PHYSICS

BOOKS - SARAS PUBLICATION

KINEMATICS

Example

1. A and B are two vectors and θ is the angle between them, if $\left|\vec{A} \times \vec{B}\right| = \sqrt{3}\left(\vec{A} . \vec{B}\right)$ the value of θ is :

A. 90°

B. 60°

C. 45°

D. 30°

Answer:

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

$f = f_0\left(1 - \frac{t}{T}\right)$ where f_0 and T are constants . The particle at t=0 has zero velocity . In the time interval between t=0 and the instant when f=0, the particle's velocity (ν_x) is:

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

B. f_0t

C. $\frac{1}{2}f_0T^2$

D. f_0T^0

Answer:

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

A. 24 m

B. 32 m

C. 54 m

D. 81 m

Answer:

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4. The distance travelled by a particle starting from rest and moving with an acceleration $\frac{4}{3}ms^{-2}$ in the third second is:

A. 6 m

B. 4m

C. $\frac{10}{3}m$

D. $\frac{19}{3}m$

Answer:

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5. A thin circular ring of mass M and radius R is rotating in a horizontal plane about an axis vertical to its plane with a constant angular velocity ω . If two objects each of mass m be attached gently to the opposite ends of a diameter of the ring, the ring will then rotate with an angular velocity:

A. $\frac{\omega M}{M+2m}$

B. $\frac{\omega(M+2m)}{M}$

C. $\frac{\omega M}{M+m}$

D. $\frac{\omega(M-2m)}{M+2m}$

Answer:

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6. A rectangular, a square, a circular and an elliptica loop, all in the (x -y) plane, are moving out of a uniform magnetic field with a

constant velocity, $\overrightarrow{V} = v\hat{i}$ The magnetic field is directed along the negative z axis direction. The induced emf. during the passage of these loops, out of the field region, will not reman constant for:

A. the circular and the elliptical loops

B. only the elliptical loop

C. any of the four loops

D. the rectangular, circular and elliptical loops

Answer:

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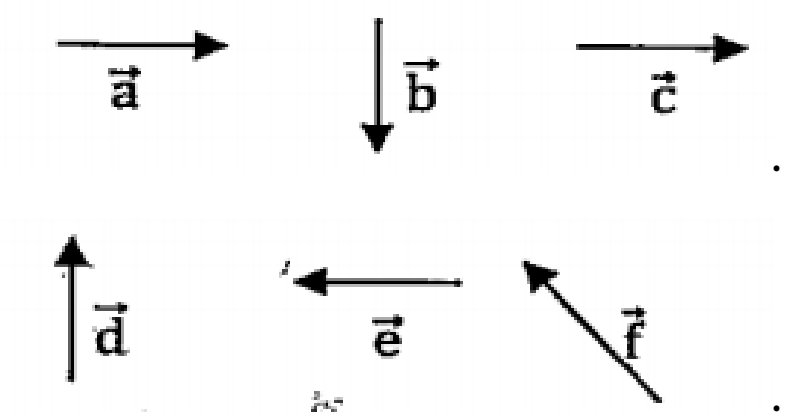
7. Six vectors , a through f have the magnitude and directions indicated in the figure.



A. $\vec{b} + \vec{c} = \vec{f}$

B. $\vec{d} + \vec{c} = \vec{f}$

C. $\vec{d} + \vec{e} = \vec{f}$

D. $\vec{b} + \vec{e} = \vec{f}$

Answer:

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8. The dimensions of $(\mu_0 \varepsilon_0)^{-\frac{1}{2}}$ are :

A. $\left[L^{-\frac{1}{2}} T^{\frac{1}{2}}\right]$

B. $\left[L^{\frac{1}{2}} T^{\frac{1}{2}}\right]$

C. $\left[L^{-1}T\right]$

D. $\left[LT^{-1}\right]$

Answer:

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9. The instantaneous angular position of a point on a rotating wheel is given by the equation $\theta(t) = 2t^3 - 6t^2$. The torque on the wheel becomes zero at:

A. t=2s

B. t=1s

C. t=0.2s

D. t=0.25s

Answer:

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10. Two spheres A and B of masses m_1 and m_2 respectively collide . A is at rest initially and B is moving with v velocity along x-axis . After

collision B has a velocity $\frac{v}{2}$ in a direction perpendicular to the original direction . The mass A moves after collision in the direction.

A. opposite to that of B

B. $\theta = \frac{\tan^{-1} 1}{2}$ to x-axis

C. `theta = tan^(-1) to x-axis

D. same as that of B

Answer:

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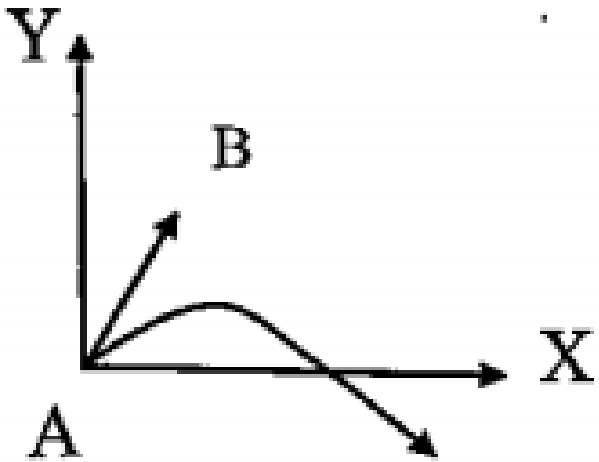
11. The velocity of a projectile at the initial point A is $\left(2\hat{i}+3\hat{j}\right)m/s$. Its velocity $(\in m/s)$ at point B :



