PHYSICS

BOOKS - KUMAR PRAKASHAN KENDRA PHYSICS (GUJRATI ENGLISH)

MOTION IN A STRAIGHT LINE

Section A

1. Give some examples of motion.

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2. How can we determine whether the object is in rest or not?

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3. When an object is said to be a particle ?

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4. What is mechanics ? Give definitions of its sub branches.

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5. Why frame of reference is required ? Explain frame of reference.

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6. Explain path length.

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7. Define and explain displacement

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8. The magnitude of displacement may or may not be equal to the path length traversed by an object." Explain this statement with example.

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9. Explain with an example that the magnitude of displacement may be zero but the corresponding path length is not zero.

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10. Give difference between path length and displacement.

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11. For an object moving on a straight line, draw $x \rightarrow t$ graphs for :

(i) When it is rest.

(ii) When it is moving with constant velocity in positive direction.

(III) When it is moving with constant velocity in · negative direction.

(iv) When it performs non-uniform motion.

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12. Explain average velocity and average speed.

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13. Draw the $x \rightarrow t$ graphs which represent the positive, negative and zero velocity

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14. Which informations cannot be drawn from average velocity ?

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15. "The magnitude of average velocity is equal to average speed". This statement is not always correct and not always incorrect. Explain with example,

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16. Give difference between average speed and average velocity.

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17. Explain instantaneous velocity and discuss how it can be determined from $x \rightarrow t$ graph.

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18. Explain the acceleration.

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19. Discuss the observation of Galileo for the objects falling freely.

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20. In what different ways, velocity is changed ?

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21. Draw the $x \rightarrow t$ graphs for positive, negative and zero acceleration.

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22. Draw and explain the $v \rightarrow t$ graphs for uniformly accelerated motion.

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23. Draw $v \rightarrow t$ graph for constant velocity and explain it.

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24. Derive the equations of uniformaly accelerated motion by graphical method.

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25. A particle starting from initial velocity v_0 moves on straight line with constant acceleration equation of distance travelled during n^{th} second will be ..... .

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26. What is free fall ? Write equations of uniformly accelerated motion for object falling freely.

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27. Draw graphs $a \to t, v \to t$ and $x \to t$ for the object falling freely.

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28. What is stopping distance for vehicle ?

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29. What will be the stopping distance if the initial velocity is doubled ?

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30. On what factors, does the stopping distance depend ?

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31. What is reaction time ?

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32. On what does the reaction time depend ?

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33. Explain the relative velocity and its two cases.

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34. $3\hat{i}$ and $5\hat{j}$ are vector along x-axis and y-axis respectively. Find the resultant vector

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Section A Try Your Self Vsqs

1. How can we determine whether the object is in rest or not?

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2. When an object is said to be a particle ?

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3. When an object is said to be a particle ?

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4. What is kinematics?

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5. What is dynamics?

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6. What is mechanics ? Give definitions of its sub branches.

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7. Why frame of reference is required ? Explain frame of reference.

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8. When an object is said to be in motion ?

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9. Explain path length.

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10. Define and explain displacement

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11. If motion is not linear then path length = magnitude of displacement.

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12. Explain with an example that the magnitude of displacement may be zero but the corresponding path length is not zero.

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13. If decrease in velocity is same in equal interval of time, then draw x $\rightarrow$ t graph.

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14. Define speed.

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15. Give difference between average speed and average velocity.

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16. Give difference between average speed and average velocity.

Watch Video Solution

17. Give difference between average speed and average velocity.

Watch Video Solution

18. How can the resultant effect of motion can be known ?

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19. Write relation between speed and magnitude of velocity.

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20. Write relation between instantaneous and relative velocity for uniform motion.

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21. Which among average speed and average velocity can be positive, negative or zero ?

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22. Why instantaneous velocity is defined ?

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23. Write definition of instantaneous velocity

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24. How instantaneous velocity can be found by graphical method ?

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25. If average and instantaneous velocities are same, then what is the type of motion ?

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26. What does i represent?

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27. Define acceleration.

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28. Define average acceleration.

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29. Define instantaneous acceleration,

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30. What will be change in speed of moving object if both speed and acceleration are positive or negative?

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31. What will be change in speed of moving object if both speed and acceleration are positive or negative?

Watch Video Solution

32. What is retardation ?

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33. Discuss the observation of Galileo for the objects falling freely.

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34. In what different ways, velocity is changed ?

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35. Draw x $\rightarrow$ graph for negative acceleration.

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36. Draw x $\rightarrow$ graph for zero acceleration.

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37. Draw x $\rightarrow$ graph for zero acceleration.

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38. What does the area of v $\rightarrow$ graph of moving object represent?

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39. Will the acceleration increase or decrease with increase in velocity ?

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40. When acceleration and average acceleration are equal for moving object?

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41. Give initial velocity of object falling freely.

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42. Write equation of distance covered by object falling freely at n^{th} second. He has

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43. Write the equation of velocity of an object falling freely from height h.

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44. Draw graphs $a \to t, v \to t$ and $x \to t$ for the object falling freely.

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45. What is stopping distance for vehicle ?

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46. Stopping distance of vehicles : When brakes are applied to a moving vehicle, the distance it travels before stopping is called stopping distance. It is an important factor for road safety and depends on the initial velocity (v_0) and the braking capacity, or deceleration, $-a$ that is caused by the braking. Derive an expression for stopping distance of a vehicle in terms of v_0 and a.

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47. On what factors, does the stopping distance depend ?

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48. What is reaction time ?

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49. On what does the reaction time depend ?

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50. What would be the stopping distance if the velocity of vehicle becomes three times ?

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51. Are motion and position relative or not?

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52. If the velocities of object A and B are v_a and v(b) respectively, then write equation of relative velocity of A w.rt. B.

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Section B

1. A car is moving along a straight line, say OP in It move from O to P in 18 s and returns from P to Q in $6s$, where OP=360 m and OQ=240 m. What are the average velocity and average speed of the car in going (a) from O to P ? And (b) from O to P and back to Q ?

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2. A car moving in a straight line at a speed of 120 km covers in 2 hours. There after from that left side it covers 50 km in 1 hours. At that moment its average speed and aveerage velocity will ..... And .....

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3. The position of an object moving along x-axis is given by $x = a + bt^2$ where $a8.5m$, $b = 2.5ms^{-2}$ and t is and $t = 2.0s$. What is the average velocity between $t = 2.0s$ and $t = 4.0s$?

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4. The positon of an object moving along x-axis is given by $x(t) = \left(4.2t^2 + 2.6\right)m$, then find the velocity of particle at $t = 0s$ and $t = 3s$, then find the average velocity of particle at t =0 s $\rightarrow$ t =3s.

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5. Obtain equations of motion for constant acceleration using method of calculus.

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6. 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 25.0 m from the ground. (a) How high will the ball rise ? and (b) how long will it be before the ball hits the ground ? Take $g = 10ms^{-2}$.

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7. Discuss the motion of an object under free fall. Neglect air resistance.

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8. The distance traversed, during equal intervals of time, of a body falling from rest, stand to one another in the same ratio as the odd numbers beginning with unity[namely,$1:3:5:7....$]. Prove it.

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9. Stopping distance of vehicles : When brakes are applied to a moving vehicle, the distance it travels before stopping is called stopping distance. It is an important factor for road safety and depends on the initial velocity (v_0) and the braking capacity, or deceleration, $-a$ that is caused by the braking. Derive an expression for stopping distance of a vehicle in terms of v_0 and a.

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10. What will be distance covered byu vehicle after applying breakes with retardation $8m/s^2$ if its velocity is 72 km/h ?

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11. What will be distance covered by vehicle after applying brakes with retardation $2m/s^2$ if its velocity is $1.8km/h$?

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12. When a situation demands our immediate action, it takes some time before we really respond. Reaction time is the time a person takes to observe, think and act. For example, if a person is driving and suddenly a boy appears on the road, then the time elapsed before he slams the brakes of the car is the reaction time. Reaction time depends on complexity of the situation and on an individual. You can measure your reaction time by a simple experiment. Take a ruler and ask your friend to drop it vertically through the gap between your thumb and forefinger . After you catch it, find the distance d travelled by the ruler. In a particular case, d was found to be 21.0 cm. Estimate reaction time.

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

(a) velocity of B with respect to A ?,

(b) velocity of ground with respect to B ?, and

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

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15. Two parallel rail tracks are in north-south direction. Train A moves towards north with a speed of 72 kmh^{-1} and train B moves towards south with a speed of 108 kmh^{-1} What is the (a) velocity of B with respect to A ?, (b) velocity of ground with respect to B ? and (c) velocity of a monkey running on the roof of the train A against its motion (with a velocity of 27 kmh^{-1} with respect to the train A) as observed by a man standing on the ground?

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16. In which of the following examples of motion, can the body be considered approximately a point object :

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

(b) a monkey sitting on top of a man cycling smoothly on a circular track.

(c) a spinning cricket ball that turns sharply on hitting the ground.

(d) a tumbling beaker that has slipped off the edge of a table.

