doubtnut
India's Number 1 Education App

PHYSICS

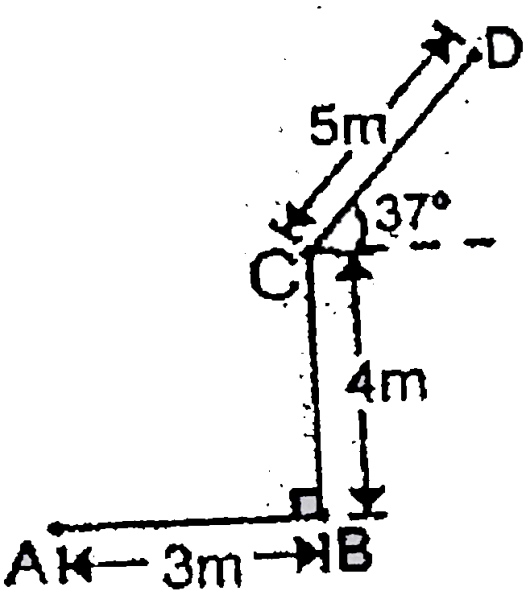
RESONANCE ENGLISH

KINEMATICS

Exercise

1. A particle moves along a path $ABCD$ as shown in the figure. Then the magnitude of net displacement of the particle from position

A to D is:



A. $10m$

B. $5\sqrt{2}m$

C. $9m$

D. $7\sqrt{2}m$

Answer: D

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

Answer: A

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3. A particle whose speed in 50 m/s moves along the line from A(2, 1) to B(9, 25). Find its velocity vector in the form of $a\hat{i} + b\hat{j}$.

A. $7\hat{i} + 24\hat{j}$

B. $8\hat{i} + 24\hat{j}$

C. $14\hat{i} + 48\hat{j}$

D. None of these

Answer: C

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4. A clock a minute-hand $10cm$ long. Find the average velocity between $6.00AM$ to $6.30AM$ for the tip of minute-hand.

A. $\frac{22}{21} cm \min^{-1}$

B. $\frac{2}{21} cm \min^{-1}$

C. $\frac{12}{21} cm \min^{-1}$

D. $\frac{2}{3} cm \min^{-1}$

Answer: D

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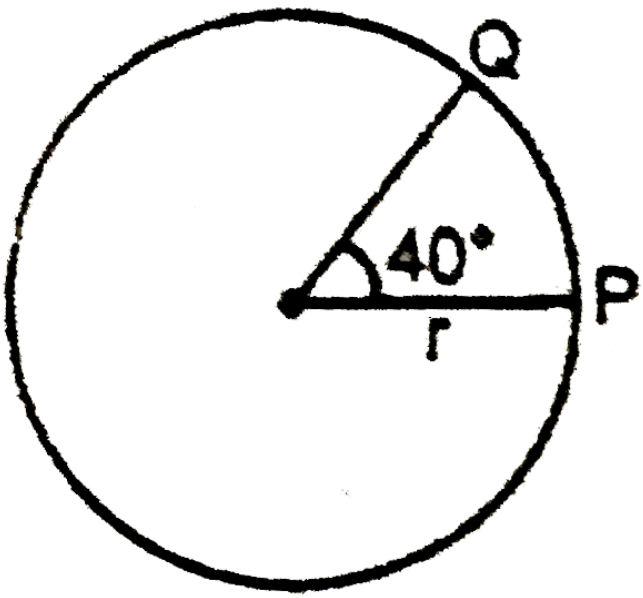
5. A particle is moving in a circle of radius r with speed v as shown in the figure. The magnitude of change in velocity in moving

from P to Q is



A. $2v\cos 40^\circ$

B. $2v\sin 20^\circ$

C. $2v\cos 20^\circ$

D. none of these

Answer: B

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

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

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

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

Answer: C

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7. Two bikes A and B start from a point. A moves with uniform speed $40m/s$ and B starts from rest with uniform acceleration $2m/s^2$. If B starts at $t = 10$ and A starts from the same point at $t = 10s$, then the time

during the journey in which A was ahead of B is :

A. $20s$

B. $8s$

C. $10s$

D. A is never ahead of B

Answer: D

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8. A stone is dropped from the top of tower. When it has fallen by $5m$ from the top, another stone is dropped from a point $25m$ below the top. If both stones reach the ground at the moment, then height of the tower from grounds is : (take $g = 10m/s^2$)

A. $45m$

B. $50m$

C. $60m$

D. $65m$

Answer: A

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9. For a particle moving in a straight line, the displacement of the particle at time t is given by

$S = t^3 - 6t^2 + 3t + 7$

What is the velocity of the particle when its acceleration is zero?

