PHYSICS

BOOKS - MODERN PUBLICATION PHYSICS (KANNADA ENGLISH)

DESCRIPTION OF MOTION IN TWO AND THREE DIMENSION

Mcq Level I

1. Given $\vec{A} = 2\hat{i} - \hat{j} + 2\hat{k}$. The unit vector of $\vec{A} - \vec{B}$ is:

A. $\frac{\vec{k}}{\sqrt{10}}$

B. $\frac{3\hat{i}}{\sqrt{10}}$

C. $\frac{3\hat{i} + \hat{j}}{\sqrt{10}}$

D. $\frac{-3\hat{i} + \hat{k}}{\sqrt{10}}$

Answer: C

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2. A force of $\left(10\hat{i}-3\hat{j}+6\hat{k}\right)$ newton acts on a body of mass 100 g and displaces it from $\left(6\hat{i}+5\hat{j}-3\hat{k}\right)$ metre to $\left(10\hat{i}-2\hat{j}+7\hat{k}\right)$m. The work done is:

A. 21J

B. 361J

C. 121J

D. 1000J

Answer: C

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3. A jeep is moving on a straight road due north with a uniform speed of 60 km h^{-1}. When it turns left through 90°. If the speed remains unchanged after turning, the change in the velocity of the jeep in the turning process is :

A. 50 km h^{-1} the west

B. 60 $\sqrt{2}kmh^{-1}$ in N-W direction

C. 60 $\sqrt{2}kmh^{-1}$ in S-W direction

D. None of these.

Answer: C

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4. The magnitude of vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$ are 12, 5 and 13 units and $\vec{A} + \vec{B} = \vec{C}$. The angle between A and B is :

A. 0°

B. 45°

C. 90°

D. 180°

Answer: C

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5. $\vec{A}$ and $\vec{B}$ are two vectors in a plane and $\vec{C}$ is a vector perpendicular to this plance their resultant is :

A. Never zero

B. Zero

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

D. lies between $\vec{A}$ and $-\vec{B}$

Answer: A

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6. If $\vec{A} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{B} = 4\hat{i} + 6\hat{j} - 2\hat{k}$ the angle between $\vec{A}$ and $\vec{B}$ will be:

A. π

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

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

D. 0°

Answer: D

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7. If $\vec{A} = 2\hat{i} + 3\hat{j} + 8\hat{k}$ is perpendicular to $\vec{B} = 4\hat{j} - 4\hat{i} + \alpha\hat{k}$, then the value of α

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

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

C. 1

D. -1

Answer: B

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8. What is the angle between x-axis and a force represented by $\vec{F} = 2\hat{i} + 3\hat{j} + 4\hat{k}$?

A. $\cos^{-1}\left(\frac{3}{\sqrt{29}}\right)$

B. $\cos^{-1}\left(\frac{3}{\sqrt{29}}\right)4$

C. $\cos^{-1}\left(\frac{5}{\sqrt{29}}\right)$

D. $\cos^{-1}\left(\frac{2}{\sqrt{29}}\right)$

Answer: D

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9. The co-ordinates of moving particle at any time t are given by x = at^2 and y = bt^2. The velocity magnitude of the particle :

A. $2t\sqrt{a^2 - b^2}$

B. $2t(a - b)$

C. $\sqrt{a^2 + b^2}$

D. $2t\sqrt{a^2 + b^2}$

Answer: D

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10. A body projected along an inclined plane of angle of inclination 300 stops after covering a distance x_1. The same body projected with the same speed stops after covering a distance x_2 when the angle of inclination of the inclined plane is increased to 60° the ratio of $x_1 / l x_2$ is

A. $\sqrt{2}$

B. 2

C. $\sqrt{3}$

D. 1

Answer: C

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11. After time 't' the height ‘y ’ of projectile is y = 8t - $5t^2$ and horizontal distance x = 6t if g=10

$ms^{-2}1$, velocity of projectile at this instant is

:

A. 10m/s

B. 8m/s

C. 6m/s

D. 4m/s

Answer: A

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12. A particle is projected with a velocity v so that its horizontal range twice the greatest height attained. The horizontal range is

A. $\frac{V^2}{g}$

B. $\frac{3}{5}\frac{V^2}{g}$

C. $\frac{4}{5}\frac{V^2}{g}$

D. $\frac{1}{5}\frac{V^2}{g}$

Answer: C

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13. Three forces $\left(2\hat{i}-3\hat{j}+4\hat{k}\right), \left(8\hat{i}-7\hat{j}+6\hat{k}\right)$ and $m\left(\hat{i}-\hat{j}+\hat{k}\right.$ keep a body in equilibirium. The value of m is:

A. 10

B. 20

C. -10

D. -20

Answer: C

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14. Two vectors of equal magnitude 'A' on addition give a resultant vector of magnitude 'A', then the magnitude of their difference vector is :

A. $\sqrt{2}$A

B. $\sqrt{3}A$

C. $2A$

D. $3A$

Answer: B

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15. A force vector applied on a mass is represented as $\vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$ N and accelerates the mass at 5 ms^{-2} . The mass of the body is :

A. $2\sqrt{2}$kg

B. 40 kg

C. 1.6 kg

D. $2\sqrt{10}$ kg

Answer: A

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16. Rain is falling vertically downwards with a speed of 4 km h^{-1}. A girl moves on a straight road with a velocity of 3 km h^{-1}. The apparent velocity of rain with respect to the girl is :

A. 3 km h^{-1}

B. 4 km h^{-1}

C. 5 km h^{-1}

D. 7 km h^{-1}

Answer: C

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17. Two forces each equal to $\frac{F}{2}$, act at right angles. Their effect may be neutralised by a third force acting along their bisector in the opposite direction with a magnitude of:

A. F

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

C. $\sqrt{2}F$

D. $\frac{F}{2}$

Answer: B

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18. Given $\overrightarrow{A} = 2\hat{i} + 4\hat{j} - 6\hat{k}$. When a vector $\overrightarrow{B}$ is added to $\overrightarrow{A}$, we get a unit vector along x-axis. Then $\overrightarrow{B}$ is :

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

B. $-\hat{i} - 4\hat{j} + 6\hat{k}$

C. $-\hat{i} - 2\hat{j} + 6\hat{k}$

D. None of these.

Answer: B

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19. A boat is sent across the river with a velocity of 8 km/h. in a direction perpendicular

to flow of river. If resultant velocity of boat is 10 km/h, then velocity of river flow is :

A. 18 km/h

B. 2 km/h

C. 6 km/h

D. None of these

Answer: C

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20. A projectile of mass m is fired with velocity v from a point P at θ = 45°. Neglecting air friction, the magnitude of change of momentum between the leaving pt. P and arriving pt. Q is :

A. $\frac{mv}{\sqrt{2}}$

B. 2mv

C. $\frac{1}{2}mv$

D. $\sqrt{2}mv$

Answer: D

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21. A gun fires two bullets at 60° and 30° with the horizontal the bullets strike at same horizontal distance. The maximum heights for the two bullets are in the ratio :

A. $2:1$

B. $3:1$

C. $4:1$

D. $1:1$

Answer: B

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22. At what angle must the two forces (x + y) and (x - y) act so that the resultant may be $\left(x^2+y^2\right)^{1/2}$:

A. $\cos^{-1}\left[\frac{-x^2-y^2}{2(x^2-y^2)}\right]$

B. $\cos^{-1}\left[\frac{2\left(x^2+y^2\right)}{x^2-y^2}\right]$

C. $\cos^{-1}\left[\frac{x^2+y^2}{x^2-y^2}\right]$

D. $\cos^{-1}\left[\frac{-x^2-y^2}{x^2+y^2}\right]$

Answer: A

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23. Three vectors $\vec{A}, \vec{B}$ and $\vec{C}$ satisfy the relation $\vec{A}.\vec{B}=0$ and $\vec{A}.\vec{C}=0$. The vector $\vec{A}$ is parallel to:

A. $\vec{B}$

B. $\vec{C}$

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

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

Answer: D

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24. Two balls are projected from the same point in directions inclined at 60° and 30° to the horizontal. If they attain the same maximum height, the ratio of their velocities of projection is :

