PHYSICS

BOOKS - UNIVERSAL BOOK DEPOT 1960 PHYSICS (HINGLISH)

MOTION IN TWO DIMENSION

Exercise

1. If the body is moving in a circle of radius r with a constant speed v , its angular velocity is

A. v^2 / r

B. vr

C. v/r

D. r/v

Answer: C

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2. Two racing cars of masses m_1 and m_2 are moving in circles of radii r_1 and r_2 respectively. Their speeds are such that each makes a complete circle in the same duration of time t. The ratio of the angular speed of the first to the second car is

A. $m_1 : m_2$

B. $r_1 : r_2$

C. $1 : 1$

D. $m_1 r_1 : m_2 r_2$

Answer: C

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3. A cyclist turns around a curve at 15 miles/hour. If he turns at double the speed, the tendency to overturn is

A. Doubled

B. Quadrupled

C. Halved

D. unchanged

Answer: B

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4. A body of mass m is moving in a circle of radius r with a constant speed v, The force on the body is $\frac{mv^2}{r}$ and is directed towards the centre what is the work done by the from in moving the body over half the circumference of the circle?

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

B. zero

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

D. $\frac{\pi r^2}{mv^2}$

Answer: B

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5. If a particle moves in a circle describing equal angles in equal intervals of time, then the velocity vector.

A. Remains constant

B. Change in magnitude

C. Change in direction

D. Change both in magnitude and direction

Answer: C

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6. A stone of mass m is tied to a string of length l and rotated in a circle with a constant speed v . If the string is released, the stone flies

A. Radially outward

B. Radialy inward

C. Tangentially outward

D. With acceleration $\dfrac{mv^2}{l}$

Answer: C

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7. A body is moving in a circular path with a constant speed. It has .

A. A constant velocity

B. A constant acceleration

C. An accleration of constant magnitude

D. An acceleration which varies with time

Answer: C

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8. A motor cyclist going round in a circular track at constant speed has

A. Constant linear velocity

B. Constant acceleration

C. Constant angular velocity

D. Constant force

Answer: C

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9. A particle P is moving in a circle of radius 'a' with a uniform speed v. C is the centre of the circle and AB is a diameter. When passing through B the angular velocity of P about A and C are in the ratio

A. $1:1$

B. $1:2$

C. $2:1$

D. $4:1$

Answer: B

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10. A car moving on a horizontal road may be thrown out of the road in taking a turn.

A. By the gravitational force

B. Due to lack of sufficient centripetal force

C. Due to rolling frictional force between tyre and road

D. Due to the reaction of the ground

Answer: B

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11. Two particles of equal masses are revolving in circular paths of radii r_1 and r_2 respectively with the same speed. The ratio of their centripetal force is

A. $\frac{r_2}{r_1}$

B. $\sqrt{\frac{r_2}{r_1}}$

C. $\left(\frac{r_1}{r_2}\right)^2$

D. $\left(\frac{r_2}{r_1}\right)^2$

Answer: A

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12. A particle moves with constant angular velocity in a circle. During the motion its

A. Energy is conserved

B. Momentum is conserved

C. Energy and momentum both are conserved

D. None of the above is conserved

Answer: A

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13. A stone tied to a string is rotated in a circle. If the string is cut, the stone flies away from the circle because

A. A centripetal force acts on the stone

B. A centripetal force acts on the stone

C. Of its inertia

D. Reaction of the centripetal force

Answer: C

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14. A body is revolving with a constant speed along a circle. If its direction of motion is reversed but the speed remains the same, then which of the following statement is true

A. The centripetal force will not suffer any change in magnitude

B. The centripetal force will have its direction reversed

C. The centripetal force will not suffer any change in direction

D. The centripetal force would be doubled

Answer: A::C

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15. When a body moves with a constant speed along a circle

A. No work is done on it

B. No acceleration is produced in the body

C. No force acts on the body

D. Its velocity remains constant

Answer: A

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16. A body of mass m moves in a circular path with uniform angular velocity. The motion of the body has constant

A. Acceleration

B. Velocity

C. Momentum

D. Kinetic energy

Answer: D

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17. On a railway curve, the outside rail is laid higher than the inside one so that resultant force exerted on the wheels of the rail car by the tops of the rails will

A. Have a horizontal inward component

B. Be vertical

C. Equilibrium the centripetal force

D. Be decreased

Answer: A

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18. If the overbridge is concave instead of being convex, the thrust on the road at the lowest position will be

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

B. $mg-\frac{mv^2}{r}$

C. $\frac{m^2v^2g}{r}$

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

Answer: A

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19. A cyclist taking turn bends inwards while a car passenger taking same turn is thrown outwards. The reason is

A. Car is heavier than cycle

B. Car has four wheels while cycle has only two

C. Difference in the speed of the two

D. Cyclist has to counteract the centrifugal force while in the case of car only the passenger is thrown by this force

Answer: D

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20. A car sometimes overturns while taking a turn. When it overturns, it is

A. The inner wheel which leaves the ground first

B. The outer wheel which leaves the ground first

C. Both the wheels leave the ground simultaneously

D. Either wheel leaves the ground first

Answer: A

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21. A tachometer is a device to measure

A. Gravitational pull

B. Speed of rotation

C. Surface tension

D. Tension in a spring

Answer: B

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22. Two bodies of mass $10kg$ and $5kg$ moving in concentric orbits of radii R and r such that their periods are the same. Then the ratio between their centipetal acceleration is

A. R/r

B. r/R

C. R^2 / r^2

D. r^2 / R^2

Answer: A

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23. The ratio of angular speeds of minute hand and hour hand of a watch is

A. $1:12$

B. $6:1$

C. $12:1$

D. $1:6$

Answer: C

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24. A car travels north with a uniform velocity. It goes over a piece of mud which sticks to the tyre. The particles of the mud, as it leaves the ground are thrown

A. Vertically upwards

B. Vertically inwards

C. Towards north

D. Towards south

Answer: D

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25. An aircraft executes a horizontal loop with a speed of 150 m/s with its, wings banked at an angle of 12°. The radius of the loop is $(g = 10m/s^2)$

A. $10.6km$

B. 9.6 km

C. 7.4 km

D. 5.8 km

Answer: A

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26. A particle is moving in a horizontal circle with constant speed. It has constant

A. Velocity

B. acceleration

C. Kinetic energy

D. Displacement

Answer: C

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27. A motor cyclist moving with a velocity of 72 km/hour on a flat road takes a turn on the road at a point where the radius of curvature of the road is 20 meters . The acceleration due to gravity is $10m/\sec^2$. In order to avoid skidding, he must not bend with respect to the vertical plane by an angle greater than

A. $\theta = \tan^{-1} 6$

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

C. $\theta = \tan^{-1} 25.92$

D. $\theta = \tan(- 1)4$

Answer: B

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28. A train is moving towards north. At one place it turn towards north -east. Here, we observe that:

A. The radius of curvature of outer rail will be greater than that of the inner rail

B. The radius of the inner rail will be greater than that of the outer rail

C. The radius of curvature of one of the rails will be greater

D. The radius of curvature of the outer and inner rails will be the same

Answer: A

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29. The angular speed of a fly wheel making 120 revolutions / minute is

A. $2\pi rad/s$

B. $4\pi^2\pi/rad$

C. $\pi rad/s$

D. $4\pi rad/s$

Answer: D

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30. A particle is moving on a circular path with constant speed, then its acceleration will be

A. Zero

B. External radial acceleration

C. Internal radial acceleration

D. Constant acceleration

Answer: C

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31. A car is moving on a circular path and takes a turn. If R_1 and R_2 be the reactions on the inner and outer wheels, respectively, then