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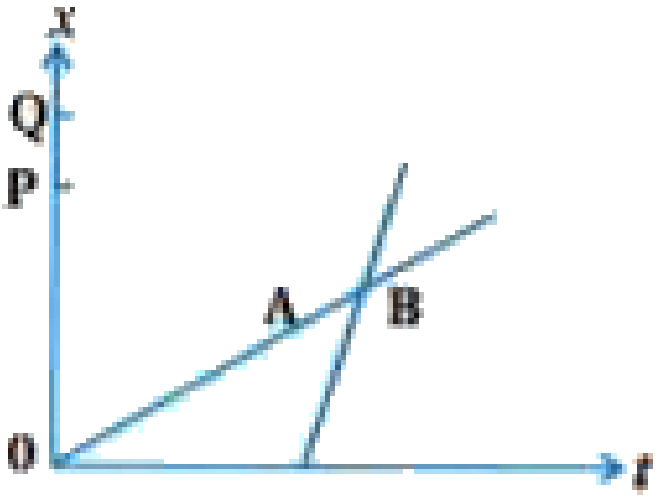
17. The position-time (x-t) graphs for two children A and B returning from their school O to their homes P and Q respectively are shown in figure. Choose the correct entries in the brackets below,

(a) (A/B) lives closer to the school than (B/A)

(b) (A/B) starts from the school earlier than (B/A)

(c) (A/B) walks faster than (B/A)

(d) A and B reach home at the same! different) time



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18. A woman starts from her home at 9.00 am, walks with a speed of $5kmh^{-1}$ on a straight road up to her office 2.5 km away, stays at the office up to 5.00 pm, and returns home by an auto with a speed of $25kmh^{-1}$. Choose suitable scales and plot the x-t graph of her motion.

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19. 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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20. A vehicle covers certain distance at constant speed of $20kmh^{-1}$ in time interval 't' on linear path. Then it covers certain distance at constant speed of $30kmh^{-1}$ in the same time interval. What is the average speed of the vehicle ?

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21. A car moving along a straight highway with speed of $126kmh^{-1}$ 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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22. 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 driver of B decides to overtake A and accelerates by $1ms^{-2}$. If after 50 s, the guard of B just brushes past the driver of A, what was the original distance between them ?

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23. On a two-ane 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 $54kmh^{-1}$ each. At a certain instant, when the distance AB is equal to AC, both being 1 km, B decides to overtake A before C does. What

minmum acceleration of car B is required to avoid an accident ?

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24. Two towns A and B are connected by a regular bus service with a bus leaving in either direction every T minutes. A man cycling with a speed of 20 kmh^{-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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25. A player throws a ball upwards with an initial speed of 29.4 ms^{-1}

(a) What is the direction of acceleration during the upward motion of the ball ?

(b) What are the velocity and acceleration of the ball at the highest

point of its motion ?

(c) Choose the x = 0 m and t=0 s 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 position, velocity and acceleration of the ball during its upward and downward motion.

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

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26. Read each statement below carefully and state with reasons and examples, if it is true or false, A particle in one-dimensional motion

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

(b) with zero speed may have non-zero velocity

(c) with constant speed must have zero acceleration,

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

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27. A ball is dropped from a height of 90 m on a floor. At each collision 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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28. Explain clearly, with examples, the distinction between : (a) magnitude of displacement (sometimes called distance) over an interval of time, and the total length of path covered by a particle over the same interval,

(b) magnitude of average velocity over an interval of time, and the average speed over the same interval. (Average speed of a particle over an interval of time is defined as the total path length divided by the time interval]. Show in both (a) and (b) that the second quantity is either greater than or equal to the first. When is the equality sign true ? (For simplicity, consider onedimensional motion only).

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29. A man walks on a straight road from his home to a market 2.5 km away with a speed of 5 kmh^{-1}. Finding the market closed, he instantly turns and walks back home with a speed of 7.5 km h^{-1}. 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 ? [Note: You will appreciate from this exercise why it is better to define average speed as total path length divided by time, and not as magnitude of average velocity. You would not like to tell the tired man on his return home that his average speed was zero !]

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30. In Exercises 3.13 and 3.14, we have carefully distinguished between average speed and magnitude of average velocity. No such distinction is necessary when we consider instantaneous speed and magnitude of

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

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31. Look at the graphs (a) to (d) (Fig. 3.20) carefully and state, with reasons, which of these cannot possibly represent onedimensional motion of a particle.

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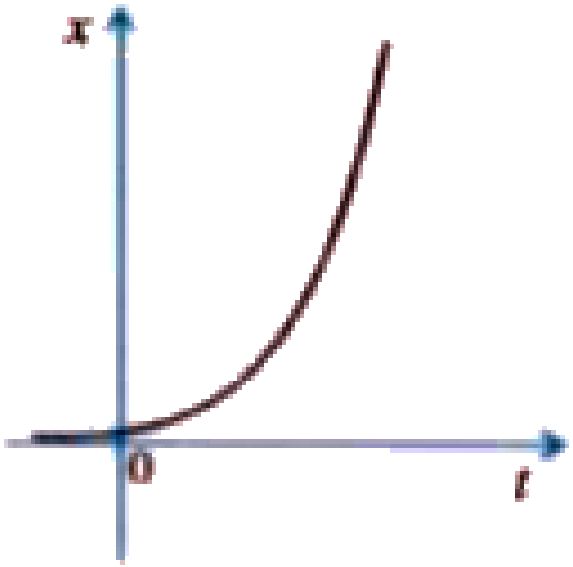
32. Figure shows the x-t plot of one-dimensional motion of a particle. Is it correct to say from the graph that the particle moves in a straight line for $llat0$ and on a parabolic path for $t > 0$? If not, suggest a

suitable physical context for this graph.



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33. A police van moving on a highway with a speed of $30kmh^{-1}$ fires a bullet at a thief's car speeding away in the same direction with a speed of $192kmh^{-1}$. If the muzzle speed of the bullet is $150ms^{-1}$ with what speed does the bullet hit the thief's car ? (Note: Obtain that speed which is relevant for damaging the thief's car).

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34. The idea of secondary wavelets for the. propagation of a wave was first given by

A. Newton

B. Huygens

C. Maxwell

D. Fresnel

Answer:

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35. Figure gives the $x \rightarrow t$ plot of a particle executing one-dimensional simple harmonic motion. (you will learn about this motion inmore detail in Chapter 14). Give the signs of position, velocity and

acceleration variables of the particle at $t = 0.3s, 1.2s, -1.2s$.

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36. Figure gives the x-t plot of a particle in one dimensional motion. Three different equal intervals of time are shown. In which interval is the average speed greatest and in which is it the least ? Give the sign of average velocity for each interval.

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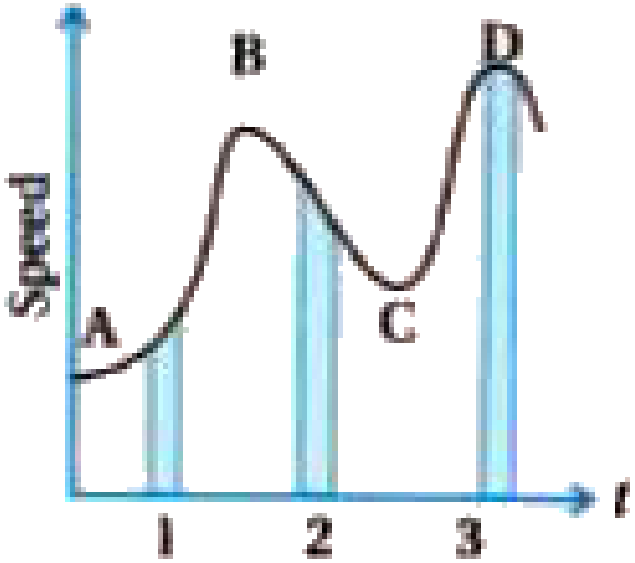
37. Figure gives a speed - time graph of a particle in motion along a constant direction. Three equal intervals of time are shown. In which interval is the average acceleration greatest in magnitude ? In which interval is the average speed greatest? Choosing the positive direction as the constant direction of motion give the signs of vand a in the

three intervals. What are the acclerations at the points A, B, C and D?



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38. A three wheeler starts from rest, accelerates uniformly with 1 ms-2 on a straight road for 10 s and then moves with uniform velocity. Plot the distance covered by the vehicle during the nth second (n = 1, 2, 3, ...) versus n. What do you expect this plot to be during accelerated motion : a straight line or a parabola ?

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

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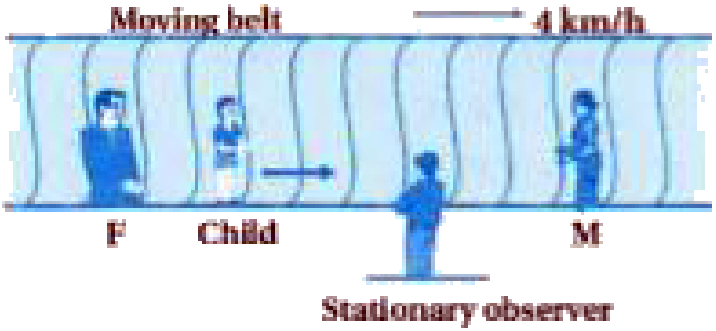
40. On a long horizontally moving belt (From figure) a child runs to and fro with a speed 9 kmh^{-1} (with respect to the belt) between his father and mother located 50 m apart on the moving belt. The belt moves with a speed of 4 kmh-l. For an observer on a stationary platform outside, what is the

(a) Speed of the child running in the direction of motion of the belt ?

(b) Speed of the child running opposite to the direction of motion of the belt ?

