PHYSICS

BOOKS - DHANPAT RAI & CO PHYSICS (HINGLISH)

MECHANICS

Solved Example

1. What is mechanics ? What are its various sub-branches ?

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2. Define the terms rest and motion. Show that rest and motion are relative terms.

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3. Can a body exist in a state of absoulate rest or of absolute rest or of absolute motion ? Explain

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4. What is meant by a point object ? Give suitable examples.

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5. What do you mean by motion in one, two and three dimension ? Give examples of each type.

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6. Distinguish between distance and displacement.

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7. Mention some important characteristics of diaplacement. Give illustrations to support these characteristics.

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8. Define the term speed. Is it a scalar or vector quantity ? Give its unis and dimensions.

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9. Define : uniform speed

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10. Define : variable speed

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11. AVERAGE SPEED

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12. What do you mean by instantaneous speed?

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13. Define the term velocity. Is it a scalar or vector quantity ? Give its units and dimensions.

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14. Define : uniform velocity

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15. Define : variable velocity

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16. Define : average velocity

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17. INSTANTANEOUS VELOCITY

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18. When is the average speed of an object equal to the magnitude of its average velocity ? Give reason also.

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19. What is meant by uniform motion ?

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20. Obtain the formulae for the position of an object moving with uniform velcity v at any time t in terms of its position at t = 0

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21. Obtain the formulae for the position of an object moving with uniform velcity v at any time t' in the terms of its position at another time t.

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22. Give some important features of uniform motion.

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23. What is non-uniform motion ?

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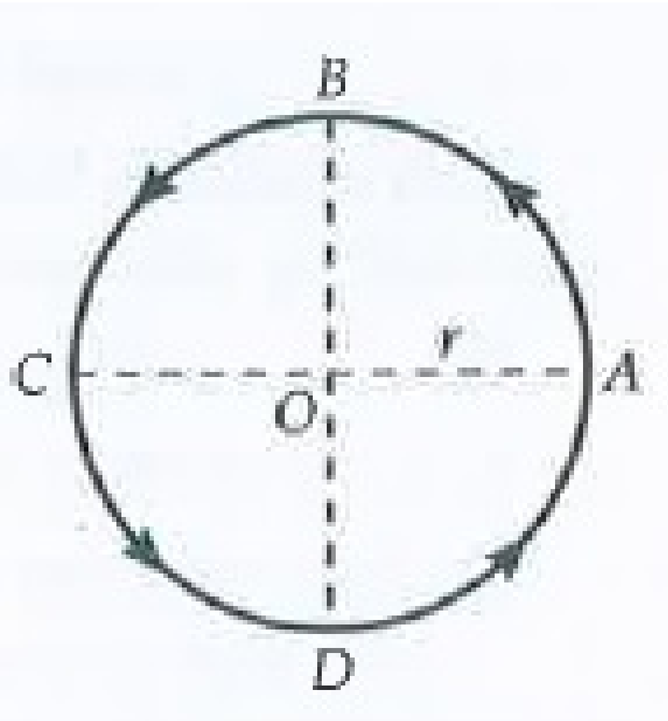
24. In Fig. 3.12 a particle moves along a circular parth of radius r. It starts from point A and moves anticlockwise. Find the distance travelled by the particle as it : moves from A to B



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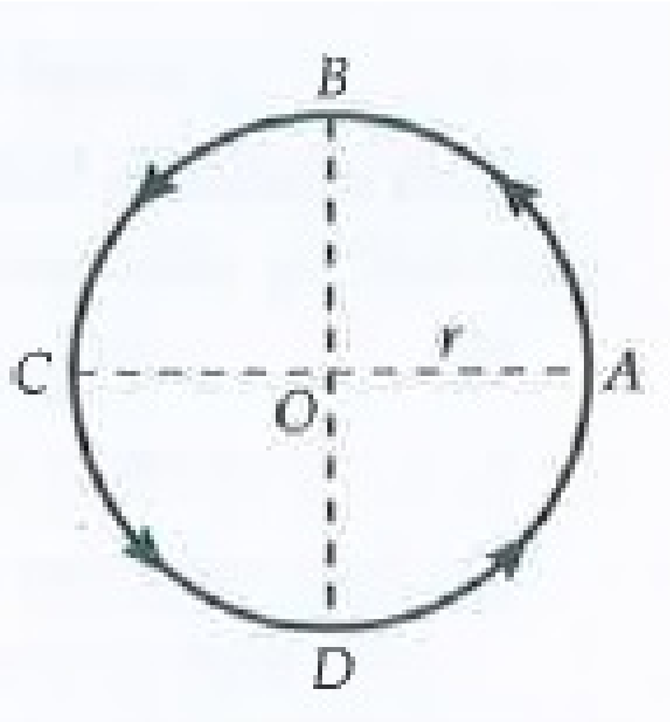
25. In Fig. 3.12 a particle moves along a circular parth of radius r. It starts from point A and moves anticlockwise. Find the distance travelled by the particle as it : moves from A to C



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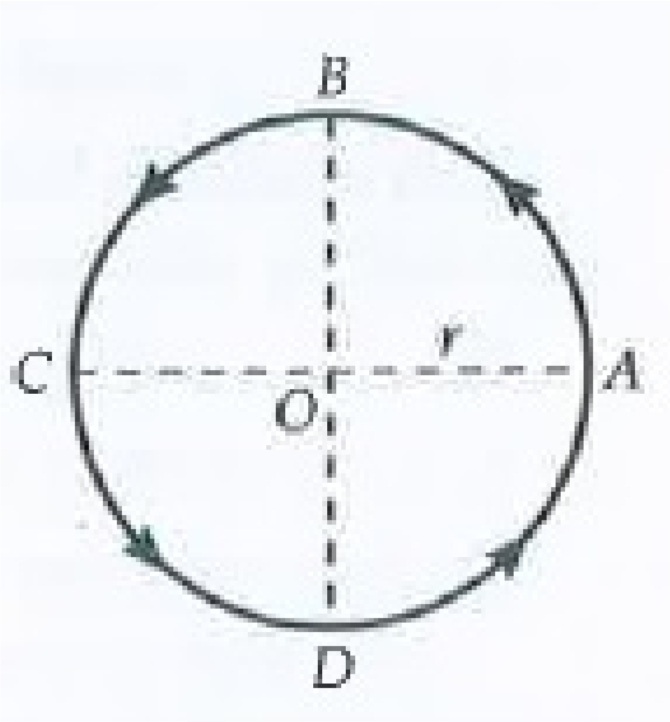
26. In Fig. 3.12 a particle moves along a circular parth of radius r. It starts from point A and moves anticlockwise. Find the distance travelled by the particle as it : moves A to D



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27. A particle moves along a circle of radius `R. It starts from (A) and moves in antilockwise direction. Calculate the distance travelled by particle (a)one complete revolution. Also calcuate the magnituede of displacement in each case. Fig. 2 (a) .28.

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28. A body travels from $A \rightarrow B$ at $40ms^{-1}$. And from $B \rightarrow A$ at 60 ms^(-1)`. Calculate the average speed and average velocity.

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29. On a 60 km track, a train travels the first 30 km with a uniform speed of $30kmh^{-1}$. How fast must the train travel the next 30 km so as to average $40kmh^{-1}$ for the entire trip ?

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30. A body covers one-third of its journey with speed 'u' , next third with speed 'v' and the last third with speed 'w'. Calculate the average speed of the body during the entire journey.

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31. A point traversed half the distance with a velocity v_0. The remaining part of the distance was covered with velocity v_1 for half the time, and with velocity v_2 for the other half of the time. Find the mean velocity of the point averaged over the whole time of motion.

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32. Define the term acceleration. Is it a scalar or a vector quantity ? Give its units and dimensions.

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33. Define the term uniform acceleration. Give one example of uniformly accelerated motion.

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34. Explain clearly (i) uniformacceleration (ii) variable acceleration (iii) Average acceleration (iv) instantaneous acceleration and show that instantaneous acceleration is the limition value of average acceleration.

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35. AVERAGE ACCELERATION

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36. INSTANTANEOUS ACCELERATION

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37. What are positive and negative accelerations ? Give examples.

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38. The position of an object moving along x-axis is given by $x = a + bt^2$ where $a = 8.5m, b = 2.5ms^{-2}$ and t is measured in seconds. What is its velocity at $t = 0s$ and $t = 2.0s$. What is the average velocity between $t = 2.0s$ and $t = 4.0s$?

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39. The displacement (in metre) of a particle moving along x-axis is given by $x = 18t + 5t^2. Calc\underline{a}te(i)the \in s \tan \tan eousvelocity$t=2 s $(ii)avera \geq velocitybetween$t=2 s $\rightarrow$ t=3 s` (iii) instantaneous acceleration.

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42. The displacement x of a particle varies with time t as

$x = 4t^2 - 15t + 25$

Find the position, velocity and acceleration of the particle at t=0. When will the velocity of the particle become zero? Can we call the motion of the particle as one with uniform acceleration ?

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43. The velocity of a particle is given by the equation, $v = 2t^2 + 5cms^{-1}$.

Find

the change in velocity of the particle during the time interval between $t_1 = 2s$ and $t_2 = 4s$.

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44. The velocity of a particle is given by the equation, $v = 2t^2 + 5cms^{-1}$.

Find

the average acceleration during the time interval between $t_1 = 2s$ and $t_2 = 4s$.

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45. The velocity of a particle is given by the equation, $v = 2t^2 + 5cms^{-1}$.

Find

the instantaneous acceleration at $t_2 = 4s$

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46. The distance x of a particle moving in one dimensions, under the action of a constant force is related to time t by the equation, $t = \sqrt{x} + 3$, where x is in metres and t in seconds. Find the displacement of the particle when its velocity is zero.

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47. The acceleration a in ms^{-2} of a particle is given by $a = 3t^2 + 2t + 2$, where t is the time. If the particle starts out with a velocity $v = 2ms^{-1}$ at $t = 0$, then find the velocity at the end of $2s$.

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48. The distance-time graph of the motion of an object moving with a contant speed is a straight line.

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49. Derive the equation of motion

$x = v_0 t + \frac{1}{2} a t^2$ using appropriate graph.

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50. Derive the following equations of motion for an object moving with constant acceleration along a straight line : $v^2 = v_0^2 + 2a(x - x_0) = v_0^2 + 2as$

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51. Derive the following equations of motion for an object moving with constant acceleration along a straight line : $s_n th = v_0 + \frac{a}{2}(2n - 1)$.

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52. Deduce the following equations for uniformly accelerated motion by using integration technique : v = u + at

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53. Deduce the following equations for uniformly accelerated motion by using integration technique : $s = ut + \frac{1}{2}at^2$

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54. Deduce the following relations analytically for a uniformly accelerated motion along a at. line, where terms have their usual meanings

$(i) v = u + at$

$(ii) s = ut = \frac{1}{2}at^2$

$(iii) v^2 = u^2 + 2as.$

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55. Deduce the following equations for uniformly accelerated motion by using integration technique : $s_n th = u + \frac{a}{2}(2n - 1)$

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56. A jet plane starts from rest with an acceleration of $3ms^{-2}$ and makes a run for 35 s before taking off. What is the minimum length of the runway and what is the velocity of the jet at take off ?

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57. An electron travelling with a speed of $5 \times 10^3 ms^{-1}$ passes through an electric field with an acceleration of $10^{12} ms^{-2}$. (i) How long will it take for the electron to double its speed ?(ii) What will be the distance covered by the electron in this time?

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59. A driver takes 0.20 s to apply the brakes after he sees a need for it. This is called the reaction time of the driver. If he ils driving a car at a speed of 54 km/h and the brakes cause a deceleration of $6.0\frac{m}{s^{2}}$, find the distance travelled by the car after he sees the need to put the brakes on.

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60. On a foggy day two drivers spot each other when they are just 80 meters apart. They are travelling at $27kmh^{-1}$ and $60kmh^{-1}$, respectively. Both of them applied brakes retarding their cars at the rate of $5ms^{-1}$ Determine whether they avert collision or not.

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61. A hunderd metre sprinter increases her speed from rest uniformly at the rate of $1ms^{-2}$ upto three quarters of the total run and covers the last quarter with uniform speed. How much time does she take to cover the first half and the second half of the run?

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62. A motor car starts from rest and accelerates uniformly for 10 s to a velocity of $20ms^{-1}$. It then runs at a constant speed and is finally brought to rest in 40 m with a constant acceleration. Total distance covered is 640 m. Find the value of acceleration, retardation and total tie taken.

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63. An athlete runs a distance of 1500m in the following manner. (i) Starting from rest, he accelerates himself uniformly at $2ms^{-2}$ till he covers a distance of 900m. (ii) He, then runs the remaining distance of 600m at the uniform speed developed. Calculate the time taken by the athlete to cover the two parts of the distance covered. Also find the time, when he is at the centre of the track.

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65. A man is l=9 m behind the door of a train when it starts moving with acceleration a=$2m/s^2$.The man runs at full speed. How far does he have to run and after what time does he get into the train ? What is his full speed ?

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66. 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.

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67. A car acceleration form 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 evaluate (a) the maximum velocity attained and (b) the total distance travelled.

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68. A body covers 12m in 2nd second and 20m in 4th second. How much distance will it cover in 4 seconds after the 5th second ?

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69. A particle is moving in a straight line with constant acceleration. If x,y and z be the distances described by a particle during the pth, qth and rth second respectively, prove that (q-r)x+(r-p)y+(p-q)z=0

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70. Two busses A and B are at positions 50m and 100m from the origin at time t=0. They start moving in the same direction simultaneously wi8th uniform velocities of $10ms^{-1}$ and $5ms^{-1}$. Determine the time and position at which A overtakes B.

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71. An object is moving along +ve x-axis with a uniform acceleration of $4ms^{-2}$. At time t=0 , x=5m and $v = 3ms^{-1}$.

(a) What will be the velocity and position of the object at time t=2s?

What will be the velocity and position of the object when it has a velocity of $5ms^{-1}$?

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(a) What will be the velocity and position of the object at time t=2s?

What will be the velocity and position of the object when it has a velocity of $5ms^{-1}$?

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73. For a freely falling body

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74. A ball throuwn vertically upwards with a speed of $19.6ms^{-1}$ from the top of a tower returns to the earth in 6s. Find the height of the tower.

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75. A ball is thrown vertically upwards with a velcotiy of $20ms^{-1}$ from the top of a multi-storey building. The height of the point fromwher the ball is thrown if 25m from the ground. (a) How high the ball will rise ? And (b) how long will it be before the ball hits the ground ? Take. $g = 10ms^{-2}$.

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76. A ball is thrown vertically upwards with a velocity of $20ms^{-1}$ from the top of a multistorey building. The height of the point from where the ball is thrown is 25 m from the ground. How long will it be before the ball hits the ground (Take, $g = 10ms^{-2}$) ?

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77. A ball is thrown vertically upwards with a velcotiy of $20ms^{-1}$ from the top of a multi-storey building. The height of the point fromwher the ball is thrown if 25m from the ground. (a) How high the ball will rise ? And (b) how long will it be before the ball hits the ground ? Take. $g = 10ms^{-2}$.

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78. A ball throuwn up is cautght by the thrower after 4s. How did it go and with what velocity was it thrown ? How far was it below the highest point 3s after it was thrown?

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79. A balloon is ascending at the rate of $9.8m/s$ and is 39.2 m above the ground when a package is dropped. (a) How long does the package take to reach the ground? (b) with what speed does it hit the ground ? $(g = 9.8m/s^2)$

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80. A food packet is released from a helicopter which is rising steadily at $2ms^{-1}$, After two second (i) What is the velocity of the packet ? (ii)How far is it below the helicopter?

Take $g = 9.8ms^{-2}$.

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81. A food packet is released from a helicopter which is rising steadily at $2ms^{-1}$, After two second (i) What is the velocity of the packet ? (ii)How far is it below the helicopter?

Take $g = 9.8ms^{-2}$.

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82. A parrachutist bails out from an aeropane and after dropping through a distance of $40m$ opens the parachute and decelerates at $2ms^{-2}$. If he reaches the ground with a speed of $2ms^{-1}$, how lowg he in the air ? At what height did he bail out from the plane ?

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83. Two balls are thrown simultaneously, A vetically upwards with a speed of $20ms^{-1}$ from the ground, and B vetically downwards from height of 40 m with the same speed and along the same line of motion. At what points do the two balls collide? Take $g = 9.8ms^{-2}$.

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84. A ball is dropped onto the floor from a height of 10 m. It rebounds to a height of 5 m. If the ball was in contact with the floor for $0.01s$, what was its average acceleration during contact ? (Take $g = 10ms^{-2}$)

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85. A stone falls from a cliff and travels 24.5 m in the last second before it reaches the ground at the foot of the cliff. Find the height of the cliff.

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86. Draw the position-time graph of a stationary object.

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87. Draw the position-time graph for an object in uniform motion. Show that the slope of the position-time graph gives the velocity of the object.

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88. Draw the position-tie graph for uniformly accelerated motion. What does its slope give ?

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89. Draw the velocity-time graph for an object in uniform motion. Show that the area under the velocity-time graph gives the displacement of the object in the given time interval.

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90. Draw the velocity-time graph for uniformly accelerated motion. Show that slope of the velocity-time graph gives acceleration of the object.

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91. Show that the area under the velocity-time graph of an object moving with constant acceleration in a straight line in certain time interval is equal to the distance covered by the object in that interval.

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92. Derive the following equations of motion for uniformly accelerated motion from velocity-time graph : v = u + at

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93. Derive the following equations of motion for uniformly accelerated motion from velocity-time graph : $s = ut + \frac{1}{2}at^2$

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94. Derive the following equations of motion for uniformly accelerated motion from velocity-time graph : $v^2 - u^2 = 2as$

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95. What is the nature of the distance-time graphs for uniform and non-uniform motion of an object ?

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96. What can you say about the motion of a body if :

(a) its displacement-time graph is a straight line ?

(b) its velocity-time graph is a straight line ?

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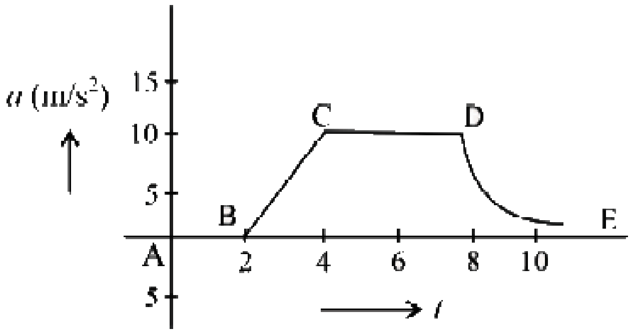
97. The uniform motion in the following acceleration-time graph is



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98. From the top of a tower, a ball is droped to fall freely under gravity and at the same time, another bal is thrown up with a velocity of $50ms^{-1}$. Plot the position-time graph for the motion of the two balls during the time interval t = 0 to t = 5s. Take $g = 10ms^{-2}$

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99. A body starting from rest acclerates uniformly along a st. line , at the rate of $10ms^{-2}$ for 5 s. It moves for $2s$ with uniform velocoty of $50ms^{-1}$.

The it retards uniformly and comes to rest in 3 s`. Draw velocity-time graph of the and find the total distance travelled by body.

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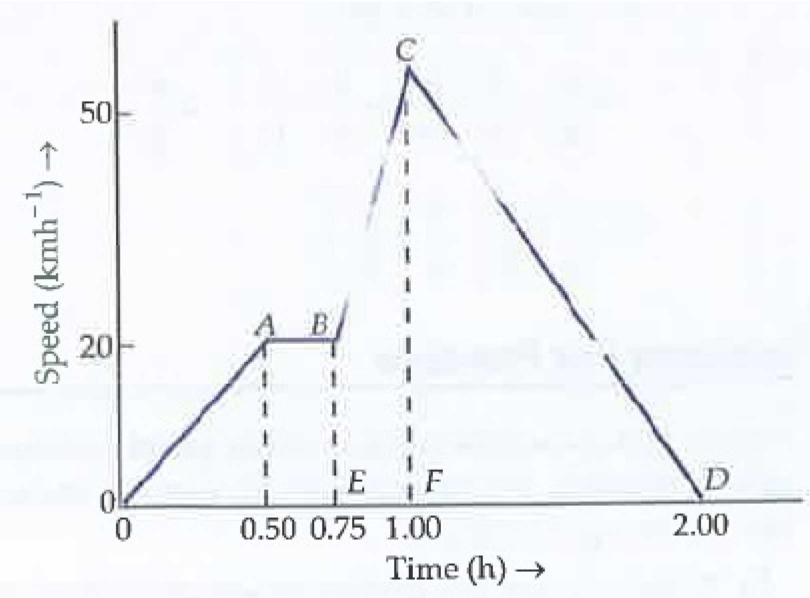
100. A train moves from one station to another in two hours' time. Its speed-time graph during the motionis shown in Fig. 3.59 : calculate the distance covered during the time interval from 0.75 hour to 1 hour.



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101. A ball is thrown upward with an initial velocity of$100ms^{-1}$. After how much time will it return ? Draw velocity - time graph for the ball and find from the graph (i) the maximum height attained by the ball and (ii) height of ball after 15 s. take g = $10ms^{-2}$.