A. $-2\hat{i}-3\hat{j}$

B. $-2\hat{i}+3\hat{j}$

C. $2\hat{i}-3\hat{j}$

D. $2\hat{i}+3\hat{j}$

Answer:

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

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

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

D. $h_1 = h_2 = h_3$

Answer:

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13. A small object of uniform density rolls up a curved surface with an initial velocity v .It reaches up to a maximum height of $\frac{3v^2}{4}g$ with respect to the initial position . The object is :

A. Ring

B. Solid sphere

C. Hollow sphere

D. Disc

Answer:

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14. Vectors $\vec{A}, \vec{B}$ and $\vec{C}$ are such that $\vec{A} . \vec{B} = 0$ and $\vec{A} . \vec{C} = 0$. Then the vectors parallel to $\vec{A}$

A. $\vec{B}$ and $\vec{C}$

B. $\vec{A} \times \vec{B}$

C. $\vec{B} + \vec{C}$

D. $\vec{B} \times \vec{C}$

Answer:

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15. The displacement 'x' (in meter)of a particle of mass 'm' (in kg) moving in one dimension under the action of a force, is related to time

't' (in sec) by $t = \sqrt{x} + 3$. The displacement of the particle when its velocity is zero will be:

A. 2m

B. 4 m

C. Om(zero)

D. 6 m

Answer:

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16. A particle is moving such that its position coordinates (x,y) are (2m,3m) at time t=0 , (6m,7m) at time t=2s Average velocity vectors $(V_a v)$ from t=0 to t=5 s is :

A. $\frac{1}{5}\left[13\hat{i}+14\hat{j}\right]$

B. $\frac{7}{3}\left[\hat{i}+\hat{j}\right]$

C. $2\left[\hat{i}+\hat{j}\right]$

D. $\frac{11}{5}\left[\hat{i}+\hat{j}\right]$

Answer:

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17. A balloon with mass m is descending down with an acceleration a (where a < g).How much mass should be removed from it so that it starts moving up with an acceleration a?

A. $\frac{2ma}{g+a}$

B. $\frac{2ma}{g-a}$

C. $\frac{ma}{g+a}$

D. $\frac{ma}{g-a}$

Answer:

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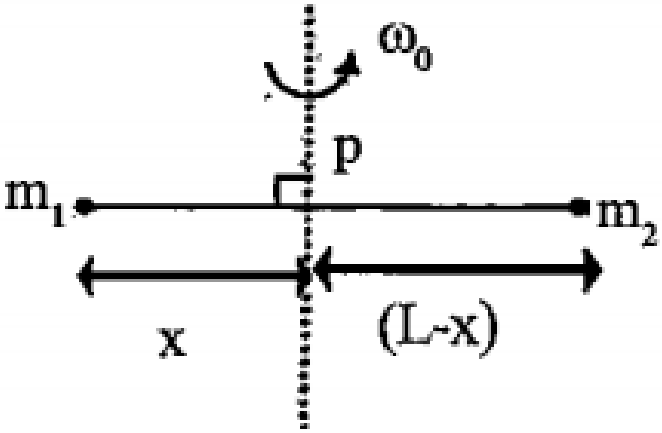
18. Point massesm_1 and m_2 are placed at the opposite ends of a rigid rod of length L, and negligible mass . The position of point p on this rod through which the axis should p on this rod through which the axis should pass so that the work required to set the rod rotating with angular velocity ω_0 is minimum , is given

by:



A. $x = m_2 \frac{L}{m_1 + m_2}$

B. $x = m_1 \frac{L}{m_1 + m_2}$

C. `x=(m_1)/(m_2)L

D. $x = \frac{m_2}{m_1} L$

Answer:

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19. What is the minimum velocity with a body of mass m must enter a vertical loop of radius R so that it can complete the loop ?

A. $\sqrt{5gR}$

B. $\sqrt{gR}$

C. $\sqrt{2gR}$

D. $\sqrt{3gR}$

Answer:

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20. If the magnitude of sum of two vectors is equal to the magnitude of difference to two vectors, the angle between these vector is :

A. 180°

B. 0°

C. 90°

D. 45°

Answer:

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21. Two cars P and Q starts from a point at the same time in a straight line and their positions are represented by $X_p(t) = at + bt^2$ and $X_0(t) = ft - t^2$.At when time do the cars have the same velocity?

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

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

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

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

Answer:

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22. Preeti reached the metro station and found that the escalator was not working . She walked up the stationary escalator in time t_1 . On other days , if she remains stationary on the moving escalator takes her up in time t_2.

The time taken by her to walk up on the moving escalator will be:

A. $\frac{t_1 t_2}{t_2 - t_1}$

B. $\frac{t_1 t_2}{t_2 + t1}$

C. $t_1 - t_2$

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

Answer:

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23. The x and y coordination of the particle at any time are $x = 5t - 2t^2$ and y =10 t respectively , where x and y are in metres and t in seconds . The acceleration of the particle at t=2s is:

A. $5m/s^2$

B. $-4m/s^2$

C. $-8m/s^2$

D. 0

Answer:

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