A. $1:1$

B. $1:2$

C. $1:73$

D. $\sqrt{3}:1$

Answer: C

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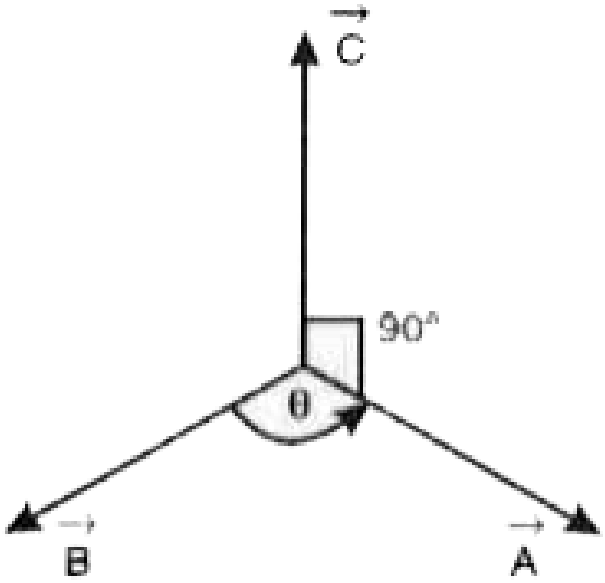
25. If the angle between the vectors $\vec{A}$ and $\vec{B}$ is θ, the value of the product $\left(\vec{B} \times \vec{A}\right).\vec{A}$

is equal to:



A. $BA^2 \sin\theta$

B. $BA^2 \cos\theta$

C. $BA^2 \sin\theta \cos\theta$

D. zero

Answer: D

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26. The greatest height to which a man can throw a stone is 100 m. The greatest distance to which he can throw it will be:

A. 100m

B. 25m

C. 50m

D. 200m

Answer: D

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27. A body is projected at an angle 30^{o} with the horizontal with momentum p. At its highest point the magnitude of the momentum is :

A. p

B. $\frac{p}{2}$

C. $\frac{\sqrt{3}}{2}p$

D. $\frac{2}{\sqrt{3}}p$

Answer: C

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28. If $\vec{A} . \vec{B} = \left|\vec{A} \times \vec{B}\right|$, then the resultant of $\vec{A}$ and $\vec{B}$ is:

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

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

C. $\sqrt{A^2 + B^2}$

D. $\sqrt{A^2 + B^2 + \sqrt{2}AB}$

Answer: D

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29. If R is the range and T is the time of flight of a projectile then the angle of projection is given by :

A. $\tan\theta = \frac{gT^2}{R}$

B. $\tan\theta = \frac{gT^2}{2R}$

C. $\tan\theta = \frac{T^2}{Rg}$

D. $\tan\theta = \frac{T^2}{2Rg}$

Answer: B

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30. A boat which has a speed 5 km/h in still water crosses a river 100 m along the shortest possible path in 1.5 min. The velocity of river water in km/h is :

A. 1

B. 3

C. 4

D. 4.1

Answer: B

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31. A persin moves 30 m north, then 20 m east and finally $30\sqrt{2}$ m south-west. The displacement from the original position is :

A. 14 m south-west

B. 10 m west

C. 28 m south

D. 15 m east

Answer: B

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32. A projectile is projected with a kinetic energy K. Its range is R. It will have the

minimum kinetic energy after covering the distance equal to :

A. 0.25R

B. 0.5R

C. 0.75R

D. R

Answer: B

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33. Which of the following is the largest when the height attained by the projectile is the greatest:

A. Range

B. Time of flight

C. Angle of projection with vertical.

D. None of these

Answer: B

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34. The magnitude of the vector product of two vectors is $\sqrt{3}$ times their scalar product. The angle between the vectors is :

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

B. $\frac{\pi}{6}$

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

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

Answer: C

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35. If a particle is at rest with three velocities of 14 units, 16 units and 26 units on it, then the angle between the directions of the two smaller velocities is :

A. 30°

B. 60°

C. 120°

D. 150°

Answer: B

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36. Two projectiles, one fired from earth with 5 ms -1 and other fired from a planet with 3 ms -1 at the same angle trace identical trajectories. Neglecting friction, what is the acceleration due to gravity on planet ?

(g = 9.8 ms^{-1}):

A. 3.5 ms^{-2}

B. $8.5ms^{-2}$

C. $1.5ms^{-2}$

D. $5.3ms^{-2}$

Answer: A

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37. The height y and the distance x along the horizontal plane of a prohectile on a certain planet (with no surrounding atmosphere) are given by y=8t-$5t^2$ meter and x=6t meter,where t is in seconds.The velocity with which the

projectile is projected is

(Acceleration due to gravity =9.8 m s^{-2})

A. $6ms^{-1}$

B. $8ms^{-1}$

C. $10ms^{-1}$

D. None of these

Answer: C

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38. The greatest height to which a man can throw a ball is 'A', the greatest distance to which he can throw it will be :

A. h

B. 2h

C. 3h

D. $\frac{h}{2}$

Answer: B

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39. A body is projected at an angle such that K.E. at the highest point is reduced to half the energy at point of projection. The angle of projection is :

A. 30°

B. 75°

C. 45°

D. 60°

Answer: C

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40. A large number of bullets are fired in all directions with same speed. What is the maximum area of their spread ?

A. $\frac{\pi v^4}{g^2}$

B. $\frac{\pi^2 v^2}{g^2}$

C. $\frac{\pi^2 v^4}{g^2}$

D. $\frac{\pi v^2}{g}$

Answer: A

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41. In case of a projectile fired at an angle equally inclined to a horizontal and vertical with velocity v, the greatest height is given by :

A. $\frac{v^4}{4g}$

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

C. $\frac{2v^2}{4}$

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

Answer: B

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42. A body is projected at an angle of 45° with K.E. 'E'. The K.E. at the highest point is :

A. Zero

B. $\frac{3E}{4}$

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

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

Answer: C

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43. A ball whose kinetic energy is E is projected at an angle of 45° to the horizontal. The kinetic energy of the ball at the highest point of its flight willbe:

A. Zero

B. $\frac{E}{4}$

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

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

Answer: C

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44. A body is projected at an angle of 60° with the horizontal with momentum p. At its highest point the magnitude of the momentum is :

A. $\frac{\sqrt{3}}{2}p$

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

C. p

D. $\frac{p}{2}$

Answer: D

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45. From the top of a tower 40 m high a ball is projected upwards with a speed of 20 ms -1 at an angle 30° with the horizontal. The ratio of the total time of flight to hit the ground to the time taken by it to come back to the same initial elevation (g = 10 ms^{-2}) is :

A. $3:2$

B. $4:1$

C. $3:1$

D. $2:1$

Answer: D

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46. The ceiling of a hall is 25 m. What is the maximum distance at which a ball can be thrown inside the hall ?

A. 100m

B. 50m

C. 75m

D. 25m

Answer: A

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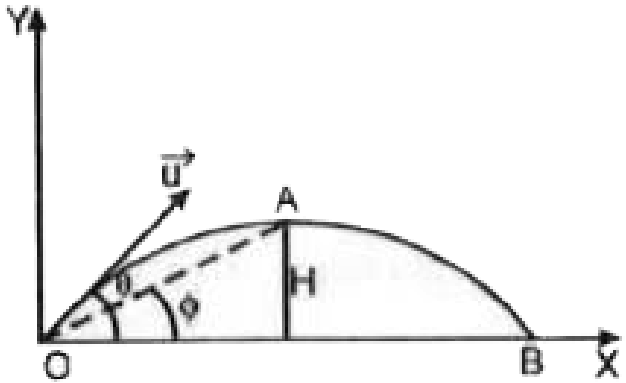
47. Figure shows the trajectory of a projectile fired at an angle θ with the horizontal. The elevation angle of the highest point as seen

from the point of launching is φ. The relation between φ and θ is :



A. $\tan\varphi = \frac{1}{2}\tan\theta$

B. $\tan^2\varphi = \frac{1}{2}\tan^2\theta$

C. $\sin\varphi = \frac{1}{2}\sin\theta$

D. $\cos^2\varphi = \frac{1}{2}\cos^2\theta$

Answer: A

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48. A ball is projected upwards from the top of a tower with velocity 50 ms^{-1} making an angle of 30° with the horizontal. If the height of the tower is 70 m, after what time from the instant of throwing, will the ball reach the ground (g = 10 ms^{-2}):

A. 2s

B. 5s

C. 7s

D. 9s

Answer: C

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49. A fighter plane flying horizontally passes over an antiaircraft gun with a uniform velocity 200 ms^{-1} . The gun can fire the shell with a velocity $200\sqrt{2}ms^{-1}$. At what angle should the gun fire the shell so as to hit the plane ?