(c) Time taken by the child in (a) and (b) ? Which of the answers alter if

motion is viewed by one of the parents ?



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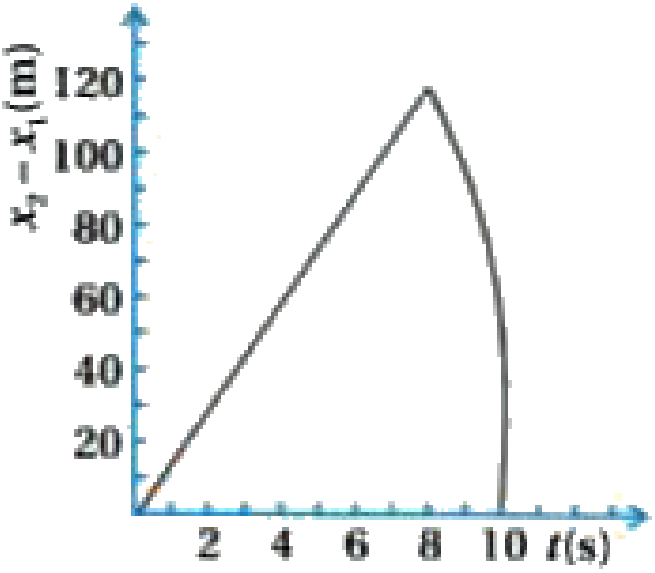
41. Two stones are thrown up simultaneously from the edge of a cliff 200 m high with initial speeds of 15 ms^{-} and 30 ms^{-1}. Verify that the graph shown in figure. Correctly represents the time variation of the relative position of the second stone with respect to the first. Neglect air resistance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

curved parts of the plot.



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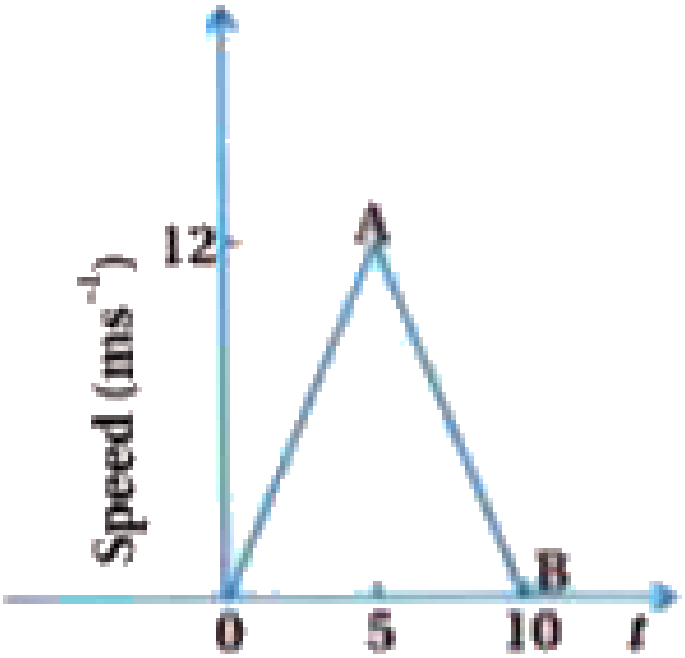
42. The speed-time graph of a particle moving along a fixed direction is shown in figure. Obtain the distance traversed by the particle between $(a) t = 0s$ to $10s$. $(b) t = 2s$ to 6s.



What is the average speed of the particle over the intervals in (a) and (b) ?

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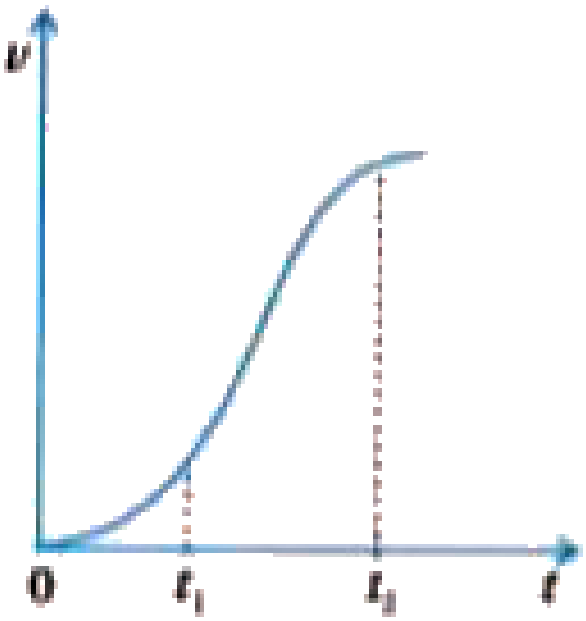
43. The velocity - time graph of a particle in one dimensional motion is shown in figure.



Which of the following formulae are correct for describing the motion of the particle over the time- interval t_1 to t_2 :

(a) $x(t_2) = x(t_1) + v(t_2 - t_1) + \left(\frac{1}{2}\right) a(t_2 - t_1)^2$

(b) $v(t_2) = v(t_1) + a(t_1)) / (t_2 - t_1)$

(C) $v_{\text{average}} = (x(t_2) - x(t_1)) / (t_2 - t_1)$

(d) $a_{\text{average}} = (v(t_2) - v(t_1)) / (t_2 - t_1)$

(e) $x(t_2) = x(t_1) + v_{\text{average}}(t_2 - t_1) + \left(\frac{1}{2}\right) a_{\text{average}}(t_2 - t_1)^2$

(f)$c(t_2) - c(t_1) =$ area under the v-t curve bonunded by the t -axis and the dotted line shown.

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44. A vehicle travels different distances with different speeds in the same direction. Find the expression for the average speed of a vehicle.

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45. A person walking in a straight line, covers half of the distance to be travelled with a speed of v_0. For half of the time, required to complete the remaining distance, he walks with a speed of v_1 and for the remaining half time his speed is v_2 What is the person's average speed during this complete walk ?

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46. A motorcyclist covers $\frac{1}{3}$ of a given distance with a speed of $10kmh^{-1}$, the next $\frac{1}{3}$ at $20kmh^{-1}$ and the last $\frac{1}{3}$ at of $30kmh^{-1}$. What is the average speed of the motorcycle for the entire journey ?

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47. The distance between two stations is 40 km. A train takes 1 hour to travel this distance. The train, after starting from first station, moves with constant acceleration for 5 km, then it moves with constant velocity for 20 km and finally its velocity keeps on decreasing continuously for 15 km and it stops at the other station. Find the maximum velocity of the train.

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48. A ball thrown in vertically upward direction attains maximum height of 16 m. At what height would its velocity be half of its initial velocity ?

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49. The position of an object, moving in one dimension, is given by the formula $x(t) = \left(4.2t^2 + 2.6\right)m$. Calculate its (i) average velocity in the time interval fromj t =0 to t = 3 s and (ii) Instantaneous velocity at $t = 3s$.

$$\left[\frac{d(x^x)}{dt} = nx^{n-1}\right]$$

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50. The position of a particle moving along a straight line is given by $x = 2 - 5t + t^3$. Find the acceleration of the particle at $t = 2s$. (x is metere).

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51. For a moving paritcle, the relation between time and position is given by $t = Ax^2 + Bx$. Where A and B are contants. Find the acceleration of the particle as a function of velocity.

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52. Two cars A and B are at positions 100 m and 200 m from the origin at t = 0. They start simultaneously with constant velocities $10ms^{-1}$ and 5 ms^{-1} respectively in the same direction. Calculate the time and position at which they will overtake one another.

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53. The distance between Ahmedabad and Vadodara is 100 km. Two trains set-off simultaneously from Ahmedabad and Vadodara towards each other. The speed of these trains are 45 kmh^{-1} and $30kmh^{-1}$ respectively. When will they cross each other ?

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54. A driver of train A, moving at a speed $30ms^{-1}$, sights another train B going on the same track and in the same direction with speed $10ms^{-1}$. He immediately applies brake that gives his train a constant retardation of $2ms^{-2}$. What must be the minimum distance between trains in order to avoid a collision ?

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55. An object is moving with constant acceleration. Its velocity is $48ms^{-1}$ at the end of 10 second and becomes $68ms^{-1}$ at the end of 15 second. What would be the distance travelled by the object in 15 second ?

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56. An object falling freely covers half of its total distance in last second, then find total height and total times g = 9.8 ms^{-2}.

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57. A stone is fallen freely from a tower and after n seconds another stone is thrown upwards with u m/s, then at what distance from top of tower second stone will overtake first stone ?

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58. A train is moving with constant acceleration. When the ends of a train pass by a signal their speeds are u and v respectively. Calculate the speed of the midpoint of the train while passing the signal.

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Section C

1. What is acceleration ? What is the direction ? Also gives its unit.

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2. Can the$x \to t$ graph of a moving object be parallel to the position axis ? Why?

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3. What do the area under $a \to t$ graph represent?

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4. What do the slope and the area under a vet graph represent?

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5. Is it possible that at any moment velocity of any object moving in straight line is zero and acceleration is non-zero ? Give example.

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6. What is retardation ?

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7. When any object is said to have retardation ?

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8. When will the relative velocity of two moving cars be zero ?

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9. When will the relative velocity of two moving cars be greater than their individual velocities?

