration $a = a0(1-t/T)$ where a_0 and T are constants if velocity at t = 0 is zero then find the average velocity from t = 0 to the time when a = 0.

A. $\frac{a_0 T}{3}$

B. $\frac{a_0 T}{2}$

C. $\frac{a_0 T}{4}$

D. $\frac{a_0 T}{5}$

Answer:

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13. A point moves with uniform acceleration and v_1, v_2, and v_3 denote the average velocities in the three successive intervals of time t_1. t_2, and t_3 Which of the following Relations is correct?.

A. $(v_1 - v_2) : (v_2 - v_3) = (t_1 - t_2) : (t_{2+t_\square}(3))$

B. $(v_1 - v_2) : (v_2 - v_3) = (t_1 + t_2) : (t_{2+t_\square}(3))$

C. $(v_1 - v_2) : (v_2 - v_3) = (t_1 - t_2) : (t_2 - t_\square)(3))$

D.

Answer:

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14. The position of a particle moving in the xy plane at any time t is given by $x = (3t^2 - 6t)$ metres, $y = (t^2 - 2t)$ metres. Select the correct statement about the moving particle from the following

A. (a) The acceleration of the particle is zero at t = 0 second

B. (b) The velocity of the particle is zero at t = 0 second

C. (c) The velocity of the particle is zero at t = 1 second

D. (d) The velocity and acceleration of the particle are never zero

Answer:

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15. Two car A and B travelling in the same direction with velocities v_1 and $v_2(v_1 > v_2)$. When the car A is at a distance d ahead of the car B, the driver of the car A applied the brake producing a uniform retardation a. There wil be no collision when.

A. $\left(d < \frac{(v_1 - v_2)^2}{2a}\right.$

B. $d < \frac{v_1^2 - v_2^2}{2a}$

C. $\left(d > \frac{(v_1 - v_2)^2}{2a}\right.$

D. $\left(d > \frac{v_1^2 - v_2^2}{2a}\right.$

Answer:

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16. A body travels for 15 second starting from rest with constant acceleration. If it travels distances S_1, S_2 and S_3 in the first five seconds, second five seconds and next five seconds respectively the relation between S_1, S_2 and $S_3$is

A. $S_1 = S_2 = S_3$

B. $5S_1 = 3S_1 = S_3$

C. $S_1 = \frac{1}{3}S_2 = \frac{1}{5}S_3$

D. $S_1 = \frac{1}{5}S_2 = \frac{1}{3}S_3$

Answer:

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17. The position of a particle moving along the x-axis at certain times is given below $|:(t(s), 0, 1, 2, 3), (x(m), -2, 0, 6, 16):|$ Which of the following describes the motion correctly?

A. (a) Uniform, accelerated

B. (b) Uniform, decelerated

C. (c) Non-uniform, accelerated

D. (d) There is not enough data for generalization

Answer:

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18. A body A moves with a uniform acceleration a and zero initial velocity. Another body B, starts from the same point moves in the same direction with a constant velocity v. The two bodies meet after a time t. The value of t is

A. $\frac{2v}{2a}$

B. $\frac{v}{a}$

C. $\frac{v}{2a}$

D. $\frac{\sqrt{v}}{2a}$

Answer:

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19. A particle moves along x-axis as $x = 4(t-2) + a(t-2)^2$

Which of the following is true?

A. (a) The initial velocity of particle is 4

B. (b) The acceleration of particle is 2a

C. (c) The particle is at origin at t = 0

D. (d) None of these

Answer:

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20. The displacement x of a particle varies with time t as $x = ae^{-\alpha t} + be^{\beta t}$. Where a, b, α and β positive constant.

The velocity of the particle will.

A. (a) Go on decreasing with time

B. (b) Be independent of α and β

C. (c) Drop to zero when $\alpha = \beta$

D. (d) Go on increasing with time

Answer:

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21. A particle moves as such acceleration is given by a = 3 sin 4t, then :

A. (1) the acceleration of the particle becomes zero after each interval of $\frac{\pi}{4}$ second

B. (2) the initial velocity of the particle must be zero

C. (3) the particle comes at its initial position after sometime

D. (4) the particle must move on a circular path

Answer:

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22. A reference frame attached to the earth

A. (1) is an inertial frame by definition

B. (2) cannot be an inertial frame because the earth is revolving round the sun

C. (3) is an inertial frame because Newton's laws are applicable in this frame

D. (4) cannot be an inertial frame because the earth is rotating about its own axis

Answer:

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23. If a particle travels a linear distance at speed v_1 and comes back along the same track at speed v_2.

