PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

MOTION IN A STRAIGHT LINE

Physics

1. A particle starts moving rectilinearly at time $t = 0$ such that its velocity v changes with time t according to the equation $v = t^2 - t$,

where t is in seconds and v in ms^{-1}. Find the time interval for which the particle retards.

A. $\frac{1}{2} < t < 1$

B. $\frac{1}{2} > t > 1$

C. $\frac{1}{4} < t < 1$

D. $\frac{1}{2} < t < \frac{3}{4}$

Answer:

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2. The co-ordinates of a moving particle at anytime 't' are given by $x = \alpha t^3$ and $y = \beta t^3$. The speed of the particle at time 't' is given by

A. $3t\sqrt{\alpha^2 + \beta^2}$

B. $3t^2\sqrt{\alpha^2 + \beta^2}$

C. $t^2\sqrt{\alpha^2 + \beta^2}$

D. $\sqrt{\alpha^2 + \beta^2}$

Answer:

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3. If a car covers $\frac{2}{(5)^{th}}$ of the total distance with v_1 speed and $\frac{3}{(5)^{th}}$ distance with v_2. Then average speed is

A. $\frac{1}{2}\sqrt{v_1 v_2}$

B. $\frac{v_1 + v_2}{2}$

C. $\frac{2v_1 v_2}{v_1 + v_2}$

D. $\frac{5v_1 v_2}{3v_1 + 2v_2}$

Answer:

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4. Choose the correct statements from the following.

A. The magnitude of instantaneous velocity of a particle is equal to its instantaneous speed

B. The magnitude of the average velocity in an interval is equal to its average speed in that interval.

C. It is possible to have a situation in which the speed of the particle is never zero but the average speed in an interval is zero.

D. It is possible to have a situation in which the speed of particle is zero but the average speed is not zero.

Answer:

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5. A particle located at $x = 0$ at time $t = 0$, starts moving along with the positive $x - direction$ with a velocity 'v' that varies as $v = a\sqrt{x}$. The displacement of the particle varies with time as

A. t^2

B. t

C. $t^{1/2}$

D. t^3

Answer:

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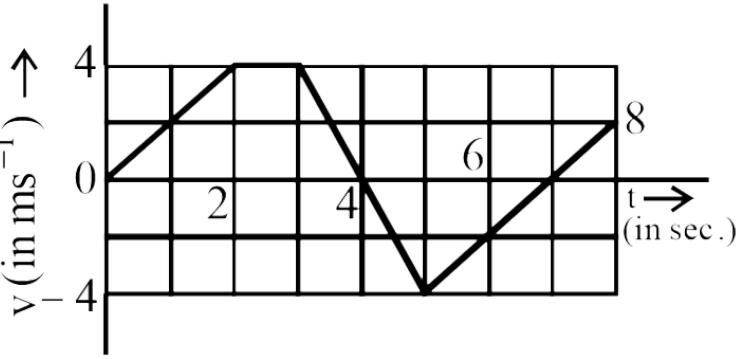
6. Figure here gives the speed-time graph for a body. The displacement travelled between t = 1.0 second and t = 7.0 second is nearest to



A. 1.5 m

B. 2 m

C. 3 m

D. 4 m

Answer:

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7. A particle is moving in a straight line with initial velocity u and uniform acceleration f. If the sum of the distances travelled in t^{th} and $(t+1)^{th}$ seconds is $100cm$, then its velocity after t seconds, in cm/s, is.

A. 80

B. 50

C. 20

D. 30

Answer:

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8. A thief is running away on a straight road in a moving with a speed of $9ms^{-1}$. A policeman chases him on a motor cycle moving at a

speed of $10ms^{-1}$. If the instantaneous separation of the jeep from the motor cycle is $100m$, how long will it take for the policeman to catch the thief ?.

A. 1 second

B. 19 second

C. 90 second

D. 100 second

Answer:

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9. The displacement x of a particle varies with time according to the relation $x = \frac{a}{b}\left(1 - e^{-bt}\right)$. Then select the false alternative.