A. 45°

B. 30°

C. 60°

D. 90°

Answer: A

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50. In the above question what should be the minimum height of plane so that it may not be hit by the shell ? (g = 10 ms^{-2}):

A. 1 km

B. 3km

C. 2km

D. 4km

Answer: C

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51. Consider $\vec{F} = 4\hat{i} - 3\hat{j}$. A vector perpendicular to $\vec{F}$ is :

A. $6\hat{i}$

B. $7\hat{k}$

C. $4\hat{i} + 3\hat{j}$

D. $3\hat{i} - 4\hat{j}$

Answer: B

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52. The angle between the vectors $\vec{A}$ and $\vec{B}$ is θ. The value of triple Product $\vec{A} . \vec{B} \times \vec{A}$ is :

A. $A^2B\cos\theta$

B. $A^2B\sin\theta$

C. A^2B

D. Zero

Answer: D

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53. With respect to a rectangular cartesian co-ordinate system three vectors are expressed as : $\vec{a} = 4\hat{i} - \hat{j}$, $\vec{b} = -3\hat{i} + 2\hat{j}$: $\vec{c} = -\hat{k}$

. The unit vector $\hat{r}$, along the direction of the sum of these vectors is :

A. $\hat{r} = \frac{1}{\sqrt{3}}\left(\hat{i} + \hat{j} - \hat{k}\right)$

B. $\hat{r} = \frac{1}{\sqrt{2}}\left(\hat{i} + \hat{j} - \hat{k}\right)$

C. $\hat{r} = \frac{1}{\sqrt{3}}\left(\hat{i} - \hat{j} + \hat{k}\right)$

D. $\hat{r} = \frac{1}{\sqrt{3}}\left(\hat{i} + \hat{j} + \hat{k}\right)$

Answer: A

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54. A particle of mass m is projected with velocity v making an angle of 45 with horizontal. Magnitude of angular momentum of particle about the point of projection when the particle is at its maximum height is

A. zero

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

C. $m^2\sqrt{2gh^3}$

D. $\frac{mv^3}{4\sqrt{2}g}$

Answer: D

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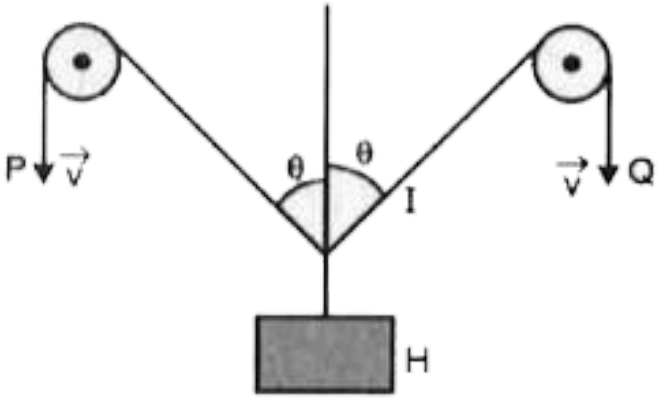
55. In the arrangement shown in the fig. the ends P and Q

color

of a string are being moved downwards with a speed of v each. The pulleys are fixed. The mass M moves upwards with a speed of :



A. $\frac{v}{\cos\theta}$

B. $\frac{2v}{\cos\theta}$

C. $v\cos\theta$

D. $2v\cos\theta$

Answer: A

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56. Find the torque due to force $\vec{F} = 2g = \hat{i} - 3\hat{j} + 4\hat{k}$ newton acting a

point with position vector $\vec{r} = 3\hat{i} + 2\hat{j} + 3\hat{k}$ metre about the origin :

A. $17\hat{i} + 6\hat{j} - 13\hat{k}$

B. $17\hat{i} - 6\hat{j} - 13\hat{k}$

C. zero

D. None of these

Answer: B

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57. The equation of projectile is $y = \sqrt{3} - \frac{g}{2}x^2$, the angle of its projection is :

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

B. zero

C. $\theta = \tan^{-1}\sqrt{3}$

D. $\theta = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$

Answer: C

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58. A projectile has same range R for the two angles of projection. If T_1 and T_2 are the times of flight in two cases, then:

A. $T_1 T_2 \propto R$

B. $T_1 T_2 \propto R^2$

C. $T_1 T_2 \propto \frac{1}{R}$

D. $T_1 T_2 \propto \frac{1}{R^2}$

Answer: A

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59. A projectile is thrown at an angle θ with the horizontal and its range is R_1 It is then thrown at an angle 0 with vertical and the range is R_2 then :

A. $R_1 = 4R_2$

B. $R_1 = 2R_2$

C. $R_1 = R_2$

D. $R_1 = \frac{R_2}{2}$

Answer: C

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60. Two projectiles A and B are thrown from the same point with velocities v and $\frac{v}{2}$ respectively. If B is thrown at an angle 45° with horizontal, what is the inclination of A when their ranges are the same ?

A. $\sin^{-1}\left(\frac{1}{4}\right)$

B. $\frac{1}{2}\sin^{-1}\left(\frac{1}{4}\right)$

C. $2\sin^{-1}\left(\frac{1}{4}\right)$

D. $\frac{1}{2}\sin^{-1}\left(\frac{1}{8}\right)$

Answer: B

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61. An object of mass 3 kg is at rest. A force $\vec{F} = 6\hat{i}t^2 + 4\hat{j}t$ is applied, then velocity of the object at t = 3 second is :

A. $18\hat{i} + 3\hat{j}$

B. $18\hat{i} + 6\hat{j}$

C. $3\hat{i} + 18\hat{j}$

D. $18\hat{i} + 4\hat{j}$

Answer: B

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62. A particle moves with velocity $\left(6\hat{i} - 4\hat{j} + 3\hat{k}\right) ms^{-1}$ under the influence of a constant force F = $20\hat{i} + 15\hat{j} - 5\hat{k}$ N. The instantaneous power applied to the particle is:

A. 35 J/s

B. 45 J/s

C. 25 J/s

D. 195 J/s

Answer: B

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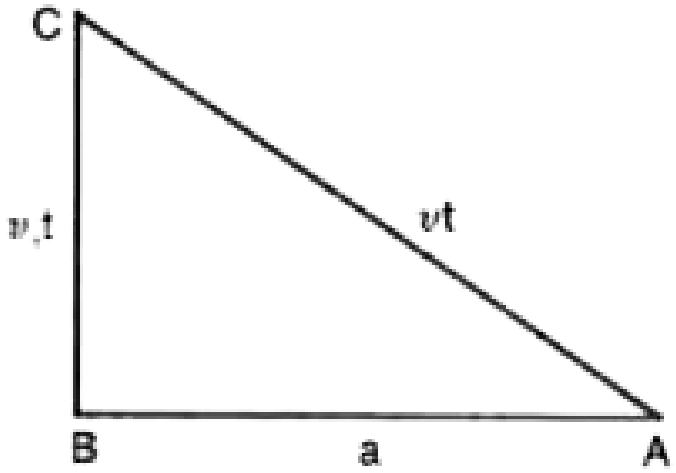
63. Two boys are standing at the ends A and B of a ground where AB = 'a'. The boy at B starts running in a direction perpendicular to AB with a velocity The boy at A also starts running simultaneously with velocity v in straight line

and catches the B in time then t is :



A. $\frac{a}{\sqrt{v^2 + v_1^2}}$

B. $\frac{a}{v + v_1}$

C. $\frac{a}{v - v_1}$

D. $\sqrt{\frac{a^2}{v^2 - v_1^2}}$

Answer: D

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64. A projectile is projected with initial velocity $(6\hat{i} + 8\hat{j})$ ms^{-1} if g = 10 ms^{-2}, then horizontal range is :

A. 4.8m

B. 9.6m

C. 19.2m

D. 14.0m

Answer: B

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65. A projectile is projected in vacuum at an angle 0, then square of the time it takes to reach the highest point shall be :

A. 2g times the greatest height

B. g times the greatest height

C. g/2 times the greatest height

D. 2/g times the greatest height

Answer: D

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66. If the vectors $\vec{P} = a\hat{i} + a\hat{j} + 3\hat{k}$ and $\vec{Q} = a\hat{i} - 2\hat{j} - \hat{k}$ are perpendicular to each other, then positive value of a is :

A. 3

B. 2

C. 1

D. zero

Answer: A

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67. Maximum height of a bullet when fired at 30° with the horizontal is 11m. Then height when it is fired with the horizontal at 60° is :

A. 22m

B. 6m

C. 33m

D. 7.8m

Answer: C

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68. The resultant of two forces is 20 N when one of force is $20\sqrt{3}$ N and angle between two forces is 30° then what is value of second force ?

A. 10N

B. 20N

C. $20\sqrt{3}N$

D. $10\sqrt{3}N$

Answer: B

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69. A body projected at an angle 45° with horizontal has range 16 m. It explodes into two parts of equal masses at the highest point. One of parts falls downwards at the point of explosion. At what distance from the point of throw, the other will fall ?