A. $R_1 = R_2$

B. $R_1 < R_2$

C. $R_1 > R_2$

D. $R_1 \geq R_2$

Answer: B

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32. A body of mass $100g$ is tied to one end of a $2m$ long string. The other end of the string is at the centre of the horizontal circle. The maximum revolution in one minute is 200. The maximum tensible strength of the string is approx

A. 8.76 N

B. 8.94 N

C. 89.42 N

D. 87.64 N

Answer: D

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33. A road is 10 m wide. Its radius of curvature is 50 m . The outer edge is above the lower edge by a distance of 1.5 m . This road is most suited for the velocity

A. $2.5m / \sec$

B. $4.5m / \sec$

C. $6.5m / \sec$

D. $8.5m/\sec$

Answer: D

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34. Certain neutron stars are believed to be rotating at about $1rev/\sec$. If such a star has a radius of 20 km, the acceleration of an object on the equator of the star will be

A. $20 \times x10^8 m/\sec^2$

B. $8 \times 10^5 m / \sec^2$

C. $120 \times 10^5 m / \sec^2$

D. $4 \times 10^8 m / \sec^2$

Answer: B

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35. A particle revolves round a circular path. The acceleration of the particle is

A. Along the circumference of the circle

B. Along the tangent

C. Along the radius

D. Zero

Answer: C

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36. The length of second's hand in watch is $1cm$. The change in Velocity of its tip in 15 seconds is

A. Zero

B. $\frac{\pi}{30\sqrt{2}} cm / \sec$

C. $\frac{\pi}{30} cm / \sec$

D. $\frac{\pi\sqrt{2}}{30} cm / \sec$

Answer: D

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37. A particle moves in a circle of radius 25 cm at two revolutions per sec. The acceleration of the particle in m / s^2 is:

A. π^2

B. $8\pi^2$

C. $4\pi^2$

D. $2\pi^2$

Answer: C

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38. An electric fan has blades of length $30cm$ as measured from the axis of rotation. If the fan is rotating at $1200r \pm$, find the acceleration of a point on the tip of a blade.

A. $1600m / \sec^2$

B. $4740m / \sec^2$

C. $2370m / \sec^2$

D. $5055m / \sec^2$

Answer: B

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39. The force required to keep a body in uniform circular motion is

A. Centripetal force

B. Centrifugal force

C. Resistance

D. None of the above

Answer: A

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40. Cream gets separated out of milk when it is churned, it is due to

A. Gravitational force

B. Centripetal force

C. Centrifugal force

D. Frictional force

Answer: C

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41. A paticle of mass m is executing uniform circular motion on a path of radius r. If p is the magnitude of its linear momentum, then the radial force acting on the particle is

A. pmr

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

C. $\frac{mp^2}{r}$

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

Answer: D

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42. A particle moves in a circular orbit under the action of a central attractive force inversely proportional to the distance r. The speed of the particle is

A. Proportional to r^2

B. Independent of r

C. Proportional to r

D. Proportional to $1/r$

Answer: B

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43. Two masses M and m are attached to a vertical axis by weightless threads of combined length l . They are set in rotational motion in a horizontal plane about this axis with constant angular velocity ω . If the tensions in the threads are the same during motion, the distance of M from the axis is

A. $\frac{Ml}{M+m}$

B. $\frac{ml}{M+m}$

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

D. $\frac{M+m}{m}l$

Answer: B

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44. A boy on a cycle pedals around a circle of 20 metres radius at a speed of $20\text{metres}/\text{sec}$. The combined mass of the boy and the cycle is

90 kg . The angle that the cycle makes with the vertical so that it may not fall is $(g = 9.8 m / \sec^2)$

A. 60.25°

B. 63.90°

C. 26.12°

D. 30.00°

Answer: B

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45. The average acceleration vector for a particle having a uniform circular motion is

A. A constant vector of magnitude $\frac{v^2}{r}$

B. A vector of magnitude $\frac{v^2}{r}$ directed normal to the plane of the given uniform circular motion

C. Equal to the instantaneous acceleration vector at the start of the motion

D. A null vector

Answer: D

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46. The radius of the curved road on a national highway is R. The width of the road is b. The outer edge of the road is raised by h with respect to the inner edge so that a car with velocity v can pass safe over it. The value of h is

A. $\frac{v^2 b}{Rg}$

B. $\frac{v}{Rgb}$

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

D. $\frac{v^2 b}{R}$

Answer: A

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47. When a particle moves in a uniform circular motion. It has

A. Radial velocity and radial acceleration

B. Tangential velocity and radial acceleration

C. Tangential velocity and tangential acceleration

D. Radial velocity and tangential acceleration

Answer: B

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48. A motorcycle is going on an overbridge of radius R. The driver maintains a constant speed. As the motorcycle is ascending on the overbridge, the normal force on it

A. Increases

B. Decreases

C. Remains the same

D. Fluctuates

Answer: A

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49. A mass 2 kg is whirled in a horizontal circle by means of a string at an initial speed of 5 revolutions per minute . Keeping the radius constant the tension in the string is doubled. The new speed is nearly

A. 14rpm

B. 10rpm

C. 2.25 rpm

D. 7 rpm

Answer: D

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50. The magnitude of the centripetal force acting on a body of mass m executing uniform motion in a circle of radius r with speed v is

A. mvr

B. mv^2/r

C. v/r^2m

D. v/rm

Answer: B

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51. A string breaks if its tension exceeds 10 newtons . A stone of mass 250 gm tied to this string of length 10 cm is rotated in a horizontal circle. The maximum angular velocity of rotation can be

A. $20 rad / s$

B. $40 rad / s$

C. $100 rad / s$

D. $200 rad / s$

Answer: A

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52. A 500 kg car takes a round turn of radius 50 m with a velocity of 36 km/hr . The centripetal force is

A. $250 N$

B. $750N$

C. $1000N$

D. $1200N$

Answer: C

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53. A ball of mass 0.25 kg attached to the end of a string of length 1.96 m is moving in a horizontal circle. The string will break if the tension is more than 25 N . What is the maximum speed with which the ball can be moved

A. $14m/s$

B. $3m/s$

C. $3.92m/s$

D. $5m/s$

Answer: A

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54. A body of mass 5 kg is moving in a circle of radius m 1 with an angular velocity of 2 radian/sec . The centripetal force is

A. 10 N

B. 20N

C. 30 N

D. 40 N

Answer: B

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55. A particle of mass m is moving in a horizontal circle of radius r, under a centripetal force equal to $\left(-K/r^2\right)$, where k is a constant. The total energy of the particle is -

A. $-\frac{k}{2r}$

B. $-\frac{k}{r}$

C. $-\frac{2k}{r}$

D. $-\frac{4k}{r}$

Answer: A

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56. A stone of mass of 16 kg is attached to a string 144 m long and is whirled in a horizontal circle. The maximum tension the string can withstand is 16 Newton . The maximum velocity of revolution that can be given to the stone without breaking it, will be

A. $20ms^{-1}$

B. $16ms^{-1}$

C. $14ms^{-1}$

D. $12ms^{-1}$

Answer: D

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57. A circular road of radius $1000m$ has hanging angle 45° The maximum safe speed (in ms^{-1} of a car having a mass $2000kg$ will be (if the coefficient of friction between tying and road is 0.3)

A. $172m/s$

B. $124m/s$

C. $99m/s$

D. $86m/s$

Answer: A

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58. The second's hand of a watch has length 6 cm. Speed of end point and magnitude of difference of velocities at two perpendicular positions will be