A. $Att = \frac{1}{b}$ the displacement of the particle is nearly $\frac{2}{3}\left(\frac{a}{b}\right)$

B. The velocity and acceleration of the particle at t = 0 are a and –ab respectively

C. The particle cannot go beyond $x = \frac{a}{b}$

D. The particle will not come back to its starting point at $t \to 00$

Answer:

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10. metro train starts from rest and in five seconds achieves a speed 108 km/h. After that it moves with constant velocity and comes to rest after travelling 45m with uniform

retardation. If total distance travelled is 395 m, find total time of travelling.

A. 12.2 s

B. 15.3 s

C. 9 s

D. 17.2 s

Answer:

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11. The deceleration exerienced by a moving motor blat, after its engine is cut-off is given by $dv/dt = -kv^3$, where k is constant. If v_0 is the magnitude of the velocity at cut-off, the magnitude of the velocity at a time t after the cut-off is.

A. $\dfrac{v_0}{\sqrt{(2v_0.^2\, kt + 1)}}$

B. $v_0 e^{-kt}$

C. $v_0/2$

D. v_0

Answer:

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12. The velocity of a particle is $v = v_0 + gt + ft^2$. If its position is $x = 0$ at $t = 0$, then its displacement after unit time $(t = 1)$ is

A. $v_0 + g/2 + f$

B. $v_0 + 2g + 3f$

C. $v_0 + g/2 + f/3$

D. $v_0 + g + f$

Answer: C

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13. A man is 45 m behind the bus when the bus starts acceleration from rest with acceleration $2.5\frac{m}{s^2}$. With what minimum velocity should man start running to catch the bus?

A. $12m / s$

B. $14m/s$

C. $15m/s$

D. $16m/s$

Answer:

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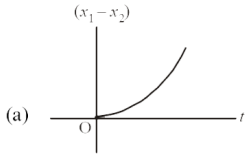
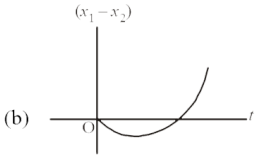
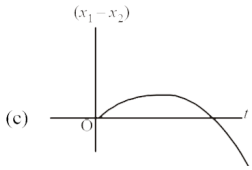
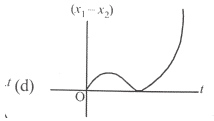
14. A body is at rest at $x = 0$. At $t = 0$, it starts moving in the positive $x - direction$ with a constant acceleration . At the same instant another body passes through $x = 0$

moving in the positive $x - direction$ with a constant speed . The position of the first body is given by $x_1(t)$ after time 't', and that of the second body by $x_2(t)$ after the same time interval . which of the following graphs correctly describes $(x_1 - x_2)$ as a function of time 't' ?

A. 

B. 

C. 

D. 

Answer:

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15. 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 second

B. 2 s

C. 3 s

D. 4 s

Answer:

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16. Two bodies begin to fall freely from the same height but the second falls T second after the first. The time (after which the first

body begins to fall) when the distance between the bodies equals L is

A. $\frac{1}{2}T$

B. $\frac{T}{2}+\frac{L}{gT}$

C. $\frac{L}{>}$

D. $t+\frac{2L}{gT}$

Answer:

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17. Let A, B, C, D be points on a vertical line such that AB = BC = CD. If a body is released from position A, the times of descent through AB, BC and CD are in the ratio.

A. $1:\sqrt{3}-\sqrt{2}:\sqrt{3}+\sqrt{2}$

B. $1:\sqrt{2}-1:\sqrt{3}-\sqrt{2}$

C. $1:\sqrt{2}-1:\sqrt{3}$

D. $1:\sqrt{2}:\sqrt{3}-1$

Answer:

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18. Water drops fall at regular intervals from a tap 5 m above the ground. The third drop is leaving the tap, the instant the first drop touches the ground. How far above the ground is the second drop at that instant. $\left(g = 10ms^{-2}\right)$

A. 1.25 m

B. 2.50 m

C. 3.75 m

D. 5.00 m

Answer:

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19. The displacement 'x' (in meter) of a particle of mass 'm' (in kg) moving in one dimension under the action of a force is released to time 't' (in sec) by $t = \sqrt{x} + 3$. The displacement of the particle when its velocity is zero will be.