A. 8m

B. 16m

C. 24m

D. 32m

Answer: D

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70. A particle moves in X-Y plane under the action of forces F such that the values of linear momentum 'p' at any times is

$p_x = 2\cos t$ and $p_y = 2\sin t$. The angle between $\vec{F}$ and at the time t will be:

A. 0°

B. 30°

C. 90°

D. 180°

Answer: C

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71. An object is projected with velocity 20 ms^{-1} making an angle of 45° with horizontal. The equation for its trajectory is $h = Ax - Bx^2$ where h is the height and x the horizontal distance at any instant. The ratio of constant A:B is:

A. $1:2$

B. $5:1$

C. $1:40$

D. $40:1$

Answer: D

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72. A projectile is projected with a speed K Ve where Ve is escape velocity and K is a constant less than one. The maximum height reached by it from the centre of earth will be :

A. R

B. $\frac{R}{K^2-1}$

C. $\frac{R}{1-K^2}$

D. $\frac{K^2 - 1}{R}$

Answer: C

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73. If the relation between range R and time of flight T is given by R = 5 T2 , the angle of throw of the projectile is :

A. 45°

B. 15°

C. 60°

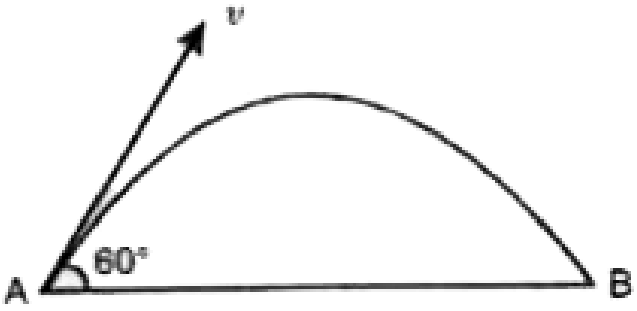
D. 90°

Answer: A

Watch Video Solution

74. A projectile of mass m is thrown with a velocity v making an angle 60^o with the horizontal. Neglecting air resistance, the change in momentum from the departure A to

its arrival at B, along the vertical directions :



A. 2mv

B. $\sqrt{3}$mv

C. mv

D. $\frac{mv}{\sqrt{3}}$

Answer: B

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75. A projectile is thrown with initial velocity $a\hat{i} + b\hat{j}$ m/s. If range of projection is twice the maximum height reached by it then :

A. $b = \frac{a}{2}$

B. b=a

C. b=2a

D. b=4a

Answer: C

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76. If $\vec{A} = 3\hat{i} + 4\hat{j}$ and $\vec{B} = 7\hat{i} + 24\hat{j}$. Find the vector having the same magnitude as $\vec{B}$ and is parallel to $\vec{A}$:

A. $15\hat{i} + 20\hat{j}$

B. $20\hat{i} + 15\hat{j}$

C. $3\hat{i} + 4\hat{j}$

D. $4\hat{i} + 3\hat{j}$

Answer: A

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

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

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

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

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

Answer: C

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78. A boy playing on the roof of a 10 m high building throws a ball with a speed of 10 m/s at an angle of 30° with the horizontal. How far from the throwing point will be ball be at the height of 10 m from the ground ?

$$\left[g = 10ms^{-2}, \sin 30^\circ = \frac{1}{2}, \cos 30^\circ = \frac{\sqrt{3}}{2}\right]$$

A. 8.66 m

B. 5.20 m

C. 4.33 m

D. 2.60 m

Answer: A

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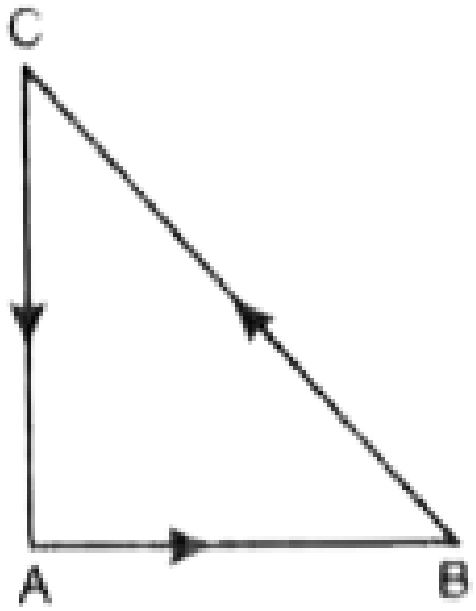
79. Three forces start acting simultaneously on a particle , moving with velocity, $\overrightarrow{v}$. These forces are represented in magnitude and direction by the three sides of a triangle ABC (as shown). The particle will now move with

velocity



A. $\overrightarrow{v}$, remaining unchanged

B. less than $\overrightarrow{v}$

C. greater than

D. $\left|\overrightarrow{v}\right|$ in the direction of the largest force BC.

Answer: A

Watch Video Solution

80. If $\overrightarrow{A} \times \overrightarrow{B} = \overrightarrow{B} \times \overrightarrow{A}$, then the angle between A and B is:

A. Never zero

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

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

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

Answer: A

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81. A particle is projected at 60° to the horizontal with a kinetic energy K. The kinetic energy at the highest point is:

A. Zero

B. K/4

C. K/2

D. K

Answer: B

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82. A particle has an initial velocity of $3\hat{i} + 4\hat{j}$ and an A A acceleration of $0.4\hat{i} + 0.3\hat{j}$. Its speed after 10 s is :

A. 7 units

B. 8.5 units

C. 10 units

D. $7\sqrt{2}$ units

Answer: D

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Mcq Level Ii

1. The vector sum of two forces is perpendicular to their vector differences. In that case, the forces :

A. are equal to each other in magnitude

B. are not equal to each other in magnitude

C. cannot be predicted

D. are perpendicular to each other

Answer: A

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2. The equations of motion of a projectile are given by x = 36t metre and $2y = 96t - 9.8r^2$ metre. The angle of projection is :

A. $\sin^{-1}\left(\frac{4}{5}\right)$

B. $\sin^{-1}\left(\frac{3}{5}\right)$

C. $\sin^{\frac{4}{3}}$

D. $\sin^{-1}\left(\frac{3}{4}\right)$

Answer: A

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3. Two particles having position $\overrightarrow{r_1} = \left(3\hat{i} + 5\hat{j}\right)$ meter and $\overrightarrow{r_2} = \left(-5\hat{i} - 3\hat{j}\right)$ metre are moving with velocities $\overrightarrow{V_1} = \left(4\hat{i} + \hat{j}\right)$ m/s and $\overrightarrow{V_2} = \left(a\hat{i} + 7\hat{j}\right)$ m/s. If they collide after 2 seconds, the value of a is :

A. 2

B. 4

C. 6

D. 8

Answer: D

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4. The sum of the magnitude of two vectors is 18. The magnitude of their resultant is 12. If the resultant is perpendicular to one of the vectors, then the magnitudes of the two vectors are :

A. 5 and 13

B. 6 and 12

C. 7 and 11

D. 8 and 10.

Answer: C

Watch Video Solution

5. When $\vec{A} . \vec{B} = -|A|.|B|$ then :

A. $\vec{A}$ and $\vec{B}$ are perpendicular to each other

B. $\vec{A}$ and $\vec{B}$ act in the same direction

C. $\vec{A}$ and $\vec{B}$ act in the opposite direction

D. $\vec{A}$ and $\vec{B}$ can act in any direction

Answer: C

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6. If retardation produced by air resistance of projectile is one-tenth of acceleration due to gravity, the time to reach maximum height:

A. decreases by 11 percent

B. increases by 11 percent

C. decreases by 9 percent

D. increases by 9 percent

Answer: C

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7. For a given angle of projection, if the time of flight of a projectile is doubled, the horizontal range will increase to :

A. four times

B. thrice

C. once

D. twice

Answer: A

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8. If $\left|\vec{A} \times \vec{B}\right| = \sqrt{3}\vec{A} \cdot \vec{B}$ then the value of $\left|\vec{A} + \vec{B}\right|$ is :

A. $\left(A^2+B^2+\frac{AB}{\sqrt{3}}\right)^{1/2}$

B. A+B

C. $\left(A^2+B^2+\sqrt{3}AB\right)^{1/2}$

D. $\left(A^2+B^2+AB\right)^{1/2}$

Answer: D

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9. For angles of projection of projectiles at ($45^\circ-\theta$) and ($45^\circ+\theta$) the horizontal ranges

described by the projectile are in the ratio

A. $2:1$

B. $1:1$

C. $2:3$

D. $1:2$

Answer: B

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10. Which of the following statement is correct about the scalar quantity ?

A. A scalar quantity is always conserved in a process.

B. A scalar cannot take a negative value

C. A scalar never varies from point to point in space.

D. A scalar has the same value for observers with different orientations of

the axes

Answer: D

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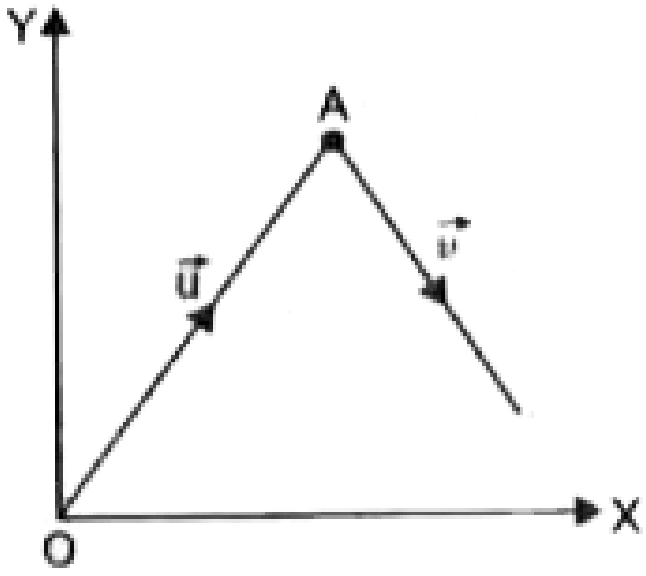
11. Two vectors $\overrightarrow{u}$ and $\overrightarrow{v}$ given by $\overrightarrow{u} = a\hat{i} + b\hat{j}$ and $\overrightarrow{v} = p\hat{i} + q\hat{j}$ have their orientation in the plane XY as shown in the fig. Which of the statements will apply correctly to

them.