A. 6.28 and $0mm / s$

B. 8.88 and $4.44mm / s$

C. 8.88 and $6.28mm / s$

D. 6.28 and $8.88mm / s$

Answer: D

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59. A sphere of mass m is tied to end of a string of length l and rotated through the other end along a horizontal circular path with speed v . The work done in full horizontal circle is

A. 0

B. $\left(\frac{mv^2}{l}\right).2\pi l$

C. $mg.2\pi l$

D. $\left(\frac{mv^2}{l}\right).\ (l)$

Answer: A

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60. A body is whirled in a horizontal circle of radius $20cm$. It has an angular velocity of $10rad/s$. What is its linear velocity at any point on the circular path

A. $10m/s$

B. $2m/s$

C. $20m/s$

D. $\sqrt{2}m/s$

Answer: B

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61. Find the maximum velocity for skidding for a car moved on a circular track of radius 100 m . The coefficient of friction between the road and tyre is 0.2

A. $0.14m/s$

B. $140m/s$

C. $1.4km/s$

D. $14m/s$

Answer: D

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62. A car when passes through a convex bridge exerts a force on it which is equal to

A. $Mg + \frac{Mv^2}{r}$

B. $\frac{Mv^2}{r}$

C. Mg

D. None of these

Answer: D

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63. The angular speed of seconds needle in a mechanical watch is

A. $\frac{\pi}{30} rad/s$

B. $2\pi rad/s$

C. $\pi rad/s$

D. $\frac{60}{\pi} rad/s$

Answer: A

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64. The angular velocity of a particle rotating in a circular orbit 100 times per minute is

A. $1.66 rad / s$

B. $10.47 rad / s$

C. $10.47 deg / s$

D. $60 deg / s$

Answer: B

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65. A body of mass 100 g is rotating in a circular path of radius r with constant velocity. The work done in one complete revolution is

A. $100rJ$

B. $(r/100)J$

C. $(100/r)J$

D. Zero

Answer: D

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66. A particle comes round a circle of radius 1 m once. The time taken by it is 10 sec . The average velocity of motion is

A. $0.2\pi m / s$

B. $2\pi m / s$

C. $2m / s$

D. Zero

Answer: D

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67. An unbanked curve has a radius of 60m. The maximum speed at which a car can make a turn if the coefficient of static friction is 0.75 , is

A. $2.1m / s$

B. $14m / s$

C. $21m / s$

D. $7m/s$

Answer: C

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68. A wheel completes 2000 revolutions to cover the 9.5 km. distance. then the diameter of the wheel is

A. $1.5m$

B. $1.5cm$

C. $7.5cm$

D. $7.5m$

Answer: A

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69. A cycle wheel of radius 0.4 m completes one revolution in one second then the acceleration of a point on the cycle wheel will be

A. $0.8m / s$

B. $0.4m / s$

C. $1.6\pi^2 m / s^2$

D. $0.4\pi^2 m / s^2$

Answer: C

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70. The centripetal acceleration is given by

A. $v2 / r$

B. v2r

C. vr

D. v/r

Answer: A

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71. A cylindrical vessel partially filled with water is rotated about its vertical central axis. It's surface will

A. Rise equally

B. Rise from the sides

C. Rise from the middle

D. Lowered equally

Answer: B

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72. If a particle covers half the circle of radius R with constant speed then

A. Momentum change is mvr

B. Change in K.E is $1/2mv$

C. Change in K.E is mv

D. Change in K.E is zero

Answer: D

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73. An aeroplane is flying with a uniform speed of 100 m/s along a circular path of radius 100 m . the angular speed of the aeroplane will be

A. $1rad / \sec$

B. $2rad / \sec$

C. $3rad / \sec$

D. $4rad / \sec$

Answer: A

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74. A body moves with constant angular velocity on a circle. Magnitude of angular acceleration

A. $r\omega$

B. Constant

C. Zero

D. None of the above

Answer: C

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75. What is the value of linear velocity, if $\overrightarrow{\omega} = 3\hat{i} - 4\hat{j} + \hat{k}$ and $\overrightarrow{r} = 5\hat{i} - 6\hat{j} + 6\hat{k}$

A. $6\hat{i}+2\hat{j}-3\hat{k}$

B. $-18\hat{i}-13\hat{j}+2\hat{k}$

C. $4\hat{i}-13\hat{j}+6\hat{k}$

D. $6\hat{i}-2\hat{j}+8\hat{k}$

Answer: B

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76. A stone is tied to one end of a string 50 cm long is whirled in a horizontal circle with a constant speed. If the stone makes 10 revolutions in 20 s , what is the magnitude of acceleration of the stone

A. $493cm / s$

B. $720cm / s$

C. $860cm / s$

D. $990cm / s$

Answer: A

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77. A $100kg$ car is moving with a maximum velocity of $9m/s$ across a circular track of radius 30 m . The maximum force of friction between the road and the car is

A. $1000N$

B. $706N$

C. $270N$

D. $200N$

Answer: C

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78. Find the maximum speed at which a car can turn round a curve of $30m$ radius on a level road if coefficient of friction between the tyres and road is $0.4. Take g = 10m/s^2$.

A. $10.84m/\sec$

B. $9.84m/\sec$

C. $8.84m/\sec$

D. $6.84m/\sec$

Answer: A

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79. The angular velocity of a wheel is $70 rad / \sec$. If the radius of the wheel is 0.5 m, then linear velocity of the wheel is

A. $70 m / s$

B. $35 m / s$

C. $30 m / s$

D. $20 m / s$

Answer: B

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80. Find the angle through which a cyclist bends when he covers a circular path $34.3m$ long in $\sqrt{22}$ sec . Given $g = 9.8ms^{-2}$.

A. 45°

B. 40°

C. 42°

D. 48°

Answer: A

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81. A particle of mass M is moving in a horizontal circle of radius R with uniform speed V. When it moves from one point to a diametrically opposite point, its

A. Kinetic energy changes by $MV^2/4$

B. Momentum does not change

C. Momentum changes by 2 MV

D. Kinetic energy changes by MV^2

Answer: C

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82. A ball of mass 0.1 Kg. is whirled in a horizontal circle of radius 1 m . by means of a string at an initial speed of 10 R.P.M. Keeping the radius constant, the tension in the string is reduced to one quarter of its initial value. The new speed is

A. 5r.p.m.

B. 10 r.p.m.

C. 20 r.p.m

D. 14 r.p.m.

Answer: A

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83. A cyclist riding at a speed of $14\sqrt{3}ms^{-1}$ takes a turn around a circular road of radius

$20\sqrt{3}$ m . What is his inclination with horizontal ?