A. 2 m

B. 4m

C. zero

D. 6m

Answer:

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20. A body moving with a uniform acceleration crosses a distance of 65 m in the 5 th second and 105 m in 9th second. How far will it go in 20 s?

A. 2040m

B. 240m

C. 2400m

D. 2004m

Answer:

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21. An automobile travelling with a speed $60km/h$, can brake to stop within a distance

of $20m$. If the car is going twice as fast i. e. , $120km/h$, the stopping distance will be

A. 60m

B. 40m

C. 20m

D. 80m

Answer:

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22. A particle accelerates from rest at a constant rate for some time and attains a velocity of 8 m/sec. Afterwards it decelerates with the constant rate and comes to rest. If the total time taken is 4 sec, the distance travelled is

A. 32m

B. 16m

C. 4m

D. none of above

Answer:

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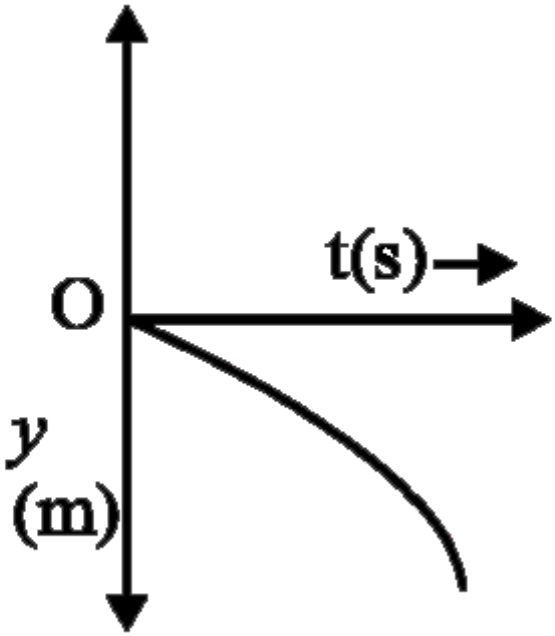
23. The equation represented by the graph below is :



A. $y = \frac{1}{2}\,gt$

B. $y = \frac{-1}{2}gt$

C. $y = \frac{1}{2}gt^2$

D. $y = \frac{-1}{2}gt^2$

Answer:

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24. A particle move a distance x in time t according to equation $x = (t+5)^{-1}$. The acceleration of particle is alphaortional to.

A. $(\text{velocity})^{3/2}$

B. $(\text{distance})^{2}$

C. $(\text{distance})^{-2}$

D. $(\text{velocity})^{2/3}$

Answer:

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25. A particle when thrown, moves such that it passes from same height at 2 and 10 seconds, then this height h is :

A. 5g

B. g

C. 8g

D. 10g

Answer:

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26. The distance through which a body falls in the nth second is h. The distance through which it falls in the next second is

A. h

B. $h + \frac{g}{2}$

C. h-g

D. h+g

Answer:

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27. A stone is thrown vertically upwards with an initial speed u from the top of a tower,

reaches the ground with a speed $3u$. The height of the tower is :

A. $3h^2 / g$

B. $4u^2 / g$

C. $6u^2 / g$

D. $9u^2 / g$

Answer:

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28. A particle moves along a straight line OX. At a time t (in seconds) the distance x (in metre) of the particle is given by $x = 40 + 12t - t^3$. How long would the particle travel before coming to rest ?