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102. A ball is thrown upward with an initial velocity of $100ms^{-1}$. After how much time will it return ? Draw velocity-time graph for the balland find from the graph : height of the ball after 15 s. Take $g = 10ms^{-2}$

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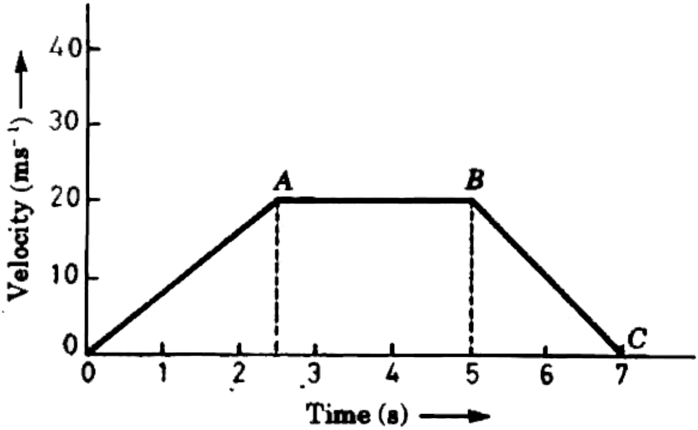
103. the velcoity - time graph for a vehicle is shown if fig 3.24. drow acceleration - time graph from it .



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104. the velcoity of a trian incrreases at a constant rate α from 0 to v and then remains constant for same interval and then finally decreases to zero at constant rate β.if the total distance coverd by the the particle x,then show that the total time taken will be

$$t\frac{x}{v}+\frac{v}{2}\left[\frac{1}{\alpha}+\frac{1}{\beta}\right].$$

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105. Define relative velocity. Deduce an expression for relative velocity of one object with respect to another in terms of their velocities relative to the earth.

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106. Define relative velocity of an object w.r.t. another. Draw position-time graph of two objects moving along a straight line, when their relative velocity is (i) zero and (ii) non-zero.

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107. Define relative velocity of an object w.r.t. another. Draw position-time graph of two objects moving along a straight line, when their relative velocity is (i) zero and (ii) non-zero.

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108. Define relative velocity of an object w.r.t. another. Draw position-time graph of two objects moving along a straight line, when their relative velocity is (i) zero and (ii) non-zero.

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109. Two bodies A and B are moving with velocities v_A and v_B, making an angle θ with each other. Determine the relative velocity of A w.r.t. B. What will be the relative velocity when the two bodies move in same direction

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110. Two bodies A and B are moving with velocities v_A and v_B, making an angle θ with each other. Determine the relative velocity of A w.r.t. B. What will be the relative velocity when the two bodies move in opposite directions ?

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111. A car (A) is moving at $60 kmh^{-1}$ on a straight road, is ahead of car (B) moving in the same direction at $10 ms^{-1}$. Find the velocity of (A) relative to (B) and vice versa.

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112. Two parallel rail tracks run north-south Train A moves north with a speed of $54 kmh^{-1}$ and train B moves south with a speed of $90 kmh^{-1}$. What is the

a. relative velocity of B with respect to A?

b. relative of a monkey running on the roof of the train A against its motion (with its velocity of $18 kmh^{1}$ with respect to the train A) as observed by a man standing on the ground?

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113. Two parallel rail tracks run north-south Train A moves north with a speed of $54 kmh^{-1}$ and train B moves south with a speed of $90 kmh^{-1}$.

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115. Two trains 120 m and 80 m in length are running in opposite directions with velocities $42kmh^{-1}$ and $30kmh^{-1}$. In what time they will completely cross each other?

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116. The speed of a motor launch with respect to water in a stream is $8ms^{-1}$ while water current's speed is $3ms^{-1}$. When the launch began travelling upstream, a float was dropped from it. After travelling a distance of $4.8km$ upstream, the launch turned back and caught up with the float. What is the total time which elapsed during the process?

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117. When does a cyclist appear to be stationary with respect to another moving cyclist ?

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118. Can earth be considered as a point object when it is describing its yearly journey around the sum ?`

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119. Can the displacement be greater than the distance travelled by an object ? Given reason.

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120. Can the speed of a body be begative ?

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121. Can a body at a constant speed and still have a varying velcity ?

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122. Can a body have a constant velocity but a varying speed ?

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123. Can a particle in one- dimensional motion have zero speed and a non-zero velocity ?

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124. Can a body have zero velocity and finite acceleration?

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125. Can an object have an eastward velocity while experiencing a westward acceleration ?

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126. Can the direction of velcity of a body change, when accleration is constant?

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127. Is it possible for a body to be accelerated without speeding up or slowing down ? If so, give an example.

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128. Under what condition is the average velcity equal to instantneous velcity ?

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129. Why is the speed in general, greater than the magniude of the velcity ?

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130. Is the direction of acceleration same as the direction of velocity ?

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131. Can we use equations of kinematics to find the height attained by a body projected upwares with any velocity ?

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132. Two balls of different masses (one lightre an other heavier) are thrown vertically upward with same initial speed. Which one will rise to greater height ?

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133. Two balls of different masses (one lighter and other heaver) are thrown vertically upwards with the same speed. Which one will pass through the point of projection in the downward direction with greater speed?

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134. Can the relative velcity ot two bodies be greater than the absolute velcity of either body.

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135. A car travelling with a velocity of $50 kmh^{-1}$ on a straight road is ahead of a motor-cycle travelling with a speed of $75 kmh^{-1}$. How would the relative velocity be altered if motor cycle is ahead of car ?

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136. Though the rain is falling vrrtically down-wards, the fromt screen ot a moving car gers wet while the back screen remains dry. Whay ?

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137. Is it possible that the brakes of a car are so perfect that the car stops instantaneously ?

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138. When a person is standing on earth, the treesand houses appera stationary to mim. However, when he is sitting in a running train all these obects appear to move in bakward direction. Why?

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139. The displacement of a body is proporticonal to the cube of time elapsed. What is the nature of the acceleration of the body ?

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140. Statement I: The average velocity of the body may be equal to its instantaneous velocity.

Statement II: For a given time interval of a given motion, average velocity is single valued while average speed can have many values.

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141. Can position-time graph have negative slope ?

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142. What is the nature of the displacement-time curve of a body moving with constant velocity ?

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143. Can the direction of motion of a body change if its velocity is changing at uniform rate ?

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144. Draw position-time graphs for two objects having zero relative velocity.

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145. Is it possible to have a constant rate of change of velcity when velcity changes both in magniude and direction ?

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146. Can an object be at rest as well as in motion at the same time ? Explain eith illustration.

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147. The states of motion and rest are relative. Explain.

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148. If the displacement of a body is zero is the distance covered by it necessarily zero ? Explain with suitable illustration.

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149. State in the following cases, whether the motion is one, two or three dimensional motion (a) a kite flying on windy day (b) a speeding car on a long straight high way (c) a carrom coin rebounding from the side if the board (d) a plane revolving around its star.

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150. State in the following cases, whether the motion is one, two or three dimensional motion (a) a kite flying on windy day (b) a speeding car on a long straight high way (c) a carrom coin rebounding from the side if the board (d) a plane revolving around its star.

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152. State in the following cases, whether the motion is one, two or three dimensional motion (a) a kite flying on windy day (b) a speeding car on a long straight high way (c) a carrom coin rebounding from the side if the board (d) a plane revolving around its star.

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154. Which of the two ,velocity and acceleration, gives the direction of motion of the body . Explain it with the help of an illustration.

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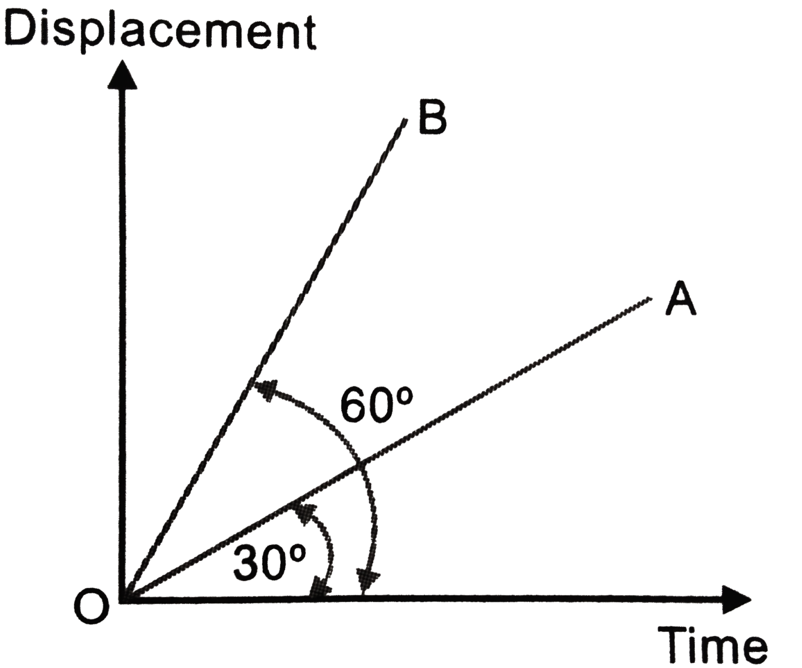
155. Two straight lines drawn on the same displacement-time graph make anles 30° and60° with time-axis respectiv ely Fig. 2 (a) .36, Which line repersents greater veloc ity ? What is the ratio of two velocities?



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156. In a case of a motion, displacement is directly proportional to the square of the time elapsed. What do you think about its acceleration i.e., constant or variable ? Explain why ?

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157. Show that average velocity of the object over an interval of time is either smaller than or equal to the average speed of the object over the same interval.

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158. An object is in unifrom motion along a straight line . What will be position-time graph for themotion of the object if

(a) $x_{0_{=\ +ve\ ,v=\ +ve}}$ (b) $x_0 = +ve, v = -ve(c)$x_(0) =- ve, v= + ve and $(d) \perp h$x_(0) and v are negative ? The letters x_0 and v position of theobject at time $t = 0$ and v represent posituion of the object at time $t = 0$ and uniform velocity of theobject respectively.

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162. An object has a uniformly acclerated motion. The object always slows down before the time, when its velcity becomes zero. Establish this statement graphiclly when (i) both initial veocity (u) and acceleration (a) are positive(iii) (u) is positive and (a) is begative and (iv) both (u) and (a) are negativ e.

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166. The distance coverd by an object between times $t_1 \text{ and } t_2$ is given by the area under the $v-t$ gaph between $t_1 \text{ and } t_2$ Prove this staement for an object moving with negative acceleration and gaving and having a positive velocity at time t_1 and and negative velocity at time t_2.

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167. Distinguish between distance and displacement.

Watch Video Solution

168. Distinguish between speed and velocity.

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169. the velocity -time relation of an electron starting from rest is given by v=kt,where $k=2ms^{-2}$.calculate the distance traversed in 3s.

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170. 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.

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171. In a car race, car A takes a time t less than car B at the finish and passes the finishing point with speed v more than that of the car B. Assuming that both the cars start from rest and travel with constant acceleration a_1 and a_2 respectively. Show that $v = \sqrt{a_1 a_2} t$.

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172. The driver of a train moving at a speed v_1 sights another train at a disane d, ahead of him moving in the same direction with a slower speed

v_2. He applies the brakes and gives a constant teradation a to his train. Show that here will be no collision if $d > (v_1 - v_2)^2 / 2a$.

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173. A juggle maintains four balls in motion making each in turn rise to a height of 20 m form his hand. With velcoity does he project them and where will the other three ball be at the instant when the fourth one is just leaving the hand ? Take g = $10m^{-2}$

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174. A bullet fired into a fixed target loses half of its velocity after penetrating 3 cm . How much further it will penetrate before coming to rest assuming that it faces constant resistance to motion?

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175. A car, starting from rest, accelerates at the rate (f) through a distance (S), then continues at constant speed for some time (t) and then decelerates at the rate $f/2$ to come to rest. If the total distance is $5S$, then prove that

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

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176. A car, moving with a speed of $50km/hr$, can be stopped by brakes after at least $6m$. If the same car is moving at a speed of $100km/hr$, the minimum stopping distance is

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177. The relation between time t and distance x is $t = ax^2 + bx$ where a and b` are constants. The acceleration is

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178. A ball is released from the top of a tower of height h metre. It takes T second to reach the ground. What is the position of the ball in $\frac{T}{3}$ second?

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179. Points P, Q and R are in vertical line such that $PQ = QR$. A ball at (P) is allowed to fall freely. What is the ratio of the times of descent through PQ and QR ?

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180. In which of the following exmples of motion, can the body be considered approxinmately a point object :

(a) a railway carriage moving without jerks between two two stations.

(b) a mondey sistting on top of a man cycling smoothly on a circulat track. (c) a spinning cricket ball that turns sharply on hitting the round .

(d) a tumbling beake theat has slopped off the edge of a table ?

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184. A woman starts from her home at 9.00 a. m., walks with a speed of $5kmh^{-1}$ on straight road up to her office $2.5km$away, stays at the office up to $5.00p.m.$, and returns home by an auto with a speed of $25kmh^{-1}$. Plot the position-time graph of the woman taking home as origin.

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185. A drunkard walking in a narrow lane takes 5 steps forward and 3 steps backward, followed again by 5 steps forward and 3 steps backward, and so on. Each step is 1 m long and requires 1 s. Plot the $x - t$ graph of his motion. Determine graphically and otherwise how long the drunkard takes to fall in a pit 13 m away from the start

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186. A jet airplance travelling at the speed of $500km^{-1}$ ejects its products of combustion at the speed of $1500kmh^{-1}$ relative to the jet plane. What is the speed of the burnt gases with respect to observer on the ground ?

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187. A car moving along a straight highway with speed of $16kmh^{-1}$ is brought to a stop within a distance of 200 m. What is the retardation of the car (assumed uniform), and how long does it take for the car to stop?

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188. Two trains A and B of length 400 m each are moving on two parallel tracks with a uniform speed of $72kmh^{-1}$ in the same direction, with A ahead of B. The dirver of B decides to overtake A and accelerates by $1ms^{-2}$. If after 50s, the guard of B just brushed past the driver of A, what was the original distance between them ?

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189. On a two lane road, car A is travelling with a speed of $36kmh^{-1}$, Two cars B and C approach car A in opposite directions with a speed of $34kmh^{-1}$. At a certain instant, when the distance AB is equal to AC, both 1 km B decided to overtake A before C does. What minimum acceleration of car B is required to avoid and accident?.

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190. Two towns A and B are connected by a regular bus service with a bus leaving in either direction every T min. A man cycling with a speed of $20kmh^{-1}$ in the direction A to B notices that a bus goes past him every $18 \min$ in the direction of his motion, and every $6 \min$ in the opposite direction. What is the period T of the bus service and with what speed (assumed constant)do the buses ply on the road?

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191. A player throwsa a ball upwards with an initial speed of $29.4ms^{-1}$.

(i) What is the direction of acceleration during the upwared motion of the ball?

(ii) What are the velocity and acceleration of the ball at the highest point of its motion?

(iii) Choose the x=0 and t=0 to be the location and time of the ball at its highest point, vertically downward direction to be the positive direction of X-axis, and give the signs of positive, velocity and acceleration of the ball during its upward, and downward motion.

(iv) To what height does the ball rise and after how long does the ball return to the player's hand?(Take g $= 9.8ms^{-2}$, and neglect air resistance).

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195. Read each staremnt below carefully and state with reasons and expamples if it is true or false ,

(a) with zero speed at an instant may have non-zero accelration at that instant

(b) with zero speed may have non-zero velocity (c) with positive constant speed must have zero accleration

(d) with positive value of acceleration must be speeding up.

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198. Read each statement below carefully and state with reason and examples, if it is true or false. A scalar quantity is one that (a) is conserved in a process (b) can never take negative values (c) must be dimensionless (d) does not vary from one point to another in space (e) has the same value for observers with different orientations of axes.

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199. A ball is dropped from a height of a height of 90 m on a floor. At each collsion with the floor , the ball loses one - tenth of its speed . Plot the speed -time graph of its motion between t 0 to 12 s.

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200. Explain clearly, with ezamples, the difference between :

(a) magnitude of displacemnt (sometimes called distance) overand interval of time, and the total length of the path coverd by a particle over the same interval.

(b) magnitude of average velocity over an intercal of time , and the average speed

over the same interval. [Average speed of a particle over an interval of time is defined as the toal path length

divided by the time intrval]. Show in both (a) and (b) that the second quantity is either greater than or equal to first.

When is the equality sing true ? [For simplocity, consider one-dimensional motion only]

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203. A man walks on a straight road from his home to a market $2.5km$ away with a speed of $5km/h$. Finding the market closed, he instantly turns and walks back with a speed of $7.5km/h$. What is the (a) magnitude of average velocity and (b) average speed of the man, over the interval of time (i) 0 to 30 min `. (ii) 0 to 50 min (iii) 0 to 40 min ?

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204. A man walks on a straight road form his home to a market 2.5 km away with speed of 5 $\frac{km}{hr}$. Finding the market closed, he instantly turns and walks back home with a speed of 7.5 $\frac{km}{hr}$. The average speed of the man over the intervel of time 0 to 40 min is equal to

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205. The instantaneous speed is always equal to the magnitude of instantaneous velocity. Why?

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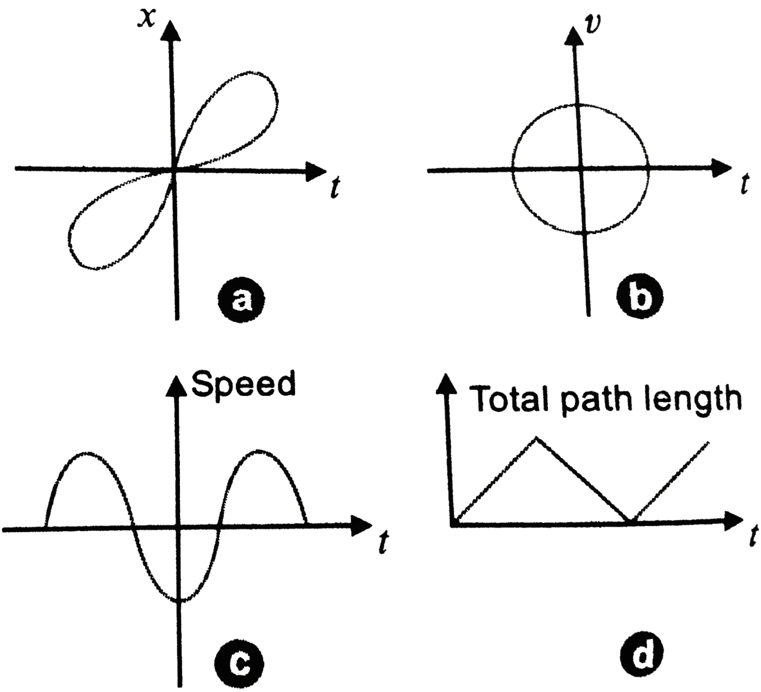
206. Look at the graphs Fig. 2 (NCT) .5.(a) to (d) carefully and state, with reasons, with of these connot possibly represent one dimensional motion of a particle.



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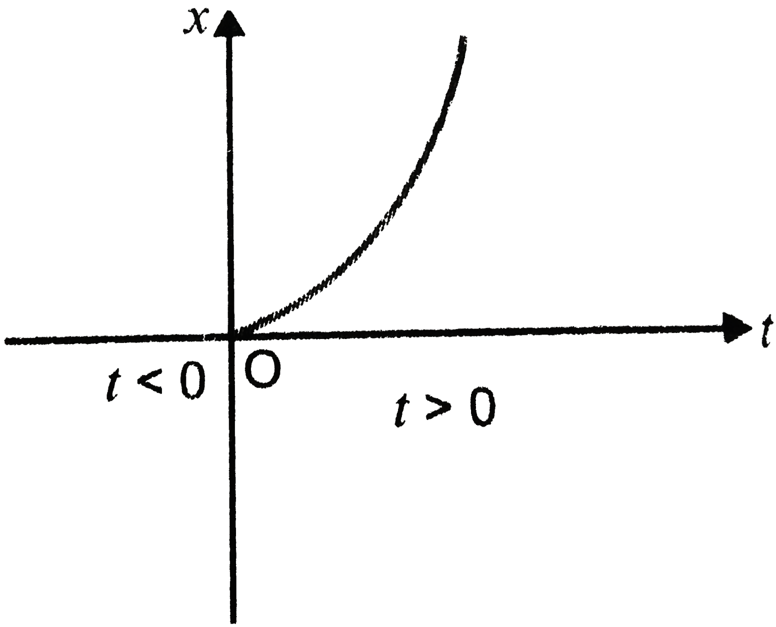
207. Fig. 2 (NCT). 6 shows $x - t$ plot of one dismensional motion a particle. Is it correct to say from the graph that the particle moves in a straight line for $t < 0$and on a parabolic path form $t > 0$? If not, suggest a suitable physical contxt for this graph.