A. $-9ms^{-1}$

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

C. $3ms^{-1}$

D. $42ms^{-1}$

Answer: A

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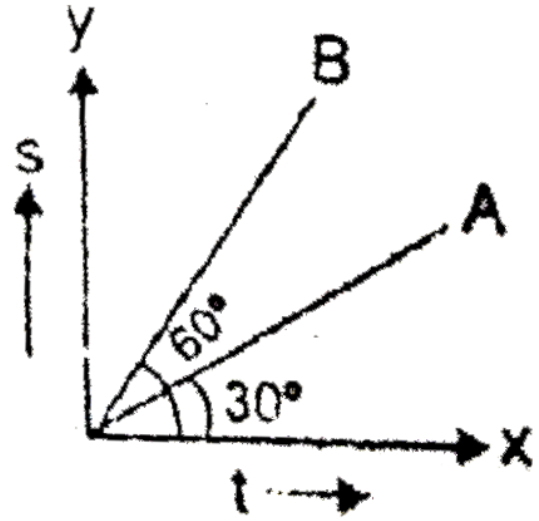
10. The displacement time graphs of two bodies A and B are shown in figure. The ratio

of velocity of A to velocity of B, v_A / v_B is:



A. $\frac{1}{\sqrt{3}}$

B. $\sqrt{3}$

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

D. 3

Answer: C

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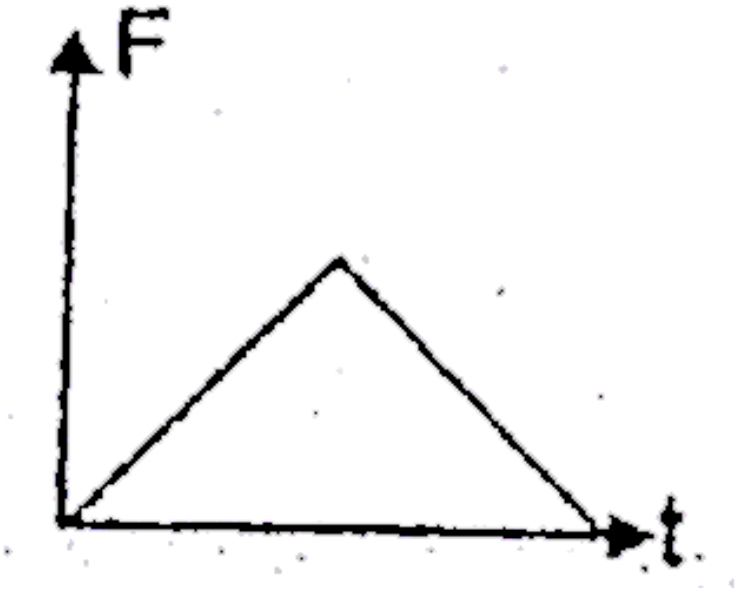
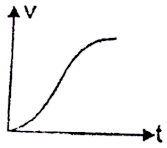
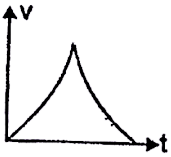
11. The force acting on a particle moving along a straight line varies with time as shown in diagram.



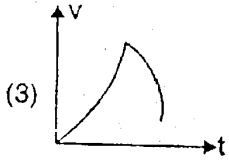
Which of the following graphs is best representative of its speed and time graphs. Initial velocity the particle is zero.



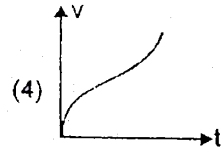
A.



B.



C.



D.

Answer: A

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12. A particle initially at rest is subjected to two forces, one is constant, the other is retarding force proportional to the particle velocity. In the subsequent motion of the particle, the acceleration