A. 40m

B. 56m

C. 16m

D. 24m

Answer:

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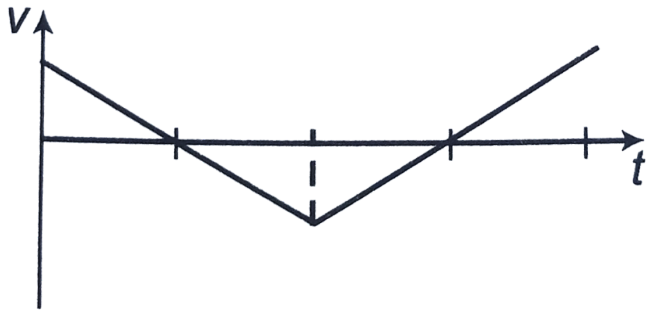
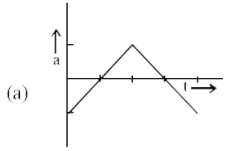
29. The graph below shws the velocity versus time graph for a body

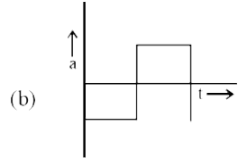


Which of the following graph represents the corresponding acceleration v//s time graph?

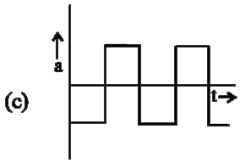
A.



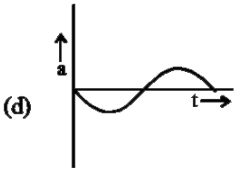
B.



C.



D.



Answer:

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30. A particle moving along x-axis has acceleration f, at time t, given by

$f = f_0\left(1 - \frac{t}{T}\right)$, where f_0 and T are constant.

The particle at $t = 0$ has zero velocity. In the time interval between $t = 0$ and the instant when $f = 0$, the particle's velocity (v_x) is :

A. $\frac{1}{2}(f_0 T^2$

B. $f_0 T^2$

C. $\frac{1}{2} f_0 T$

D. $f_0 T$

Answer:

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31. A ball is thrown vertically up with a velocity u. It passes three points A, B and C in its upward journey with velocities $\frac{u}{s}$, $\frac{u}{3}$ and $\frac{u}{4}$, respectively. Find $\frac{AB}{BC}$.

A. $20:7$

B. 2

C. $10:7$

D. 1

Answer:

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32. A boat takes two hours to travel 8 km and back in still water. If the velocity of water is 4 km/h, the time taken for going upstream 8 km and coming back is

A. 160 minutes

B. 80 minutes

C. 100 minutes

D. 120 minutes

Answer:

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33. A body starts from rest and travels a distance x with uniform acceleration, then it travels a distance 2x with uniform speed, finally it travels a distance 3x with uniform retardation and comes to rest. If the complete motion of the particle is along a straight line,

then the ratio of its average velocity to maximum velocity is

A. $2/5$

B. $3/5$

C. $4/5$

D. $6/7$

Answer:

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34. A man of $50kg$ mass is standing in a gravity free space at a height of $10m$ above the floor. He throws a stone of $0.5kg$ mass downwards with a speed $2m/s$. When the stone reaches the floor, the distance of the man above the floor will be

A. 9.9m

B. 10.1m

C. 10m

D. 20m

Answer:

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35. A boy moving with a velocity of $20kmh^{-1}$ along a straight line joining two stationary objects. According to him both objects

A. move in the same direction with the same speed of $20kmh^{-1}$

B. move in different direction with the same speed of $20kmh^{-1}$

C. move towards him

D. remain stationary

Answer:

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36. A rubber ball is dropped from a height of $5m$on a plane, where the acceleration due to gravity is not shown. On bouncing it rises to $1.8m$. The ball loses its velocity on bouncing by a factor of

A. $\frac{3}{5}$

B. $\frac{9}{25}$

C. $\frac{2}{5}$

D. $\frac{16}{25}$

Answer:

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37. A stone falls freely from rest from aheight h and it travels a distance $9h/25$ in the last second. The value of h is

A. 145m

B. 100m

C. 122.5m

D. 200m

Answer:

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38. Which of the following equation represents the motion of a body moving with constant finite acceleration ? In these

equation, y denotes the displacement in time t and p.q and r the arbitary constants ?

A. $y = at$

B. $y = at + bt^2$

C. $y = at + bt^2 + ct^2$

D. $y = \frac{a}{t} + bt$

Answer:

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39. A particle travels half the distance with a velocity of $6ms^{-1}$. The remaining half distance is covered with a velocity of $4ms^{-1}$ for half the time and with a velocity of $8ms^{-1}$ for the rest of the half time. What is the velocity of the particle averaged over the whole time of motion ?