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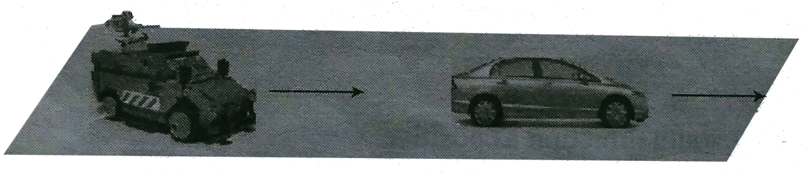
208. A police van moving on a highway with a speed of $30 kmh^{-1}$ Fires a bullet at a thief's car speeding away in a same direction with a speed of $192 kmh^{-1}$. If the muzzle speed of the buller is $150 ms^{-1}$, with what speed does the bullet hit thief's car? .



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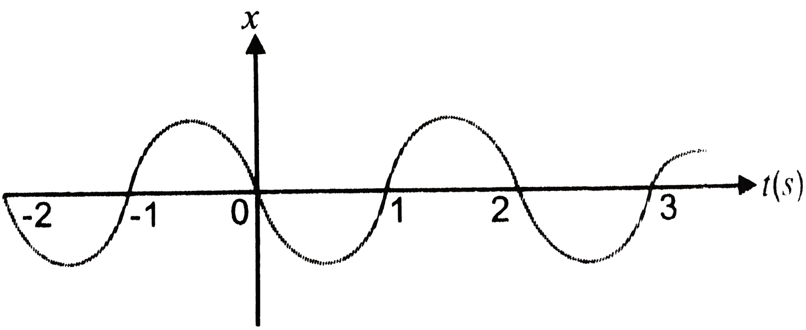
209. Fig 2 (NCT).8 gives the $x-t$ plot of a particle executing one dimensional simle harmonic motion. Give the signs of position, velocity and acceleration variables of the particles at $t = 0.3s, 1.2s, \ -1.\ 2s,$



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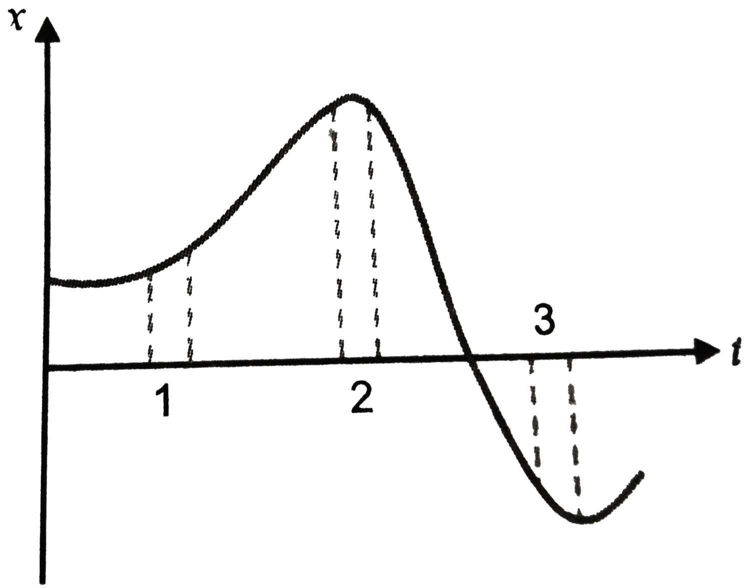
210. Fig. 2 (NCT).9 show the $x - t$ plot of a particle in one dimensional motion. Three different equal intervals of time are shown. In which interval the average speed is greatest and in which it is the least ? Give th sign of average speed for each interval.



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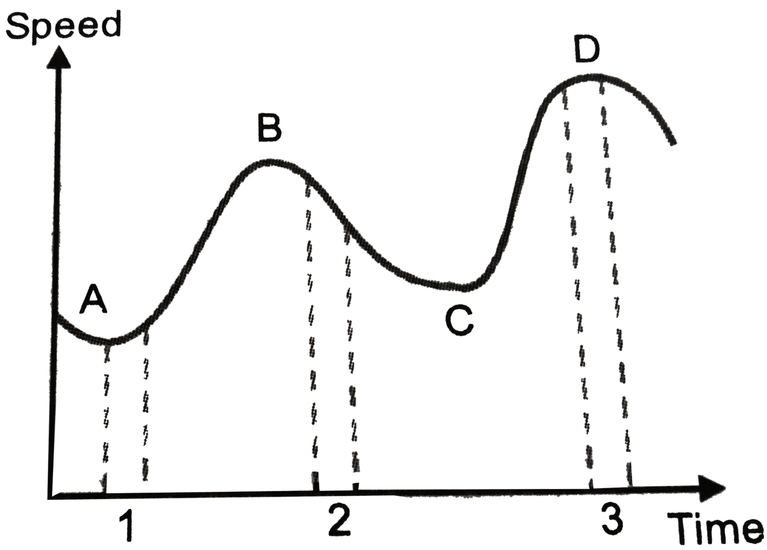
211. Given a speed-time graph of a particle in one dimensional motion. Three different equal intervals of time are shown. In which interval is the average acceleration greatest in magnitude ? In which interval is the average speed greatest ? Choosing the positive direction as the constant direction of motion, give the signs of u and a in the three intervals. What are the accelerations at the points A, B, C and D ?



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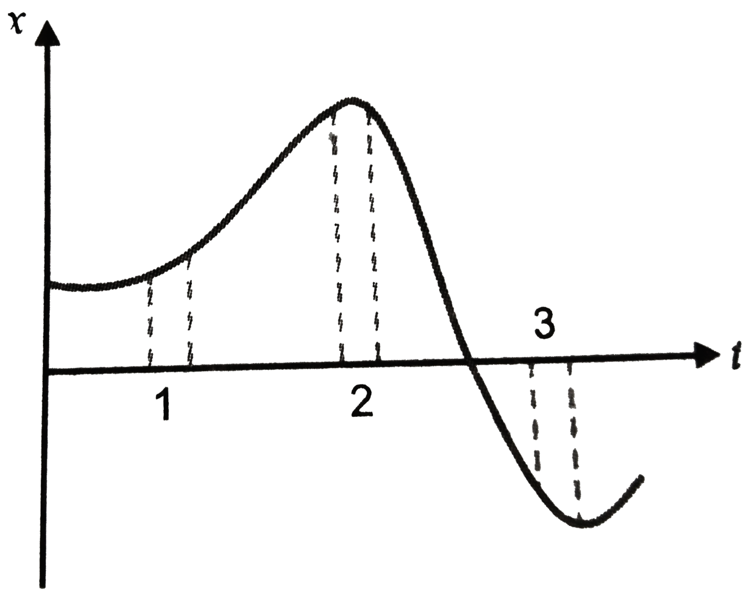

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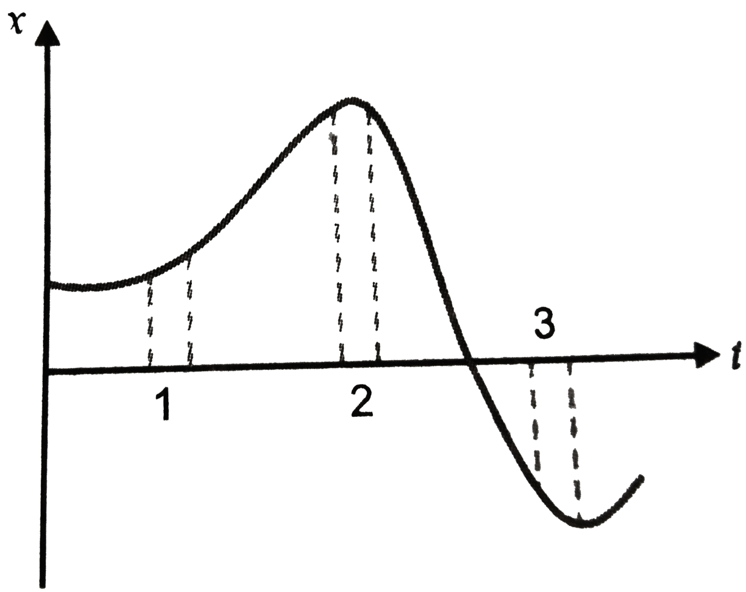

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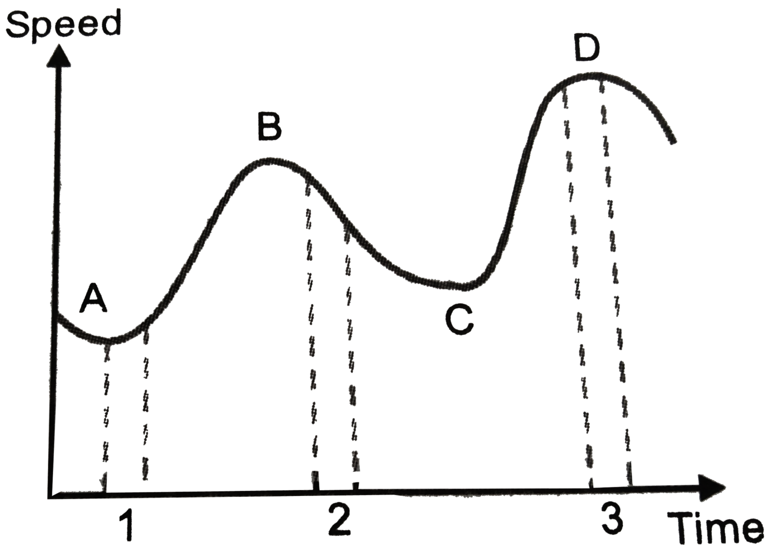

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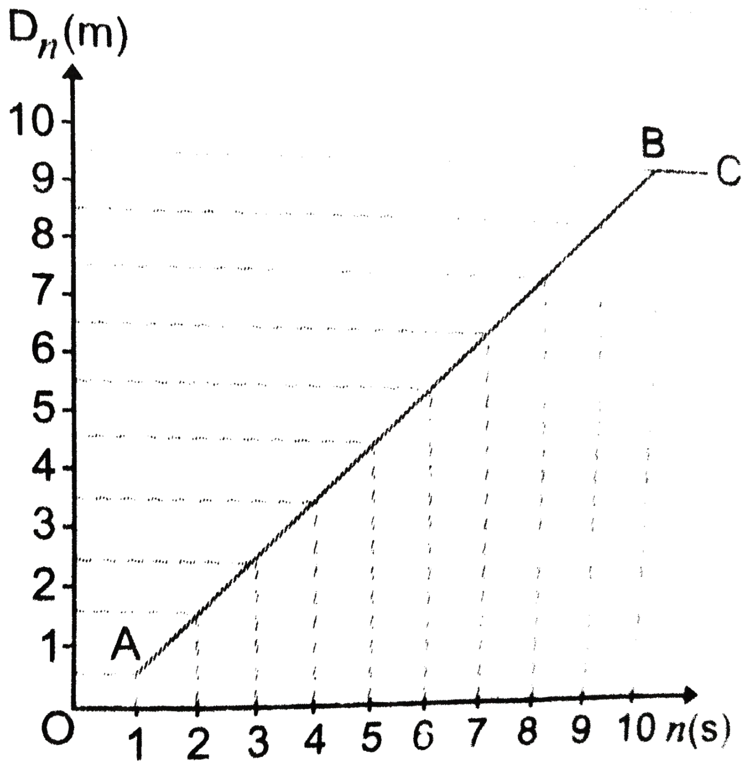
215. A three wheeler starts from rest, accelerates uniformly with $1ms^{-2}$ on a straight road for $10s$ and then moves with uniform velocity . Plot a graph between the distance covered by the vehicle during the nth second (n = 1,2,3, ...) versus (n) What do you expect the plot to be during

accelerated motion: a straight line or a parabola ?



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216. A boy standing on a stationary lift (open from above) throws a ball upwards with the maximum initial speed he can, equal to $49ms^{-1}$. How much time does the ball take to return to his hands ? If the lift starts moving up with a uniform speed of $5ms^{-1}$ and the boy again throws the ball up with the maximum speed he can , how hoes the ball take to return to his hands ?

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218. A long belt is moving horizontally with a speed of $5kmh^{-1}$. A child runs on this belt to and fro with a speed of $9km/h$ (w.r.t. bett) between his father and mother located $50m$ apart on the belt. For an observer on a stationalry plateform outsied, what is the

(a) speed of the chils runningin the derection of motion of the belt, (b) speed of thechaild runing opposite to thedirection of the belt, and (c) time taken by the child in cases (a) and (b) ? Which of theanswers change, if motion is viewed by one of the parents ?gt

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219. On a long horizontally moving belt, a child runs to and fro with a speed $9kmh^{-1}$ (with respect to the belt) between his father and mother located 50 m apart on the moving belt. The belt moves with a speed of $4kmh^{-1}$. For an observer on a stationary platform outside, what is the : speed of the child running opposite to the direction of motion of the belt.Which of the answer alter if motionis viewed by one of the parents ?

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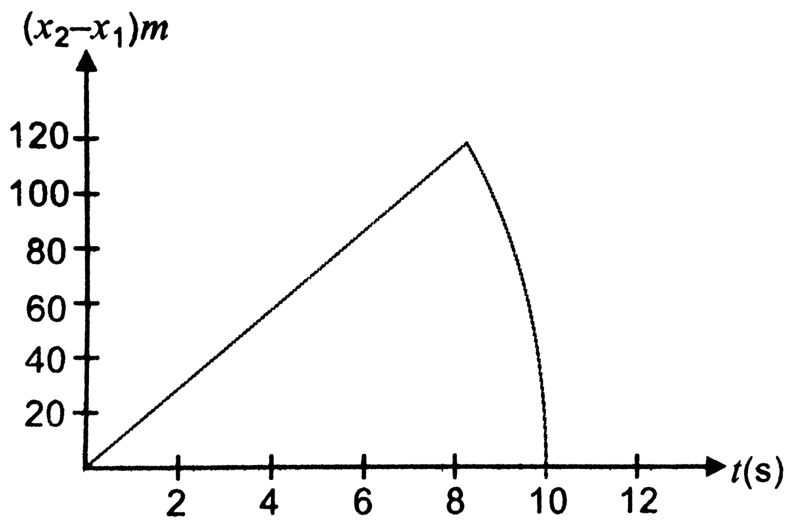
220. Two stones are thrown up simultaneously from the edge of a cliff $200m$ high with initial speeds of $15ms^{-1}$ and $30ms^{-1}$. Verify that the graph shown in Fig. 2 (NCT). 13 , correctly represents the time variation of the relative position of the second stone with respect to the first. Neglect the air resistance and assume that the stones do not rebound after hitting the ground. Take $g = 10ms^{-2}$.Give equations for the linear and curved parts of the plot.



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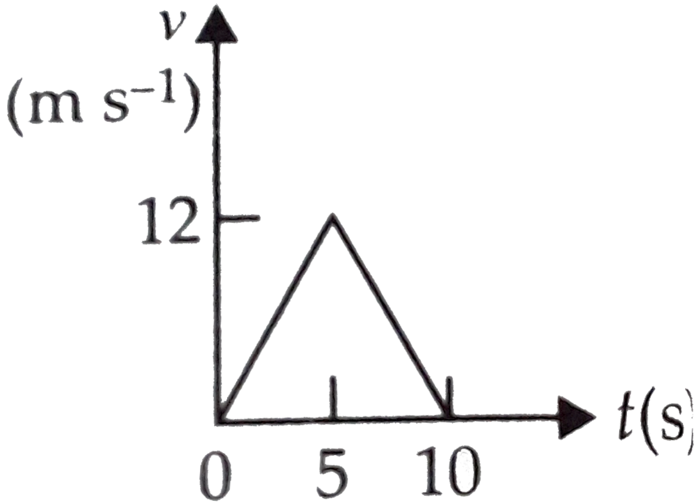
221. The speed-time graph of a particle moving along a fixed direction as shown in the figure. The distance traversed by the particle between t = 0 s to t = 10 s is



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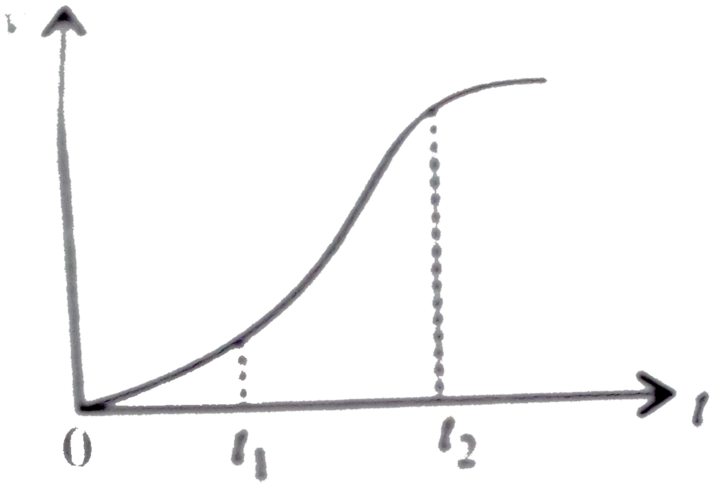
222. The velocity-time graph of a particle in one-dimensional motion is shown in the figure. Which of the following formulae is correct for describing the motion of the particle over the time interval t_1 to t_2?



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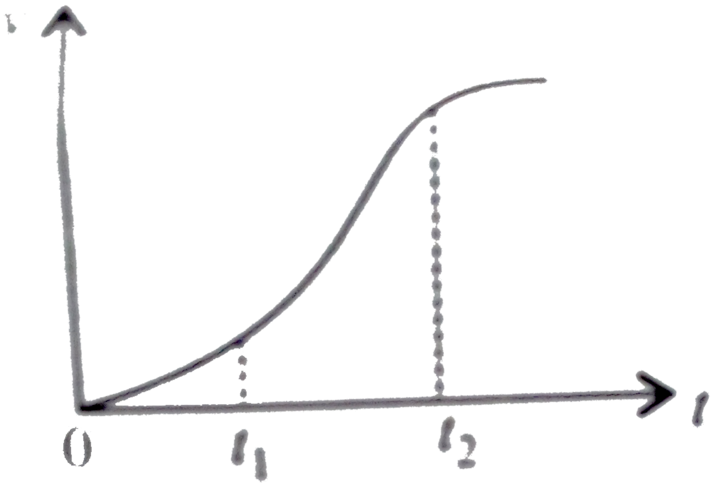

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Exercise

1. A cyclist moving on a circular track of radius 100 m completes one revolution in 4 minutes What is his average speed ?

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2. A cyclist moving on a circular track of radius 100 m completes one revolution in 4 minutes What is his average velocity in one full revolution ?

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3. A body travels a distance s_1 with vleocity v_1 and distance s_2 with velocity v_2 in the with velocity v_2 . Calculate the average velocity.

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4. A car covers the first half of the distance between two places at a speed of $40 km h^{-1}$ and second half at $60 km h^{-1}$ Calculate the average speed of the car.

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5. A train moves with a speed o f$30kmh^{-1}$ in the first 15 minutes,with another speed of $40kmh^{-1}$ the next 15 minutes,and then with a speed of $60kmh^{-1}$ in the last 30 minutes. Calculate the average speed of the train of train for this journey.

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6. The body travels a distance s_1 with velcity v_1 and s_2 with velcity v_2 in the same directin. Calculate the average velocity of the body .

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7. A car along a starigth line for the first half time with speed $50kmh^{-1}$ and the second half time with speed $60kmh^{-1}$. Find the average speed of the car.

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8. The displacement x of a particle at time t along a straight line is given by $x = \alpha - \beta t + \gamma t^2$. The acceleraion of the particle is

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9. The displacement x of a particle is dependent on time t according to the relation : $x = 3 - 5t + 2t^2$. If t is measured in seconds and s in metres, find its velocity at t = 2s.

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10. The displacement x of a particle is dependent on time t according to the relation : $x = 3 - 5t + 2t^2$. If t is measured in seconds and s in metres, find its acceleration at t = 4s.

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11. The displacement of a particle along the x-axis is given by $x = 3 + 8t + 7t^2$. Obtain its velocity and acceleration at $t = 2s$.

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12. The distance traversed by a particle moving along a straight lne is given by $x = 180t + 50t^2$ metre. The acceleration of the particle is

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13. The distance traversed by a particle moving along a straight line is given by $x = 180t + 50t^2$ metre. Find the velocity at the end of 4s.

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14. The distance traversed by a particle moving along a straight lne is given by $x = 180t + 50t^2$ metre. The acceleration of the particle is

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15. A race car accelerates on a straight road from rest to a speed of $180 km h^{-1}$ in 25s. Assuming uniform acceleration of the car throughout, find the distance covered in this time.

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16. A bullet travellling with a velocity of 16 m/s penetrates a tree trunk and comes to rest in 0.4 m. Find the time taken during the retardation.

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17. A car moving along a stainght highway with a speed of $72 km h^{-1}$ is brought to a stop within a distance of 100m. What is the retardation of the car and how long does it takes for the car to stop ?

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18. on turning a corner a car driving at $36kmh^{-1}$ finds a child on the road 55 m abead. He immediately applies brakes,so as to stop within 5 m of the child . Calculate the retardation produced and the time taken by the car to stop .

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19. the reaction time for an automobile drive os 0.6s if the automobile can be decelerated at $5ms^{-2}$, calculate the total distance travelled in coming to stop fro, an intial velocity of $30kmh^{-1}$ after a singnal is observed.