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Watch Video Solution

10. When will the relative velocity of two moving cars be greater than their individual velocities?

Watch Video Solution

11. What does speedometer of vehicle measure ? Instantaneous velocity or instantaneous speed ?

Watch Video Solution

12. Give velocity and acceleration at any point for an moving object whose $x \rightarrow t$ graph is straight line.

Watch Video Solution

13. Find the ratio of accelerations of two objects whose $v \to t$ graphs make angles $30^\circ \text{ and } 45^\circ$ with axis of time.

Watch Video Solution

14. A car starts uniform motion from rest, than find shapes of graphs :

(i) $x \to t$, (ii)$v \to t$ and (iii) $a \to t$

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15. When an object is said to be in motion ?

Watch Video Solution

16. How motion of any particle is described ?

Watch Video Solution

17. What is kinematics?

Watch Video Solution

18. In which condition two substance can be considered as a particles ?

Watch Video Solution

19. "Different types of speed's average is called average speed". Is this true ?

Watch Video Solution

20. If direction of velocity and acceleration are in mutually opposite direction then what will be the change in speed ?

Watch Video Solution

21. When an average velocity of a particle becomes its instantaneous velocity ?

Watch Video Solution

22. For the given vehicle, its stopping distance is proportional to ..... of the speed.

Watch Video Solution

23. Two cars moving with speeds 40 km/hr and 80 km/hr respectively with uniform acceleration. How many times the stopping distance of car with 80 km/hr is greater than another car ?

Watch Video Solution

24. When the average acceleration of the particle becomes instantaneous acceleration ?

Watch Video Solution

25. Give relation between displacement and path length ?

Watch Video Solution

26. What would be the distance covered by the particle falling freely in 1s? (g = 10 ms^{-2})

Watch Video Solution

27. Is it possible for any moving object that velocity is constant but speed is changing ?

Watch Video Solution

28. "Zero speed and non-zero velocity". Is this statement true or false ? Explain.

Watch Video Solution

29. Speed of moving object can never be negative. Why ?

Watch Video Solution

30. "Slope of $x \rightarrow t$ graph may be negative". Is this true or false ?

Watch Video Solution

31. Does displacement depend on the selection of origin of cartasian coordinate system?

Watch Video Solution

32. In which situation, distance and magnitude of displacement are same?

Watch Video Solution

33. Is it possible for any moving object that speed is constant but velocity is changing ?

Watch Video Solution

34. Uniform acceleration means constant slope of $x \rightarrow t$ graph. Is it is true or false ?

Watch Video Solution

35. Two particles A and B are moving on a straight line and B is ahead of A. Their velocities are constant, then what will be effect on their relative velocities when A is ahead of B ?

Watch Video Solution

36. If object starts moving with acceleration $\beta t,$ then what will be the velocity after 't' time ?

Watch Video Solution

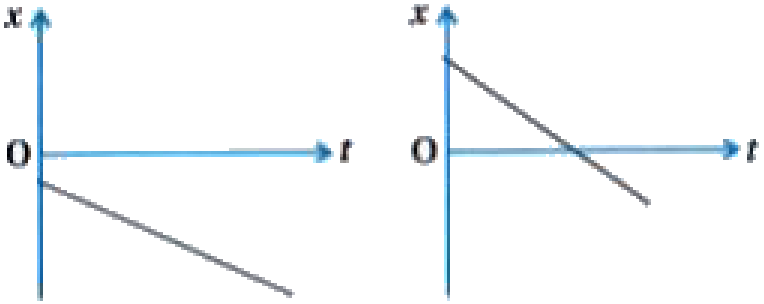
37. The position of moving object at time 't', $x = 2t^3,$ then find the acceleration.

Watch Video Solution

38. What type of motion is represented by equation $\Delta s = v\Delta t$?

Watch Video Solution

39. What is common following two graphs ?



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40. Give one example of uniform motion even if object has acceleration.

Watch Video Solution

41. If the displacement of object moving in straight line proportional to square of time, then what will be constant ? Velocity of acceleration ?

Watch Video Solution

42. If a ball fallen freely from 'h' height reaches in time 't' at ground, then what will be the time when it reaches at height $\frac{h}{2}$?

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43. What is the difference between uniform velocity and non-uniform velocity ?

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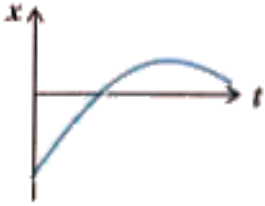
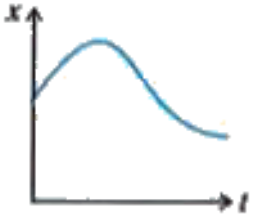
Section D

1. Among the four graph shown in the figure there is only one graph for which average velocity over the time interval (O,T) can vanish for a suitably chosen T. Which one is it ?

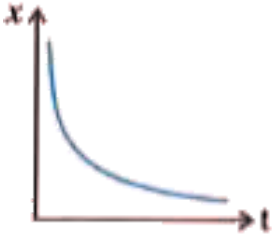
A.



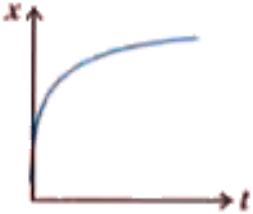
B.



C.



D.



Answer: B

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2. A lift is coming from 8th floor and it just a about to reach 4th flor. Taking ground floor as origin and positive direction upwards for all quantities, which one of the following is correct ?

A. $x < 0, v < 0, a > 0$

B. $x > 0, v < 0, a < 0$

C. $x > 0, v < 0, a > 0$

D. $xo, v > 0, a < 0$

Answer: A

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3. In one dimensional motion, instantaneous speed v satisfies $0 \leq v < v_0$.

A. The displacement in time T must always take non-negative values

B. The displacement x in time T satisied - $v_0 T < x < v_0 T$

C. The acceleration is always a non-negative number

D. The motion has no turning points

Answer: B

Watch Video Solution

4. A person walking in a straight line, covers half of the distance to be travelled with a speed of v_0. For half of the time, required to complete the remaining distance, he walks with a speed of v_1 and for the remaining half time his speed is v_2 What is the person's average speed during this complete walk ?

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

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

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

D. $\frac{L(v_1 + v_2)}{v_1 v_2}$

Answer: C

Watch Video Solution

5. The displacement of a particle is given by $x = (t-2)^2$ where x is in metre and t in second. The distance covered by the particle in first 4 seconds is

A. 4m

B. 8m

C. 12m

D. 16m

Answer: B

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6. At a metro station, a girl walks up a stationary escalator in time. t_1, If she remains stationary on the escalator, then the escalator take her up in time t_2. The time taken by her to walk up on the moving escalator will be

A. $(t_1 + t_2)/2$

B. $t_1 t_2/(t - t_1)$

C. $t_1 t_2/(t_2 + t_1)$

D. $t_1 - t_2$

Answer: C

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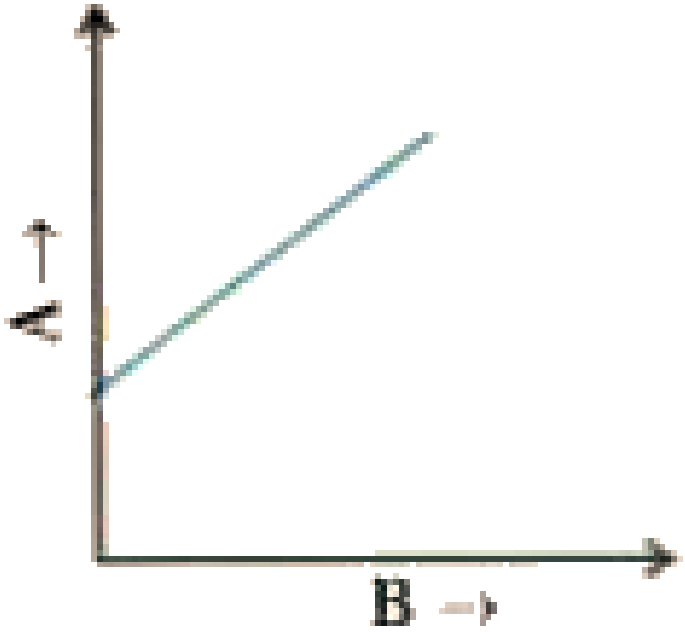
7. The variation of quantity A with quantity B, plotted in figure. Describes the motion of a particle in a straight line.



A. Quantity B may represent time

B. Quantity A is velocity if motion is uniform

C. Quantity A is displacement if motion is uniform

D. Quantity A is velocity if motion is uniformaly accelerated

Answer: A::B::C

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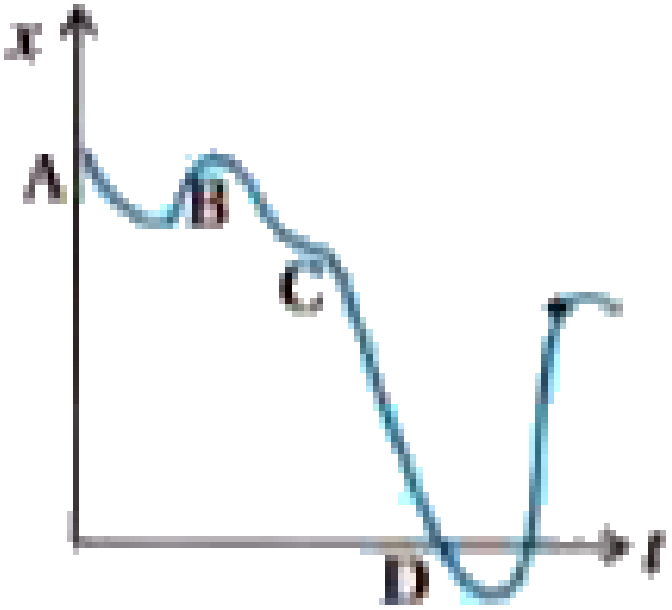
8. A graph of x versus t is shown in figure. Choose correct alternatives given below.