A. will increases then decreases

B. will decreases than increases

C. will decreases to zero

D. will decrease and become constant at some non zero value.

Answer: C

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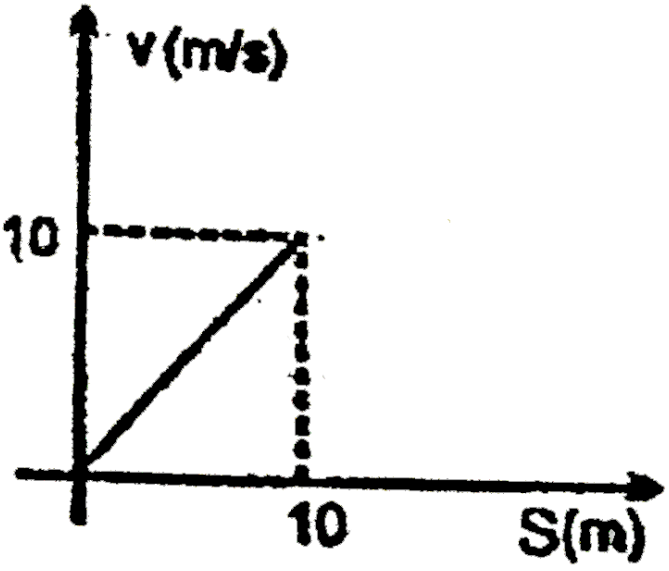
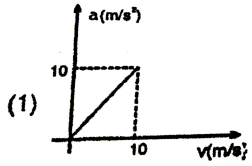
13. Velocity (v) versus displacement (s) graph of a particle moving in a straight line is shown in figure. Corresponding acceleration (a)

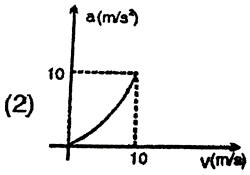
versus velocity (v) graph will be



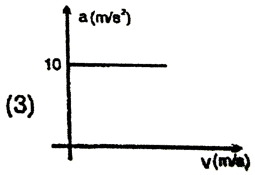
A.



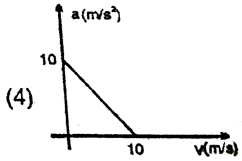
B.



C.



D.



Answer: A

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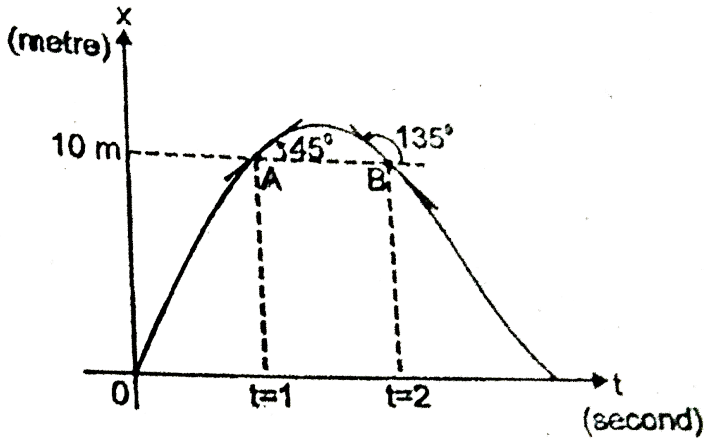
14. Displacement-time curve of a particle moving along a straight line is shown. Tangents at A and B makes angle 45° and

135° with positive x-axis respectively. The average acceleration of the particle during $t = 1, t = 2$ seconds is



A. $-2m/s^2$

B. $1m/s^2$

C. $-1m/s^2$

D. zero

Answer: A

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15. Two identical balls are shot upward one after another at an interval of 2s along the same vertical line with same initial velocity of $40ms^{-1}$. The height at which the balls collide is

A. $120m$

B. $75m$

C. $200m$

D. $45m$

Answer: B

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16. A stone thrown upwards with a speed u from the the top of the tower reaches the ground with a speed 3u. The 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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17. Three particles are projected upwards with initial speeds $10m/s, 20m/s, 30m/s$. The

displacements covered by them in their last second of motion are x_1, x_2, x_3 then:

A. $x_1 : x_2 : x_3 = 1 : 2 : 3$

B. $x_1 : x_2 : x_3 = 1 : 4 : 9$

C. $x_1 : x_2 : x_3 = 1 : 5 : 7$

D. none of these

Answer: D

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18. A ball is thrown vertically upwards from the top of tower of height h with velocity v . The ball strikes the ground after time.

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

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

C. $\frac{v}{g}\left(1+\frac{2gh}{v^2}\right)^{1/2}$

D. $\frac{v}{g}\left(1-\frac{2gh}{v^2}\right)^{1/2}$

Answer: A

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19. Particle is projected along a rough horizontal table, its path must be : (assuming only gravity and contanct force due to the table acting).