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20. A car starts from rest and accelerates uniformly for $10s$to a velocity of $80ms^{-1}$. It then runs at a constant velocity and is finally brought to rest in $64m$ with a constant retardation. The total distance covered by the car is $584m$ Find the value of acceleration, retardation, and total time taken.

Watch Video Solution

21. two tains one travelling at $72kmh^{-1}$ and other at $90kmh^{-1}$ are heading towards one another along a strauight level track. When they are 1.0km apart, both the drivers simultanously see the other 's train and apply brakes which restard each train at the rate of $1.0ms^{-2}$.determine whether the trains would collide or not.

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22. A scooter starts from rest have an acceleration of $1ms^{-2}$ while a car 150 m behind it starts from rest with an acceleration of $2ms^{-2}$. After how much time the car catches up with the scooter ?

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23. A ball rolls down an inclined trck 2 m long in 4s. Find acceleration

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24. A ball rolls down an inclined trck 2 m long in 4s. Find time taken to cover the second metre of the track.

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25. A ball rolls down an inclined trck 2 m long in 4s. Find speed of the ball at the bottom of the track.

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26. A bus starts from rest with constant acceleration of 5 $ms^{-}2$. At the same time a car travelling with a constant velocity of 50 $ms^{-}1$ overtakes and passes the bus. (i) Find at what distance will the bus overtake the car ? (ii) How fast will the bus be travelling then ?

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27. A bus starts from rest with a constant acceleration of $5m/s^2$ at the same time a car travelling with a constant velocity $50m/s$ over takes and passes the bus. How fast is the bus travelling when they are side by side?

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28. A body starting from rest accelerates uniformly at the rate of $10cms^{-2}$ and retaeds uniformly at the rate of $20cms^{-2}$. Find the least time in which it can complete the journey of 5km if the maximum velocity attained by the body is $72kmh^{-1}$.

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29. A body covers $10m$ in the second second and $25m$ in fifth second of its motion. If the motion is uniformly accelerated, how far will it go in the the seventh second?

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30. A body covers a distance of 4 m in 3^{rd} second and 12m in 5^{th} second. If the motion is uniformly accelerated. How far will it travel in the next 3 seconds?

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31. An object is moving with uniform acceleration. Its velocity after $4s$ is $20ms^{-1}$ and after $7s$ is $29ms^{-1}$. Find the distance traveled by the object in 10th second.

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32. A stone is thrown vertically upwards with a velocity of $4.9ms^{-1}$. Calculate : the maximum height reached.

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33. A stone is thrown vertically upwards with a velocity of $4.9ms^{-1}$.

Calculate : the time taken to reach the maximum height.

Watch Video Solution

34. A stone is thrown vertically upwards with a velocity of $4.9ms^{-1}$.

Calculate : the velocity with which it returns to the ground.

Watch Video Solution

35. A stone is thrown vertically upwards with a velocity of $4.9ms^{-1}$.

Calculate : the time taken to reach the ground.

Watch Video Solution

36. A stone thrown upwards from the top of a tower 85 m high, reaches the ground in 5s. Find the greatest height above the ground.Take

$g = 10ms^{-2}$

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37. A stone is thrown upwards from the top of tower 85 m high , reaches the ground in 5 s. find (i) the greatest height it reaches above the ground (ii) the velocity with which it reaches the ground and (iii) the time taken to reach the maximum height . Take g =$10ms^{-2}$?

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38. A stone is thrown upwards from the top of tower 85 m high , reaches the ground in 5 s. find (i) the greatest height it reaches above the ground (ii) the velocity with which it reaches the ground and (iii) the time taken to reach the maximum height . Take g =$10ms^{-2}$?

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39. from the top of multi-storeyed building ,39.2 m tall , a boy projects a stone vertically upward with an initial velocity of $9.8ms^{-1}$ such that it finally drops to the ground (i) when will the stone reach the ground? (ii) whn will it pass through the point of projection ? (iii) what will be its velocity before striking the ground ? take g =$10ms^{-2}$

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40. from the top of multi-storeyed building ,39.2 m tall , a boy projects a stone vertically upward with an initial velocity of $9.8ms^{-1}$ such that it finally drops to the ground (i) when will the stone reach the ground? (ii) whn will it pass through the point of projection ? (iii) what will be its velocity before striking the ground ? take g =$10ms^{-2}$

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41. from the top of multi-storeyed building ,39.2 m tall , a boy projects a stone vertically upward with an initial velocity of $9.8ms^{-1}$ such that it finally drops to the ground (i) when will the stone reach the ground? (ii) whn will it pass through the point of projection ? (iii) what will be its velocity before striking the ground ? take g =$10ms^{-2}$

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42. A rocket is fired vertically up from the ground with a resultant vertical acceleration of $10m/s^2$. The fuel is finished in 1 min and it continues to move up. (a) What is the maximum height reached? (b) Afte2r how much time from then will the maximum height be reached?(Take $g = 10m/s^2$)

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43. A balloon is ascending at the rate of $14ms^{-1}$ at a height of 98 m above the ground when the food packet is dropped from the balloon. After how much time and with what velocity does it reach the ground ? Take $g = 9.8ms^{-2}$

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44. A stone is dropped from a balloon rising upwards with a velocity of $16ms^{-1}$. The stone reaches the ground in 4 s. Calculate the height of the balloon when the stone was dropped.

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45. Form the top of a tower $100m$ in height a ball is dropped and at the same time another ball is projected vertically upwards from the ground with a velcoity of $25ms^{-1}$. Find when and where the two balls will meet.

Watch Video Solution

46. An object is dropped from rest at a height of $150m$ and simultanously another object is dropped from rest at a height $100m$. What is the difference in their height after $2s$ if both the objects drop with same acceleration ? How does the difference in height vary with time ?

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47. A body is dropped from rest at a height of $150m$ and simultanceously, another body is dropped from rest from a point $100m$ above the ground. What is the difference between heights after theymave fallen for (i) $3s(ii)5s$. Consider that the body on reaching ground remains there and acceleration due to gravity be $10m/s^2$.

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48. A body falling freely under gravity passes two points 30 m apart in 1 s. From what point above the upper point it began to fall? (Take g = $9.8ms^{-2}$).

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49. Four marbles are dropped from the top of a tower one after the other with an interval of one second. The first one reaches the ground after 4 seconds . When the first one reaches the ground the distance between the first and second, the second and third and the third and forth will be respectively

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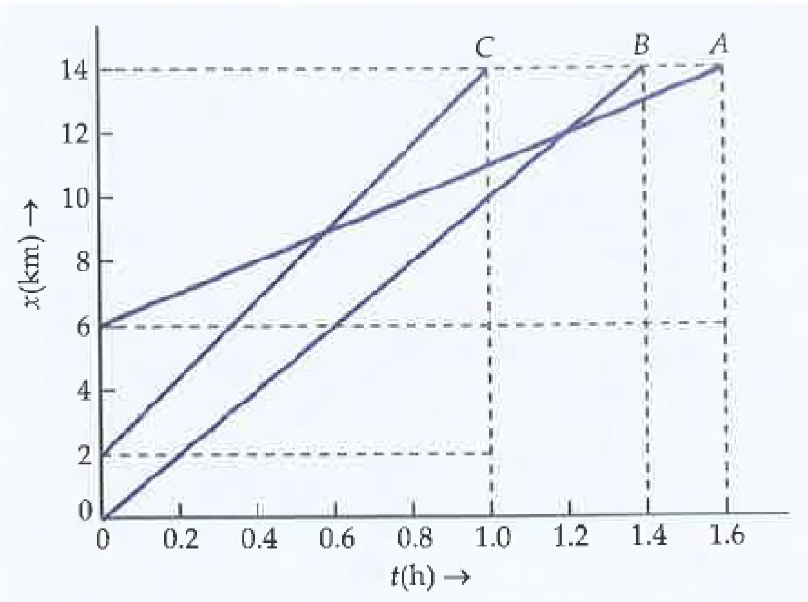
50. Figure 3.64 shows the position-time graphs of three car A, B and C. On the basis of the graphs, answer the following questions : Which car has the highest speed and which the lowest ?



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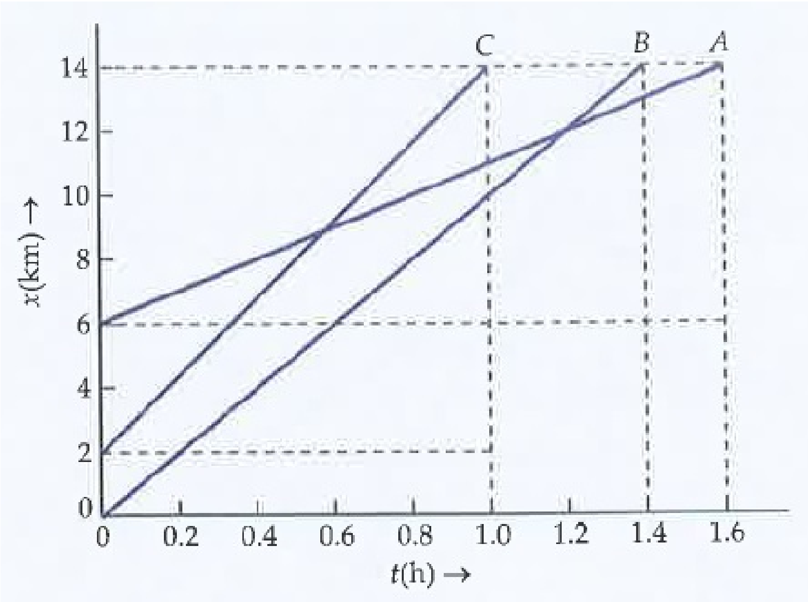
51. Figure 3.64 shows the position-time graphs of three car A, B and C. On the basis of the graphs, answer the following questions : Are the three cars ever at the same point on the road ?



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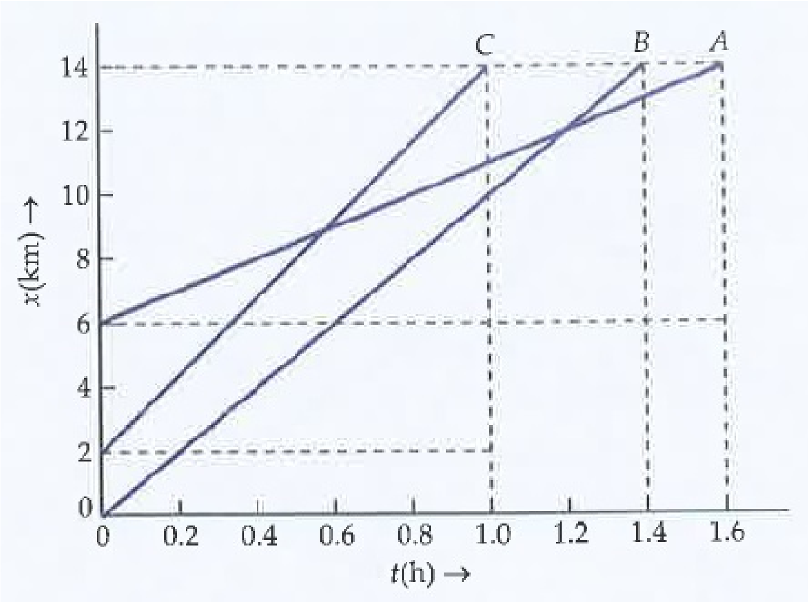
52. Figure 3.64 shows the position-time graphs of three car A, B and C. On the basis of the graphs, answer the following questions : When A passes

C, where is B ?



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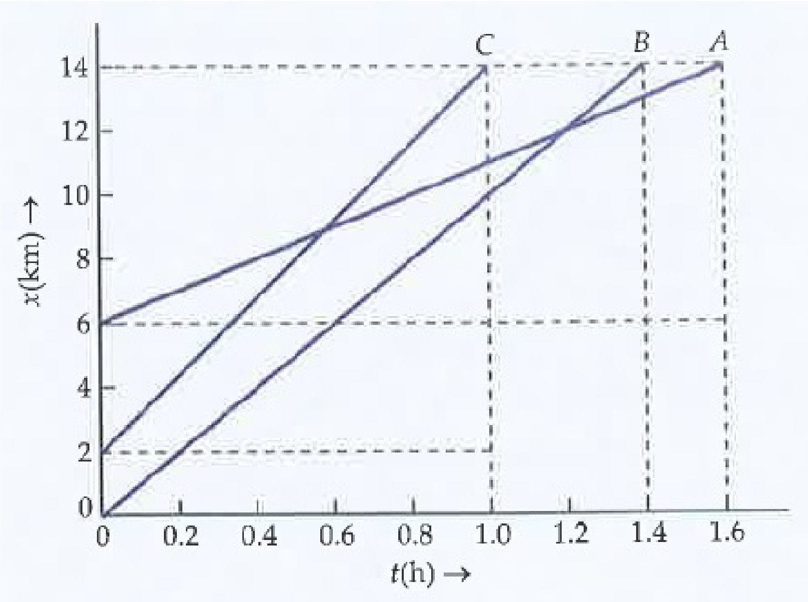
53. Figure 3.64 shows the position-time graphs of three car A, B and C. On the basis of the graphs, answer the following questions : How far did car

A travel between the time it passed cars B and C ?



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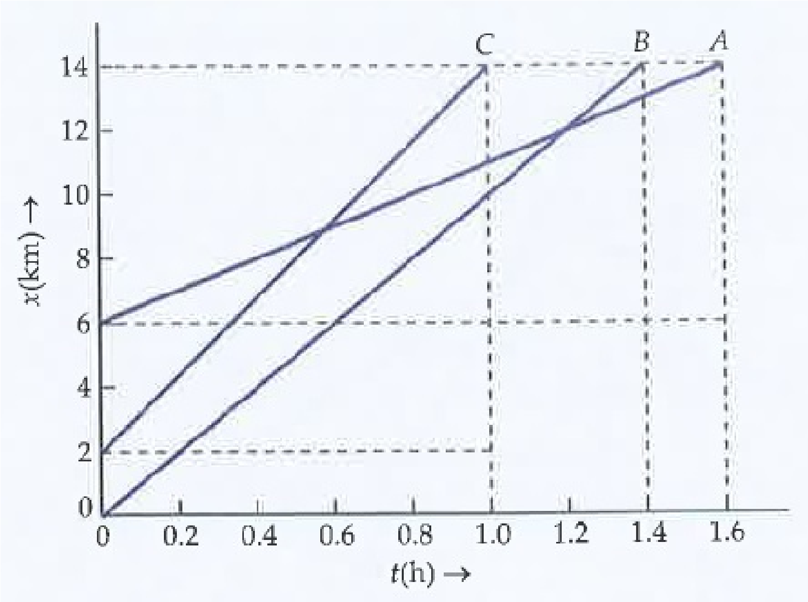
54. Figure shows the position-time graphs of three car A, B and C. On the basis of the graphs, answer the following questions : What is the relative velocity of car C with respect to car A ?



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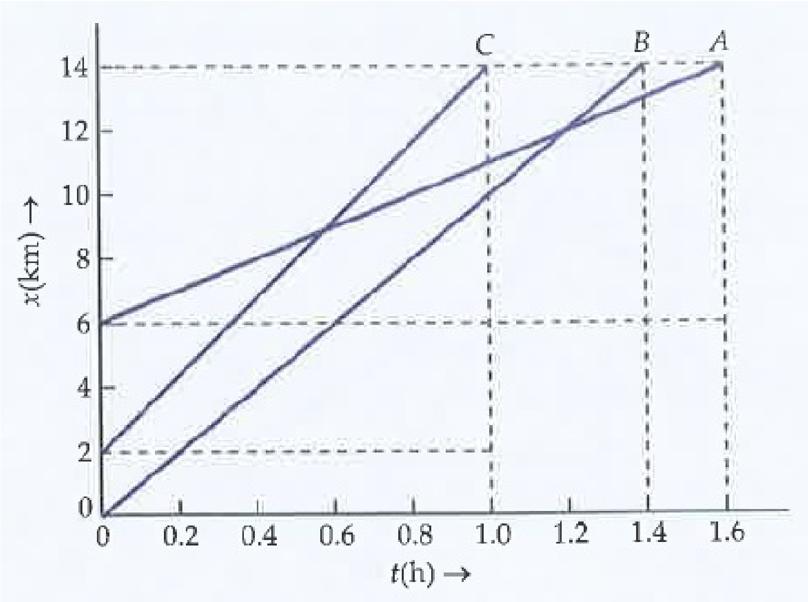
55. Figure shows the position-time graphs of three car A, B and C. On the basis of the graphs, answer the following questions : What is the relative velocity of car B with respect to car C ?



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56. An insect crawling up awall crawls 5 cm upwards in the first minute but then slides 3 cm downwardsin the next minute. It again crawls up 5 cm upwards in the third minute but again slides 3 cm downwards in the fourth minute. How long will the insect take to reach a crevice in the wall at a height of 24 cm from its starting point ? How does the position-time graph of the insect look like ?

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57. a driver of a car travelling at $52km/h$ applies the brakes and acceleration uniformly in the opposite direction. The car stops in $5s$. Another driver going at $34km/h$ in another car applies his brakes slowly and stops in $10s$. On the same graph paper, plot the speed versus time graphs for the two cars. Which of the two cars travelled farther after the brakes were applied ?

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58. A motor car, starting from rest, moves with uniform acceleration and attains a velocity of $8ms^{-1}$ in 8 s. It then moves with uniform velocity and finally brought to rest in 32 m under unifrom retardation. The total distance covered by the car is 464 m. Find the acceleration.

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59. A motor car, starting from rest, moves with uniform acceleration and attains a velocity of $8ms^{-1}$ in 8 s. It then moves with uniform velocity and finally brought to rest in 32 m under unifrom retardation. The total distance covered by the car is 464 m. Find the retardation

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60. A motor car, starting from rest, moves with uniform acceleration and attains a velocity of $8ms^{-1}$ in 8 s. It then moves with uniform velocity and finally brought to rest in 32 m under unifrom retardation. The total distance covered by the car is 464 m. Find the total time taken.

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61. Starting from rest a car accelerates unifromly with $3ms^{-2}$ for 5 s and then moves with uniform velocity. Drwa the distance-time graph of the motion of the car upto t = 7s.

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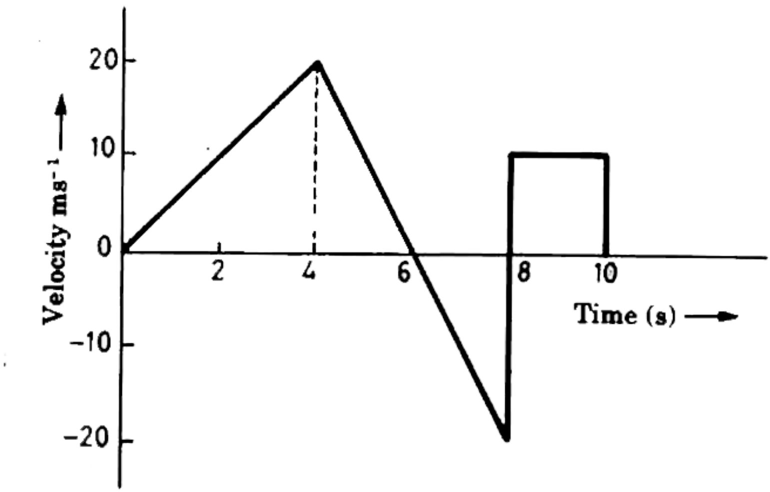
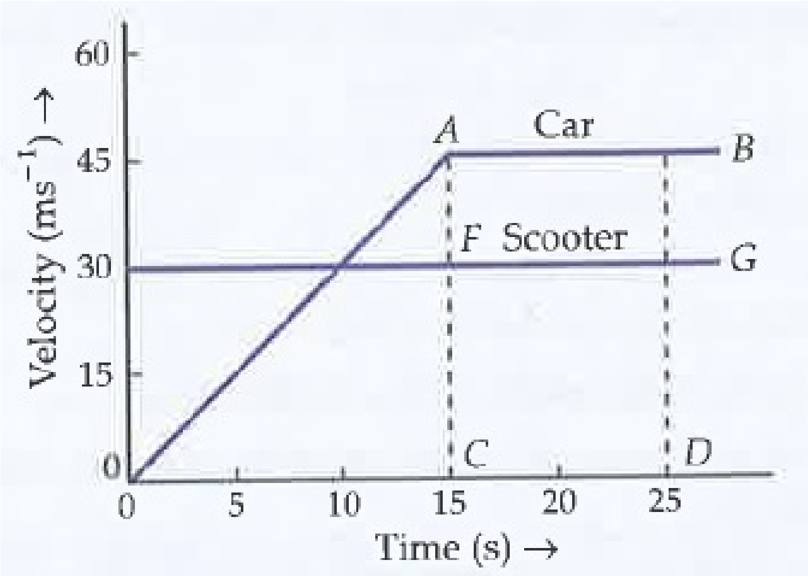
62. The velocity-time graph of an object moving along a straight line is as shown in Fig. 3.37. Find the net distance covered by the object in time interval between t=0 to t=10s. Also find the displacement in time 0 to 10 s.



63. As soon as a car just starts from rest in a certain direction, a scooter moving with a uniform speed overtakes the car. Their velocity-time graphs are shown in Fig. Calculate the difference between the distances travelled by the car and the scooter in 15 s.