A. The particle was released from rest at $t = 0$

B. At B, the acceleration $a > 0$

C. Average velocity for the motion between A and D is positive

D. The speed at D exceeds that at E

Answer: A::C::D

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9. For the one-dimensional motion, described by x = t - sint

A. $x(t) > 0$ for all $t > 0$

B. $v(t) > 0$ for all$t > 0$

C. $a(t) > 0$ for all $t > 0$

D. v (t) lies between 0 and 2

Answer: A::B

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10. A spring with one end attached to a mass and the other to a rigid support is stretched and released.

A. Magnitude of acceleration, when just released is maximum

B. Magnitude of acceleration, when at equilibrium position is maximum

C. Speed is maximum when mass is at equilibrium position

D. Magnitude of displacement is always maximum whenever speed is minimum

Answer: A::D

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11. A ball is bouncing elastically with a speed 1 m/s between walls of a railway compartment of size 10 m in a direction perpendicular to walls. The train is moving at a constant velocity of 10 m/s parallel to the direction of motion of the ball. As seen from the ground.

A. The direction of motion of the ball changes every 10.

B. Speed of ball changes every 10

C. Average speed of ball over any 20 interval is fixed.

D. The acceleration of ball is the same as from the train

Answer: B::C

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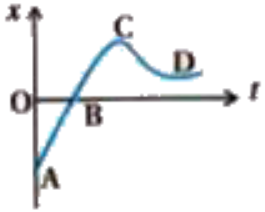
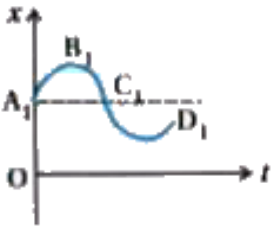
12. Refer to the graph in figure. Match the following

Graph	Characteristics	
(a)	(i)	has $v > 0$ and $a < 0$ throughout
(b)	(ii)	has $x > 0$ throughout and has a point with $v = 0$ and a point with $a = 0$
(c)	(iii)	has a point with zero displacement for $t > 0$
(d)	(iv)	has $v < 0$ and $a > 0$

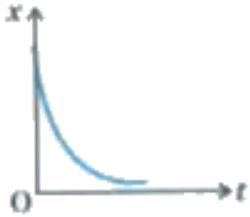
A.



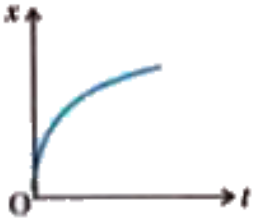
B.



C.



D.



Answer:

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13. A uniformly 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 backward direction as positive).

Watch Video Solution

14. Give examples of a one-dimensional motion where

(a) The particle moving along positive x-direction comes to rest periodically and moves forward.

(b) The particle moving along positive x-direction comes to rest periodically and moves backward.

Watch Video Solution

15. Give example of a motion where$x > 0, v < 0, a > 0$ at a particular instant.

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16. An object falling through a fluid is observed to have acceleration given by a = g - bv where g = gravitational acceleration and b is

constant. After a long time of release, it is observed to fall with constant speed. What must be the value of constant speed ?

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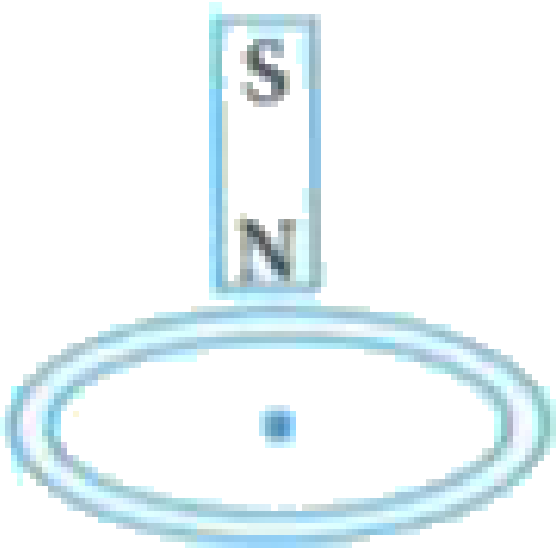
17. As shown in fig. a metal ring is held horizontally and a bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet is .....



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18. A particle executes the motion described by $x(f) = x_0\left(1 - e^{\lambda t}\right), t \geq 0, x_0 > 0.$

(a) Where does the particle start and with what velocity ? (b) Find maximum and minimum values of x(t), v(t), a(t). Show that X(t) and alt) increase with time and v(t) decreases with time.

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19. A bird is tossing (flying to and fro) between two cars moving towards each other on a straight road. One car has a speed of 18 km/h while the other has the speed of 27 km/h. The bird starts moving from first car towards the other and is moving with the speed of 36 km/h and when the two cars were separated by 36 km. What is the total distance covered by the bird?

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20. A man runs across the roof, top of a tall building and jumps horizontally with the hope of landing on the roof of the next building which is at a lower height than the first. If his speed is 9 m/s. the horizontal) distance between the two buildings is 10 m and the height difference is 9 m, will be able to land on the next building? (Take g = 10 m/s^{-2})

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21. A ball is dropped from a building of height 45 m. Simultaneously another ball is thrown up with a speed 40 m/s. Calculate the relative speed of the balls as a function of time.

Watch Video Solution

22. Write equation of relation between time period and frequency.

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23. It is a common observation that rain clouds can be at about a kilometer altitude above the ground. (a) If a rain drop falls from such a height freely under gravity, what will be its speed? Also calculate in km/h (g = 10 m / s^2).

(b) A typical rain drop is about 4 mm diameter. Momentum is mass x speed in magnitude. Estimate its momentum when it hits ground.

(c) Estimate the time required to flatten the drop.

(d) Rate of change of momentum is force. Estimate how much force such a drop would exert on you.

(e) Estimate the order of magnitude force on umbrella. Typical lateral separation between two rain drops is 5 cm.

(Assume that umbrella is circular and has a diameter of 1 m and cloth is not pierced through.)

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24. A motor car moving at a speed of 72 km/h cannot come to a stop in less than 3.0 s while for a truck this time interval is 5.0 s. On a highway, the car is behind the truck both moving at 72 km/h. The truck gives a signal that it is going to stop at emergency. At what distance the car should be from the truck so that it does not bump onto (collide with) the truck. Human response time is 0.5 s.

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25. A monkey climbs up a slippery pole for 3 and subsequently slips for 3. Its velocity at time t is given by $v(t) = 2t(3-t), 0 < t < 3$ and $v(t) = -(t-3)(6-t)f$ or $3 < t < 6$ s in m/s. It repeats this cycle till it reaches the height of 20 m.

(a) At what time is its velocity maximum ?

(b) At what time is its average velocity maximum ?

(c) At what time is its acceleration maximum in magnitude ?

(d) How many cycles (counting fractions) are required to reach the top ?

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26. A man is standing on top of a building 100 m high. He throws two balls vertically, one at t = 0 and after a time interval (less than 2 seconds). The later ball is thrown at a velocity of half the first. The vertical gap between first and second ball is + 15 m at t = 2 s. The gap is found to remain constant. Calculate the velocity with which the balls were thrown and the exact time interval between their throw.

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Section E

1. Velocity of a particle is given by $v = \left(3t^2 + 2t\right)\frac{m}{s}$. Find its average velocity between t = 0 to t=3s and also find its acceleration at t = 3s. Motion of the particle is in one dimension.

A. $11\frac{m}{s}, 10\frac{m}{s^2}$

B. $12\frac{m}{s}, 20\frac{m}{s^2}$

C. $11\frac{m}{s}, 20\frac{m}{s^2}$

D. None of the given

Answer: B

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2. The displacement of an object varies with time according to the equation,

$ty = \left(\frac{3}{8}t^2 03t + 5\right)m.$ Find the instataneous velocity at t = 4s.

A. $45ms^{-1}$

B. $12ms^{-1}$

C. $3ms^{-1}$

D. $0ms^{-1}$

Answer: D

Watch Video Solution

3. The ratio of distances travelled by a body starting from rest with constant acceleration in g^{th} and 8^{th} second is .....