A. 30°

B. 90°

C. 45°

D. 60°

Answer: D

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84. If a cycle wheel of radius 4 m completes one revolution in two seconds. Then acceleration of a point on the cycle wheel will be

A. $\pi^2 m / s^2$

B. $2\pi^2 m / s^2$

C. $4\pi^2 m / s^2$

D. $8\pi m / s^2$

Answer: C

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85. A bob of mass 10 kg is attached to wire 0.3 m long. Its breaking stress is $4.8 \times 10^7 N/m^2$. The area of cross section of the wire is $10^{-6} m^2$. The maximum angular velocity with which it can be rotated in a horizontal circle

A. $8 rad/\sec$

B. $4 rad/\sec$

C. $2 rad/\sec$

D. $1 rad/\sec$

Answer: B

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86. In uniform circular motion, the velocity vector and acceleration vector are

A. Perpendicular to each other

B. Same direction

C. Opposite direction

D. Not related to each other

Answer: A

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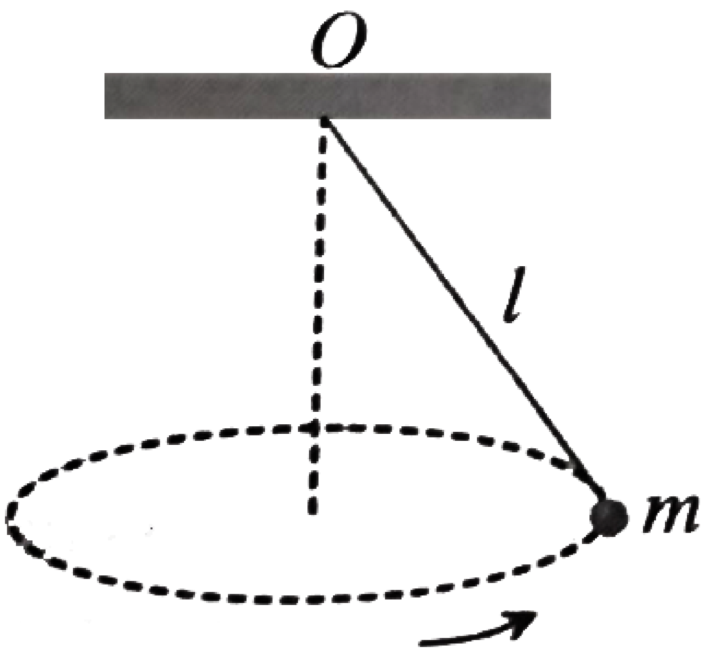
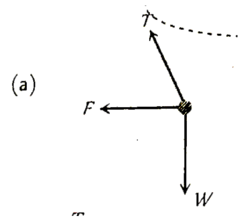
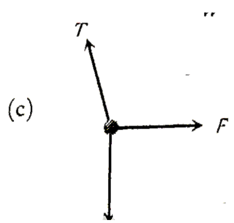


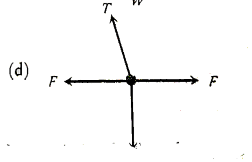
87.

A point mass m is suspended from a light thread of length l, fixed at O, is whirled in a horizontal circle at constant speed as shown. From your point of view, stationary with respect to the mass, the forces on the mass are

A. 

B. 

C. 

D. 

Answer: C

Watch Video Solution

88. If a cyclist moving with a speed of $4.9m/s$ on a level road can take a sharp circular turn of radius 4 m , then coefficient of friction between the cycle tyres and road is

A. 0.41

B. 0.51

C. 0.61

D. 0.71

Answer: C

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89. A car moves on a circular road. It describes equal angles about the centre in equal intervals of time. Which of the following statement about the velocity of the car is true

A. Magnitude of velocity is not constant

B. Both magnitude and direction of velocity change

C. Velocity is directed towards the centre of the circle

D. Magnitude of velocity is constant but direction changes

Answer: D

Watch Video Solution

90. A scooter is going round a circular road of radius 100 m at a speed of $10m/s$. The angular speed of the scooter will be

A. $0.01rad/s$

B. $0.1rad/s$

C. $1rad/s$

D. $10rad/s$

Answer: B

Watch Video Solution

91. A particle of mass M moves with constant speed along a circular path of radius r under the action of a force F. Its speed is

A. $\sqrt{\frac{rF}{m}}$

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

C. $\sqrt{Fmr}$

D. $\sqrt{\frac{F}{mr}}$

Answer: A

Watch Video Solution

92. In an atom for the electron to revolve around the nucleus, the necessary centripetal force is obtained from the following force exerted by the nucleus on the electro

A. Nuclear force

B. Gravitational force

C. Magnetic force

D. Electrostatic force

Answer: D

Watch Video Solution

93. A particle moves with constant speed v along a circular path of radius r and completes the circle in time T. The acceleration of the particle is

A. $2\pi v / T$

B. $2\pi r / T$

C. $2\pi r^2 / T$

D. $2\pi v^2 / T$

Answer: A

Watch Video Solution

94. The maximum velocity (in ms^{-1}) with which a car driver must traverse a flat curve of radius 150 m and coefficient of friction 0.6 to avoid skidding is

A. 60

B. 30

C. 15

D. 25

Answer: B

Watch Video Solution

95. A car is moving with high velocity when it has a turn. A force acts on it outwardly because of

A. Centripetal force

B. Centrifugal force

C. Gravitational force

D. All the above

Answer: B

Watch Video Solution

96. A motor cycle driver doubles its velocity when he is having a turn. The force exerted outwardly will be

A. Double

B. Half

C. 4 times

D. $\frac{1}{4}$ times

Answer: C

Watch Video Solution

97. The coefficient of friction between the tyres and the road is 0.25. The maximum speed with which a car can be driven round a curve of radius 40 m without skidding is (assume $g = 10ms^{-2}$)

A. $40ms^{-1}$

B. $20ms^{-1}$

C. $15ms^{-1}$

D. $10ms^{-1}$

Answer: D

Watch Video Solution

98. An athelete completes one round of a circular track of radius R in 40 seconds. What will be the displacement at the end of ` 2 min. 20 second ?

A. $70m$

B. $140m$

C. $110m$

D. $220m$

Answer: D

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99. A proton of mass $1.6 \times 10^{-27} kg$ goes round in a circular orbit of radius 0.10 m under a centripetal force of $4 \times 10^{-13} N$. then the frequency of revolution of the proton is about

A. 0.08×10^{8} cycles per sec

B. 4×10^{8} cycles per sec

C. 8×10^{8} cycles per sec

D. 12×10^{8} cycles per sec

Answer: A

Watch Video Solution

100. A particle is moving in a circle with uniform speed v . In moving from a point to another diametrically opposite point

A. The momentum changes by mv

B. The momentum changes by $2mv$

C. The kinetic energy changes by $(1/2)mv$

D. The kinetic energy changes by mv^2

Answer: B

Watch Video Solution

101. In uniform circular motion

A. Both the angular velocity and the angular momentum vary

B. The angular velocity varies but the angular momentum remains constant

C. Both the velocity and the angular momentum stay constant

D. The angular momentum varies but the angular velocity remains constant

Answer: C

Watch Video Solution

102. When a body moves in a circular path, no work is done by the force since,

A. There is no displacement

B. There is no net force

C. Force and displacement are perpendicular to each other

D. The force is always away from the centre

Answer: C

Watch Video Solution

103. Which of the following statements is FALSE for a paricle moving in a circle with a constant angular sppeed?

A. The velocity vector is tangent to the circle

B. The acceleration vector is tangent to the circle

C. The acceleration vector points to the centre of the circle

D. The velocity and acceleration vectors are perpendicular to each other

Answer: B

Watch Video Solution

104. If a_r and a_t represent radial and tangential accelerations, the motion of a particle will be uniformly circular if

A. $a_r = 0$ and $a_t = 0$

B. $a_r = 0$ but $a_t \neq 0$

C. $a_r \neq 0$ but $a_t = 0$

D. $a_r \neq 0$ but $a_t \neq 0$

Answer: C

Watch Video Solution

105. A person with his hands in his pockets is skating on ice at the velocity of $10m/s$ and describes a circle of radius 50 m . What is his inclination with vertical

A. $\tan^{-1}\left(\frac{1}{10}\right)$

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

C. $\tan^{-1}(1)$

D. $\tan^{-1}\left(\frac{1}{5}\right)$

Answer: D

Watch Video Solution

106. If the radius of curvature of the path of two particles of same masses are in the ratio $1:2$, then the in order to have constant centripetal force, their velocity, should be in the ratio of