A. (1) Its average speed is arithmetic mean $\frac{v_1 + v_2}{2}$

B. (2) Its average speed is harmonic mean $2v_1 \frac{v_2}{v_1 + v_2} / (2)$

C. (3) Its average speed is geometric mean $\sqrt{V_1 v_2}$

D. (4) Its average velocity is zero

Answer:

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24. The distance travelled (in meters) by the particle from time to t = 0 to t = 1s will be –

A. $\frac{2}{\pi}$

B. $\frac{1}{\pi}$

C. $\frac{4}{\pi}$、

D. None of these

Answer:

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25. The distance travelled (in meters) by the particle from time t = 0 to t =

t will be –

A. $\frac{2}{\pi^2}\sin\pi t - \frac{2t}{\pi}$

B. $\frac{-2}{\pi^2}\sin\pi t + \frac{2t}{\pi}$

C. $\frac{2t}{\pi}$

D. None of these

Answer:

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26. The magnitude of displacement (in meters) by the particle from time t = 0 to t = t will be –

A. $\frac{2}{\pi^2}\sin\pi t - \frac{2t}{\pi}$

B. $-\frac{2}{\pi^2}\sin\pi t + \frac{2t}{\pi}$

C. $\frac{2t}{\pi}$

D. None of these

Answer:

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27. Statement-1 : The position-time graph of a uniform motion in one dimension of a body can have negative slope.

Statement-2 : When the speed of body decreases with time, the position-time graph of the moving body has negative slope.

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28. Assertion: A body having non zero acceleration can have a constant velocity.

Reason: Acceleration is the rate of change of velocity.

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29. Assertion: Displacement of a body may be zero when distance travelled by it is not zero.

Reason: The displacement is the longest distance between initial and final position.

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30. A stone dropped from a building of height h and it reaches after t second on the earth. From the same building if two stones are thrown (one upwards and other downwards) with the same speed and they reach the earth surface after t_1 and t_2 seconds, respectively, then

A. $t = t_1 - t_2$

B. $t = \frac{t_1 + l_2}{2}$

C. $t = \sqrt{t_1 t_2}$

D. $t = t_1^2 t_2^2$

Answer:

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31. A ball is projected upwards from a height h above the surface of the earth with velocity v. The time at which the ball strikes the ground is

A. $\frac{v}{g} + \frac{2hg}{\sqrt{2}}$

B. $\frac{v}{g}\left[1 - \sqrt{1 + \frac{2h}{g}}\right]$

C. $\frac{v}{g}\left[1 + \sqrt{1 + \frac{2gh}{V^2}}\right]$

D. $\frac{v}{g}\left[1 + \sqrt{V^2 + \frac{2g}{h}}\right]$

Answer:

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32. A man throws ball with the same speed vertically upwards one after the other at an interval of 2 seconds. What should be the speed of the throw so that more than two ball are in the sky at any time (Given $g = 10\frac{m}{2^2}$)

A. a) At least 0.8 m/s

B. (b) Any speed less than 19.6 m/s

C. (c) Only with speed 19.6 m/s

D. (d) More than 19.6 m/s

Answer:

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33. If a ball is thrown vertically upwards with speed u, the distance covered during the last t second of its ascent is

A. $\frac{1}{2} >^2$

B. $ut - \frac{1}{2} >^2$

C. $(u - \ >)t$

D. ut d

Answer:

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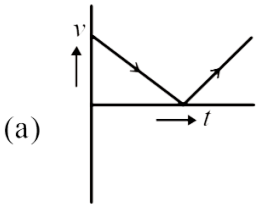
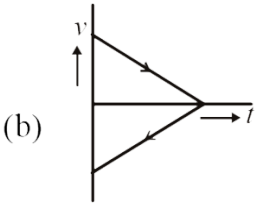
34. A ball is thrown vertically upwards. Which of the following graph/graphs represent velocity time graph of the ball during its flight (air resistance is neglected).

A.



B.