A. $\frac{17}{15}$

B. $\frac{8}{9}$

C. $\frac{15}{17}$

D. $\frac{9}{8}$

Answer: A

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4. A ball is thrown in vertically upward direction. It returns back to the same position in 2s. Then the maximum height achieved by the ball is ..... (Take g = 9.8 ms^{-2})

A. $9.8m$

B. $14.7m$

C. $4.9m$

D. 19.6m

Answer: C

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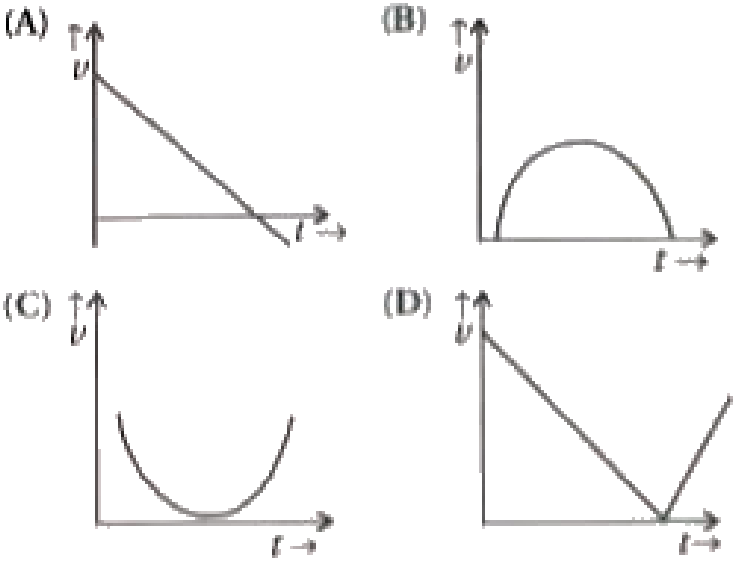
5. A particle is thrown in vertically upward direction, the correct graph of speed $(v) \rightarrow$ time (1) is .....



A. a

B. b

C. c

D. d

Answer: D

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6. Acceleration of a particle is given by $\overrightarrow{a} = (2t + 5)\hat{i}ms^{-2}$. Calculate the velocity of particle after 5s, if it starts from rest.

A. $\hat{i}\frac{m}{s}$

B. $50\hat{i}\frac{m}{s}$

C. $75\hat{i}\frac{m}{s}$

D. $100\hat{i}\frac{m}{s}$

Answer: B

Watch Video Solution

7. A car is moving with a constant acceleration and initial velocity $2ms^{-1}$ on a straight path. After 10 s it attains the velocity $12ms^{-1}$. Then find the distance covered by it in this 10 s.

A. 140 m

B. 50 m

C. 160 m

D. 70 m

Answer: D

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8. A car starting from rest, moves some distance with constant acceleration $3ms^{-2}$.

Then it moves with constant deceleration $2ms^{-2}$ and finally becomes stationary. If the total time taken for the complete journey is 100 s, what was maximum velocity of the car e iu during the journey ?

A. 100

B. 80

C. 140

D. 120

Answer: D

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9. When a ball A is thrown in vertically upward direction with velocity $20ms^{-1}$, exactly at the same time another ball B is allowed to fall freely from height 1. The magnitude of velocity of A with respect to B at time 2 sec is ..... $ms^{-1}(g = 10m/s^2)$

A. 40

B. 10

C. 20

D. 30

Answer: C

Watch Video Solution

10. A car starting from position of rest, moves with constant acceleration x. Then it moves with constant deceleration y and become stationary. If the total time elapsed during this is t, then the total distance travelled by car in time t is

A. $\left(\frac{xy}{x+y}\right)t$

B. $\frac{1}{2}\left(\frac{xy}{x+y}\right)t^2$

C. $2\left(\frac{xy}{x+y}\right)t^2$

D. $\left(\frac{xy}{x+y}\right)t^2$

Answer: B

Watch Video Solution

11. A car moving over a straight path, covers a distance d with constant speed of 40 km/hr and then the same distance with speed 60km/hr. The average speed of car is .....

A. 50 km/hr

B. 48 km/hr

C. 52 km/hr

D. None of the given

Answer: B

Watch Video Solution

12. Obtainwork energy theorem of a particle moving in one dimension under the variable force .

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

B. $\sqrt{3}ms^{-1}$

C. $\frac{1}{\sqrt{3}}ms^{-1}$

D. $2ms^{-1}$

Answer: D

Watch Video Solution

13. A particle, starting from rest, moves with constant acceleration $4ms^{-2}$. The distance travelled by the particle in 5^{th} second is.

A. 20 m

B. 18 m

C. 22 m

D. 50 m

Answer: B

Watch Video Solution

14. Displacement (in metre) of a particle varies with time (in second) is given as $y(t) = 4t^2 - 16t + 5$. Time taken by the particle to come to rest is.....

A. 4s

B. 3 s

C. 6 s

D. 2 s

Answer: D

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15. If the speed of a vehicle become 3 times for a given deceleration its stopping distance become .....

A. 2 times

B. 9 times

C. 1/9` times

D. 3 times

Answer: B

Watch Video Solution

16. The linear speed of the tip of second arm of a clock is v. The magnitude of change in its velocity in 30 second is .....

A. 2 v

B. $\frac{v}{\sqrt{2}}$

C. $\sqrt{2}v$

D. zero

Answer: A

Watch Video Solution

17. A body initially at rest is moving with uniform acceleration "a". It's velocity after n seconds is V. The displacement of the body in last 2 seconds is .....

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

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

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

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

Answer: D

Watch Video Solution

18. When a driver of Shatabdi Express, running with velocity 108 km/hr, sights a goods train going ahead of him at a distance 50 m in the same direction on the same track, running with velocity 72 km/hr, he applies brakes. In order to avoid an accident, what should be the magnitude of the deceleration produced by the brakes?

A. $5ms^{-2}$

B. $1ms^{-2}$

C. $3ms^{-2}$

D. None of these

Answer: B

Watch Video Solution

19. A train is moving with constant acceleration. When the ends of the train pass by a signal their speeds are 30 km/h and 40 km/h respectively. Calculate the speed of the midpoint of train while passing the signal.

A. 35 km/hr

B. $\frac{25}{\sqrt{2}} km / hr$

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

D. $25 km / hr$

Answer: C

Watch Video Solution

20. Two cars A and B are at positions 50 m and 100 m from the origin at t = 0. They start simultaneously with constant velocities 10 m/s and 5 m/s respectively in the same direction. Find the time at which they will overtake one another.

A. 10 s

B. 20 s

C. 5 s

D. 15 s

Answer: A

Watch Video Solution

21. If velocity (in ms^{-1}) varies with time as V = 5t, find the distance travelled by the particle in time interval of t = 2s to t = 4 s.

A. 24 m

B. 30 m

C. 10 m

D. 20 m

Answer: B

Watch Video Solution

22. A bullet comes out of the barrel of gun of length 2 meter with a speed of 20 m/s. The average acceleration of the bullet is ..... m / s^2.

A. 10

B. 100

C. 1000

D. 1

Answer: C

Watch Video Solution

23. A ball thrown in vertically upward direction attains maximum height of 20 meter. At what height would its velocity be half of its initiall velocity?

A. 15 m

B. 6m

C. 12 m

D. 9m

Answer: A

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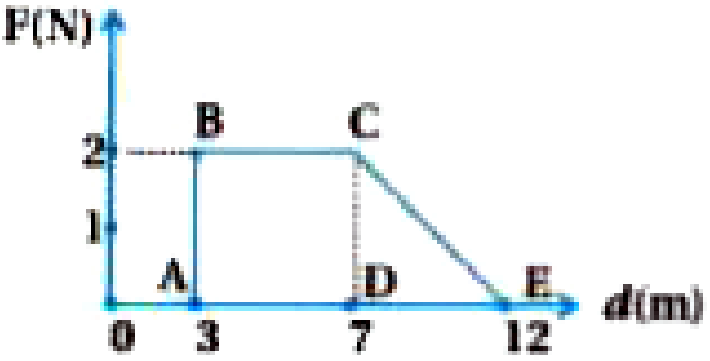
24. A particle is subjected to a force which varies with distance as shown in figure . The work done on the particle at in dispalcement of 12

m is . . . . . .



A. $-50m$

B. $50m$

C. $0m$

D. $100m$

Answer: B

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25. The displacement of a particle is given by $x(t) = \left(4t^2 + 8\right)$ meter. The instantaneous velocity of a particle at t = 2s is

A. 12m/s

B. 16m/s

C. 8cm/s

D. 16 cm/s

Answer: B

Watch Video Solution

26. An object is thrown in vertically upward direction. The time to reach maximum height is .....

A. $\frac{g}{v_0}$

B. $\frac{v_0^2}{g}$

C. $\frac{v_0}{g}$

D. $\frac{v_0}{g^2}$

Answer: C

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27. The ratio of the distance travelled in the fourth and the third second by a starting particle, moving over a straight path from rest with constant acceleration is.....

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

B. $\frac{7}{3}$

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

D. $\frac{3}{7}$

Answer: A

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28. The position of a particle moving along a. straight line is given by $x = 2 - 5t + t^3$ The acceleration of the particle at t = 2 sec. is ..... Here x is in meter.

A. $12\frac{m}{s^2}$

B. $8m / s^2$

C. $7m / s^2$

D. None of these

Answer: A

Watch Video Solution

29. The path length can be equal to or ..... than the displacement.

A. less

B. $+1$

C. -1

D. greater

Answer: D

Watch Video Solution

30. With uniform circular motion, the equation of the centripetal force is ....

A. $\frac{mv^2}{r}$

B. $r^2\omega^2$

C. $m\omega^2$

D. $\frac{v^2}{r}$

Answer: A

Watch Video Solution

31. The distance between Ahmedabad and Surat is 300 km. Two trains set off simultaneously towards each other with speeds 60 km/h and 40 km/h respectively. When will they cross each other?