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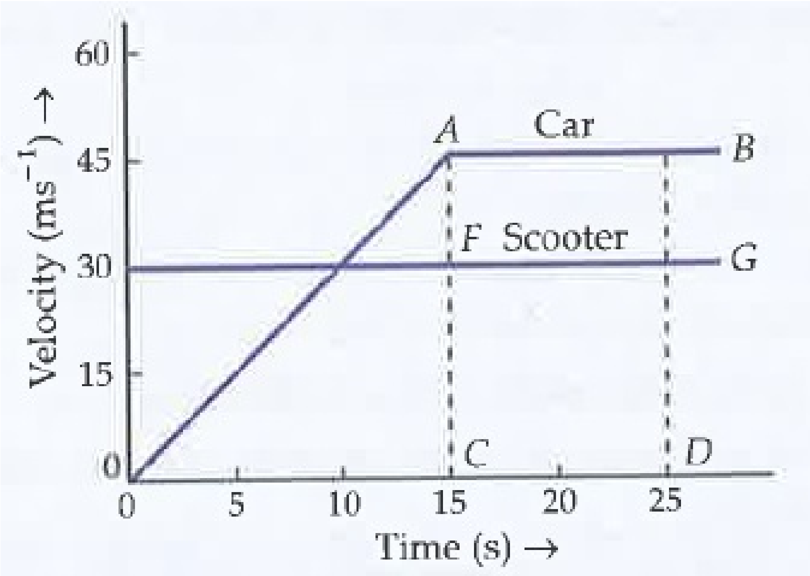
64. As soon as a car just starts from rest in a certain direction, a scooter moving with a uniform speed overtakes the car. Their velocity-time graphs are shown in Fig. 3.66. Calculate the time when the car will catch up the scooter.



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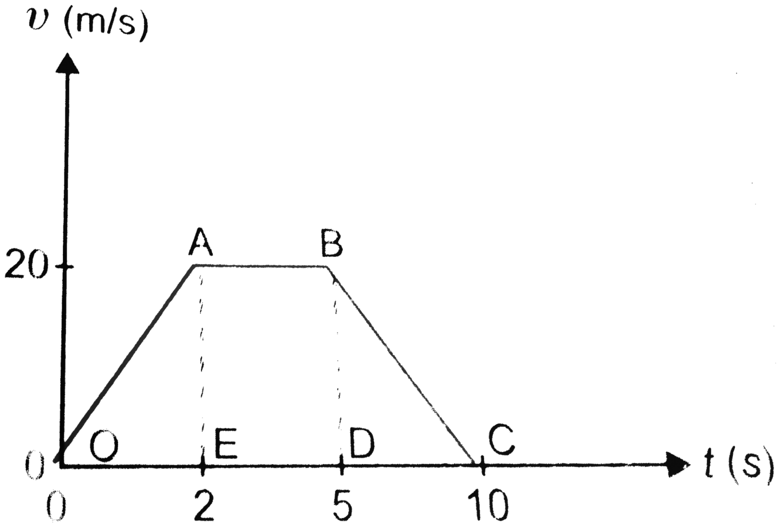
65. The velocity (u)-time (t) graph of an object moving along a straight line is as shown is Fig. 2 (b) . 30. Calculate the distance covered by object between $(i) t = 0 \to t = 5s$ (ii) $t = 0 \to t = 10s$.



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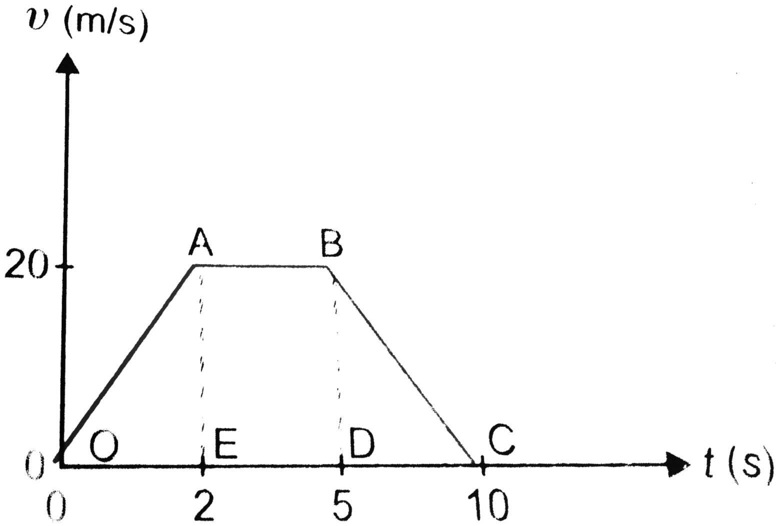
66. The velocity (u)-time (t) graph of an object moving along a straight line is as shown is Fig. 2 (b) . 30. Calculate the distance covered by object between $(i) t = 0 \rightarrow t = 5s$ (ii) $t = 0 \rightarrow t = 10s$.



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67. A jet airplane travelling at the speed of $450 kmh^{-1}$ ejects the burnt gases at the speed of $1200 kmh^{-1}$ relative to the jet airplane. Find the speed of the brunt gases w.r.t a stationay observer on earth .

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68. two car A and B are moving with velocities of $60 kmh^{-1}$ and $45 kmh^{-1}$ respectively. Calculate the relative velocity of A w.r.t B if (i) both cars are travelling eastwards and (ii)car A is travelling eastwards and car B is travelling westwards.

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69. two car A and B are moving with velocities of $60 kmh^{-1}$ and $45 kmh^{-1}$ respectively. Calculate the relative velocity of A w.r.t B if (i) both cars are travelling eastwards and (ii)car A is travelling eastwards and car B is travelling westwards.

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70. an open car is moving on a road with a speed of $100 kmh^{-1}$. A man sitting in the car fires a bullet from the gun in the oppositve direction. If the spedd of the bullet is $250 kmh^{-1}$ relative to the car.then find its (bullt 's) speed with respect to an observe on the ground.

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71. A car A is moving with is speed of $60kmh^{-1}$ an car B is moving with a speed of $75kmh^{-1}$,along parallel strainght paths , starting paths starting from the same point. What is the position of car A w.r.t B after 20 mintues ?

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72. two buses start simultaneoulsly towards each othehr from towns A and B which are 480 km apart. The first bus taken 8 hours to travel form A to B while the second bus takes 12 hours to travel from B to A. determine when and where the buses will meet.

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73. Two trains, each of length $100m$, are running on parallel tracks. One overtakes the other in $20 \sec ond$ and one crosses the other in $10 \sec ond$.

Calculate the velocities of two trains.

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74. A man swins in a river with and against water at the rate of $15kmh^{-1}$ and $5kmh^{-1}$. Find the man's speed in still water and the speed of the river.

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75. A motor boat covers the distance between the two spost on the tiver in $9h$ and $13h$ down stream and upstream respectively. Find the time required by the boat to cover this distance in still water.

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76. A car A is travelling on a straight level road with a uniform speed of 60 km/h. It is followed by another car B which in moving with a speed of 70 km/h. When the distance between then is 2.5km, the car B is given a deceleration of $20\frac{km}{h^2}$. After how much time will B catch up with A

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77. A particle is constrained to move on a straight line path. It returns to the starting point after 10 sec . The total distance covered by the particle during this time is 30 m . Which of the following statements about the motion of the particle is false

A. displacement of the particle is zero

B. displacement of the particle is 30 m

C. average speed of the particle is 3 m/s

D. both (a) and (c)

Answer:

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78. A car travels the first half of a distance between two places at a speed of $30km/hr$ and the second half of the distance at $50km/hr$. The average speed of the car for the whole journey is

A. $37.5km/hr$

B. $42km/hr$

C. $40km/hr$

D. $49km/h$

Answer:

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79. A car travels from A to B at a speed of $20km/hr$ and returns at a speed of $30km/hr$. The average speed of the car for the whole journey is

A. $5km/h$

B. $24km/h$

C. $25km/h$

D. $50km/h$

Answer:

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80. If the first one - third of q journey is travelled at 20 km h^{-1}, Next one - third at $40kmh^{-1}$ And the last one third at $60kmh^{-1}$ then the average speed for the whole journey will be

A. $32.7km/h$

B. $35km/h$

C. $40km/h$

D. $45km/h$

Answer:

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81. A person travelling on a straight line moves with a uniform velocity v_1 for some time and with uniform velocity v_2 for the next equal time. The average velocity v is given by

A. $\sqrt{v_1 v_2}$

B. $\left(\frac{1}{v_1} + \frac{1}{v_2}\right)^{-1}$

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

D. `2(1/v_1 + 1/v_2)^(-1)

Answer:

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82. A 100 m long train is moving with a uniform velocity of $45 km / hr$. The time taken by the train to cross a bridge of length 1 km is

A. 58s

B. 68s

C. 78s

D. 88s

Answer:

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83. You drive a car at a speed of $70km/h$ in a straight road for 8.4 km, and then the car runs out of petrol. You walk for 30 min to reach a petrol pump at a distance of 2 km. The average velocity from the beginning of your drive till you reach the petrol pump is

A. $16.8km/h$

B. $35km/h$

C. $64km/h$

D. $18.6km/h$

Answer:

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84. A car moving with a speed of 25 ms^{-1} takes a U-turn in 5 seconds, without changing its speed. The average acceleration during these 5 seconds is

A. $10m/s^2$

B. $5m/s^2$

C. $2m/s^2$

D. $7m/s^2$

Answer:

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85. A particle moves along the x-axis with a position given by the equation x(t) = 5 + 3t, where x is in metres, and t is in seconds. The positive directions east. Which of the following statements about the particle is false ?

A. The particle is east of the origin at t = 0

B. The particle is at rest at t = 0

C. The particle's velocity is constant

D. The particle's acceleration is constant

Answer:

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86. The motion of a particle is described by the equation at $u = at$.The distance travelled by the particle in the first 4 seconds

A. 4a

B. 12a

C. 6a

D. 8a

Answer:

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87. The acceleration a of a particle starting from rest varies with time according to relation, $a = \alpha t + \beta$. Find the velocity of the particle at time instant t.

Strategy : $a = \dfrac{dv}{dt}$

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

B. $\dfrac{\alpha t^2}{2} + (\beta t)$

C. $\alpha t^2 + \dfrac{1}{2}\beta t$

D. $\dfrac{\alpha t^2 + \beta}{2}$

Answer:

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88. Given a = 2t + 5`. Calculate the velocity of the body after 10 sec if it starts from rest.

A. $50m/s$

B. $25m/s$

C. $100m/s$

D. $75m/s$

Answer:

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89. With the usual notations the following equation $S_t = u + \frac{1}{2}a(2t-1)$ is

A. only numerically correct

B. only dimensionally correct

C. both numerically and dimensionally correct

D. neither numerically nor dimensionally correct

Answer:

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90. What is the relation between displacement, time and acceleration in case of a body having uniform acceleration

A. $s = ut + \frac{1}{2} f t^2$

B. $s = (u + f)t$

C. $s = v^2 - 2fs$

D. none of these

Answer:

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91. A body sliding down on a smooth inclined plane slides down $1/4th$ distane in 2s. I will slide down the complete plane in

A. 4s

B. 5s

C. 2s

D. 3s

Answer:

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92. A particle moving in one dimension with a constant acceleration of $2\frac{m}{s^2}$ is observed to cover a distance of 5 m during a particular interval of 1 s. Thedistance covered by the particle in the next 1 s interval (in metre) is

A. 5

B. 6

C. 7

D. 10

Answer:

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93. A particle starts from rest, accelerates at $2\frac{m}{s^2}$ for 10 s and then goes for constant speed for 30 s and then decelerates at $4\frac{m}{s^2}$. Till it stops. What is the distance travelled by it?

A. 650 m

B. 700 m

C. 750 m

D. 800 m

Answer:

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94. The velocity of a particle at an instant is $10ms^{-1}$. After 3 s its velocity will becomes $16ms^{-1}$. The velocity at 2 s, before the given instant will be

A. $6m/s$

B. $4m/s$

C. $2m/s$

D. $1m/s$

Answer:

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95. A particle starts from rest with uniform acceleration a. Its velocity after 'n' second is 'v'. The displacement of the body in the last two second is

A. $\frac{2v(n-1)}{n}$

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

C. $\frac{v(n+1)}{n}$

D. $\frac{2v(n+1)}{n}$

Answer:

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96. A car accelerates from rest at a constant rate for some time after which it decelerates at a constant rate β to come to rest. If the total time elapsed is t, the maximum velocity acquired by the car is given by :

A. $ab\frac{t}{a+b}$

B. $a^2\frac{t}{a}+b$

C. $a\frac{t}{a+b}$

D. `b^(2)t/a+b

Answer:

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97. The velocity with which a body stricks the ground is always equal to the velocity with which it was projected upwards.' is the statement true ? On what principle is ist based ?

A. v = 0

B. v = 0.5 u

C. v = 2 u

D. v = u

Answer:

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98. If a ball is thrown vertically upwards with a velocity of $40m/s$, then velocity of the ball after $2s$ will be $(g = 10m/s^2)$

A. $10m/s$

B. $30m/s$

C. $20m/s$

D. $40m/s$

Answer:

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99. A stone released with zero velocity from the top of a water, reaches the ground in 4s. The height of the tower is $(g = 10m/s^2)$

A. 20 m

B. 80 m

C. 40 m

D. 160 m

Answer:

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100. A stone is thrown vertically up from the ground. It reaches a maximum height of 50 m in 10 sec. After what time it will reach the ground from maximum height position ?

A. 1.2 sec

B. 10 sec

C. 5 sec

D. 25 sec

Answer:

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101. A stone falls freely such that the distance covered by it in the last second of its motion is equal to the distance covered by it in the first 5 seconds. It remained in air for :-

A. 12 sec

B. 13 sec

C. 25 sec

D. 26 sec

Answer:

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102. A body sliding on a smooth inclined plane requires $4s$ to reach the bottom, starting from rest at the at the top. How much time does it take to cover ont-foruth the distance startion from rest at the top?

A. 1 sec

B. 4 sec

C. 2 sec

D. 16 sec

Answer:

Watch Video Solution

103. Find the ratio of the distances travelled by a freely falling body in first, second and third second of its fall.

A. $1:1:1$

B. $1:3:5$

C. $1:2:3$

D. $1:4:9$

Answer:

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104. When a ball is thrown vertically upwards, at the maximum height

A. the velocity is zero and therefore there isno acceleration acting on the particle

B. the acceleration is present and therefore velocity is not zero

C. the acceleration depends on the velocity as $a = d\frac{v}{dt}$

D. the acceleration is independent of the velocity

Answer:

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105. A ball is droped from a high rise platform $t = 0$ starting from rest. After $6s$ another ball is thrown downwards from the same platform with a speed v. The two balls meet at $t = 18s$. What is the value of v ?

A. $74ms^{-1}$

B. $64ms^{-1}$

C. $84ms^{-1}$

D. $94ms^{-1}$

Answer:

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106. A body A is thrown up vertically from the ground with velocity V_0 and another body B is simultaneously dropped from a height H. They meet simultaneously dropped from a height H. They meet at a height $\frac{H}{2}$ if V_0 is equal to

A. $\sqrt{2}gH$

B. $\sqrt{g}H$

C. $\frac{1}{2}\sqrt{g}H$

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

Answer:

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107. A ball falls from 20 m height on floor and rebounds to 5 m. Time of contact is 0.02 s. Find acceleration during impact.

A. $1200m/s^2$

B. $1000m/s^2$

C. $2000m/s^2$

D. $1500m/s^2$

Answer:

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108. A ball is dropped from top of a tower of 100 m height. Simultaneously another ball was thrown upward from bottom of the tower with a speed of $50m/s(g=10m/s^2)$. They will cross each other after

A. 1 sec

B. 2 sec

C. 3 sec

D. 4 sec

Answer:

Watch Video Solution

109. A body dropped from a height h with an initial speed zero, strikes the ground with a velocity $3k\frac{m}{h}$. Another body of same mass is dropped from the same height h with an initial speed $-u' = 4km/h$. Find the final velocity of second body with which it strikes the ground

A. $3km/h$

B. $4km/h$

C. $5km/h$

D. $12km/h$

Answer:

Watch Video Solution

110. A ball thrown upward from the top of a tower with speed v reaches the ground in t_1 sec. If this ball is thrown downward from the top of the same tower with speed v it reaches the ground in t_2 sec. In what time, the ball shall reach the grouned, if it is allowed to fall freely under gravity from the top of the tower?

A. $\frac{t_1 + t_2}{2}$

B. $\frac{t_1 - t_2}{2}$

C. $\sqrt{t_1 t_2}$

D. $t_1 + t_2$

Answer:

Watch Video Solution

111. Velocity-time curve for a body projected vertically upwards is with times (s)

A. ellipse

B. hyperbola

C. parabola

D. straight line

Answer:

Watch Video Solution

112. Which of the following equation is best representation of given graph's? ltimg src="https://d10lpgp6xz60nq.cloudfront.net/physics_images/ALN_PHY_R04_E0

width="80%"gt

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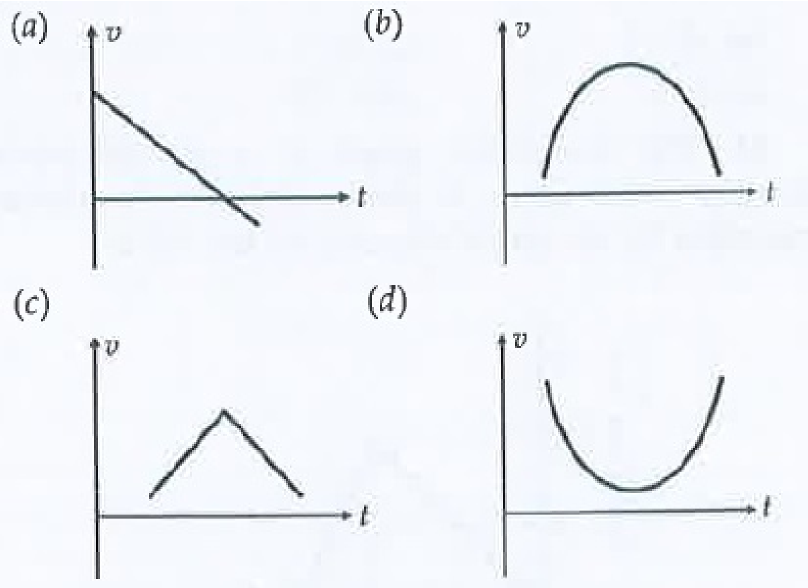
113. A particleis thrown above, the correct v-t graph will be



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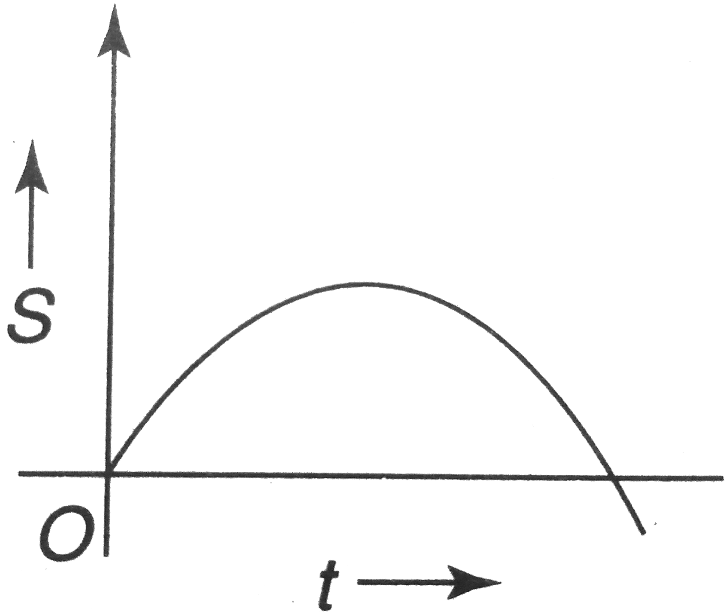
114. The graph of displacement versus time is shown. Its corresponding velocity-time graph will be.



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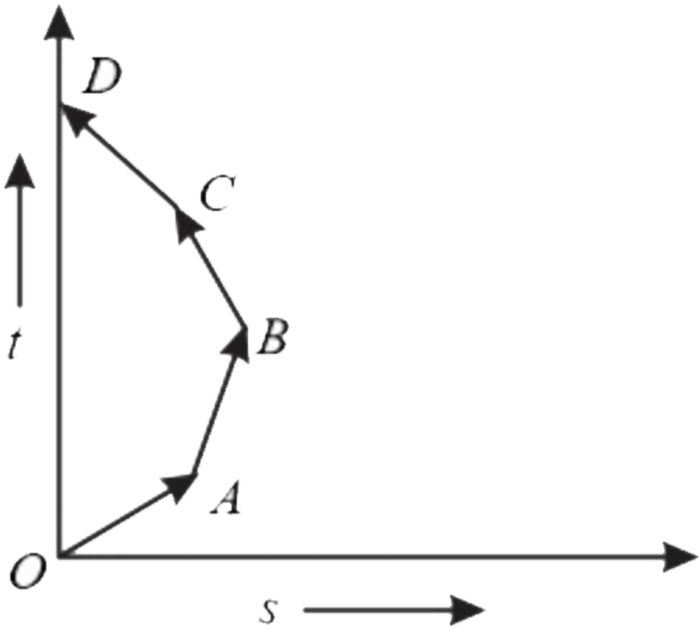
115. Which of the following options is correct for the object having a straight line motion represented by the following graph ?