A. ‘a’ and 'p’ are positive while ‘b’ and 'q' are negative

B. ‘a' , ‘p' and 'b' are positive while 'q' is negative.

C. ‘a’, ‘q' and ‘b’ are positive while ‘p’ is negative

D. a', 'p', 'b', 'q' are all positive.

Answer: B

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12. The two vectors are $\overrightarrow{A} = \hat{i} + \hat{j}$ and $\overrightarrow{B} = \hat{i} - \hat{j}$. What is the angle between them ?

A. 45°

B. 90°

C. -45°

D. 180°

Answer: B

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13. The component of a vector $\overrightarrow{r}$ along x- axis will have a maximum value if

A. $\overrightarrow{r}$ acts along positive Y-axis.

B. $\overrightarrow{r}$ acts along positive X-axis.

C. $\overrightarrow{r}$ acts along negative Y-axis.

D. $\overrightarrow{r}$ acts at an angle of 45° with X-axis.

Answer: D

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14. The horizontal range of a projectile projected with a velocity V at angle 15° with the horizontal is 50 m. What will be its

horizontal range if its angle of throw is increased by 30° keeping the velocity of throw to be the same ?

A. 60 m

B. 80 m

C. 100 m

D. 140 m

Answer: C

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15. If the vectors $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}+\vec{b}\right|=\left|\vec{a}\right|$ then does it imply that:

A. $\vec{b}=0$

B. $\vec{a}.\ \vec{b}$ are antiparallel

C. $\vec{a}.\ \vec{b}$ are perpendicular

D. $\vec{a}.\ \vec{b}\leq 0$

Answer: B

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16. If $\left|\vec{a}+\vec{b}\right|=\left|\vec{a}-\vec{b}\right|$ then

A. $|a|=|b|\neq 0$

B. $\vec{a}$ is perpendicular to $\vec{b}$

C. $|a|=|b|\neq 0$ and $\vec{a}$ and $\vec{b}$ are parallel and antiparallel

D. when either of |a| or |b| is zero

Answer: B

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17. An aeroplane is flying at a height of 2000 m above the ground horizontally with a uniform speed of 720 km/h. At what angle of sight (w.r. to the horizontal) should the pilot drop a bomb so as to hit target on the ground ?

A. $26^{o}.57$

B. $30^{o}.2$

C. $41^{o}.3$

D. $20^{o}.41$

Answer: A

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18. The torque of a force $\overrightarrow{F} = -3\hat{i} + \hat{j} + 5\hat{k}$ acting at a point is $\overrightarrow{\tau}$. If the position vector of the point vector of the point is $7\hat{i} + 3\hat{j} + \hat{k}$, then $\overrightarrow{\tau}$ is :

A. $14\hat{i} - 38\hat{j} + 16\hat{k}$

B. $4\hat{i} - \hat{j} + 6\hat{k}$

C. $-14\hat{i} + 38\hat{j} - 16\hat{k}$

D. $-21\hat{i} + 3\hat{j} + 5\hat{k}$

Answer: A

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19. The position vectors of radius are $\overrightarrow{r_1} = 2\hat{i} + \hat{j} + \hat{k}$, $\overrightarrow{r_2} = 2\hat{i} - 3\hat{j} + \hat{k}$ while those of linear momentum are $2\hat{i} + 3\hat{j} - \hat{k}$. The angular momentum is :

A. $2\hat{i} - 4\hat{k}$

B. $4\hat{i} - 8\hat{k}$

C. $2\hat{i} - 4\hat{j} + 2\hat{k}$

D. $4\hat{i} - 8\hat{j}$

Answer: B

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20. A force vector applied on a mass is represented by $\vec{F} = 6\hat{i} + 8\hat{j} + 10\hat{k}$ and it accelerates it with 1 ms^{-1} . What will be the mass of the body ?

A. $10\sqrt{2}$ kg

B. $2\sqrt{10}$ kg

C. 10 kg

D. 20 kg

Answer: A

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21. Which vector should be added to $2\hat{i} + 4\hat{j} - 3\hat{k}$ and $3\hat{i} - 5\hat{j} + 7\hat{k}$ to get a unit vector along y-axis ?

A. $5\hat{i} + \hat{j} + \hat{k}$

B. $\hat{i}$

C. $-3\hat{k}$

D. $-5\hat{i} + 2\hat{j} - 4\hat{k}$

Answer: D

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22. The sum of the magnitude of two vectors is 18. The magnitude of their resultant is 12. If the resultant is perpendicular to one of the

vectors, then the magnitudes of the two vectors are :

A. 5 and 13

B. 6 and 12

C. 7 and 11

D. 8 and 10

Answer: A

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23. If unit vectors $\vec{A}$ and $\vec{B}$ are inclined at an angle θ then $\left|\vec{A} - \vec{B}\right|$ is:

A. $2\sin\left(\frac{\theta}{2}\right)$

B. $2\cos\left(\frac{\theta}{2}\right)$

C. $2\tan\left(\frac{\theta}{2}\right)$

D. $\tan\theta$

Answer: A

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24. Angle which the vector $\vec{A} = 2\hat{i} + 3\hat{j}$ makes with the y-axis is given by :

A. $\tan^{-2}\left(\frac{3}{2}\right)$

B. $\tan^{-2}\left(\frac{2}{3}\right)$

C. $\sin^{-1}\left(\frac{2}{3}\right)$

D. $\cos^{-1}\left[\frac{3}{2}\right]$

Answer: B

View Text Solution

25. If the magnitude of the vector product is $\sqrt{3}$ times the magnitude of the scalar product, the angle between the two vectors is :

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

B. $\frac{\pi}{6}$

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

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

Answer: C

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26. A particle of mass m = 5 is moving with uniform speed v = $3\sqrt{2}$ in the XOY plane along the line Y = X + 4. The magnitude of angular momentum of the particle about the origin is :

A. 60units

B. $40\sqrt{2}$units

C. zero

D. 7.5 units

Answer: A

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27. The velocity of projection of an oblique projectile is $\left(6\hat{i}+8\hat{j}\right)ms^{-1}$ horizontal range of the projectile is:

A. 4.9 m

B. 9.6 m

C. 19.6 m

D. 14 m

Answer: B

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28. A projectile is thrown at angel with vertical. It reaches a maximum height H. The time taken to reach the highest point of its path is :

A. $\sqrt{\frac{H}{g}}$

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

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

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

Answer: B

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29. A ball is projected from a certain point on the surface of a planet at a certain angle with the horizontal surface. The horizontal and vertical displacements x and y vary with time t in second as $x = 10\sqrt{3}t$ and $y = 10t - t^2$

The maximum height attained by the ball is:

A. 100m

B. 75m

C. 50m

D. 25m

Answer: D

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30. If the air resistance causes a vertical retardation of 10% of value of acceleration due to gravity, then the time of flight of an oblique projectile will be decreased by nearly:

A. 0.06

B. 0.07

C. 0.08

D. 0.09

Answer: D

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31. A body is thrown horizontally with a velocity $\sqrt{2gh}$ from the top of a tower of height h. It strikes the level ground through

the foot of the tower at a distance x from the tower. The value of x is :

A. h

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

C. $2h$

D. 2 h/3

Answer: C

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32. The range of the projectile for a given initial velocity of projection is minimum, if the angle of projection is :

A. 0

B. 45°

C. 90°

D. 60°

Answer: A

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33. A ball is projected at an angle 30° with the horizontal. What is the component of acceleration along the velcoity of projection ?