A. $1:4$

B. $4:1$

C. $\sqrt{2}:1$

D. $1:\sqrt{2}$

Answer: D

Watch Video Solution

107. An object is moving in a circle of radius 100 m with a constant speed of $31.4 m / s$. What is its average speed for one complete revolution

A. Zero

B. $31.4 m / s$

C. $3.14 m / s$

D. $\sqrt{2} \times 31.4 m / s$

Answer: B

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Watch Video Solution

108. A body of mass 1 kg tied to one end of string is revolved in a horizontal circle of radius 0.1 m with a speed of $3\text{revolution}/\text{sec}$, assuming the effect of gravity is negligible, then linear velocity, acceleration and tension in the string will be

A. $1.88m/s, 35.5m/s^2, 35.5N$

B. $2.88m/s, 45.5m/s^2, 45.5N$

C. $3.88m/s, 55.5m/s^2, 55.5N$

D. None of these

Answer: A

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109. The acceleration of a train travelling with speed of $400m/s$ as it goes round a curve of radius 160 m , is

A. $1km/s^2$

B. $100m/s^2$

C. $10m / s^2$

D. $1m / s^2$

Answer: A

Watch Video Solution

110. A car of mass 800 kg moves on a circular track of radius 40 m . If the coefficient of friction is 0.5, then maximum velocity with which the car can move is

A. $7m/s$

B. $14m/s$

C. $8m/s$

D. $12m/s$

Answer: B

Watch Video Solution

111. A 500 kg crane takes a turn of radius 50 m with velocity of $36km/hr$. The centripetal force is

A. $1200N$

B. $1000N$

C. $750N$

D. $250N$

Answer: B

Watch Video Solution

112. Two particles of equal masses are revolving in circular paths of radii r_1 and r_2

respectively with the same speed. The ratio of their centripetal force is

A. $\left(\frac{R_2}{R_1}\right)^2$

B. $\frac{R_1}{R_2}$

C. $\left(\frac{R_1}{R_2}\right)^2$

D. $\sqrt{R_1 R_2}$

Answer: B

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113. In case of uniform circular motion which of the following physical quantity do not remain constant

A. Speed

B. Momentum

C. Kinetic energy

D. Mass

Answer: B

Watch Video Solution

114. What happens to the centripetal acceleration of a revolving body if you double the orbital speed v and half the angular velocity ω

A. The centripetal acceleration remains unchanged

B. The centripetal acceleration is halved

C. The centripetal acceleration is doubled

D. The centripetal acceleration is quadrupled

Answer: A

Watch Video Solution

115. A mass is supported on a frictionless horizontal surface. It Is attached to a string and rotates about a fixed center at an angular velocity ω_0.If the length of the string and angular velocity both are doubled, the tension in the string which was initially T_0 is now

A. T_0

B. $T_0 / 2$

C. $4T_0$

D. $8T_0$

Answer: D

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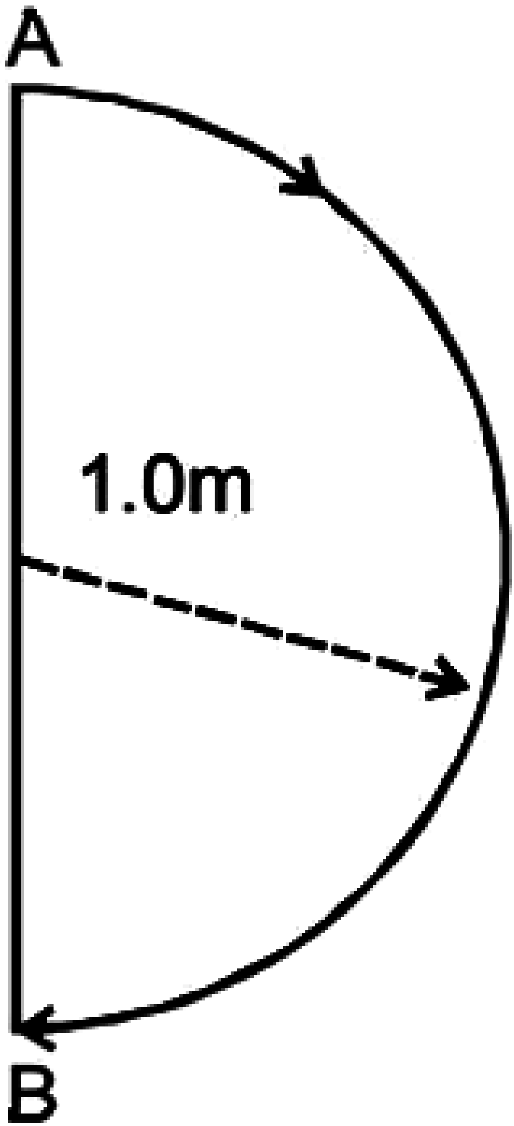
116. In $1.0s$, a particle goes from point A to point B, moving in a semicircle of radius $1.0m$ (see figure). The magnitude of the average velocity



A. $3.14m/s$

B. $2.0m/s$

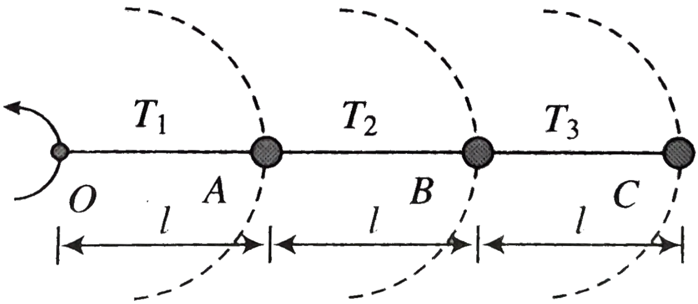
C. $1.0m/s$

D. Zero

Answer: B

Watch Video Solution

117. Three identical particles are joined together by a thread as shown in figure All the partical are moving in a horizontal plane If the vertical of the outermost particle is v_0 then the ratio of tension in the three sections of the string $(T_1 : T_2 : T_3 = ?)$ is



A. $3 : 5 : 7$

B. $3 : 4 : 5$

C. $7 : 11 : 6$

D. $6 : 5 : 3$

Answer: D

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118. A particle is moving in a circle of radius R with constant speed v, if radius is double then its centripetal force to keep the same speed should be

A. Double

B. Halved

C. Quadrupled

D. unchanged

Answer: B

Watch Video Solution

119. A stone tied to the end of string 1m long is whirled in a horizontal circle with a constant speed. If the stone makes 22 revolution in 44s, What is the magnitude and direction of acceleration of the ston is ?

A. $\frac{\pi^2}{4} ms^{-2}$ and direction along the radius towards the centre

B. $\pi^2 ms^{-2}$ and direction along the radius away from the centre

C. $\pi^2 ms^{-2}$ and direction along the radius towards the centre

D. $\pi^2 ms^{-2}$ and direction along the tangent to the circle

Answer: C

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120. A particle describes a horizontal circle in a conical funne whoses inner surface is smooth with speed of $0.5m/s$. What is the height of the plane of circle from vertex the funnel?

A. $0.25cm$

B. $2cm$

C. $4cm$

D. $2.5cm$

Answer: D

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121. What is angular velocity of earth spinning around its own axis ?