A. The object moves with constantly increasing velocity from O to A and then it moves with constant velocity.

B. Velocity of the object increases uniformly

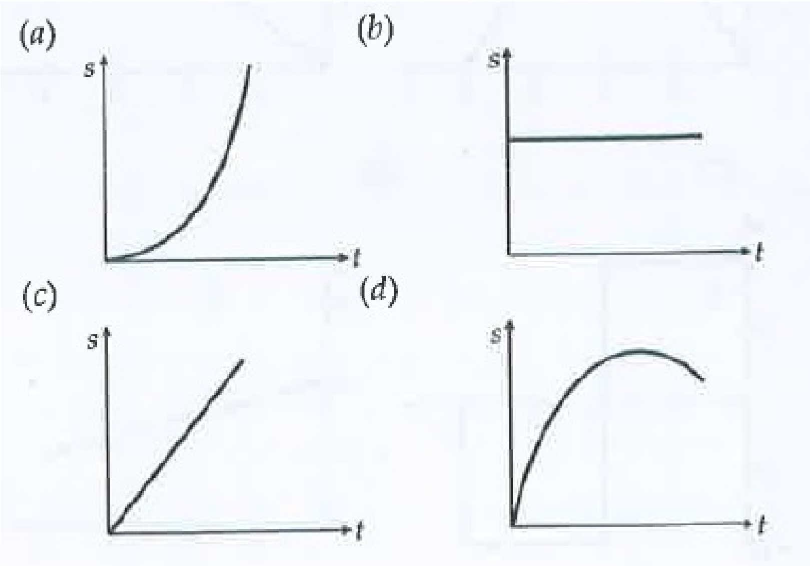
C. Average velocity is zero

D. The graph shown is impossible

Answer:

Watch Video Solution

116. A body is travelling in a straight line with uniformly increasing speed. Which one of the plots represents the changes in distance (s) travelled with time (t) ?



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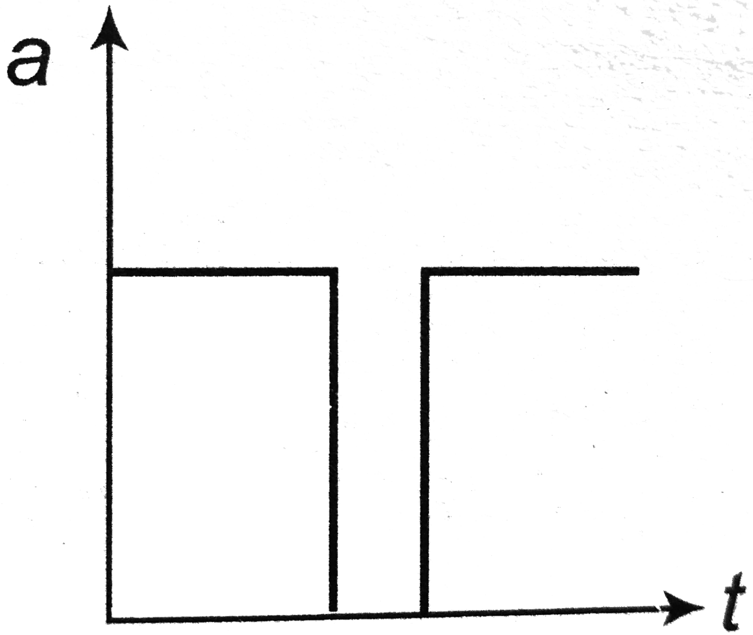
117. A body is thrown vertically upwards. Which one of the following graphs correctly represent the velocity vs time?

Watch Video Solution

118. Acceleration-time graph of a body is shown. The corresponding velocity-time graph of the same body is.



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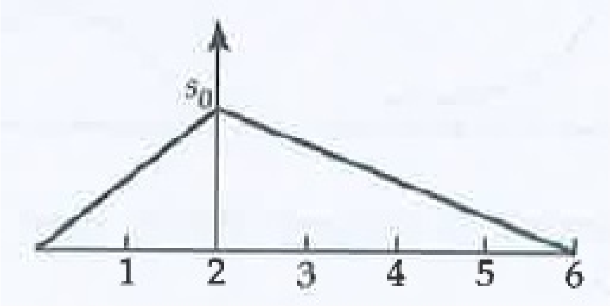
119. What will be ratio of speed in first two seconds to the speed in next 4 seconds ?



A. $\sqrt{2}:1$

B. $3:1$

C. $2:1$

D. $1:2$

Answer:

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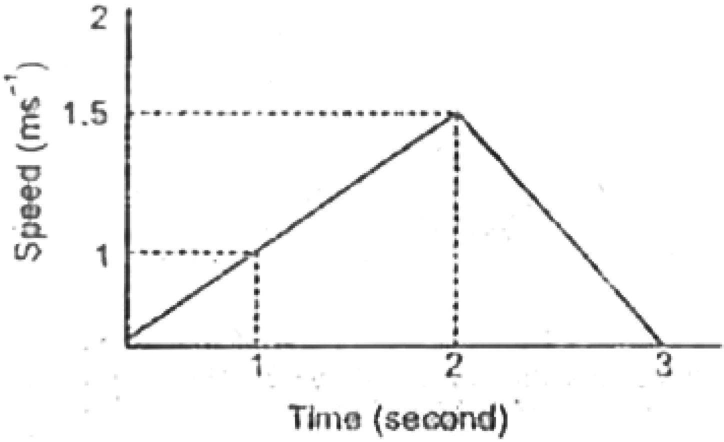
120. The speed - time graph of a particle moving along a solid curve is shown below. The distance traversed by the particle from t = 0 to t = 3 is



A. $\frac{9}{2}m$

B. $\frac{9}{4}m$

C. $\frac{9}{3}m$

D. $\frac{9}{5}m$

Answer:

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121. The driver of a train travelling at 115 km/hour sees on the same track 100 m in front of him a slow train travelling in same direction at 25 km/hr.

The least retardation that must be applied to the faster train to avoid a collision will be-

A. $25ms^{-2}$

B. $50ms^{-2}$

C. $75ms^{-2}$

D. $3.125ms^{-2}$

Answer:

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122. A police jeep is chasing with, velocity of $45km/h$ a thief in another jeep moving with velocity $153km/h$. Police fires a bullet with muzzle velocity of $180m/s$. The velocity it will strike the car of the thief is.

A. $27ms^{-1}$

B. $150ms^{-1}$

C. $250ms^{-1}$

D. $450ms^{-1}$

Answer:

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123. Tom and Dick are running forward with the same speed. They are following a rubber ball to each other at a constant speed v as seen by the thrower. According to Sam who is standing on the ground the speed of ball is

A. same as v

B. greater than v

C. less than v

D. none of these

Answer:

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124. A branch of mechanics which deals with the study of motion of objects taking into account the factors which cause moving is called ....

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125. Completion type Question : For studying its motion around the sun, the earth can be regarded as a .... object.

Watch Video Solution

126. Completion type Question : The motion of planets around the sun is a .... Dimensional motion.

Watch Video Solution

127. Completion type Question : The magnitude of displacement of an object can never be .... the actual distance travelled by the object in the given time interval.

Watch Video Solution

128. Completion type Question : Displacement of an object between two given positions is .... Of the actual path followed by the object in moving from one position to another.

Watch Video Solution

129. Completion type Question : A speeding car on a long straight highway is an example of .... dimensional motion.

Watch Video Solution

130. A body is said to be moving with unifrom speed if it covers equal distance in _______

Watch Video Solution

131. The ratio fo the total displacment of a body to the total time taken is _________

Watch Video Solution

132. Completion type Question : A body travels first half the total distance with velocity v_1 and second half with velocity v_2. Its average velocity is ....

Watch Video Solution

133. A body travels a distance s_1 with vleocity v_1 and distance s_2 with velocity v_2 in the with velocity v_2 . Calculate the average velocity.

Watch Video Solution

134. A body travels along a straight line with uniform accleration a_1 for time t_1 and with uniform acceleration a_2 for time t_2 . What is the average acceleration?

Watch Video Solution

135. Under what condition is the average velcity equal to instantneous velcity ?

Watch Video Solution

136. Completion type Question : The slope of position-time graph at any point gives .... While the slope of velocity-time graph gives ....

Watch Video Solution

137. If the displacement-time of a particle is parallel to (b) displacement axis (b) the time axis,

what will be the velcity of the particle ?

Watch Video Solution

138. If the displacement-time of a particle is parallel to (b) displacement axis (b) the time axis,

what will be the velcity of the particle ?

Watch Video Solution

139. Completion type Question : The displacement time graphs for two particles A and B are straight lines inclined at angles of 30° and 45° with the time axis. The ratio of their velocities $v_A : v_B$ = ...

Watch Video Solution

140. Completion type Question : The v-t graphs of two objects make angles of 30° and 60° with the time-axis. The ratio of their accelerations is ....

Watch Video Solution

141. Completion type Question : The area under the acceleration-time graph gives .... For the given time interval.

Watch Video Solution

142. Completion type Question : The position coordinate of a moving particle is given by $x = 6 + 18t + 9t^2$ (x is in metres and t in seconds) At t = 2s, the velocity of the particle will be ....

Watch Video Solution

143. The displacement x of a particle along a straight line at time t is given by $x = a_0 - a_1 t + a_2 t^2$. The acceleration of the particle is -

Watch Video Solution

144. Assertion : A body is dropped from height h and another body is thrown vertically upwards with a speed $\sqrt{gh}$. They meet at height $\frac{h}{2}$.

Reason : The time taken by both the blocks in reaching the height $\frac{h}{2}$ is same.

Watch Video Solution

145. When a ball is thrown up vertically with velocity v_0, it reaches a maximum height of h. If one wishes to triple the maximum height then the ball should be thrown with velocity

Watch Video Solution

146. A body is released from the top of a tower of height h. It takes t sec to reach the ground. Where will be the ball after time $\frac{t}{2}$ sec?

Watch Video Solution

147. Completion type Question : A body is thrown vertically up from the ground with a speed u and it reaches its maximum height h at time $t = t_0$. The height to which it would have risen at `t = (t_0)/2 is.........

Watch Video Solution

148. Completion type Question : A body is dropped from the top of a tower of height h and at the same time another body is projected from the foot of the tower, in the same vertical line, with a velocity which would be just sufficient to take it to the same height h. The two bodies will meet at a height ....

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149. Completion type Question : From a place, where $g = 9.8 ms^{-2}$, a stone is thrown upwards with a velocity of $4.9 ms^{-1}$. The time taken for the stone to return to ground is ....

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150. A food packet is released from a helicopter which is rising steadily at $2 ms^{-1}$, After two second (i) What is the velocity of the packet ? (ii)How far is it below the helicopter?

Take $g = 9.8 ms^{-2}$.

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151. Completion type Question : The position of a body with respect to time is given by $x = 2t^3 - 6t^2 + 92t + 6$. If x is in metres and t in seconds, then acceleration at t = 0 is

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152. Explain how can a body be simultaneously at rest and in motion?

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153. If the origin is shifted to the point (0,-2) by a translation of the axes, the coordinates of a point become (3, 2). Find the original coordinates of the point.

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154. Can a body have

a. Zero instantaneous velocity and yet be accelerating?

b. Zero average speed but non-zero average velocity?

c. Negative acceleration and yet be speeding up?

d. Magnitude of average velocity be equal to average speed ?

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155. Assertion: The average velocity of a particle is zero in a time interval. It is possible that the instantaneous acceleration is never zero in the interval.

Reason: The magnitude of average velocity in an interval is equal to its average speed in that interval.

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156. If the displacement of a particle is zero, then distance covered by it

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157. In Ques.8, the direction of acceleration is

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158. Does the acceleration produced in a freely falling body depend on the mass of the body ?

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159. Two balls of different masses are thrown vertically upwards with the same speed . They pass through the point of projection in their downward motion with the same speed (Neglect air resistance).

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160. In a case of a motion, displacement is directly proportional to the square of the time elapsed. What do you think about its acceleration i.e., constant or variable ? Explain why ?

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161. The displacement of a body is proporticonal to the cube of time elapsed. What is the nature of the acceleration of the body ?

Watch Video Solution

162. True/False type quesiton : The ratio of the distances covered by a body falling freely from rest in the first, second and third seconds of its fall is $1:3:5$.

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163. Assertion: A body,whatever its motion, is always at rest in a frame of reference which is fixed to the body itself.

Reason: The relative velocity of a body with respect to itself is zero.

Watch Video Solution

164. Explain that a particle can have zero average velcoity but not zero average speed.

Watch Video Solution

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

Reason: Acceleration is the rate of change of velocity.

Watch Video Solution

166. Matching type Question :

(a)	Average acceleration	(p)	$\frac{d^2x}{dt^2}$
(b)	Instantaneous acceleration	(q)	$\frac{dx}{dt}$
		(r)	$\frac{\Delta v}{\Delta t}$

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167. Matching type Question : For a body thrown vertically upwards with initial velocity u

(a)	Maximum height reached	(p)	$\frac{u}{g}$
(b)	Time of flight	(q)	$\frac{u^2}{2g}$
		(r)	$\frac{2u}{g}$

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168. Matching type Question :

(a)	Area under $v-t$ graph	(p)	Change in velocity
(b)	Area under $a-t$ graph	(q)	Change in acceleration
		(r)	Change in position

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169. Matching type Question :

(a)	s-t graph a line ∥ time-axis	(p)	Uniform velocity
(b)	v-t graph a line ∥ time-axis	(q)	Uniform acceleration
		(r)	Stationary object

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170. Matching type Question :

(a)	$s-t$ graph a line inclined to time-axis	(p)	Uniform acceleration
(b)	$v-t$ graph a line inclined to time-axis	(q)	Uniform velocity
		(r)	Variable velocity

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171. Matching type Question :

(a)	Displacement-time curve bends upwards	(p)	Zero acceleration
(b)	Displacement-time curve bends downwards	(q)	Accelerated motion
		(r)	Decelerated motion

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172. Matching type Question : A ball thrown up is caught by the thrower after 4s. Take $g = 9.8 ms^{-2}$.

(a)	Height of the ball after 2s	(p)	$9.8\ ms^{-1}$
(b)	Height of the ball after 3s	(q)	$19.6\ ms^{-1}$
(c)	Speed of the ball after 3s	(r)	19.6 m
(d)	Speed of the ball after 4s	(s)	14.7 m

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173. Are rest and motion absolute or relative terms ?

Watch Video Solution

174. Can an object be at rest as well as in motion at the same time ? Explain eith illustration.

Watch Video Solution

175. Assertion: A body,whatever its motion, is always at rest in a frame of reference which is fixed to the body itself.

Reason: The relative velocity of a body with respect to itself is zero.

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176. Mention the condition when on object in motion (a) can be considered point object (b) cab bot considered point object.

Watch Video Solution

177. Give an example of a physical phenomenon in which earth cannot be regarded as a point mass.

Watch Video Solution

178. Under what codition will the distance and displacement of a moving object have the same magnitude ?

Watch Video Solution

179. A bullet is fired from a gun falls at a distance half of its maximum range. The angle of projection of the bullet can be :

Watch Video Solution

180. A particle is moving along a circular track of radius r. What is the distance traversed by particle in half revolution ? What is its displacement ?

Watch Video Solution

181. Will the displacement of an object change on shifting the position of origin of the coordinate system ?

Watch Video Solution

182. What does the speedometer of a car measure average speed or instantaneous speed ?

Watch Video Solution

183. What is the numberical ratio of velocity to speed of an object ?

Watch Video Solution

184. A ball hits a wall with a velocity of $30ms^{-1}$ and rebounces with the same velocity. What is the change in its velocity ?

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185. Unit of time occurs twice in unit of acceleration. Why ?

Watch Video Solution

186. Statement-I : A positive acceleration can be associated with a 'slowing down' of the body.

Statement-II : The origin and the positive direction of an axis are a matter of choice.

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187. Give an example which shows that a negative acceleration can be associated with a speeding up object.

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188. Is the acceleration of a car greater when when the accelerator is pushed to the floor or when brake is pushed hard ?

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189. The v-t graphs of two objects make angles of 30° and 60° with the time-axis. Find the ratio of their accelerations.

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190. Is it possible that your cycle has a northward velocity but southward acceleration ? If yes, how ?

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191. If the instantaneous velocity of a particle is zero, will its instantaneous acceleration be necessarily zero

Watch Video Solution

192. A man standing on the edge of a cliff throws a stone straight up with initial speed (u) and then throws another stone straight down with same initial speed and from the same position. Find the ratio of the speeds. The stones would have attained when they hit ground at the base of the cliff.

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193. A body travels along a straight line with uniform accleration a_1 for time t_1 and with uniform acceleration a_2 for time t_2 . What is the average acceleration?

Watch Video Solution

194. What is the nature of the distance-time graphs for uniform and non-uniform motion of an object ?

Watch Video Solution

195. what does slope of prosition-time graph represeent for a unitorm motion?

Watch Video Solution

196. The slope of velocity-time graph for uniform motion of an object is

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197. If the displacement-time of a particle is parallel to (b) displacement axis (b) the time axis,

what will be the velcity of the particle ?

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198. If the displacement-time graph for a particle is parallel to time-axis, how much is the velocity of the particle ?

Watch Video Solution

199. How can the distance travelled is calculated from velcity-time graph in a unitor motion ?

Watch Video Solution

200. The area under acceleration-time graph gives

Watch Video Solution

201. What is the area under the velocity-time curve in the case of a body projected vertically upwards from the ground after reaching the ground ?

Watch Video Solution

202. Assertion : — A particle having zero acceleration must have constant speed.

Reason : — A Particle having constant speed must have zero acceleration.

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203. Derive the equations of motion given below: v=u+at

Watch Video Solution

204. A body projected up reached a point P of its path at the end of 4 seconds and the highest point at the end of 12 seconds. After how many seconds from the start will it reach P again ?

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205. When a body is subjected to a uniform acceleration, it always moves in a straight line.

Straight line motion is the natural tendency of the body.

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206. A uniform moving cricket ball is turned back by hitting it with a bat for a very short time interval. Show the variation of its acceleration with time. (Take acceleration in the back ward direction as positive).

Watch Video Solution

207. The position coordinate of a moving particle is given by $x = 6 + 18t + 9t^2$ (x in metres and t in seconds). What is its velocity at l = 2 sec.

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208. A player throws a ball upwards with an initial speed of $29.4ms^{-1}$. What are the velcity and acceleration of the hall at the highest point os its motion ?

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209. Under what codition will the distance and displacement of a moving object have the same magnitude ?

Watch Video Solution

210. Under what conditions (s) is the magnitude of average velocity of an object equal to its average speed ?

Watch Video Solution

211. What does the slope of velocity-time graph represent ?

Watch Video Solution

212. The area under velocity-time graph for a particle in a given interval of time represnets

Watch Video Solution

213. The area under acceleration-time graph gives

Watch Video Solution

214. The displacement-time graph for two particles A and B are straight lines inclined at angles of 30° and 60° with the time axis. The ratio of velocities of $V_A : V_B$ is

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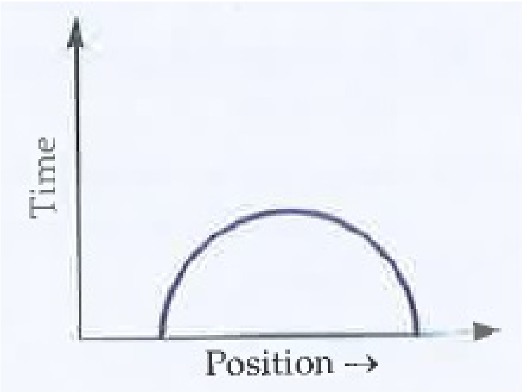
215. Is the time variationof position, shown in the adjacent figure, observed in nature ?



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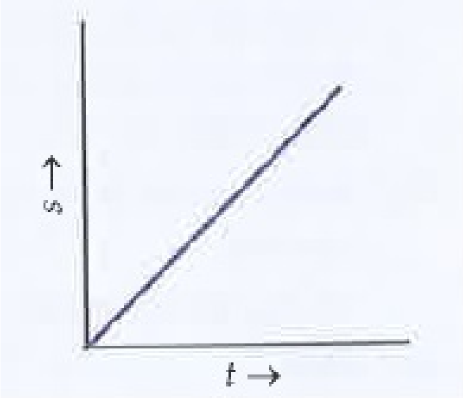
216. Displacement-time graph of any object is shown in the adjacent figure. Draw velocity-time graph for this motion.



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217. Acceleration is defined as the rate of change of velocity. Suppose we call the rate of change of acceleration as $SLAP$? (i) What is the unit of $SLAP$.

(ii) How can we calculate instantaneous SLAP ?

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218. What are the characteristics of uniform motion ?

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219. Use graphical method to derive the relation $v^2 - u^2 = 2as$, where the symbols have their usual meanings.