A. straight line

B. circular

C. parabolic

D. elliptical

Answer: A

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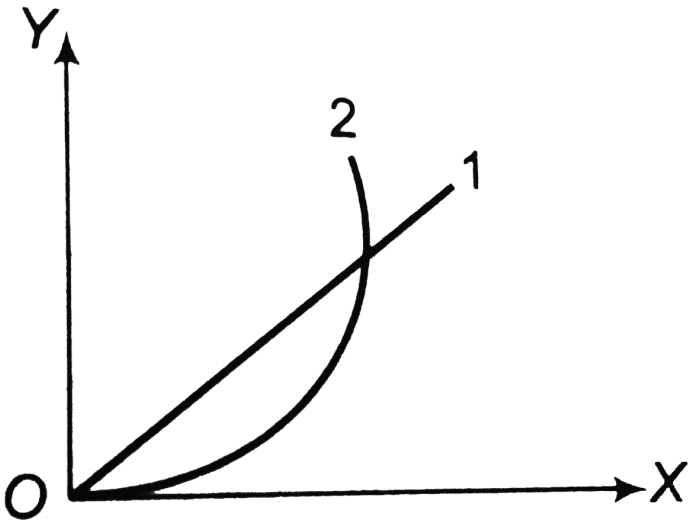
20. A particle is resting over a smooth horizontal floor. At $t = 0,$ a horizontal force starts acting on it. Magnitude of the force increases with time according to law $F = \alpha t,$ Where alpha is a positive constant. From

figure, which of the following statements are



correct ?

A. Curve 1 shows acceleration against time

B. Curve 2 shows velocity against time

C. Curve 2 shows velocity against acceleration

D. none of these

Answer: D

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21. A particle is moving with initial velocity $\bar{u} = \hat{i} - \hat{j} + \hat{k}$. What should be its acceleration so that it can remain moving in the same straight line?

A. $\vec{a} = 2\hat{i} - 2\hat{j} + 2\hat{k}$

B. $\vec{a} = -2\hat{i} + 2\hat{j} + 2\hat{k}$

C. $\vec{a} = 3\hat{i} + 3\hat{j} + 3\hat{k}$

D. $\overrightarrow{a} = 1\hat{i} - 1\hat{j}$

Answer: A

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22. A particle moving along a straight line with a constant acceleration of $-4m/s^2$ passes through a point A on the line with a velocity of $+8m/s$ at some moment. Find the distance travelled by the particle in 5 seconds after that moment.

A. 10

B. 26

C. 13

D. 20

Answer: B

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23. A moving train is stopped by applying brakes. It stops after travelling $80m$. If the

speed of the train is doubled and retardation remain the same, it will cover a distance-

A. Same as earlier

B. Double the distance covered earlier

C. Four times the distance covered earlier

D. Half the distance covered earlier

Answer: C

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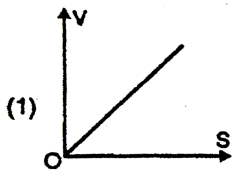
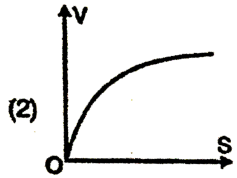
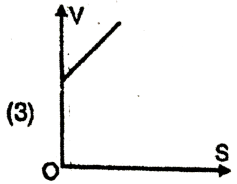
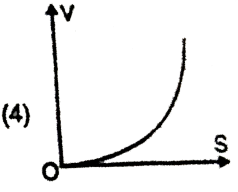
24. A particle starts from rest and moves along a straight time with constant acceleration. The variation of velocity v with displacement s is

A. 

B. 

C. 

D. 

Answer: B

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25. A body starts from rest, what is the ratio of the distance travelled by the body during the 4th and 3rd s?

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

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

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

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

Answer: A

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26. The initial velocity of a body moving along a straight lines is $7m/s$. It has a uniform acceleration of $4m/s^2$ the distance covered by the body in the 5^{th} second of its motion is-

A. $25m$

B. $35m$

C. $50m$

D. $85m$

Answer: A

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27. Acceleration of a particle under projectile motion at the highest point of its trajectory is :

A. g

B. zero

C. less than g

D. dependent upon projection velocity

Answer: A

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28. A particle A is projected with speed V_A from a point making an angle 60° with the horizontal. At the same instant, a second particle B is thrown vertically upwards from a point directly below the maximum height

point of parabolic path of A, with velocity V_B .

If the two particles collide then the ratio of V_A / V_B should be:

A. 1

B. $2/\sqrt{3}$

C. $\sqrt{3}/2$

D. $\sqrt{3}$

Answer: B

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29. A particle is projected from a horizontal floor with speed $10m/s$ at an angle 30° with the floor and striking the floor after sometime. State which is correct.