A. g

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

C. g/2

D. Zero

Answer: C

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34. A particle is projected at an angle of 45° from the foot of a wall, just touches the top of the wall and falls on the ground on the opposite sides at a distance 4 m from it. The height of wall is :

A. $\frac{2}{3}m$

B. $\frac{4}{3}m$

C. $\frac{8}{3}m$

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

Answer: C

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35. The equation of projectile is $y = \sqrt{3} - \frac{g}{2}x^2$, the angle of its projection is :

A. $\theta = \frac{\tan^{-1} 1}{\sqrt{3}}$

B. $\theta = \tan^{-1} \sqrt{3}$

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

D. Zero

Answer: B

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36. A projectile is thrown from a point in a horizontal plane such that its horizontal and verticaly velocity components are 9.8 and 19.6 m s^{-1} respectively. It strikes the ground after covering a horizontal distance of :

A. 39.2 m

B. 19.6 m

C. 9.8 m

D. 4.9 m

Answer: A

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37. A projectile is fired at 45° with a speed of 200 ms^{-1} . Its maximum height will be the same as that for a projectile fired vertically upwards with a speed of:

A. $400ms^{-1}$

B. $200\sqrt{2}ms^{-1}$

C. $\frac{200}{\sqrt{2}}ms^{-1}$

D. $100ms^{-1}$

Answer: C

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38. The initial velcoity of particle $\vec{u} = 4\hat{i} + 3\hat{j}$. It is moving with uniform acceleration $\vec{a} = 0.4\hat{i} + 0.3\hat{j}$. Its velocity after 10 seconds is :

A. 3 units

B. 4 units

C. 5 units

D. 10 units

Answer: D

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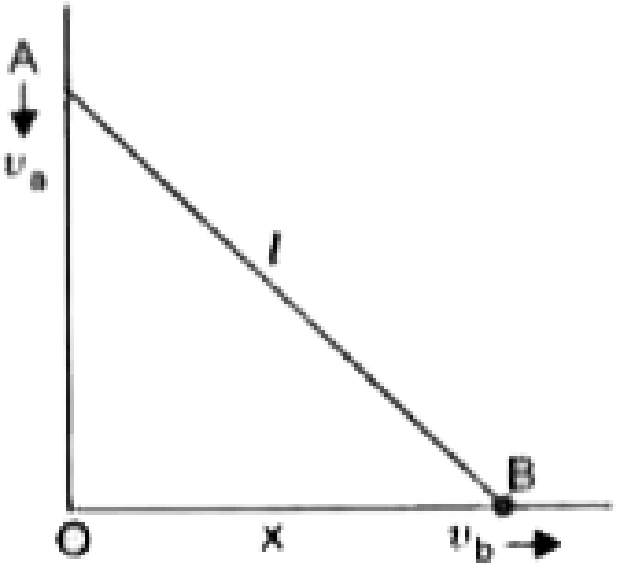
39. A rod of length 'l' rests at a point A against a smooth vertical wall while end B is on the floor as shown in the fig. If the end A moves uniformly downwards, what will be the velocity

of the end B if x is the distance of point B from wall.



A. $v_B = \sqrt{\frac{l^2}{x^2} - 1}. v_a$

B. $\sqrt{\frac{x^2}{l^2} - 1}. v_a$

C. $\frac{l^2 - x^2}{x}. v_a$

D. None of these

Answer: B

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40. Two projectiles are thrown from the same point simultaneously with same velocity 10 m s^{-1} . One goes straight vertically while other at 60° with the vertical. What will be the distance of separation between the two after 1 second of their throw ?

A. 20m

B. 10m

C. 5m

D. 15m

Answer: B

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41. If $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = \hat{i} + \hat{j}$, then the vector component of $\vec{A}$ in the direction of $\vec{B}$ is :

A. $\left(\hat{i}+\hat{j}\right)$

B. $2.5\left(\hat{i}+\hat{j}\right)$

C. $2\left(\hat{i}+\hat{j}\right)$

D. $3\left(\hat{i}+\hat{j}\right)$

Answer: B

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42. An object is projected with velocity 20 ms^{-1} making an angle of 45° with horizontal. The equation for its trajectory is

$h = Ax - Bx^2$ where h is the height and x the horizontal distance at any instant. The ratio of constant A:B is:

A. $1:5$

B. $5:1$

C. $1:40$

D. $40:1$

Answer: D

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43. A stone is thrown with a velocity v at an angle 0 with the horizontal. Its speed when it makes an angle /3 with the horizontal is :

A. $v \cos \theta$

B. $\frac{v}{\cos \beta}$

C. $v \cos \theta \cos \beta$

D. $\frac{v \cos \theta}{v \cos \beta}$

Answer: D

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44. Show that a projectile fired at an angle 0 with the horizontal crosses a certain height at two timings t_1 and t_2 and the sum of these two is equal to :

A. Total time of flight

B. $\frac{1}{4}$th of the total of flight

C. Any fraction of time of fligh

D. Half of the total time of flight.

Answer: A

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45. If $\overrightarrow{A} = 3\hat{i} + 4\hat{j}$ and $\overrightarrow{B} = 7\hat{i} + 24\hat{j}$. Find the vector having the same magnitude as $\overrightarrow{B}$ and is parallel to $\overrightarrow{A}$:

A. $15\hat{i} + 20\hat{j}$

B. $20\hat{i} + 15\hat{j}$

C. $3\hat{i} + 4\hat{j}$

D. $4\hat{i} + 3\hat{j}$

Answer: A

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46. A particle moves in X-Y plane under the action of forces F such that the values of linear momentum 'p' at any times is $p_x = 2\cos t$ and $p_y = 2\sin t$. The angle between $\overrightarrow{F}$ and at the time t will be:

A. 0°

B. 30°

C. 90°

D. 180°

Answer: C

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47. If the relation between range R and time of flight T is given by $R = 5\ T2$, the angle of throw of the projectile is :

A. 45^{o}

B. 15^{o}

C. 60^{o}

D. 90^{o}

Answer: A

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48. Given : $\vec{a} + \vec{b} + \vec{c} = 0$. Out of the three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$, two are equal in magnitude. The magnitude of the third vector is $\sqrt{2}$ times that of either of the two having equal magnitude. The angles between the vectors are :

A. 90°, 135°, 135°

B. $30^{\circ}, 60^{\circ}, 90^{\circ}$

C. $45^{\circ}, 45^{\circ}, 90^{\circ}$

D. $45^{\circ}, 60^{\circ}, 90^{\circ}$.

Answer: A

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49. The resultant of three vectors 1, 2 and 3 units whose directions are those of the sides of an equilateral triangle is :

A. at an angle of 30° with the first vector

B. at an angle of 15° with the first vector

C. at an angle of 100° with the first vector

D. at an angle of 150° with the first vector

Answer: A

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50. When a projectile is moving at 60 m s^{-1} at the highest point of its trajectory, it explodes into two equal parts. One part moves vertically

up with a velocity of 50 ms^{-1} . The magnitude of velocity of other part is:

A. $50ms^{-1}$

B. $60ms^{-1}$

C. $120ms^{-1}$

D. $130ms^{-1}$

Answer: D

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51. A projectile can have the same range 'R' for two angles of projection. If t_1 and t_2 be the times of flight in the two cases, then product of the two times of flights is proportional to :

A. R^2

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

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

D. R

Answer: D

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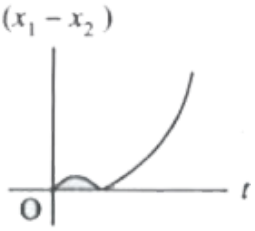
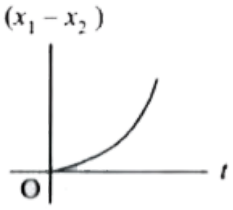
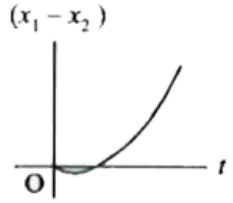
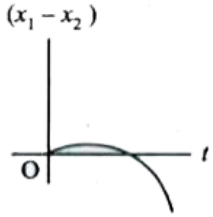
52. A body is at rest at x = 0. At t = 0, it starts moving in the positive x-direction with a constant acceleration. At the same instant another body passes through x = 0 moving in the positive x-direction with a constant speed. The position of the first body is given by X_1 (r) after time t and that of the second body by x_2 (r) after the same time interval. Which of the following graphs correctly describes ($x_1 - x_2$) as a function of time t?

A. 

B. 

C. 

D. 

Answer: A

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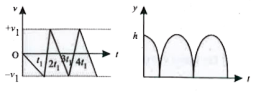
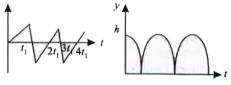
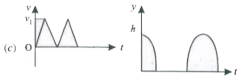
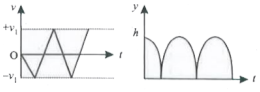
53. Consider a rubber ball freely falling from a height h = 4.9 m on to a horizontal elastic plate. Assume that the duration of collision is negligible and the collision with the plate is totally elastic.

Then the velocity as a function of time and the height as a function of time will be :

A. 

B. 

C. 

D. 