Watch Video Solution

220. Prove that $x = x_0 + v_0 t + \frac{1}{2}at^2$.

Watch Video Solution

221. Show that the slope of displacement-time graph is equal to the velcoity of uniform motion.

Watch Video Solution

222. Draw velocity-time graphof uniform motion and prove that the area under the velocity-time graph of a particle gives the displacement of the particle in a given time.

Watch Video Solution

223. Using graphical method, derive the equations

$v = u + at$ and $s = ut + \frac{1}{2}at^2$

where symbols have their usual meanings.

Watch Video Solution

224. Use velocity time graph to derive the relation : $v^2 - u^2 = 2$ as, where the symbols have their usual meaning.

Watch Video Solution

225. Distinguish between average velocity and instanteneous velocity. If the velocity does not change from instant in to instant, will the average velocities be different for the different intervals?

Watch Video Solution

226. Explain with example the distinction between the magnitude of average velocity and average speed over the same period. Show that and the average speed is either greater than or equal to the average velocity. When is the equality sign true?

Watch Video Solution

227. Derive the equations of motion given below: v=u+at

Watch Video Solution

228. Using graphical method, derive the equations

$v = u + at$ and $s = ut + \frac{1}{2}at^2$

where symbols have their usual meanings.

Watch Video Solution

229. Check the dimensional consistency of the following equations :

(i) $v = u + at$ (ii) $s = ut + \frac{1}{2}at^2$

(iii) $v^2 - u^2 = 2as$

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230. Prove the following relations by calculus method: $v^2 - u^2 = 2as$

Watch Video Solution

231. Use integeration technique to prove that the distance travelled in nth second: $s_n th = u + \frac{a}{2}(2n - 1)$

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232. Show that area under the velocity-time graph of an object moving with constant acceleration in a straight line in certain time interval is equal to the distance covered by the object in the interval.

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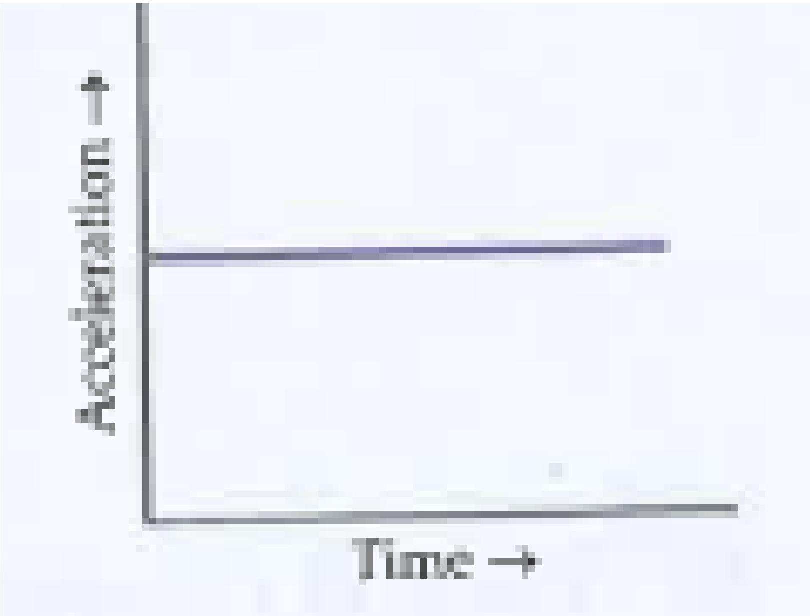
233. Derive the three kinematic equations for uniformly accelerated motion graphically.

Watch Video Solution

234. Acceleration-time graph of a moving object is shown in figure. Draw the velocity- time graph and displacement-time graph corresponding to this type of motion.



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235. Draw a graph showing the difference between distance and displacement.

Watch Video Solution

236. Draw the following graphs (expected nature only) between distance and time of an object in case of:For a body moving with uniform velocity.

Watch Video Solution

237. Draw the following graphs (expected nature only) between distance and time of an object in case of:For a body moving with constant acceleration.

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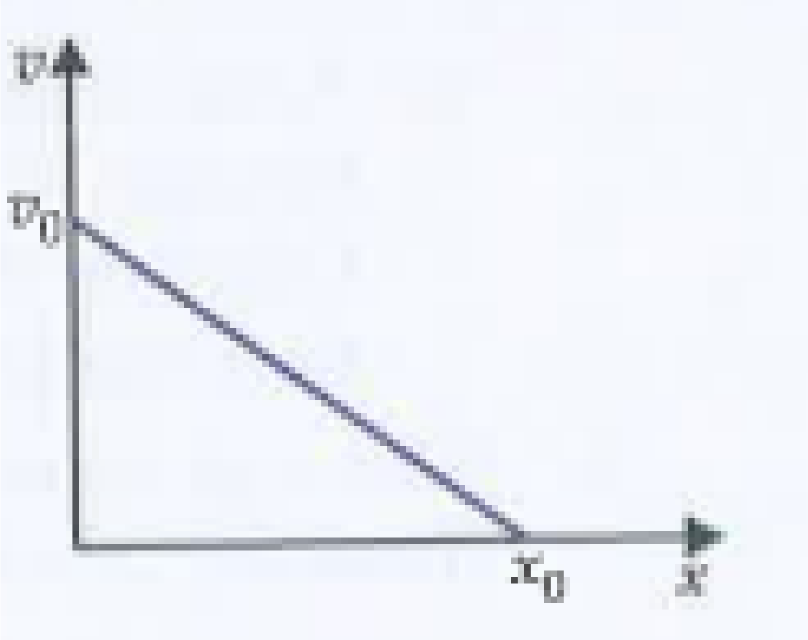
238. The velocity-displacement graph of a particle is shown in the figure. Write the relation/equation between v and x.



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239. A system is shown in the figure. The time period for small oscillations of the two bolcks will be :-

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240. Discuss the motion of an object under free fall and draw (a) acceleration-time , (b) velocity-time and (c) position-time graph for this motion .

Watch Video Solution

241. Discuss the motion of an object under free fall and draw (a) acceleration-time , (b) velocity-time and (c) position-time graph for this motion .

Watch Video Solution

242. Discuss the motion of an object under free fall and draw (a) acceleration-time , (b) velocity-time and (c) position-time graph for this motion .

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243. Assertion: Area under velocity-time graph give displacement.

Reason: Area under acceleration-time graph give velocity.

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244. Using velocity time graph, establish the relation $s = ut + \frac{1}{2}at^2$, where the symbols have their usual meanings.

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245. A car moving aling a straight highway with speed of $126 kmh^{-1}$ is brought to a stop within a distance of $200m$. What is the retardation of the car (assumed uniform) ans how doest it take fro the car to stop ?

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246. Derive an equation for the distance covered by a uniformly accelerated body in nth second of its motion. A body travels half its total path in the last second of its fall from rest, calculate the time of its fall.

Watch Video Solution

247. Draw velocity – time graph of uniformly accelerated motion in one dimension. From the velocity – time graph of uniform accelerated motion, deduce the equations of motion in distance and time.

Watch Video Solution

248. Draw velocity – time graph of uniformly accelerated motion in one dimension. From the velocity – time graph of uniform accelerated motion, deduce the equations of motion in distance and time.

Watch Video Solution

249. Deduce the equations of unifromly accelerated motion in one dimension by following calculus method.

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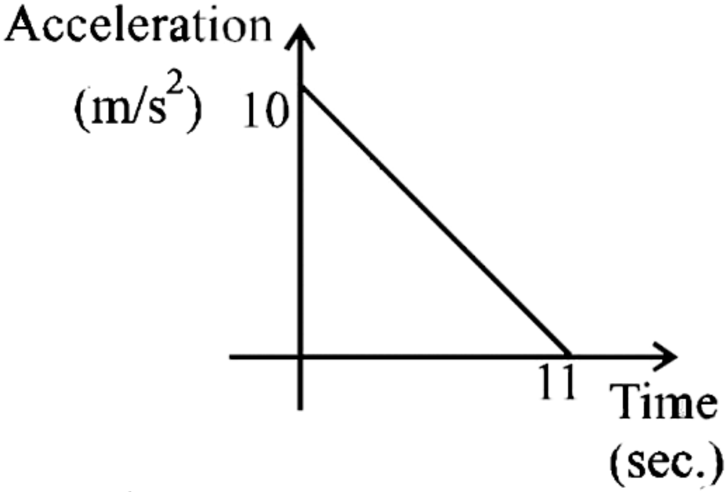
250. Define relative velocity of an object w.r.t. another. Draw position-time graph of two objects moving along a straight line, when their relative velocity is (i) zero and (ii) non-zero.

Watch Video Solution

251. Define relative velocity of an object w.r.t. another. Draw position-time graph of two objects moving along a straight line, when their relative velocity is (i) zero and (ii) non-zero.

Watch Video Solution

252. A body starts from rest at time $t = 0$, the acceleration time graph is shown in the figure . The maximum velocity attained by the body will be



A. $110m/s$

B. $55m/s$

C. $650m/s$

D. $550m/s$

Answer:

Watch Video Solution

253. A small block slides without friction down an iclined plane starting form rest. Let S_n be the distance traveled from time $t = n - 1$ to $t = n$.

Then $\frac{S_n}{S_{n+1}}$ is:

A. $\frac{2n-1}{2n}$

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

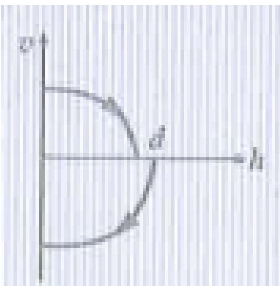
C. $\frac{2n-1}{2n+1}$

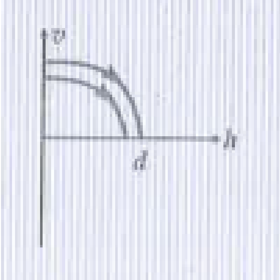
D. $\frac{2n}{2n+1}$

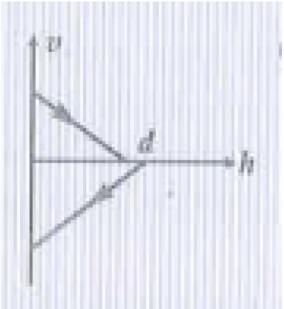
Answer:

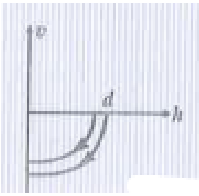
Watch Video Solution

254. v34

A. 

B. 

C. 

D. 

Answer:

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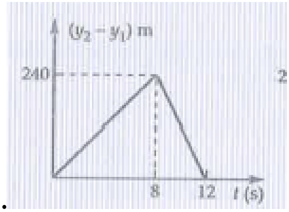
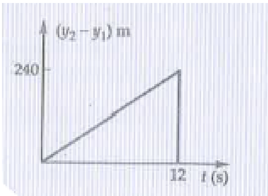
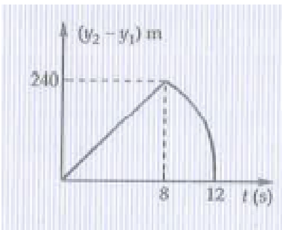
255. Two stones are thrown up simultaneously from the edge of a cliff $240m$ high with initial speed of $10m/s$ and $40m/s$ respectively . Which of the following graph best represents the time variation of relative position of the speed stone with respect to the first ?

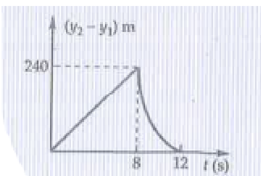
(Assume stones do not rebound after hitting the groumd and neglect air resistance , take $g = 10m / s^2$)

(The figure are schematic and not drawn to scale)

A. $v2 - yi.$ 

B. $y2 - y1.$ 

C. $y2 - y.$ 

D. $yj - yi$ 

Answer:

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256. Consider an expanding sphere of instantaneous radius ? whose total mass remains constant. The expansion is such that the instantaneous density ρ remains uniform throughout the volume. The rate of fractional change in density $\left(\frac{dp}{\rho dt}\right)$ is constant. The velocity v of any point on the surface of the expanding sphere is proportional to

A. $R3$.

B. R

C. $R^{2/3}$.

D. $1/R$.

Answer:

Watch Video Solution

257. A particle is moving eastwards with a velocity of $5m/s$. In $10s$ the velocity changes to $5m/s$ nothwards. The average acceleration in this time is

A. Zero

B. $\frac{1}{\sqrt{2}}m/s^2$.towards north-west

C. $\frac{1}{\sqrt{2}}m/s^0$.toward north-east

D. $\frac{1}{2}m/s^0$.toward north-west

Answer:

Watch Video Solution

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

B. $|\alpha|$.cannot exceed 2 at any point in its path

C. $|\alpha|$.must be ≥ 4 at some point or points in its path.

D. α must change sign during the motion, but no other assertion can be made with the information given.

Answer:

Watch Video Solution

259. STATEMENT -1 : For an observer looking out through the window of a fast moving train , the nearby objects appear to move in the opposite direction to the train , while the distant objects appear to be stationary .

STATEMENT - 2 : If the observer and the object are moving at velocities $\vec{v}_1$ and $\vec{v}_2$ respecttively with refrence to a laboratory frame , the velocity of the object with respect to a laboratory frame , the velocity of the object with respect to the observer is $\vec{v}_2 - \vec{v}(1)$.

(a) Statement -1 is True, statement -2 is true , statement -2 is a correct explanation for statement -1

(b) Statement 1 is True , Statement -2 is True , statement -2 is NOT a correct explanation for statement -1

(c) Statement - 1 is True , Statement -2 is False

(d) Statement -1 is False, Statement -2 is True

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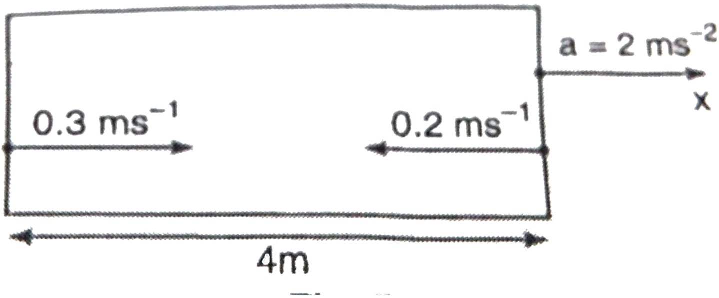
260. A rocket is moving in a gravity free space with a constnat acceleration of $2ms^{-1}$ along +x direction (see Fig.5.126). The length of a chamber inside the rocket is 4m. A ball is thrown from th left end of the chamber in +x direction with a speed of 0.3 ms^{-1} relaitve to the rocket. At the same time , another ball is thrown in -x direction with a speed of 0.2ms^(-1)` from its right and relative to the rocket. the time in seconds when the two balls hit each other is:



A. Statement 1 is true , Statement 2 is true ,Statement 2 is a correct explanation fo,Statement 1

B. Statement 1 is true , Statement 2 is true , atement 2 is not a correct explanation for Statement 1.

C. Statement l is true , Statement 2 is false

D. Statement 1 is false , Statement 2 is trite

Answer:

Watch Video Solution

261. A bullet fired into a fixed target loses half of its velocity after penetrating 3 cm . How much further it will penetrate before coming to rest assuming that it faces constant resistance to motion?

A. 1.5cm

B. 1.0cm

C. 3.0cm

D. 2.0cm

Answer:

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262. A car, moving with a speed of $50km/hr$, can be stopped by brakes after at least $6m$. If the same car is moving at a speed of $100km/hr$, the minimum stopping distance is

A. 12m

B. 18m

C. 24m

D. 6m

Answer:

Watch Video Solution

263. An automobile travelling with a speed $60 km/h$, can brake to stop within a distance of $20m$. If the car is going twice as fast i. e. , $120 km/h$, the stopping distance will be

A. 20m

B. 40m

C. 60m

D. 80m

Answer:

Watch Video Solution

264. Speeds of two identical cars are u and 4u at at specific instant. The ratio of the respective distances in which the two cars are stopped from that instant is

A. $1:1$.

B. $1:4$.

C. $1:8$.

D. $1:16$.

Answer:

Watch Video Solution

265. If a body looses half of its velocity on penetrating 3 cm in a wooden block, then how much will it penetrate more before coming to rest?

A. 1cm

B. 2cm

C. 3cm

D. 4cm

Answer:

Watch Video Solution

266. 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 f/ 2 to come to rest. If the total distance travelled is 15 s, then

A. $s = ft.$

B. $s = \frac{1}{6}ft^2.$

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

D. $s = \frac{1}{4}ft^2.$

Answer:

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267. The relation between time t and distance x is $t = ax^2 + bx$ where a and b` are constants. The acceleration is

A. $-2abv^2$.

B. $-2bv^3$.

C. $-2av^3$.

D. $-2av^2$.

Answer:

Watch Video Solution

268. A particle located at x = 0 at time t = 0, starts moving along the positive x-direction with a velocity that varies as $v = p\sqrt{x}$. The displacement of the particle varies with time as (where, p is constant)

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

B. t^3.

C. t^2.

D. t

Answer:

Watch Video Solution

269. The velocity of particle is $v = v_0 + \text{gt} + ft^2$. If its position is $x = 0$ at $t = 0$ then its displacement after unit time $(t = 1)$ is

A. $-v_o + \frac{8}{2} + f$.

B. $v_0 + 2g + 3f$

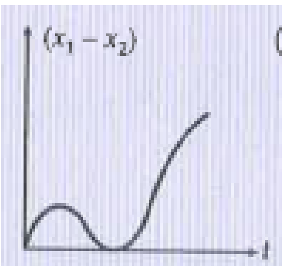
C. $v_0 + \frac{g}{2} + \frac{f}{3}$

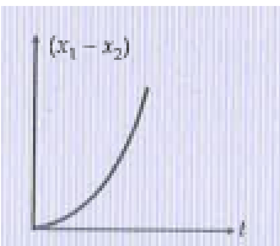
D. $v_0 + g + f$

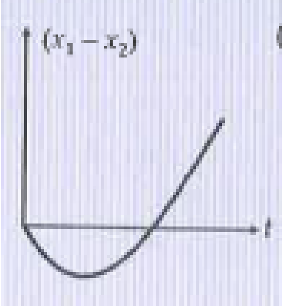
Answer:

Watch Video Solution

270. 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. 

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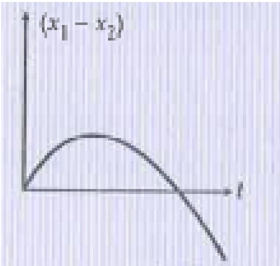
D. 

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Answer:

Watch Video Solution

271. From a building two balls A and B are thrown such that A is thrown upwards and B downwards (both vertically with the same speed). If v_A and v_B are their respective velocities on reaching the ground , then

A. $v_B > v_A$.

B. $v_A = v_B$.

C. $v_A > v_B$.

D. their velocities depend on their masses

Answer:

Watch Video Solution

272. A ball is released from the top of a tower of height h metre. It takes T second to reach the ground. What is the position of the ball in $\frac{T}{3}$ second?

A. $h/9$.metres from the ground

B. $7h/9$. metres from the ground

C. $8h/9$ metres from the ground

D. $17h/18$. metres from the ground

Answer:

Watch Video Solution

273. A parachutist after bailing out falls 50m without friction. When parachute opens, it decelerates at $2m/s^2$. He reaches the ground with a speed of $3m/s$. At what height, did the bail out?

A. 293m

B. 111m

C. 91m

D. 182m

Answer:

Watch Video Solution

274. An object , moving with a speed of $6.25m/s$, is decelerated at a rate given by :

$\frac{dv}{dt} = -2.5\sqrt{v}$ where v is the instantaneous speed . The time taken by the object , to come to rest , would be :

A. 4Y

B. 2s

C. 4s

D. 8s

Answer:

Watch Video Solution

275. From a tower of height H, a particle is thrown vertically upwards with a speed u. The time taken by the particle, to hit the ground, is n times that taken by it to reach the highest point of its path. The relation between H, u and n is

A. $2gH = n^2u^r$

B. $gH = (n - 2)^2u^2$

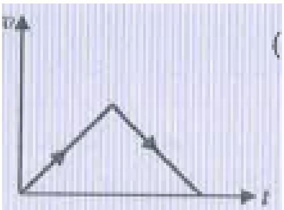
C. $2gH = \nu^2(n - 2)$.

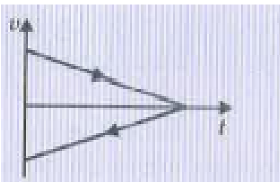
D. gH =(n -2)u^2.

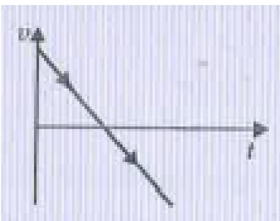
Answer:

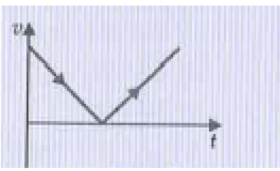
Watch Video Solution

276. A body is thrown vertically upwards. Which one of the following graphs correctly represent the velocity vs time?

A. .

B. .

C. .

D. .

Answer:

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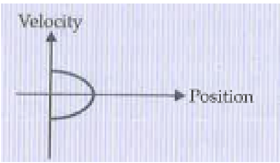
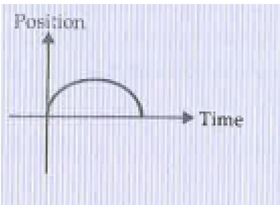
277. All the graphs below are intended to represent the same motion. One of them does it incorrectly. Pick it up.