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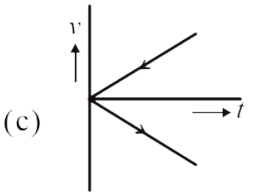
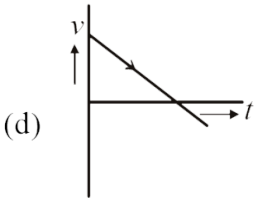


D.



Answer:

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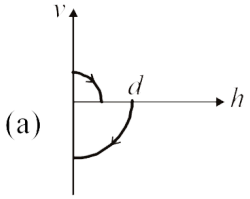
35. A ball is dropped vertically from a height d above the ground . It hits the ground and bounces up vertically to a height

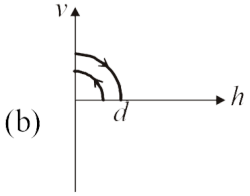
$(d)/(2).\ Neg \leq ct \in g \subset sequentmotion$ and $airresis\tan ce, itsvelocity$

$vvarieswiththeheighth$` above the ground as

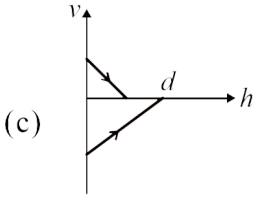
A.



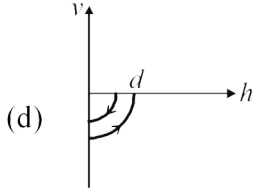
B.



C.



D.



Answer:

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36. P, Q and R are three balloons ascending with velocities U, 4U and 8U respectively. If stones of the same mass be dropped from each, when they are at the same height, then

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37. A body is projected up with a speed u and the time taken by it is T to reach the maximum height H. Pich out the correct statement

A. It reaches H//2 in T//2 sec

B. It acquires velocity $u/2$ in $t/2$ sec

C. Its velocity is $u/2$ at $H/2$

D. Same velocity at 2T

Answer:

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38. Time taken by an object falling from rest to cover the height of h_1 and $h_2 is respectively t_1$ and $t_2 then the ratio of t_1 \to t_2$ is

A. $h_1 : h_2$

B. $\sqrt{h_1} : \sqrt{h_2})$

C. $h_1 : 2h_2$

D. $2h_1 : h_2$

Answer:

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39. Three different objects of masses m_1, m_2 and m_2 are allowed to fall from rest and from the same point O along three different frictionless paths. The speeds of three objects on reaching the ground will be:

A. $m_1 : m_2 : m_3$

B. $m_1 : 2m_2 : 3m_3$

C. $1:1:1$

D. $\frac{1}{m_1}:\frac{1}{m_1}:\frac{1}{m_3}$

Answer:

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40. From the top of a tower, a particle is thrown vertically downwards with a velocity of $10m/s$. The ratio of the distances, covered by it in the $3rd$ and $2nd$ seconds of the motion is $\left(\text{Take} g = 10m/s^2\right)$.

A. $5:7$

B. $7:5$

C. $3:6$

D. $6:3$

Answer:

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41. A body falls from a height $h = 200m$ (at New Delhi). The ratio of distance travelled in each $2\sec$ during $t = 0$ to $t = 6$ seconds of the journey is.

A. $1:4:9$

B. $1:2:4$

C. $1:3:5$

D. $1:2:3$

Answer:

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42. The effective acceleration of a body, when thrown upwards with acceleration a will be :

A. $\sqrt{a - g^2}$

B. $\sqrt{a^2+g^2}$

C. (a-g)

D. (a+g)

Answer:

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43. An aeroplane is moving with a velocity u. It drops a packet from a height h. The time t taken by the packet in reaching the ground will be

A. $\sqrt{\frac{2g}{h}}$

B. $\sqrt{\frac{2u}{g}}$

C. $\sqrt{\frac{h}{g}}$

D. $\sqrt{\frac{2h}{g}}$

Answer:

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44. Two trains, each $50m$ long, are travelling in opposite directions with velocities $10ms^{-1}$ and $15ms^{-1}$. The time of their crossing each other is.

A. 2s

B. 4s

C. $2\sqrt{3s}$

D. $4\sqrt{3s}$

Answer:

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45. A train of $150m$ length is going toward north direction at a speed of $10ms^{-1}$. A parrot flies at a speed of $5ms^{-1}$ toward south direction

parallel to the railway track. The time taken by the parrot to cross the train is equal to.