Answer: D

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54. A particle is moving with velocity $\overrightarrow{v} = K\left(y\hat{i} + x\hat{j}\right)$, where K is a constant. The general equation for its path is:

A. $y^2 = x^2$ + constant

B. $y = x^2$ + constant

C. $y^2 = x +$ constant

D. xy =constant

Answer: A

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Mcq Level Iii Questions From Aieee Jee Examinations

1. A particle of mass W is projected with a velocity V making an angle of 30° with the horizontal. The magnitude of angular momentum of the projectile about the point of projection when the particle is at its maximum height H is:

A. zero

B. $\frac{mv^2}{\sqrt{2}g}$

C. $\frac{\sqrt{3}mv^3}{16g}$

D. $\frac{\sqrt{3}mv^3}{2g}$

Answer: C

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2. A water fountain on the ground sprinkles water all around it. If the speed of water coming out of fountain is v, the total area around the fountain that gets wet is :

A. $\pi \frac{v^4}{g^2}$

B. $\frac{\pi}{2} \frac{v^4}{g^2}$

C. $\pi \frac{v^2}{g^2}$

D. $\pi \frac{v^4}{g}$

Answer: A

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3. A boy can throw a stone up to a maximum height of 10 m. The maximum horizontal distance that the boy can throw the same stone up to will be :

A. 20 m

B. $20\sqrt{2}$ m

C. 10 m

D. $10\sqrt{2}$ m

Answer: A

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4. A projectile is given an initial velocity of $\left(\hat{i}+2\hat{j}\right)$ m/s, where $\hat{i}$ is along the ground and $\hat{j}$ is along the vertical. If $g = 10m/s^2$, the equation of its trajectory is:

A. $y = 2x - 5x^2$

B. $4y = 2x - 5x^2$

C. $4y = 2x - 25x^2$

D. $y = x - 5x^2$

Answer: A

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5. From a tower of height H, a particle is thrown vertically upwards with a speed u. The time taken by the particle, to hit the ground, is

n times that taken by it to reach the highest point of its path. The relation between H, u and n is :

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

B. $2gH = n^2u^2$

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

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

Answer: D

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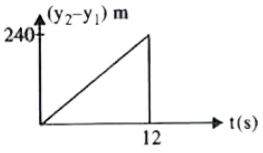
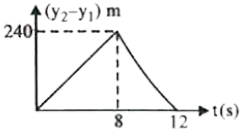
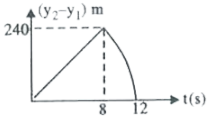
6. Two stones are thrown up simultaneously from the edge of a cliff 240 m high with initial speed of 10 m/s and 40 m/s respectively. Which of the following graph best represents the time variation of relative position of the second stone with respect to the first ?

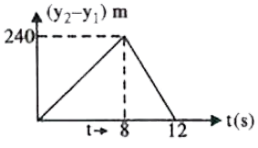
(Assume stones do not rebound after hitting the ground and neglect air resistance, take g = 10 m/s^2). (The figures are schematic and not drawn to scale)

A.



B. 

C. 

D. 

Answer: C

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Recent Competitive Questions

1. The resultant of two forces acting an angle of 120° is 10 kg wt and is perpendicular to one of the forces .That force is

A. $10\sqrt{3}$kg wt

B. $20\sqrt{3}$ kg wt

C. 10 kg wt

D. $\frac{10}{\sqrt{3}}$ kg wt

Answer: D

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2. The height y and the distance x along the horizontal plane of a prohectile on a certain planet (with no surrounding atmosphere) are given by y=8t-$5t^2$ meter and x=6t meter,where t is in seconds.The velocity with which the projectile is projected is

(Acceleration due to gravity =9.8 m s^{-2})

A. $6ms^{-1}$

B. $8ms^{-1}$

C. $10ms^{-1}$

D. $14ms^{-1}$

Answer: C

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3. The X and Y components of a force F acting at 30° to x- axis are respectively

A. $\frac{F}{\sqrt{2}}, F$

B. $\frac{F}{2}, \frac{\sqrt{3}}{2}F$

C. $\frac{\sqrt{3}}{2}F, \frac{1}{2}F$

D. $F, \frac{F}{2}$

Answer: C

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4. A projectile is projected at $10ms^{-1}$ by making at an angle 60° to the horizontal. After some time its velocity makes an angle of 30° to the horizontal. Its speed at this instant is

A. $\frac{10}{\sqrt{3}}$

B. $10\sqrt{3}$

C. $\frac{5}{\sqrt{3}}$

D. 5sqrt(3)`

Answer: A

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5. Which of the following is not a vector quantity ?

A. Weight

B. Nuclear spin

C. Momentum

D. Potential energy

Answer: D

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6. A particle is projected with a velocity v so that its horizontal range twice the greatest height attained. The horizontal range is

A. $2v^2/3g$

B. $v^2/2g$

C. v^2/g

D. $4v^2/5g$

Answer: D

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7. Vector A has a magnitude of 10 units and makes an angle of 30° with the positive X-axis. Vector B has a magnitude of 20 units and

makes an angle of 30° with the negative X-axis. What is the magnitude of the resultant between these two vectors ?

A. $20\sqrt{3}$

B. 35

C. $15\sqrt{3}$

D. $10\sqrt{3}$

Answer: D

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Revision Test

1. The torque of a force $\overrightarrow{F} = -3\hat{i} + \hat{j} + 5\hat{k}$ acting at a point is $\overrightarrow{\tau}$. If the position vector of the point vector of the point is $7\hat{i} + 3\hat{j} + \hat{k}$, then $\overrightarrow{\tau}$ is :

A. $14\hat{i} - \hat{j} + 3\hat{k}$

B. $7\hat{i} - 8\hat{j} + 9\hat{k}$

C. $2\hat{i} - 3\hat{j} + 8\hat{k}$

D. $14\hat{i} - 38\hat{j} + 16\hat{k}$

Answer: D

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2. The position vectors of the head and tail of radius vector are $2\hat{i}+\hat{j}+\hat{k}$ and $2\hat{i}-3\hat{j}+\hat{k}$. The linear mementium is $2\hat{i}+3\hat{j}+\hat{k}$. The angular momentum is :

A. $4\hat{i}-8\hat{k}$

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

C. $2\hat{i}+3\hat{j}+\hat{k}$

D. $2\hat{i} - \hat{j} + \hat{k}$

Answer: A

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3. Given $\vec{r} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{P} = 2\hat{i} + 3\hat{j} + \hat{k}$ angular momentum $\vec{L}$ is:

A. $8\hat{k}$

B. $4\hat{i}$

C. $4\hat{i} - 8\hat{k}$

D. $4\hat{i} + 8\hat{k}$

Answer: C

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4. The angle between two vectors $\overrightarrow{A} = \overrightarrow{B}$ is θ . The resultant of $\overrightarrow{A}$ and $\overrightarrow{B}$ making an angle $\frac{\theta}{2}$ with $\overrightarrow{A}$. Then

A. A = B

B. AB = 1

C. A = 2B

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

Answer: A

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5. Two forces of magnitude F and $\sqrt{3}$ F act at right angles to each other. Their resultant makes an angle θ with F. The value of θ is :

A. 30°

B. 45°

C. 60°

D. 135°

Answer: C

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6. The magnitude of the vector product of two vectors is 4. The magnitude of their scalar product is $4\sqrt{3}$. The angle between the two vectors is :

A. 30°

B. 45°

C. 60°

D. 75°

Answer: A

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7. ABCDEF is a regular hexagon with point O as centre. The value of $\overrightarrow{AB} + \overrightarrow{AC} + \overrightarrow{AD} + \overrightarrow{AE} + \overrightarrow{AF}$ is:

A. $2\overrightarrow{AO}$

B. $4\overrightarrow{AO}$

C. $6\overrightarrow{AO}$

D. 0

Answer: C

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8. A projectile is projected horizontally with 8 ms^{-1}, its velocity after $\frac{1}{4}$ second is equal to :

A. 8.37 ms^{-1}

B. 4.37 ms^{-1}

C. 0.837 ms^{-1}

D. 83.7 ms^{-1}

Answer: A

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9. Two projectiles are thrown with same velocity but at an angle θ and $(90^\circ - \theta)$ with

horizontal, the ratio of their maximum heights will be :

A. (1:1)

B. $\sin\theta : \cos\theta$

C. $\sin^2\theta : \cos^2\theta$

D. $\sqrt{\sin\theta} : \sqrt{\cos\theta}$

Answer: C

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10. A projectile is thrown with angle of projection $\tan^{-1}\left(\frac{4}{3}\right)$ The ratio of its horizontal range to the greatest height reaches is :

A. (2: 1)

B. (3: 1)

C. (4: 1)

D. (5: 1)

Answer: B

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11. The angle between two vectors $2\hat{i} + 3\hat{j} + \hat{k}$ and $3\hat{i} + 6\hat{j}$ is :

A. 0°

B. 60°

C. 60°

D. 90°

Answer: D

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12. If resultant of two forces $\overrightarrow{F}$ and $\overrightarrow{F}$ is F.