A. 3 hours

B. 15 hours

C. $\frac{1}{3}$ hours

D. $\frac{4}{3}$ hours

Answer: A

Watch Video Solution

32. A particle of mass m moves on a circular path of radius r . Its centripetal acceleration is kt^2 , where k is a constant and t is time . Express power as function of t .

A. $2\pi r$

B. $2r$

C. πr

D. r

Answer: C

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33. The ratio of the distance travelled in the third and fourth second by a particle moving over a straight path with constant acceleration is .....

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

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

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

D. $\frac{3}{7}$

Answer: B

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34. The slope of graph $v \rightarrow t$ represents .....

A. Velocity

B. Acceleration

C. Speed

D. Displacement

Answer: C

Watch Video Solution

35. The displacement of a particle is given by $y(t) = 2t^2 + 5m$. Hence its velocity at the end of 6 sec. will be ..... m/s.

A. 77

B. 4

C. 0

D. 24

Answer: D

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36. Two trains cross each other in opposite direction with velocity 72 km/h. The magnitude of relative velocity of one train with respect to the other is .....

A. 144 km/h

B. 0 km/h

C. 1 km/h

D. 72 km/h

Answer: A

Watch Video Solution

37. A bus covers 3 equal distances. The first is covered with speed 10 km/h, second with speed 20 km/h and third with 60 km/h, then find its average speed in km/h.

A. 9

B. 16

C. 18

D. 60

Answer: C

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38. If a size of particle is a and wavelength of light is λ for $a << \lambda$ scattering is directly proportional to....

A. D

B. F

C. C

D. E

Answer: D

Watch Video Solution

39. The object reaches at maximum height of 20 m in 5 s when thrown upwards. Then what time will be taken by it to come to ground?

A. $2.5s$

B. $5s$

C. $10s$

D. $25s$

Answer: B

Watch Video Solution

40. An object fallen freely from top of tower reaches at ground in 4s, then find the height of tower. (Take $g = 10ms^{-2}$)

A. 20 m

B. 40 m

C. 80 m

D. 160 m

Answer: C

Watch Video Solution

41. The ratio of the speeds of the objects of masses $m_1, m_2,$ and my respectively are fallen freely from a same point 'O' when reaches at ground is .....

A. $m_1 : m_2 : m_3$

B. $m_1 : m_2 : 3m_3$

C. $1 : 1 : 1$

D. $\frac{1}{m_1} : \frac{1}{m_2} : \frac{1}{m_3}$

Answer: C

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42. What will be the velocity of object thrown upwards with $40ms^{-1}$ after 2 s?

A. 15

B. 20

C. 25

D. 28

Answer: B

Watch Video Solution

43. An object starting from rest and performing | 41 uniform accelerated motion gains 144 km/h speed in 20 s, then what will be distance covered in 20 s?

A. 20

B. 400

C. 1440

D. 2880

Answer: B

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44. The displacement of particle with respect to time is $s = 3^{t3} - 7t^2 + 5t + 8$ where s is in m and t is in s, then acceleration of

particle at t = ls is

A. $14ms^{-2}$

B. $18ms^{-2}$

C. $32ms^{-2}$

D. zero

Answer: C

Watch Video Solution

45. Displacement of particle changes with respect to time according to equation $x = ae^{-\alpha t} + be^{\beta t}$ where a, b, a and Bare positive constants, then velocity of particle is .....

A. indipendent of α and β

B. will be zero if $\alpha = \beta$.

C. will increase with repsect to time.

D. will increase with respect to time.

Answer: D

Watch Video Solution

46. The ratio of time taken by two objects A and B of masses 1 kg and 3 kg to free fall from height 16 m and 25 m respectively is .....

A. $\frac{12}{5}$

B. $\frac{5}{12}$

C. $\frac{4}{5}$

D. $\frac{5}{4}$

Answer: C

Watch Video Solution

47. Water drops are falling from a pipe at 5 m height at regular interval of time. When the third drop is released at the same time the first drop touches the ground. Then the height of second drop from ground is ..... m. (g = 10 ms^{-2})

A. 1.25

B. 3.75

C. 2.50

D. 4.0

Answer: B

Watch Video Solution

48. A car moving with a speed of 40 km/h can be stopped by applying brakes after at least 2m. If the same car is moving with a speed of 80 km/ h. The minimum stopping distance will be.....

A. 8

B. 2

C. 4

D. 6

Answer: A

Watch Video Solution

49. A stone is dropped from the top of tower. If its velocity at the mid point of height of tower is $10ms^{-1}$, then the height of a tower is ..... $(g = 10ms^{-2})$

A. 10

B. 16

C. 8

D. 20

Answer: A

Watch Video Solution

50. A person throws balls upward in regular intervals of time of 2 s. What should be the speed of throwing of balls such that both balls remain in air ?

A. less than $19.6ms^{-1}$

B. equal to $19.6ms^{-1}$

C. less than $9.8ms^{-1}$

D. greater than $19.6ms^{-1}$

Answer: D

Watch Video Solution

51. A particle moves in X-direction with acceleration f from rest. This acceleration changes according to $f = f_0\left(1 - \frac{t}{T}\right)$. and T are constant. t = 0 and for if any negative time interval if f = 0, then velocity of particle is .....

A. $\frac{1}{2}f_0T$

B. $\frac{1}{2}f_0t^2$

C. f_0T

D. f_0T^2

Answer: A

Watch Video Solution

52. A ship A is moving Westwards with a speed of $10kmh^{-1}$ and a ship B 100 km South of A, is moving Northwards with a speed of $10kmh^{-1}$. The time after which the distance between them becomes shortest, is :

A. 0 hr

B. 5 hr

C. $5\sqrt{2}hr$

D. $10\sqrt{2}hr$

Answer: B

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53. A particle of unit mass undergoes one dimensional motion such that its velocity varies according to $v(x) =$ = beta x ^(-2n)` where B and n are constants and x is the position of the particle. The acceleraion of the particle as a function of x, is given by :

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

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

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

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

Answer: A

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54. Two stones of masses m and 2 m are whirled in horizontal circles, the heavier one in a radius and the lighter one in radius $\frac{r}{2}$. The tangential speed of lighter stone is n times that of the value of heavier stone when they experience same centripetal forces. The value of n is:

A. 1

B. 2

C. 3

D. 4

Answer: B

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55. Two cars P and Q start from a point at the same time in a straight line and their positions 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. $\frac{a+f}{2(a+b)}$

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

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

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

Answer: B

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56. Find the area of a square inscribed in a circle of radius 8 cm.

A. $5.7m/s$

B. $6.2m/s$

C. $5.0m/s$

D. $5.7m/s$

Answer: A

Watch Video Solution

57. A stone falls freely under gravity. It covers 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. $h_1 = h_2 = h_3$

B. $h_1 = 2h_2 = 3h_3$

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

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

Answer: C

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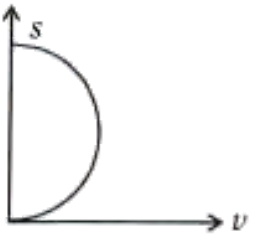
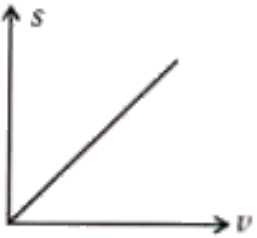
58. In an n type silicon, which of the following statements is true:

A.



B.

C.

D. 

Answer: C

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59. The displacement of object is proportional to cube of the time, then acceleration is .....

A. constant, but not zero.

B. increasing with time.

C. zero.

D. decreasing with time.

Answer: B

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60. When a man walks he waves his hands, because.....

A. to retain constant velocity.

B. to achieve trnsion force.

C. to increase velocity.

D. to balance the gravitation effect by earth.

Answer: D

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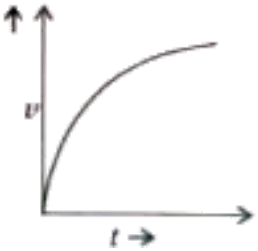
61. If A and B are invertible matrices, then which of the following is not correct

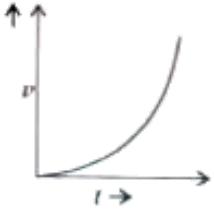
A.

B.

C.



D.



Answer: C

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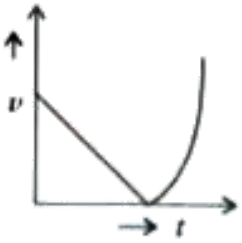
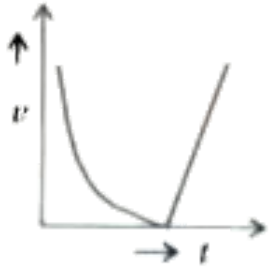
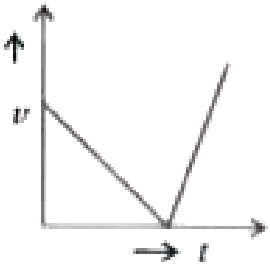
62. Which of the following statement is correct ?



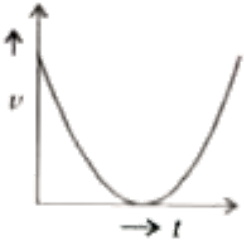
A.



B.



C.



D.

Answer: D

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63. Mass of an object is 2 kg and mass of another object is 4 kg. Size of both objects is identical. If both are fallen from 72 m height, then ..... of both objects will be same when they reach at I m height from ground.