A. velocity of particle will be perpendicular to initial direction two seconds after projection.

B. minimum speed of particle will be $5m/\sec.$

C. Displacement of particle after half second will be $35/4m$.

D. None of these

Answer: D

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30. A particle is projected up the inclined such that its component of velocity along the incline is $10m/s$. Time of flight is 2 sec and

maximum height above the incline is $5m$. Then velocity of projection will be

A. $10m/s$

B. $10\sqrt{2}m/s$

C. $5\sqrt{5}m/s$

D. none

Answer: B

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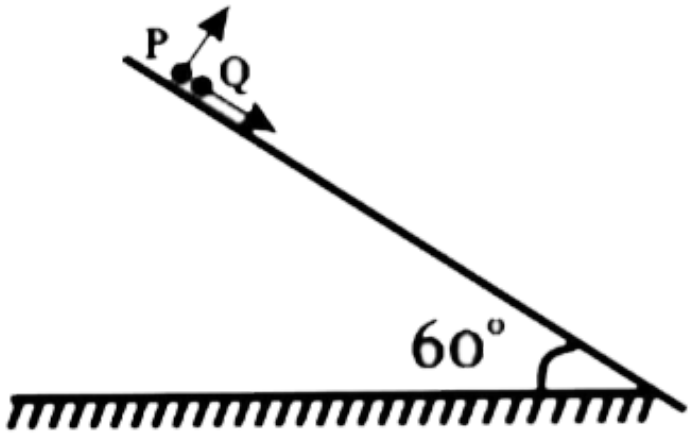
31. A particle P is projected from a point on the surface of a smooth inclined pane (see figure). Simultaneously another particle Q is released on the smooth inclined plane from the same postion. P and Q colide on the inclined plane after $t = 4$ seconds. Find the speed projection in m/s.



A. $5m/s$

B. $10m/s$

C. $15m/s$

D. $20m/s$

Answer: B

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32. Velocity of a stone projected, 2 second bofore it reaches the maximum height makes

angle 53° with the horizontal then the velocity at highest point will be

A. $20m/s$

B. $15m/s$

C. $25m/s$

D. $80/3m/s$

Answer: B

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33. A stone projected at angle θ with horizontal from the roof of a tall building falls on the ground after three seconds. Two second after the projection it was again at the level of projection. Then the height of the building

A. $5m$

B. 25 m

C. 20m

D. 15m

Answer: D

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34. A stone projected at angle 53° attains maximum height 25m during its motion in air. Then its distance from the point of projection where it will fall is

A. 75m

B. $\frac{400}{3}m$

C. $50m$

D. $60m$

Answer: A

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35. A particle is projected with speed $10m/s$ at angle 60° with the horizontal. Then the time after which its speed becomes half of initial.

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

B. $1\,\text{sec}$

C. $\sqrt{3/2}\,\text{sec}$

D. $\sqrt{3}/2\,\text{sec}$

Answer: D

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36. A stone is projected with speed $20m/s$ at angle 37° with the horizontal and it hits the ground with speed $12m/s$ due to air resistance. Assume the effect of air resistance

to reduce only horizontal component of velocity. Then the time of flight will be-

A. greater than $2.4\,\sec$

B. less than $2.4\,\sec$

C. $2.4\,\sec$

D. depends on other data

Answer: C

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37. Speed at the maximum height of a projectile is half of its initial speed u. Its range on the horizontal plane is :

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

B. $\frac{\sqrt{3}u^2}{2g}$

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

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

Answer: B

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38. Distance between a frog and an insect on a horizontal plane is 10m. Frog can jump with a maximum speed of $\sqrt{10}m/s$. Minimum number of jumps required by the frog to catch the insect is : $g = 10m/s^2$.

A. 5

B. 10

C. 100

D. 50

Answer: B

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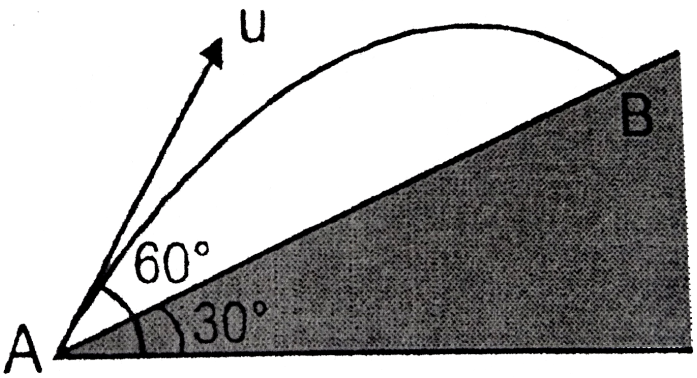
39. A stone is projected from point A with speed u making an angle 60° with horizontal as shown. The fixed inclined surface makes an angle 30° with horizontal. The stone lands at B after time t. Then the distance AB is equal

to .