A. 12 sec

B. 8 sec

C. 15 sec

D. 10 sec

Answer:

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46. The distance between two particles is decreasing at the rate of 6 m/sec. If these particles travel with same speeds and in the same direction, then the separation increase at the rate of 4 m/sec. The particles have speed as

A. 5m / sec,1m / sec

B. 4m / sec,1m / /sec

C. 4 m / sec,2 m / /sec

D. 5 m / sec,2 m / sec

Answer:

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47. A train is moving due east and a car is moving due north with equal speeds. A passenger in the train finds that the car is moving towards

A. (a) East-north direction

B. (b) West-north direction

C. (c) South-east direction

D. (d) None of these

Answer:

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48. An express train is moving with a velocity v_1. Its driver finds another train is movig on the same track in the same direction with velocity v_2. To escape collision, driver applies a retardation a on the train. The minimum time of escaping collision be

A. $t = \frac{v_1 - v_2}{a}$

B. $t_1 = \frac{v_1^2 - V_2^2}{2}$

C. Both (a) and (b)

D. None of these

Answer:

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49. Two particles move simultaneously from two points A and B, 300m apart. The particle at A, starts towards B with a velocity of 25 m/s and that at B, moves normal to the former with a velocity of 20 m/s

A. (1) The relative velocity of the particle at A, w.r.t. that at B is 32.02 m/s

B. (2) The relative velocity of the particle at A, w.r.t. that at B is 12.04 m/s

C. (3) They are closest to each other after 7.32 sec.

D. (4) They are closest to each other after 4.25 sec.

Answer:

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50. A plane is to fly due north. The speed of the plane relative to the air is 200 km/h, and the wind is blowing from west to east at 90 km/h.

A. (1) The plane should head in a direction of $\sin^{-1}(0.45)$

B. (2) The plane should head in a direction of $\sin^{-1}(0.60)$

C. (3) The relative velocity of plane w.r.t. ground is 179km/h

D. (4) The relative velocity of plane w.r.t. ground is 149km/h

Answer:

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51. From the top of a multi-storeyed building 40m tall, a boy projects a stone vertically upwards with an initial velocity of$10ms^{-1}$such that it eventually falls to the ground.

A. (1) After 4 s the stone will strike the ground

B. (2) After 2 s the stone will pass through the point from where it was projected

C. (3) Its velocity when it strikes the ground is 30 m//s

D. (4) Its velocity when it strikes the ground is 40 m/s

Answer:

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52. If the plane has an eastward heading, and a $20m/s$ wind blows towards the southwest, then the plane's speed is –

A. $80m/s$

B. more than $80m/s$ but less than $100m/s$

C. $100m/s$

D. more than 100 m/s

Answer:

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53. The pilot maintains an eastward heading while a $20m/s$ wind blows northward. The plane's velocity is deflected from due east by what angle?

A. $\frac{\sin^{-1}(20)}{100}$

B. $\frac{\cos^{-1}(20)}{100}$

C. $\frac{\tan^{-1}(20)}{100}$

D. none

Answer:

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54. Let ϕ denote the answer of above question. The plane has what speed with respect to the ground ?

A. $(100m/s)\sin\phi$

B. (100 m/s) cos ϕ

C. $\frac{100m/s}{\sin\phi}$

D. $\frac{100m/s}{\cos\phi}$

Answer:

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55. Assertion:- The magnitude of velocity of two boats relative to river is same. Both boats start simultaneously from same point on one bank They may reach opposite bank simultaneously moving along different straight line paths.

Reason:- For boats to cross the river in same time, the component of their velocity relative to river in direction normal to flow should be same.

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56. Statement-1 : The acceleration of a body of mass 2 kg thrown vertically upwards is always constant.

Statement-2 : A body of all mass group travels under constant acceleration when only gravity acts on it.

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57. Statement-1 : The velocity of a body A relative to the body B is the sum of the velocities of bodies A and B if both travel in opposite

direction on a straight line.

Statement-2 : The velocity of a body A relative to the body B is the difference of the velocities of bodies A and B if both travel in opposite direction on a straight line.

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