A. $\frac{2\pi}{86400} rad/\sec$

B. $\frac{2\pi}{3600} rad/\sec$

C. $\frac{2\pi}{24} rad/\sec$

D. $\frac{2\pi}{6400} rad/\sec$

Answer: A

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122. If the length of the second's hand in a stop clock is 3 cm the angular velocity and linear velocity of the tip is

A. $0.2047 rad/\sec., 0.0314 m/\sec$

B. $0.2547 rad/\sec., 0.314 m/\sec$

C. $0.1472 rad/\sec., 0.06314 m/\sec$

D. $0.1047 rad/\sec., 0.00314 m/\sec$

Answer: D

Watch Video Solution

123. In a circus stuntman rides a motorbike in a circular track of radius R in the vertical plane. The minimum speed at highest point of track will be

A. $\sqrt{2gR}$

B. $2gR$

C. $\sqrt{3gR}$

D. $\sqrt{gR}$

Answer: D

Watch Video Solution

124. A block of mass m at the end of a string is whirled round in a vertical circle of radius R. The critical speed of the block at the top of its swing below which the string would slacken before the block reaches the top is

A. Rg

B. $(Rg)^2$

C. R/g

D. $\sqrt{Rg}$

Answer: D

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125. A sphere is suspended by a thread of length l. What minimum horizontal velocity has to be imparted the ball for it to reach the height of the suspension?

A. gl

B. $2gl$

C. $\sqrt{gl}$

D. $\sqrt{2gl}$

Answer: D

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126. A bottle of soda water is rotated in a vertical circle with the neck held in hand. The air bubbles are collected

A. Near the bottom

B. In the middle of the bottle

C. Near the neck

D. Uniformly distributed in the bottle

Answer: C

Watch Video Solution

127. A bucket tied at the end of a $1.6m$ long string is whirled in a verticle circle with constant speed. What should be the minimum speed so that the water from the bucket does not spill, when the bucket is at the highest position $(Take g = 10 m/s^2)$

A. $4m/\sec$

B. $6.25m/\sec$

C. $16m/\sec$

D. None of the above

Answer: A

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128. A wheel is subjected to uniform angular acceleration about its axis. Initially, its angular velocity is zero. In the first $2\,\mathrm{sec}$, it rotates through an angle θ_1, in the next $2\,\mathrm{sec}$, it rotates through an angle θ_2. The ratio of θ_2 / θ_1 is

A. 1

B. 2

C. 3

D. 5

Answer: C

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129. A $1kg$ stone at the end of $1m$ long string is whirled in a vertical circle at a constant speed of $4m/s$. The tension in the string is $6N$, when the stone is at $\left(g=10m/s^2\right)$

A. Top of the circle

B. Bottom of the circle

C. Half way down

D. None of the above

Answer: A

Watch Video Solution

130. A cane filled with water is revolved in a vertical circle of radius 4 m and water just does not fall down. The time period of revolution will be –

A. 1 sec

B. 10 sec

C. 8 sec

D. 4 sec

Answer: D

Watch Video Solution

131. A 2 kg stone at the end of a string 1 m long is whirled in a vertical circle at a constant speed. The speed of the stone is $4m / \sec$. The tension in the string will be 52 N , when the stone is

A. At the top of the circle

B. At the bottom of the circle

C. Halfway down

D. None of the above

Answer: B

Watch Video Solution

132. A body is allowed to slide down a frictionless track from rest position at its top under gravity. The track ends in a circular loop of diameter D. Then, the minimum height of the inclined track (in terms of D) so that it may complete successfully the loop is

A. $h = \frac{5D}{2}$

B. $h = \frac{5D}{4}$

C. $h = \frac{3D}{4}$

D. $h = \frac{D}{4}$

Answer: B

Watch Video Solution

133. A car is moving with speed $30m/\sec$ on a circular path of radius 500 m . Its speed is increasing at the rate of , $2m/\sec^2$, What is the acceleration of the car

A. $2m/\sec^2$

B. $2.7m/\sec^2$

C. $1.8m/\sec^2$

D. $9.8m / \sec^2$

Answer: B

Watch Video Solution

134. The string of pendulum of length l is displaced through 90° from the vertical and released. Then the minimum strength of the string in order to withstand the tension, as the pendulum passes through the mean position is

A. mg

B. $3mg$

C. $5mg$

D. $6mg$

Answer: B

Watch Video Solution

135. A weightless thread can support tension up to $30N$. A particle of mass $0.5kg$ is tied to it and is revolved in a circle of radius $2m$ in a verticle plane. If $g = 10m / s^2$, then the maximum angular velocity of the stone will be

A. $5rad / s$

B. $\sqrt{30}rad / s$

C. $\sqrt{60}rad / s$

D. $10rad / s$

Answer: A

Watch Video Solution

136. A particle originally at rest at the highest point of a smooth vertical circle is slightly displaced. It will leave the circle at a vertical distance h below the highest points, such that h is equal to

A. $h = R$

B. $h = \frac{R}{3}$

C. $h = \frac{R}{2}$

D. $h = \frac{2R}{3}$

Answer: B

Watch Video Solution

137. A heavy mass is attached to a thin wire and is whirled in a vertical circle. The wire is most likely to break

A. When the mass is at the highest point of the circle

B. When the mass is at the lowest point of the circle

C. When the wire is horizontal

D. At an angle of $\cos^{-1}(1/3)$ from the upward vertical

Answer: B

Watch Video Solution

138. A weightless thread can bear tension upto $3.7kg$ wt A stone of mass $500g$ is tied to it and revolves in a verticle circle of radius $4m$ What will be the maximum angular velocity of the stone if $g = 10m/s^2$.

A. $4 \text{ radians} / \text{sec}$

B. $16 \text{ radians} / \text{sec}$

C. $\sqrt{21} \text{ radians} / \text{sec}$

D. $2 \text{ radians} / \text{sec}$

Answer: A

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139. The maximum velocity at the lowest point, so that the string just slack at the highest point in a vertical circle of radius l.

A. $\sqrt{gl}$

B. $\sqrt{3gl}$

C. $\sqrt{5gl}$

D. $\sqrt{7gl}$

Answer: C

Watch Video Solution

140. If the equation for the displacement of a particle moving in a circular path is given by $(\theta) = 2t^3 + 0.5$, where θ is in radians and t in seconds, then the angular velocity of particle after $2s$ from its start is

A. $8rad/\sec$

B. $12rad/\sec$

C. $24rad/\sec$

D. $36rad/\sec$

Answer: C

Watch Video Solution

141. A body of mass m hangs at one end of a string of length l , the other end of which is fixed. It is given a horizontal velocity so that the string would just reach where it makes an angle of 60° with the vertical. The tension in the string at mean position is

A. $2mg$

B. mg

C. $3mg$

D. $\sqrt{3}mg$

Answer: A

Watch Video Solution

142. In a vertical circle of radius r , at what point in its path a particle has tension equal to zero if it is just able to complete the vertical circle

A. Highest point

B. Lowest point

C. Any point

D. At a point horizontally from the centre of circle of radius r

Answer: A

Watch Video Solution

143. The tension in the string revolving in a vertical circle with a mass m at the end which is at the lowest position

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

B. $\frac{mv^2}{r} - mg$

C. $\frac{mv^2}{r} + mg$

D. mg

Answer: C

Watch Video Solution

144. A hollow sphere has radius 6.4 m. Minimum velocity required by a motor cyclist at bottom to complete the circle will be.