A. $\frac{ut}{\sqrt{3}}$

B. $\frac{\sqrt{3}ut}{2}$

C. $\sqrt{3}ut$

D. $2ut$

Answer: A

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40. A projectile can have the same range 'R' for two angles of projection . If $'T_1'$ and $'T_2'$ to be times of flights in the two cases, then the product of the two times of flights is directly proportional to .

A. $1/R^2$

B. $1/R$

C. R

D. R^2

Answer: C

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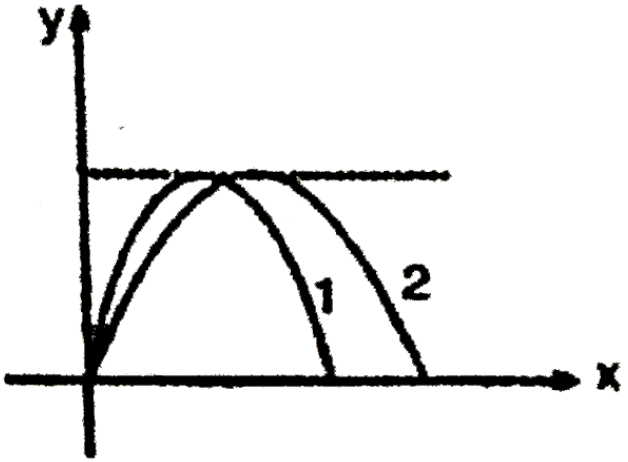
41. Two stones are projected from level ground. Trajectory of two stones are shown in figure. Both stones have same maximum heights above level ground as shown. Let T_1 and T_2 be their time of flights and u_1 and u_2 be their speeds of projection respectively

(neglect air resistance). then



A. $T_2 > T_1$

B. $T_1 = T_2$

C. $u_1 > u_2$

D. $u_1 = u_2$

Answer: B

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42. One stone is projected horizontally from a $20m$ high cliff with an initial speed of $10ms^{-1}$. A second stone is simultaneously dropped from that cliff. Which of the following is true?

A. Both strike the ground with same speed.

B. Tha ball with initial speed $10ms^{-1}$ reaches the ground first.

C. The ball which is dropped, reaches the ground first.

D. Both strike the ground with different speed

Answer: D

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43. A small rolls of the top of a stairway horizontally with a velocity of $4.5ms^{-1}$. Each step is 0.2 m high and 0.3 m wide. If g is

$10ms^{-2}$, then the ball will strike the nth step where n is equal to (assume ball strike at the edge of the step).

A. 10

B. 9

C. 8

D. 11

Answer: B

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44. A projectile is thrown with velocity v making an angle θ with the horizontal. It just crosses the top of two poles,each of height h, after 1 seconds 3 second respectively. The time of flight of the projectile is

A. 2s

B. 6s

C. 8s

D. 4s

Answer: D

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45. An arrow is shot in air, its time of flight is 5 sec and horizontal range is 200 m. the inclination of the arrow with the horizontal is

A. $\tan^{-1}.\frac{5}{8}$

B. $\tan^{-1}.\frac{8}{5}$

C. $\tan^{-1}.\frac{1}{8}$

D. 45°

Answer: A

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46. Two projectiles are projected angle $\left(\frac{\pi}{4}+\theta\right)$ and $\left(\frac{\pi}{4}-\theta\right)$ with the horizontal , where $\theta < \frac{\pi}{4}$, with same speed. The ratio of horizontal ranges described by them is

A. $2:1$

B. $1:2$

C. $1:1$

D. $2:3$

Answer: C

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47. The time of flight of a projectile is 10 s and range is 500m. Maximum height attained by it is $[g = 10m / s^2]$

A. $25m$

B. $50m$

C. $82m$

D. $125m$

Answer: D

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48. An eaeroplane is to go along straight line from A to B, and back again. The relative speed with respect to wind is V. The wind blows perpendicular to line AB with speed v. The distance between A and B is l. The total time for the round trip is:

A. $\frac{2l}{\sqrt{V^2 - v^2}}$

B. $\frac{2vl}{V^2 - v^2}$

C. $\frac{2vl}{V^2 - v^2}$

D. $\frac{2l}{\sqrt{V^2 + v^2}}$

Answer: A

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49. A man crosses the river perpendicular to river in time t seconds and travels an equal distance down the stream in T seconds. The

ratio of man's speed in still water to the river water will be:

A. $\frac{t^2 - T^2}{t^2 + T^2}$

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

C. $\frac{t^2 + T^2}{t^2 - T^2}$

D. $\frac{T^2 + t^2}{T^2 - t^2}$

Answer: C

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50. Passenger of a train just drops a stone from it. The train was moving with constant velocity. What is path of the stone as observed by (a) the passenger itself, (b) a man standing on ground?

A. parabola

B. straight line for sometimes & parabola for the remaining time

C. straight line

D. variable path that cannot be defined

Answer: C

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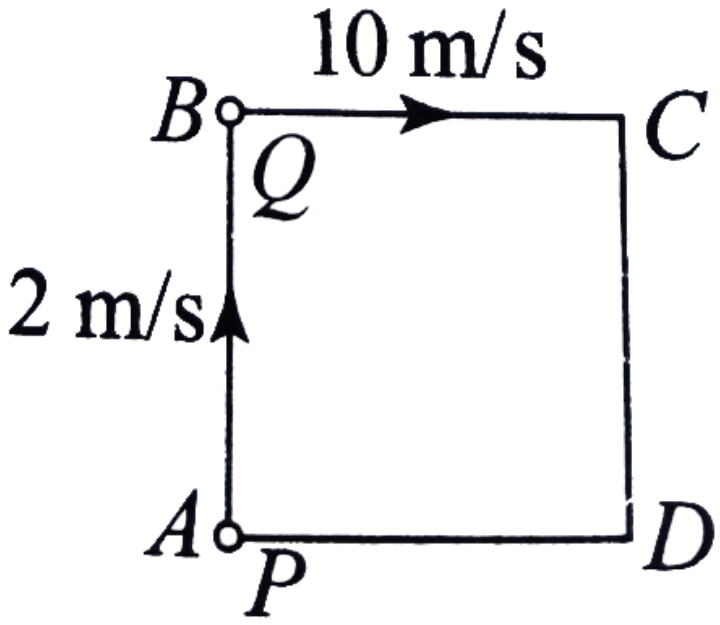

51.

Two men P & Q are standing at corners A & B of square ABCD of side 8m. They start moving

along the track with constant speed $2\frac{m}{s}$ and $10\frac{m}{s}$ respectively. Find the time when they will meet for the first time

A. $2\,\text{sec}$

B. $3\,\text{sec}$

C. $1\,\text{sec}$

D. $6\,\text{sec}$

Answer: B

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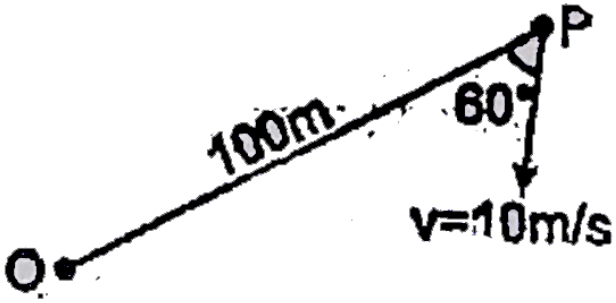
52. P is a point moving with constant speed $10m/s$ such that is velocity vector always maintains an angle 60° with line OP as shown in figure (O is a fixed point in space). The initial distance between O and P is 100 m.



A. $10\,\text{sec}$

B. $15\,\text{sec}$

C. $20\,\sec$

D. $20\sqrt{3}\,\sec$

Answer: C

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53. A coin is released inside a lift at a height of 2m from the floor of the lift. The height of the lift is 10 m. The lift is moving with an acceleration of $9m/s^2$downwards. The time

after which the coin will strike with the lift is :

$(g = 10m/s^2)$

A. 4s

B. 2s

C. $\frac{4}{\sqrt{21}}s$

D. $\frac{2}{\sqrt{11}}s$

Answer: B

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54. A man is holding an umbrella at angle 30° with vertical with lower end towards himself, which is appropriate angle to protect him from rain for his horizontal velocity $10m/s$. Then which of the following will be true-

A. rain is falling at angle 30° with vertical.

Towards the man

B. rain may be falling at angle 30° with

vertical, away from the man

C. rain is falling vertically

D. none of these

Answer: B

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55. A man is sitting inside a moving train and observes the stationary objects outside of the train. Then choose the single correct choice from the following statements –

A. all stationary objects outside the train will move with same velocity in opposite direction of the train with repsect to the man.