A. 

.

B. .

C. 

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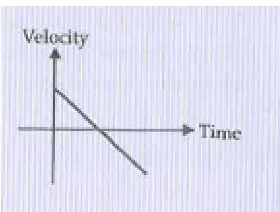
D. 

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Answer:

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278. The displacement of a body is proporticonal to the cube of time elapsed. What is the nature of the acceleration of the body ?

A. increasing with time

B. decreasing with time

C. constant but not zero

D. Zero

Answer:

Watch Video Solution

279. The velocity of a bullet is reduced from $200m/s$ to $100m/s$ while travelling through a wooden block of thickness $10cm$. The retardation, assuming it to be uniform, will be.

A. $10 \times 10^4 ms^{-2}$.

B. $12 \times 10^4 ms^{-2}$.

C. $13.5 \times 10^4 ms^{-2}$.

D. $15 \times 10^4 ms2$.

Answer:

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280. A particles starts from rest and has an acceleration of $2m/s^2$ for 10 sec. After that , it travels for 30 sec with constant speed and then undergoes a retardation of $4m/s^2$ and comes back to rest. The total distance covered by the particle is

A. 650m

B. 700m

C. 750m

D. 800m

Answer:

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281. A body A starts from rest with an acceleration a_1. After 2 seconds, another body B starts from rest with an acceleration a_2. If they travel equal distances in the $5th$ second, after the start of A, then the ratio $a_1 : a_2$ is equal to :

A. $5 : 9$.

B. $5 : 7$.

C. $9 : 5$.

D. $9 : 7$.

Answer:

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282. A body starts from rest and moves with constant acceleration. The ratio of distance covered by the body in nth second to that covered in n second is.

A. $\frac{2}{n} - \frac{2}{n^2}$.

B. $\frac{1}{n^2} - \frac{1}{n}$.

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

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

Answer:

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283. The displacement of a particle moving along x-axis is given by :

$x = a + bt + ct^2$

The acceleration of the particle is.

A. b_0

B. b_1

C. b_2

D. $2b_2$.

Answer:

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284. The velocity with which a body stricks the ground is always equal to the velocity with which it was projected upwards.' is the statement true ? On what principle is ist based ?

A. v =0

B. v =2u

C. v =0.5u

D. v = u

Answer:

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285. 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. $1/m_1 : 1/m_2 : 1/m_3$.

D. $1:1:1$

Answer:

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286. When a ball is thrown up vertically with velocity v_0, it reaches a maximum height of h. If one wishes to triple the maximum height then the ball should be thrown with velocity

A. $\sqrt{3}v_0$

B. $3v_0$

C. $9v_0$

D. $3v_0 / 2$

Answer:

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287. A ball is droped from a high rise platform $t = 0$ starting from rest. After $6s$ another ball is thrown downwards from the same platform with a speed v. The two balls meet at $t = 18s$. What is the value of v ?

A. $74m / s$.

B. $64m / s$.

C. $84m / s$.

D. $94m / s$.

Answer:

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288. The ball is dropped from a bridge $122.5m$ above a river, After the ball has been falling for 2 s, a second ball is thrown straight down after it. What must its initial velocity be so that both hit the water at the same time ?

A. $40m/s.$

B. $55.5m/s.$

C. $26.1m/s.$

D. $9.6m/s.$

Answer:

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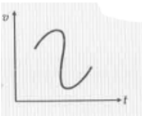
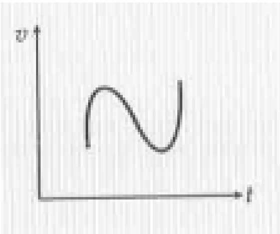
289. Which of the following velocity-time graphs shows a realistic situation for a body in motion ?

A.  .

B. 

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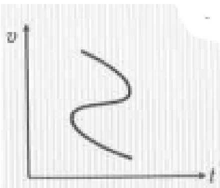
C. 

.

D. .

Answer:

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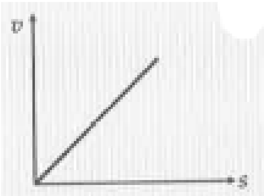
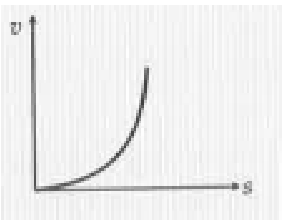
290. A body starting from rest moves along a straight line with a constant acceleration. The variation of speed (v) with distance (s) is represented by the graph:

A. 

.

B. .

C. .

D. 

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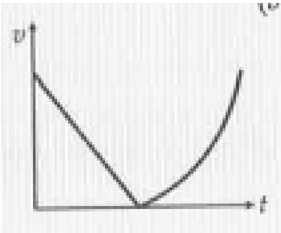
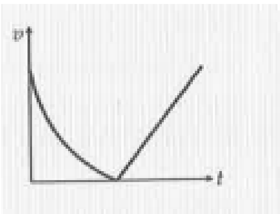
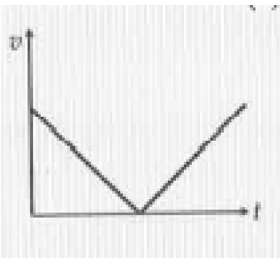
Answer:

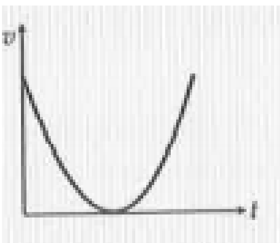
Watch Video Solution

291. A ball is thrown vertically upwards. Which of the following plots represents the speed-time graph of the ball during its height if the air resistance is ignored ?

A. .

B. .

C. .

D. .

Answer:

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292. A man is at a distance of 6 m from a bus. The bus begins to move with a constant acceleration of $3ms^{-2}$. In order to catch the bus, the minimum speed with which the man should run towards the bus is

A. $2ms^{-1}$.

B. $4ms^{1}$.

C. $6ms^{-1}$.

D. 8ms^-1`.

Answer:

Watch Video Solution

293. A body starts from rest and travels a distance S with uniform acceleration, then moves uniformly a distance $2S$ uniformly , and finally comes to rest after moving further $5S$ under uniform retardation. The ratio of the average velocity to maximum velocity is.

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

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

C. $\frac{4}{7}$

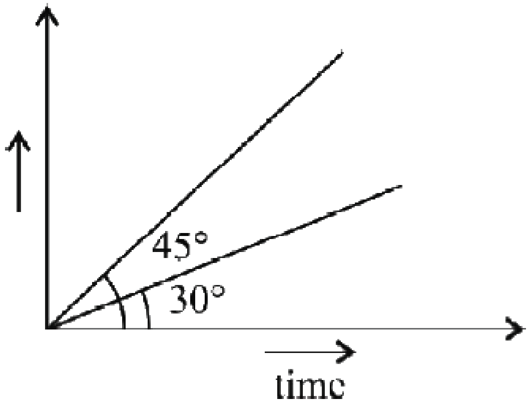
D. $\frac{5}{7}$

Answer:

Watch Video Solution

294. The displacemenet time graph of two moving particles make agnes of 30° and 45° with the x-axis. The ratio of the two velocities

V_A and V_B is



A. $\sqrt{3}:2$

B. $1:1$.

C. $1:2$.

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

Answer:

Watch Video Solution

295. A ball is dropped from the top of a building 100 m high. At the same instant another ball is thrown upwards with a velocity of $40ms^{-1}$ from the bottom of the building. The two balls will meet after.

A. 3s

B. 2s

C. 2.5s

D. 5s

Answer:

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296. A projectile of mass m is thrown vertically up with an initial velocity v from the surface of earth (mass of earth = M). If it comes to rest at a height h, the change in its potential energy is

A. 1.3

B. 1.2

C. 1.1

D. 1

Answer:

Watch Video Solution

297. A rocket is fired vertically up from the ground with a resultant vertical acceleration of $10m/s^2$. The fuel is finished in 1 min and it continues to move up. (a) What is the maximum height reached? (b) Afte2r how much time from then will the maximum height be reached? (Take $g = 10m/s^2$)

A. 42.3km

B. 48.4km

C. 36.4km

D. 25.6km

Answer:

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298. A car covers the first half of the distance between two places at a speed of $40kmh^{-1}$ and second half at $60kmh^{-1}$ Calculate the average speed of the car.

A. $40km/h$

B. $48km/h$

C. $50km/h$

D. $60km/h$

Answer:

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299. A car moves a distance of $200m$. It covers the first-half of the distance at speed $40km/h$ and the second-half of distance at speed vkm/h. The average speed is $48km/h$. Find the value of v.

A. $56km/h$

B. $60km/h$

C. $50km/h$

D. $48km/h$

Answer:

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300. A bus travelled the first one-third distance at a speed of $10km/h$, the next one-third at $20km/h$ and the last one-third at $60km/h$. The average speed of the bus is

A. 9km/h

B. 16km/h

C. 18km/h

D. 48km/h

Answer:

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301. A car moves from X to Y with a uniform speed v_u and returns to Y with a uniform speed v_d. The average speed for this round trip is :

A. $\sqrt{v_u v_d}$.

B. $\dfrac{v_d v_u}{v_d + v_u}$

C. $\dfrac{v_u + v_d}{2}$.

D. $\dfrac{2 v_d v_u}{v_d + v_u}$.

Answer:

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302. A particle covers half of its total distance with speed v_1 and the rest half distance with speed v_2. Its average speed during the complete journey is.

A. $\dfrac{v_1^2 v_2^2}{v_1^2 + v_2^2}$

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

C. $(v_1 v_2)(v_1 + v_2)$

D. $(2v_1 v_2)(v_1 + v_2)$

Answer:

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303. A car moves along a straight line whose equation of motion is given by

$s = 12t + 3t^2 - 2t^3$

where s is in metres and t is in seconds. The velocity of the car at start will be :-

A. $7ms^{-1}$.

B. $9ms^{-1}$

C. $12ms^{-1}$.

D. $16ms^{-1}$.

Answer:

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304. A particle moves along a straight line AB. At a time t (in seconds) the distance x (in metres) of the particle from O is given by x = 600 + 12t – t^3. How long would the particle travel before coming to rest: -

A. 16m

B. 24m

C. 40m

D. 56m

Answer:

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305. The position x of a particle varies with time t as $x = at^2 - bt^3$. The acceleration at time t of the particle will be equal to zero, where (t) is equal to .`

A. $\frac{a}{3b}$.

B. Zero

C. $\frac{7a}{3b}$.

D. $\frac{a}{b}$.

Answer:

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306. Motion of particle is given by equation

$s = (3t^3 + 7t^2 + 14t + 8)m$

The value of acceleration of the particle at t = 1 s is

A. $10m/s^2$

B. $32m/s^2$

C. `23m//s^2

D. $16m/s^2$

Answer:

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307. A particle moves along a staight line such that its displacement at any time t is given by $s=t^3-6t^2+3t+4m$. Find the velocity when the acceleration is 0.

A. $3m/s$

B. $42m/s$

C. $-9m/s.$

D. $-15m/s.$

Answer:

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308. The motion of a particle along a straight line is described by equation : $x = 8 + 12t - t^3$ where x is in metre and t in second. The retardation of the particle when its velocity becomes zero is.

A. $24ms^{-2}$.

B. Zero

C. $6ms^2$.

D. $12ms^2$.

Answer:

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

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

B. $(dis\tan ce)^2$.

C. $(dis\tan ce)^{-2}$.

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

Answer:

Watch Video Solution

310. A particle of unit mass undergoes one-dimensional motion such that its velocity varies according to

$v(x) = \beta x^{-2n}$

where β and n are constant and x is the position of the particle. The acceleration of the particle as a function of x is given by.

A. $2n\beta^2 x^{-4n-1}$

B. $-2\beta^2 x^{-2n+1}$

C. $2n\beta^2 x^{-4n+1}$

D. $-2n\beta^2 x^{-2n-1}$

Answer:

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311. 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. be independent of p

B. drop to zero when a = p

C. go on decreasing with time

D. go on increasing with time

Answer:

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312. The position x of a particle with respect to time t along x-axis is given by $x = 9t^2 - t^3$ where x is in metres and t is in seconds. What will be the position of this pariticle when it achieves maximum speed along the + x direction ?

A. 54m

B. 81m

C. 24m

D. 32m

Answer:

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313. 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. $V_0/2$

B. v_0

C. $\dfrac{v_0}{\sqrt{2}v_0^2kt+1}$

D. $v_0c^{-k}t$

Answer:

Watch Video Solution

314. A particle moving along x-axis has acceleration f, at time t, given by $f=f_0\left(1-\dfrac{t}{T}\right)$, 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. $\dfrac{1}{2}f_0T^2$

B. f_0T^2.

C. $\dfrac{1}{2}f_0T$

D. f_0T

Answer:

Watch Video Solution

315. 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. $v_0 t + \frac{1}{3} b t^2$

B. $v_0 t + \frac{1}{2} b t^2$

C. $v_0 t + \frac{1}{6} b t^3$

D. $v_0 t + \frac{1}{3} b t^3$

Answer:

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316. If a car at rest, accelerates uniformly to a speed of $144km/h$ in $20s$, it covers a distance of

A. 1440cm

B. 2980cm

C. 20m

D. 400m

Answer:

Watch Video Solution

317. The velocity of train increases uniformly from 20 km/h to 60 km/h in 4 hour. The distance travelled by the train during this period is

A. 160km

B. 180km

C. 100km

D. 120km

Answer:

Watch Video Solution

318. A car moving with a speed of $40 km / h$ can be stopped by applying the brakes after at least 2 m. If the same car is moving with a speed of $80 km / h$, what is the minimum stopping distance?

A. 4m

B. 6m

C. 8m

D. 2m

Answer:

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319. A car is moving along a straight road with a uniform acceleration. It passes through two points P and Q separated by a distance with velocity $30km/h$ and $40km/h$ respectively. The velocity of the car midway between P and Q is

A. 33.3km/h

B. $20\sqrt{2}km/h$

C. $25\sqrt{2}km/h$

D. $35km/h$

Answer:

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320. A car accelerates from rest at a constant rate for some time after which it decelerates at a constant rate β to come to rest. If the total time elapsed is t, the maximum velocity acquired by the car is given by :

A. $\dfrac{\alpha^2 - \beta^2 t}{\alpha\beta}$

B. $\dfrac{\alpha^2\beta^2 t}{\alpha\beta}$

C. $\dfrac{\alpha+\beta t}{\alpha\beta}$

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

Answer:

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

A. ut

B. $\dfrac{1}{2} >^2$.

C. $ut - \dfrac{1}{2} >^2$

D. $(u+gt)t.$

Answer:

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322. A particle starts its motion from rest under the action of a constant force. If the distance covered in first $10s$ is s_1 and the covered in the first $20s$ is s_2, then.

A. $S_2 = S_1$

B. $S_2 = 2S_1$

C. $S_2 = 3S_1$

D. $S_2 = 4S_1$

Answer:

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323. 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. $7:9$.

C. $16:25$.

D. $1:1$.

Answer:

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324. Two bodies A (of mass $1kg$) and B (of mass $3kg$) are dropped from heights of $16m$ and $25m$. Respectively. The ratio of the time taken to reach the ground is :

A. $4/5$.

B. $5/4$.

C. $12/5$.

D. $5/12$.

Answer:

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325. 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. $h_1 = 2h_2 = 3h_3$

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

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

D. $h_1 = h_2 = h_3$

Answer:

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326. A ball is throw vertically upward. It has a speed of $10m/s$ when it has reached on half of its maximum height. How high does the ball rise ? (Taking $g = 10m/s^2$).

A. 10m

B. 5m

C. 15m

D. 20m

Answer:

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327. A body dropped from top of a tower falls through $40m$ during the last two seconds of its fall. The height of tower in m is (g= 10 m//s^@)`

A. 60m

B. 45m

C. 80m

D. 50m

Answer:

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328. A body dropped from a height h with an initial speed zero, strikes the ground with a velocity $3k\frac{m}{h}$. Another body of same mass is dropped from the same height h with an initial speed $-u' = 4km/h$. Find the final velocity of second body with which it strikes the ground

A. $5km/s$

B. $12km/s$

C. $3km/s$

D. $4km/s$

Answer:

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329. 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. 3.75m

B. 4.00m

C. 1.25m

D. 2.50m

Answer:

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

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

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

Answer:

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331. A boy standing at the top of a tower of 20m of height drops a stone. Assuming $g = 10ms^{-2}$, the velocity with which it hits the ground is :-

A. $10.0m/s$

B. $20.0m/s$

C. $40.0m/s$

D. $5.0m/s$

Answer:

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332. A ball is droped from a high rise platform $t = 0$ starting from rest. After $6s$ another ball is thrown downwards from the same platform with a speed v. The two balls meet at $t = 18s$. What is the value of v ?

A. $75m/s$

B. $55m/s$

C. $40m/s$

D. $60m/s$

Answer:

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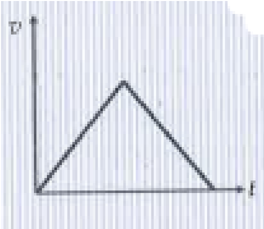
333. Which of the following curves does not represent motion in one dimensions?

A. 

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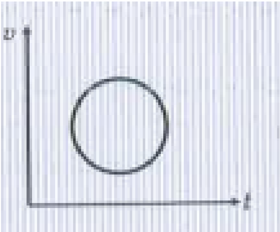
B. 

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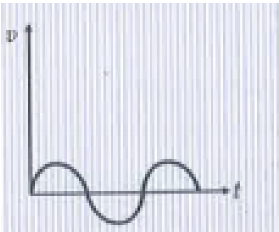
C. .

D. 

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Answer:

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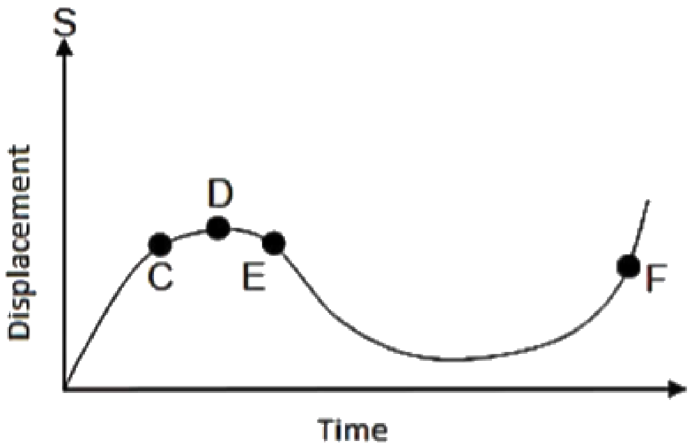
334. The displacement time graph of a moving particle is shown below



The instantaneous velocity of the particle is negative at the point

A. E

B. F

C. C

D. D

Answer:

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335. 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. 12sec

B. 8sec

C. 15sec

D. 10sec

Answer:

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336. A bus is moving with a speed of $10ms^{-1}$ on a straight road. A scooterist wishes to overtake the bus in 100 s. If the bus is at a distance of 1 km from the scooteritst with what speed should the scooterist chase the bus?

A. $10ms^{-1}$.

B. $20ms^{-1}$.

C. $40ms^{-1}$.

D. $25ms^{1}$.

Answer:

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337. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1. On other days, if the remains stationary on the moving escalator, then the escalator takes her up in time t_2. The time taken by her to walk up on the moving escalator will be :

A. $\dfrac{t_1 + t_2}{2}$.

B. $\dfrac{t_1 t_2}{t_2 - t_1}$.

C. $\dfrac{t_1 t_2}{t_2 + t_1}$.

D. $t_1 - t_2$.

Answer:

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338. A particle of mass 10 g moves along a circle of radius 64 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to $8 \times 10^{-4} J$ by the end of the second revolution after the beginning of the motion ?

A. $0.1 m / s^2$

B. $0.15 m / s^2$

C. $0.18 m / s^2$

D. $0.2 m / s^2$

Answer:

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339. If the velocity of a particle is $v = At + Bt^2$, where A and B are constant, then the distance travelled by it between $1s$ and $2s$ is :

A. $\frac{3}{2}A + 4B$

B. 3A+7B

C. $\frac{3}{2}A + \frac{7}{3}B.$

D. $\frac{A}{2} + \frac{B}{2}$

Answer:

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340. Two cars P and Q start from a point at the same time in a straight line and their position are represented by $x_p(t) = at + bt^2$ and $x_Q(t) = ft - t^2$. At what time do the cars have the same velocity ?

A. $\frac{a+f}{2(1+b)}.$

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

C. $\frac{a-f}{(1+b)}$.

D. $\frac{+f}{2(b-1)}$.

Answer:

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341. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field $\overrightarrow{E}$. Due to the force $q\overrightarrow{E}$, its velocity increases from 0 to $6m/s$ in one second duration. At that instant the direction of field is reversed.

The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively.

A. 2m/s,4m/s

B. 1.5m/s,3m/s

C. 1m/s,3.5m/s

D. 1m/s,3m/s

Answer:

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