A. velocity

B. kinetic energy

C. potential energy

D. acceleration

Answer: D

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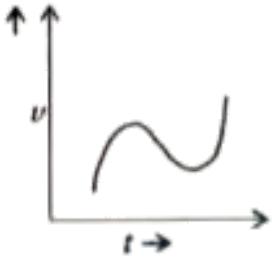
64. Which of the following statement is correct ?

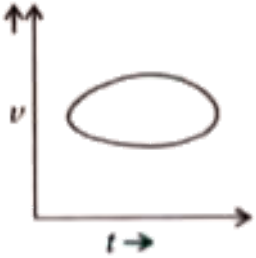
A.

B.



C.

D.



Answer: B

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65. A train of 100 m length moves with 40 m/s and overtakes another train of 200 m length moves with $30ms^{-1}$. Time taken by 1^{st} train to overtake another train is .....

A. 30 s

B. 40 s

C. 50 s

D. 60 s

Answer: A

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66. A bullet is fired into a huge wooden block. The bullet while moving inside the block loses halfthe velocity when it travels 3 cm inside the

block. How far, then would it go inside the block ? Resistive force is constant.

A. 1 cm

B. 2 cm

C. 3 cm

D. 4 cm

Answer: A

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

A. $1:1$

B. $1:4$

C. $1:8$

D. $1:16$

Answer: D

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68. A ball is fallen freely from top of tower of height 100 m and another ball is thrown upwards with 50 m/s at the same time when they will cross each other ? $\left(g = 10m/s^2\right)$

A. 1 s

B. 2 s

C. 3 s

D. 4 s

Answer: B

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69. If the displacement at time 't' is x = acost, the acceleration is .....

A. $\cos t$

B. $-a\cos t$

C. $a\sin t$

D. $-a\sin t$

Answer: B

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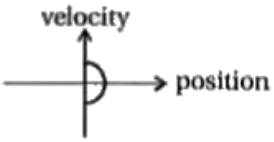
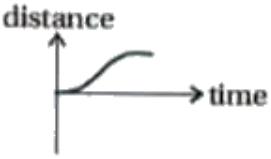
70. The below shown graphs represent the same motion. But one of them is incorrect. Find it.

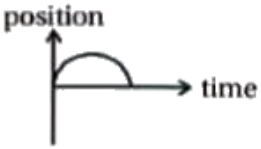
A.



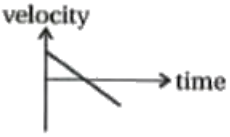
B.



C.



D.



Answer: B

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71. Due to which the surface charge density arises on the surface of a dielectric slab, when it is placed in a uniform electric field ?

A. $1.5m/s, 3m/s$

B. $2m/s, 4m/s$

C. $1m/s, 3.5m/s$

D. $1m/s, 3m/s$

Answer: D

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Section F

1. Distance covered by ball thrown upwards with speed 'u' in last 't' seconds before it reaches max. height is .....

A. $(u+gt)t$

B. ut

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

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

Answer: C

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2. Ratio of distances covered by object falling freely under gravity in $1^{st}, 2^{nd} \& 3^{rd}$ second 18 .....

A. $1:3:5$

B. $1:2:5$

C. $1:4:9$

D. $1:5:9$

Answer: A

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3. Speed of water in river is 5 m/min from west to east. A man can swim with 10 m/min in river water. At what angle should the man swim such that it can reach towards south with shortest path ?

A. At 30° with flow of water

B. At 60° with flow of water

C. At 120° with flow of water

D. towards south

Answer: C

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4. Plane travels 400 m towards north then 300 m towards south and 1200 m vertically upwards, then find resultant displacement .....

A. 1200 m

B. 1300 m

C. 1400 m

D. 1500 m

Answer: A

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5. Rate of decrease of velocity of an object moving with $6.25m/sis\frac{dv}{dr} = -2.5\sqrt{v}.$ Where v is instantaneous speed. Time taken by object to come to rest is .....

A. 1s

B. 2s

C. 4s

D. 7s

Answer: B

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6. An object moving with uniform acceleration covers 40 m in initial 5 seconds and 65 m in next 5 seconds, then its initial velocity is .....

A. $4m/s$

B. $2.5m/s$

C. $5.5m/s$

D. $11m/s$

Answer: C

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7. A wheel of 1 m radius completes half rotation on horizontal path. Magnitude of displacement form the point of contact with path initially is.....

A. 2π

B. π

C. $\sqrt{\pi^2+4}$

D. 2

Answer: C

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8. An object falls freely from rest. It covers the same distance in last second. Which is covered in first 3 seconds, then in ....., it will reach the ground.

A. 3s

B. 5s

C. 7s

D. 9s

Answer: B

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9. A bus starts moving with $1ms^{-2}$ acceleration. A man 48 m away from bus starts moving with 10 ms to catch the bus, then man will reach to bus after .....

A. 5 seconds

B. 6 seconds

C. 7 seconds

D. 8 seconds

Answer: D

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10. A stone is thrown upwards with initial velocity 'u' from top of a tower and it reaches to ground with velocity '3u' then height of the tower is .....

A. $\frac{3u^2}{g}$

B. $\frac{4u^2}{g}$

C. $\frac{6u^2}{g}$

D. $\frac{9u^2}{g}$

Answer: B

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11. A train starting from a railway station and moving with uniform acceleration attains a speed of $40km^{-1}$ in 10 minute. Find its acceleration.

A. $1ms^{-2}$

B. $2ms^{-2}$

C. $3ms^{-2}$

D. $4ms^{-2}$

Answer: B

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12. A car moving over a straight path, covers a distance d with constant speed of 40 km/hr and then the same distance with speed 60km/hr. The average speed of car is .....

A. 50

B. 48

C. 52

D. 100

Answer: B

Watch Video Solution

13. A train is moving with constant acceleration. When the ends of a train pass by a signal their speeds are u and v respectively. Calculate

the speed of the midpoint of the train while passing the signal.

A. $\frac{u+v}{2}$

B. $\frac{u^2+v^2}{2}$

C. $\sqrt{\frac{u^2+v^2}{2}}$

D. $\sqrt{\frac{v+u}{2}}$

Answer: C

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14. Rate of decrease in distance between two objects moving with certain speed towards each other is 6 m/s and rate of decrease decrease in distance between those objects with same speed when move in some direction is 4 m/s. Then the speeds of objects are .....

A. $5m/s, 1m/s$

B. $4m/s, 2m/s$

C. $4m/s, 1m/s$

D. $5m/s, 2m/s$

Answer: A

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15. An object is allowed to fall freely from a cliff. When it travels a distance 'h', its velocity is v. Hence, in travelling further distance of ..... its velocity will become 2v.

A. 4h

B. 3h

C. 2h

D. h

Answer: C

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16. The displacement (in metre) of a particle varies with time (in second) according to the equation $y = -\frac{2}{3}t^2 + 16t + 2$. How long does the particle take to come to rest ?

A. 12 s

B. 8 s

C. 16 s

D. 10 s

Answer: A

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17. Train A 120 m long is moving with 20 m/s. Train B 130 m long is moving with 30 m/s in opposite direction. In what time, train B will cross train A?

A. 65

B. 365

C. 385

D. None of these

Answer: D

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18. A person throws balls upward in regular intervals of time of 2 s. What should be the speed of throwing of balls such that both balls remain in air ?

A. less than $19.6ms^{-1}$

B. equal to $19.6ms^{-1}$

C. less than $9.8ms^{-1}$

D. greater than $19.6ms^{-1}$

Answer: D

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19. A bus is moving with a speed of 10m/s 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 scooterist with what speed should the scooterist chase the bus?

A. $40ms^{-1}$

B. $25ms^{-1}$

C. $10ms^{-1}$

D. $20ms^{-1}$

Answer: D

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20. Two trains moving mutually opposite with some speed on parallel tracks. If speed of wind parallel to truck is u. If the ratio of relative velocities of trains with respect to wind is 1:2, then find the same speed of trains.

A. 3u

B. 2u

C. 5u

D. 4u

Answer: A

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Question Paper

1. Define frame of reference and give its types.

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2. What is uniform motion ?

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3. Can the $x \rightarrow t$ graph of a moving object be parallel to the position axis ? Why?

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4. What is stopping distance for vehicle ?

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5. What will be the velocity and acceleration of ball upwards at maximum height ?

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6. When the relative velocity of two cars $v_A = v_B$ becomes zero ?

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7. The magnitude of displacement may or may not be equal to the path length traversed by an object." Explain this statement with example.

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8. For an object moving on a straight line, draw $x \rightarrow t$ graphs for :

(i) When it is rest.

(ii) When it is moving with constant velocity in positive direction.

(III) When it is moving with constant velocity in · negative direction.

(iv) When it performs non-uniform motion.

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9. A police van moving on a highway with a speed of $30kmh^{-1}$ fires a bullet at a thief's car speeding away in the same direction with a speed of $192kmh^{-1}$. If the muzzle speed of the bullet is $150ms^{-1}$ with what speed does the bullet hit the thief's car ? (Note: Obtain that speed which is relevant for damaging the thief's car).

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10. 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 driver of B decides to overtake A and accelerates by $1ms^{-2}$. If after 50 s, the guard of B just brushes past the driver of A, what was the original distance between them ?

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11. Two towns A and B are connected by a regular bus service with a bus leaving in either direction every T minutes. A man cycling with a speed of 20 kmh^{-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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