A. $17.7m/s$

B. $10.2m/s$

C. $12.4m/s$

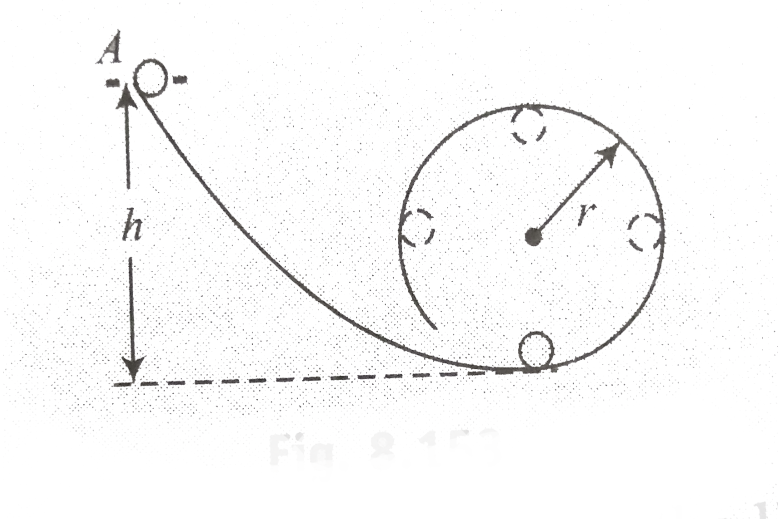
D. $16.0m/s$

Answer: A

Watch Video Solution

145. A block is released from rest at the top of an inclined plane which later curves into a circular track of radius r as shown in figure.

Find the minimum height h from where it should be released so that it is able to complete the circle.



A. $h < 5r/2$

B. $h > 5r/2$

C. $h = 5r/2$

D. $h \geq 5r / 2$

Answer: D

Watch Video Solution

146. A pendulum bob on a 2 m string is displaced 60° from the vertical and then released. What is the speed of the bob as it passes through the lowest point in its path

A. $\sqrt{2} m / s$

B. $\sqrt{9.8}m / s$

C. $4.43m / s$

D. $1 / \sqrt{2}m / s$

Answer: C

Watch Video Solution

147. A fan is making 600 revolutions per minute. If after some time it makes 1200 revolutions per minute, then the increase in its angular velocity is

A. $10\pi rad / \sec$

B. $20\pi rad / \sec$

C. $40\pi rad / \sec$

D. $60\pi rad / \sec$

Answer: B

Watch Video Solution

148. A particle is tied to 20 cm long string. It performs circular motion in vertical plane.

What is the angular velocity of string when the tension in the string at the top is zero

A. $5rad/\sec$

B. $2rad/\sec$

C. $7.5rad/\sec$

D. $7rad/\sec$

Answer: D

Watch Video Solution

149. A stone tied with a string, is rotated in a vertical circle. The minimum speed with which the string has to be rotated

A. Is independent of the mass of the stone

B. Is independent of the length of the string

C. Decreases with increasing mass of the stone

D. Decreases with increasing in length of the string

Answer: A

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150. For a particle in a non-uniform accelerated circular motion

A. Velocity is radial and acceleration is transverse only

B. Velocity is transverse and acceleration is radial only

C. Velocity is radial and acceleration has both radial and transverse components

D. Velocity is transverse and acceleration has both radial and transverse components

Answer: D

Watch Video Solution

151. A fighter plane is moving in a vertical circle of radius 'r'. Its minimum velocity at the highest point of the circle will be

A. $\sqrt{3gr}$

B. $\sqrt{2gr}$

C. $\sqrt{gr}$

D. $\sqrt{gr/2}$

Answer: C

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152. A ball is moving to and fro about the lowest point A of a smooth hemispherical bowl. If it is able to rise up to a height of 20 cm on either side of A , its speed at A must be (Take $= 10m / s$, mass of the body 5 g)

A. $0.2m / s$

B. $2m / s$

C. $4m / s$

D. $4.5ms$

Answer: B

Watch Video Solution

153. A stone of mass m is tied to a string and is moved in a vertical circle of radius r making n revolution per minute. The total tension in the string when the stone is its lowest point is.

A. mg

B. $m(g + \pi nr^2)$

C. $m(g + \pi nr)$

D. $m\{g+(\pi^2 n^2 r)/900\}$

Answer: D

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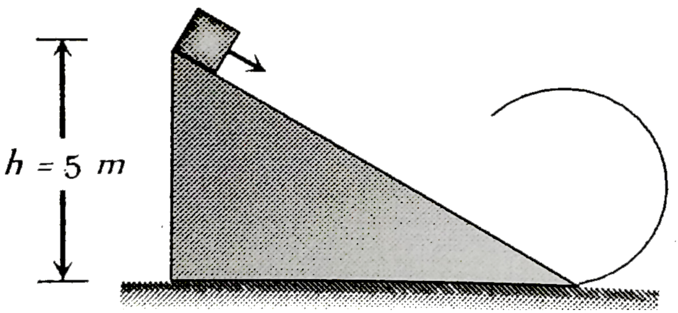
154. As per given figure to complete the circular loop what should be the radius if initial height is 5 m



A. $4m$

B. $3m$

C. $2.5m$

D. $2m$

Answer: D

Watch Video Solution

155. A coin, placed on a rotating turntable slips, when it is placed at a distance of $9cm$ from the center. If the angular velocity of the turnable is tripled, it will just slip, If its distance from the center is

A. $27cm$

B. $9cm$

C. $3cm$

D. $1cm$

Answer: D

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156. When a celling fan is switched off, its angular velocity falls to half while it makes 36 rotations. How many more rotations will it make before coming to rest ?

A. 18

B. 12

C. 36

D. 48

Answer: B

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157. A body crosses the topmost point of a vertical circle with a critical speed. Its centripetal acceleration, when the string is horizontal will be

A. $6g$

B. $3g$

C. $2g$

D. g

Answer: B

Watch Video Solution

158. A simple pendulum oscillates in a vertical plane. When it passes through the mean position, the tension in the string is 3 times the weight of the pendulum bob.what is the maximum displacement of the pendulum with respect to the vertical

A. 30°

B. 45°

C. 60°

D. 90°

Answer: D

Watch Video Solution

159. A particle is moving in a vertical circle with constant speed. The tansions in the string when passing through two positions at angles

30° and 60° from vertical (lowest position) are T_1 and T_2 respectively. Then

A. $T_1 = T_2$

B. $T_2 > T_1$

C. $T_1 > T_2$

D. Tension in the string always remains the same

Answer: C

Watch Video Solution

160. A Particle is kept at rest at the top of a sphere of diameter $42m$.when disturbed slightly, it slides down. At what height h from the bottom, the particle will leave the sphere

A. $14m$

B. $28m$

C. $35m$

D. $7m$

Answer: C

Watch Video Solution

161. The coordinates of a moving particle at any time 't' are given by $x = \alpha t$ and $y = \beta t$. The speed of the particle at time 't' 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: A

Watch Video Solution

162. A small disc is on the top of a hemisphere of radius R. What is the smallest horizontal velocity v that should fbe given to the disc for it to leave the hemisphere and not slide down it?[There is no friction]

A. $v = \sqrt{2gR}$

B. $v = \sqrt{gR}$

C. $v = \frac{g}{R}$

D. $v = \sqrt{g^2 R}$

Answer: B

Watch Video Solution

163. A body of mass 0.4 kg is whirled in a vertical circle making 2 rev/sec . If the radius of the circle is 2 m , then tension in the string when the body is at the top of the circle, is

A. $41.56N$

B. $89.86N$

C. $109.86N$

D. $122.2N$

Answer: D

Watch Video Solution

164. A bucket full of water is revolved in vertical circle of radius 2 m . What should be the maximum time-period of revolution so that the water doesn't fall off the bucket