B. stationary objects near the train will move with greater velocity & objects far

from train will move with lesser velocity with respect to the man.

C. large objects like moon or mountains will move with same velocity as that of the train.

D. all of these

Answer: A

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56. Which of the following is true ?

A. path of particle moving along a straight line with respect to the observer moving along another straight line must be straight line.

B. path of the particle depends upon the coordinate axis system taken.

C. path of the man who projects a particle, will be parabolic with respect to the

particle.

D. none of these

Answer: D

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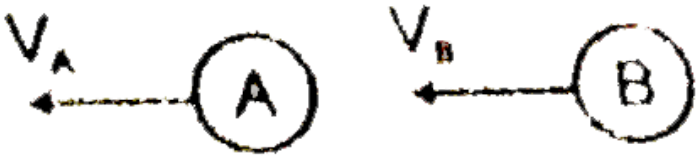
57. Two particles are moving along a straight line as shown. The velocity of approach between A and B is



A. $V_A + V_B$

B. $|V_A - V_B|$

C. $V_A - V_B$

D. $V_B - V_A$

Answer: D

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58. A man who can swin at the rate of 2 $\left(\frac{km}{h}r\right)$ (in still river) crosses a river to a point

exactly opposite on the other bank by swimming in a direction of 120° to the flow of the water in the river. The velocity of the water current in $\frac{km}{hr}$ is

A. 1

B. 2

C. $1/2$

D. $3/2$

Answer: A

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59. A river is flowing from west to east at a speed of $5 metres per \ min \ ute$. A man on the south bank of the river , capable of swimming at $10 metres per \ min \ ute$, in still water , wants to swim across the river in the shortest time . He should swim in a direction

A. due north

B. 30° east of north

C. 30° west of north

D. 60° east of north

Answer: A

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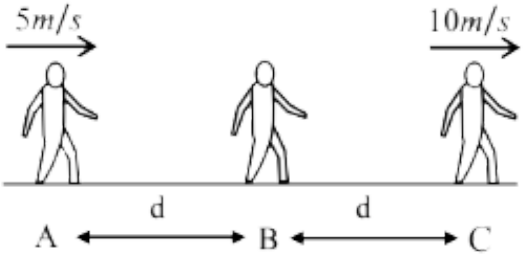
60. Three persons A, B and C are moving along a straight line with constant speed in same direction as shown in figure. Speed of A is 5 m/s and speed of C is 10 m/s. Initially separation between A and B is ‘d’ and between B and C is also d. When ‘B’ catches ‘C’, separation between A and C becomes 3d. Then

the speed of B will be:



A. $7.5m/s$

B. $15m/s$

C. $20m/s$

D. $5m/s$

Answer: B

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61. A jet airplane travelling at the speed of $500kmh^{-1}$ ejects its products of combustion at the speed of $1500kmh^{-1}$ relative to the jet plane. The speed of the products of combustion with respect to an observer on the ground is

A. $1000kmh^{-1}$ in the direction west to east

B. $1000kmh^{-1}$ in the direction east to west

C. $2000kmh^{-1}$ in the direction west to east

D. $2000kmh^{-1}$ in the direction east to west

Answer: A

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62. A man is on ship which is moving in east direction with speed $60km/hr$. Waves of ocean is taking ship towards west with speed

$20km/hr$. Man start running on ship with flag in his hand in north direction with speed $30km/hr$ and wind is blowing with $50km/hr, 37^\circ$ towards south of west then find the direction of flutter the flag as seen by man on ground.

A. 37° south of west

B. 53° south of west

C. 37° west of north

D. flag with not flutter

Answer: A

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63. A battalion of soldiers is ordered to swim across a river $500m$ wide. At what minimum rate should they swim perpendicular to river flow in order to avoid being washed away by the waterfall 300 m downstream. The speed of current being 3m/sec:

A. $10m/s$

B. $5m/s$

C. $4m/s$

D. $3m/s$

Answer: B

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64. A stone is just released from the window of a train moving along a horizontal straight track. The stone will hit the ground in

A. Straight line path

B. Circular path

C. Parabolic path

D. Hyperbolic path

Answer: C

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65. The motion of a projectile as seen from other projectile is

A. Accelerated motion

B. Uniform motion

C. Motion with uniform distance

D. None of these

Answer: B

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