A. $9ms^{-1}$

B. $6ms^{-1}$

C. $5.35ms^{-1}$

D. $5ms^{-1}$

Answer:

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40. A bullet is fired with a speed of 1000 m/sec in order to penetrate a target situated at 100 m away. If $g = 10m/s^2$, the gun should be aimed

A. directly towards the target

B. 5 cm above the target

C. 10 cm above the target

D. 15 cm above the target

Answer:

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41. A body covers 26, 28, 30, 32 meters in 10^(th), 11^(th), 12^(th) and 13^(th) seconds respectively. The body starts

A. from rest and moves with uniform velocity

B. from rest and moves with uniform acceleration

C. with an initial velocity and moves with uniform acceleration

D. with an initial velocity and moves with uniform velocity

Answer:

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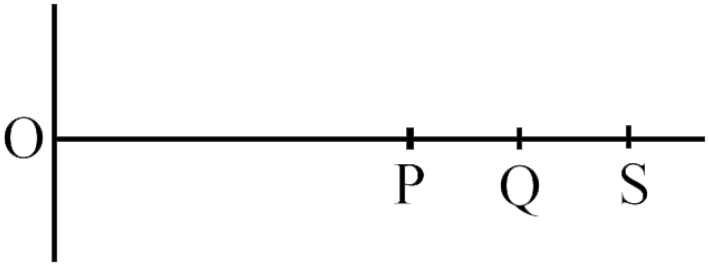
42. A particle is moving with uniform acceleration along a straight line. The average velocity of the particle from P to Q is $8ms^{-1}$ and that Q to S is $12ms^{-1}$. If QS = PQ, then the average velocity from P to S is



A. $9.6ms^{-1}$

B. $12.87ms^{-1}$

C. $64ms^{-1}$

D. 30m

Answer:

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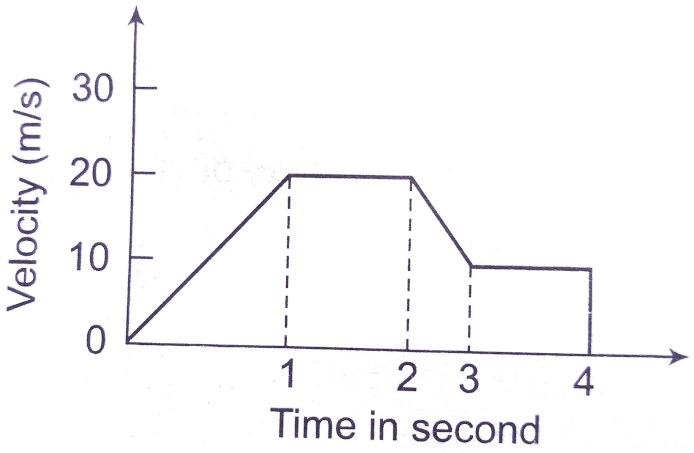
43. The variation of velocity of a particle with time moving along a straight line is illustrated in the following figure. The distance travelled

by the particle in four seconds is.



A. 60m

B. 55m

C. 25m

D. 30m

Answer:

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44. A stone falls freely under gravity. It covered distances h_1, h_2 and h_3 in the first 5 seconds. The next 5 seconds and the next 5 seconds respectively. The relation between h_1, h_2 and h_3 is :

A. $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$

B. $h_2 = 3h_1$ and $h_3 = 3h_2$

C. $h_1 = h_2 = h_3$

D. $h_1 = 2h_2 = 3h_3$

Answer:

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45. A car , starting from rest, accelerates at the rate f through a distance S then continues at constant speed for time t and then decelerates at the rate $\frac{f}{2}$ to come to rest . If the total distance traversed is $15S$, then

A. $S = \frac{1}{6}ft^2$

B. $S = ft$

C. $S = \frac{1}{4} ft^2$

D. $S = \frac{1}{72} ft^2$

Answer:

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