The angle between two forces is :

A. 0°

B. 60°

C. 120°

D. 60°

Answer: C

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13. A ball is projected at an angle 30° with the horizontal. What is the component of acceleration along the velcoity of projection ?

A. g

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

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

D. zero

Answer: B

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14. A body is projected with K.E. 'E' so as to have a maximum horizontal range. What is the P.E. at the highest point ?

A. E

B. $\frac{E}{2}$

C. $\frac{3E}{4}$

D. zero

Answer: D

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15. Angle which the vector $\vec{A} = 2\hat{i} + 3\hat{j}$ makes with the y-axis is given by :

A. $\tan^{-1}\left(\frac{3}{2}\right)$

B. $\tan^{-1}\left(\frac{2}{3}\right)$

C. $\sin^{-1}\left(\frac{2}{3}\right)$

D. $\cos^{-1}\left(\frac{3}{2}\right)$

Answer: B

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16. If the magnitude of the vector product is $\sqrt{3}$ times the magnitude of the scalar product, the angle between the two vectors is :

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

B. $\frac{\pi}{4}$

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

D. $\frac{\pi}{6}$

Answer: C

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17. If $\vec{A} \cdot \vec{B} = \left|\vec{A} \times \vec{B}\right|$, then the resultant of $\vec{A}$ and $\vec{B}$ is:

A. $\sqrt{A^2 + B^2 + \sqrt{2}AB}$

B. (A-B)

C. $\sqrt{A^2 + B^2}$

D. (A + B).

Answer: A

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18. A ball is projected from a certain point on the surface of a planet at a certain angle with the horizontal surface. The horizontal and vertical displacement x and y vary with time t in second as :

x=10$\sqrt{3t}$ and y=10t-t^2

The maximum height attained by the ball is :

A. 100 m

B. 75 m

C. 50 m

D. 25 m

Answer: D

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19. The vector which must be added to the sum of the two vectors $\hat{i}+2\hat{j}-\hat{k}$ and $\hat{i}-2\hat{j}+2\hat{k}$ to get a resultant of unit vector along z-axis is :

A. $2\hat{i}+\hat{j}$

B. $-2\hat{i}$

C. $\hat{i}+\hat{j}+\hat{k}$

D. $\hat{i}-\hat{j}-\hat{k}$

Answer: B

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20. If the time of flight of a body is T and horizontal range is R, then the angle of inclination of direction of projection with the horizontal is :

A. $\tan^{-1}\left(\frac{gT^2}{R}\right)$

B. $\cos^{-1}\left(\frac{gT^2}{R}\right)$

C. $\tan^{-1}\left(\frac{gT^2}{2R}\right)$

D. $\sin^{-1}\left(\frac{gT^2}{R}\right)$

Answer: C

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21. A force of $\left(10\hat{i} - 3\hat{j} + 6\hat{k}\right)$ newton acts on a body of mass 100 g and displaces it from

$\left(6\hat{i}+5\hat{j}-3\hat{k}\right)$ metre to $\left(10\hat{i}-2\hat{j}+7\hat{k}\right)$m.

The work done is:

A. 21I

B. 121 J

C. 361 J

D. 1000 J

Answer: B

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22. Given a vector $\vec{A} = 3\hat{i} - 4\hat{j}$. Which of the following is perpendicular to it ?

A. $3\hat{i}$

B. $4\hat{i}$

C. $4\hat{i} + 3\hat{j}$

D. $3\hat{i} + 4\hat{j}$

Answer: C

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23. Two projectiles A and B are thrown with velcoity v and $\frac{v}{2}$ respectively. They have the same range. If B is thrown at an angle of 15° to the horizontal. A must have been thrown at an angle.

A. $\sin^{-1}\left(\frac{1}{16}\right)$

B. $\sin^{-1}\left(\frac{1}{4}\right)$

C. $2\sin^{-1}\left(\frac{1}{4}\right)$

D. $\frac{1}{2}\sin^{-1}\left(\frac{1}{8}\right)$

Answer: D

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24. A small ball suspended from a string is set into oscillation. When the ball passes through the lowest point of the motion, the string is cut. If the ball is then moving with the velocity 0.8 ms^{-1} at a height of 5 m above the ground, the horizontal distance travelled by the ball is :

(Given g = 10 ms^{-2})

A. 0.2 m

B. 0.4 m

C. 0.6 m

D. 0.8 m

Answer: D

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25. A stone is thrown with a velocity v at an angle θ with the horizontal. Its speed when it makes an angle β with the horizontal is :

A. v cos θ

B. $\frac{v}{\cos \beta}$

C. v cos θ cos β

D. $\frac{v \cos \theta}{\cos \beta}$

Answer: D

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26. Two projectiles thrown with different velocities and at different angles so as to cover the same maximum heights. The sum of

the time taken by each to reach highest point is equal to:

A. Total time of flight of each

B. $\frac{1}{2}$ of the total time of flight of each

C. $\frac{1}{4}$ th of the total time of flight of each

D. None of these.

Answer: A

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27. Show that a proejctile fired at an angle θ with the horizontal crosses a certain height at two timings t_1 and t_2 and sum of these two is equal to :

A. Total time of flight

B. $\frac{1}{4}$ th of the total time of flight

C. Any fraction of time of flight

D. Half of the total time of flight.

Answer: A

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28. If $\vec{A} = 3\hat{i} - 4\hat{j}, \vec{B} = -2\hat{i} + 3\hat{j}$ and $\vec{C} = \vec{A} \times \vec{B}$, then $\vec{C}$ is:

A. $12\hat{i} - 9\hat{j} - 8\hat{k}$

B. $-12\hat{i} - 9\hat{j} - 8\hat{k}$

C. $-12\hat{i} + 9\hat{j} - 8\hat{k}$

D. $-12\hat{i} - 9\hat{j} + 8\hat{k}$

Answer: B

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29. A projectile of mass 100 g is fired with a velocity of 20 ms^{-1} making an angle of 30° with the horizontal. As it rises to the highest point of its path, its momentum changes by:

A. $\frac{1}{2}$ kg ms^{-1}

B. 1kg ms^{-1}

C. 2kg ms^{-1}

D. None of these

Answer: B

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30. A projectile is fired with a velocity v at angle θ with the horizontal. The magnitude of the change in momentum between the starting point and the point at which it strikes is given by :

A. 2 mv cos θ

B. 2 mv sin θ

C. 2mv

D. Zone

Answer: B

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31. A particle projected horizontally from the top of an inclined plane inclined at an angle θ with the horizontal with velocity u. What is the distance along the plane from the point of projection at which the projectile strikes the inclined plane ?

A. $\frac{2u^2 \tan(\theta)}{g}$

B. $\frac{1}{2}\frac{u^2 \tan(\theta)}{g}$

C. $\frac{2u^2 \tan^2(\theta)}{g}$

D. $\frac{2u^2 \tan(\theta)\sec\theta}{g}$

Answer: D

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32. Two peojectiles are fired from the same point with same velocity at angles α and β with the horizontal. They are aimed at a target

distant, R from the point of projection. One falls a distance x short of R while other a distance y beyond R. If θ is the correct angle of projection then

A. $\theta = \sin^{-1}\left[\frac{x\sin 2\alpha + y\sin 2\beta}{x+y}\right]$

B. $\theta = \frac{1}{2}\sin^{-1}\left[\frac{x\sin 2\beta + y\sin 2\alpha}{x+y}\right]$

C. $\theta = \sin^{-1}\left[\frac{x\sin 2\beta + y\sin 2\alpha}{x+y}\right]$

D. $\theta = \frac{1}{2}\sin^{-1}\left[\frac{x\sin 2\alpha + y\sin 2\beta}{x+y}\right]$

Answer: B

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33. The equation of motion of a projectile is $y = \sqrt{3x} - \frac{gx^2}{2}$ The angle of projection is :

A. $\theta = \frac{\tan^{-1} 1}{\sqrt{3}}$

B. $\theta = \tan^{-1} \sqrt{3}$

C. $\theta = \frac{\pi}{2}$

D. $\theta = 0^\circ$

Answer: B

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34. At what angle an object be projected so that the horizonal range is equal to the maximum height ?

A. $\tan^{-1} 1$

B. $\tan^{-1} 2$

C. $\tan^{-1} 3$

D. $\tan^{-1} 4$

Answer: D

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35. Three vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$ are such that $\vec{A} \cdot \vec{B} = 0$ and $\vec{A} \cdot \vec{C} = 0$. The vector $\vec{A}$ is parallel to:

A. $\vec{B}$

B. $\vec{C}$

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

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

Answer: D

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36. Two vectors of equal magnitude 'A' on addition give a resultant vector of magnitude 'A', then the magnitude of their difference vector is :

A. $\sqrt{2}$A

B. $\sqrt{3}$A

C. 2A

D. 3A

Answer: B

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