A. $1 \sec$

B. $2 \sec$

C. $3 \sec$

D. $4 \sec$

Answer: C

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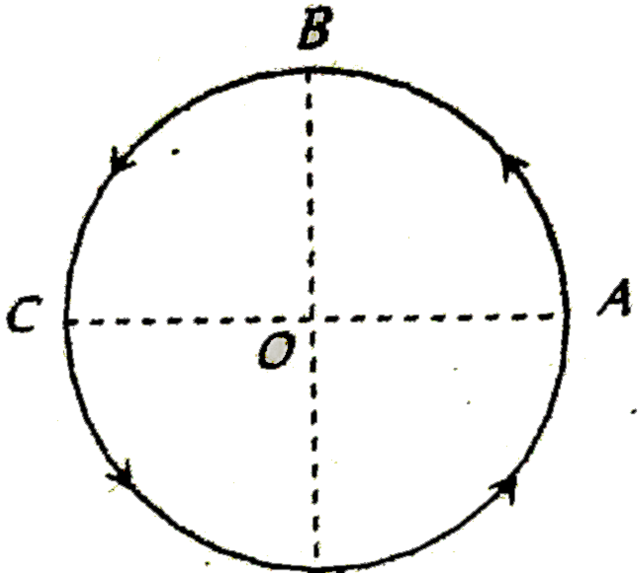
165. Figure shows a body of mass m moving with a uniform speed v along a circle of radius r . The change in velocity in going from A to B is



A. $v\sqrt{2}$

B. $v/\sqrt{2}$

C. v

D. Zero

Answer: A

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166. The maximum and minimum tension in the string whirling in a circle of radius 2.5 m with constant velocity are in the ratio $5:3$ then its velocity is

A. $\sqrt{98}m/s$

B. $7m/s$

C. $\sqrt{490}m/s$

D. $\sqrt{4.9}$

Answer: A

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167. For a particle in circular motion the centripetal acceleration is

A. Less than its tangential acceleration

B. Equal to its tangential acceleration

C. More than its tangential acceleration

D. May be more or less than its tangential acceleration

Answer: D

Watch Video Solution

168. A particle moves in a circular path with decreasing speed . Choose the correct statement.

A. Angular momentum remains constant

B. Acceleration $\left(\vec{a}\right)$ is towards the center

C. Particle moves in a spiral path with decreasing radius

D. The direction of angular momentum remains constant

Answer: D

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169. A body of mass 1 kg is moving in a vertical circular path of radius 1 m. The difference between the kinetic energies at its highest and lowest position is

A. $20J$

B. $10J$

C. $4\sqrt{5}J$

D. $10(\sqrt{5}-1)J$

Answer: A

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170. The angle turned by a body undergoing circular motion depends on time as $\theta = \theta_0 + \theta_1 t + \theta_2 t^2$. Then the angular acceleration of the body is

A. θ_1

B. θ_2

C. $2\theta_1$

D. $2\theta_2$

Answer: D

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171. The maximum range of a gun from horizontal terrain is $16km$. If $g = 10m/s^2$ what must be the muzzle velocity of the shell?

A. $200m/s$

B. $400m/s$

C. $100m/s$

D. $50m/s$

Answer: B

Watch Video Solution

172. 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 path

B. Circular path

C. Parabolic path

D. Hyperbolic path

Answer: C

Watch Video Solution

173. A bullet is dropped from the same height when another bullet is fired horizontally. They will hit the ground

A. One after the other

B. Simultaneously

C. Depends on the observer

D. None of the above

Answer: B

Watch Video Solution

174. An aeroplane is flying at a constant horizontal velocity of $600 km / hr$ at an elevation of 6 km towards a point directly above the target on the earth's surface. At an appropriate time, the pilot releases a ball so that it strikes the target at the earth. The ball will appear to be falling

A. On a parabolic path as seen by pilot in the plane

B. Vertically along a straight path as seen by an observer on the ground near the target

C. On a parabolic path as seen by an observer on the ground near the target

D. On a zig-zag path as seen by pilot in the plane

Answer: C

Watch Video Solution

175. A bomb is dropped from an aeroplane moving horizontally at constant speed. When air resistance is taken into consideration, the bomb

A. Falls to earth exactly below the aeroplane

B. Fall to earth behind the aeroplane

C. Falls to earth ahead of the aeroplane

D. Flies with the aeroplane

Answer: B

Watch Video Solution

176. A man projects a coin upwards from the gate of a uniformly moving train. The path of coin for the man will be

A. Parabolic

B. Inclined straight line

C. Vertical straight line

D. Horizontal straight line

Answer: C

Watch Video Solution

177. An aeroplane is flying in a horizontal direction with a velocity $600km/h$ at a height of 1960 m. When it is vertically above the point A on the ground, a body is dropped from it.

The body strikes the ground at point B.

Calculate the distance AB.

A. $1200m$

B. $0.33km$

C. $3.33km$

D. $33km$

Answer: C

Watch Video Solution

178. A ball is rolled off the edge of a horizontal table at a speed of $4m/\mathrm{second}$. It hits the ground after 0.4 second . Which statement given below is true

A. It hits the ground at a horizontal distance 1.6 m from the edge of the table

B. The speed with which it hits the ground is 4.0 m/second

C. Height of the table is $0.8m$

D. It hits the ground at an angle of 60° to the horizontal

Answer: A::C

Watch Video Solution

179. An aeroplane flying $490m$ above ground level at $100m/s$, releases a block. How far on ground will it strike

A. $0km$

B. $1km$

C. $2km$

D. None

Answer: B

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180. A body is thrown horizontally from the top of a tower of height $5m$. It touches the ground at a distance of $10m$ from the foot of the tower. Find the initial velocity of the body.

A. $2.5ms^{-1}$

B. $5ms^{-1}$

C. $10ms^{-1}$

D. $20ms^{-1}$

Answer: C

Watch Video Solution

181. An aeroplane moving horizontally with a speed of $720km/h$ drops a food pocket, while flying at a height of 396.9 m . the time taken by a food pocket to reach the ground and its horizontal range is (Take $g = 9.8m / \sec$)

A. $3 \sec$ and $2000m$

B. $5 \sec$ and $500m$

C. $8 \sec$ and $1500m$

D. $9 \sec$ and $1800m$

Answer: D

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182. A particle (A) is dropped from a height and another particles (B) is thrown into horizontal direction with speed of 5m/s sec from the same height. The correct statement is

A. Both particles will reach at ground simultaneously

B. Both particles will reach at ground with same speed

C. Particle (A) will reach at ground first with respect to particle (B)

D. Particle (B) will reach at ground first with respect to particle (A)

Answer: A

Watch Video Solution

183. A particle moves in a plane with constant acceleration in a direction different from the initial velocity. The path of the particle will be

A. A straight line

B. An arc of a circle

C. A parabola

D. An ellipse

Answer: C

Watch Video Solution

184. At the height 80 m , an aeroplane is moving with $150m/s$. A bomb is dropped from it so as to hit a target. At what distance from the target should the bomb be dropped

(given $g = 10m / s$)

A. $605.3m$

B. $600m$

C. $80m$

D. $230m$

Answer: A

Watch Video Solution

185. A bomber moving horizontally with $500 m / s$ drops a bomb which strikes ground in 10s. The angle of strike with horizontal is

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

B. $\tan\left(\frac{1}{5}\right)$

C. $\tan^{-1}(1)$

D. $\tan^{-1}(5)$

Answer: A

Watch Video Solution

186. A large number of bullets are fired in all directions with the same speed v. Find the maximum area on the ground on which these bullets will spread.

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

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

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

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

Answer: B

Watch Video Solution

187. A projectile fired with initial velocity u at some angle θ has a range R . If the initial velocity be doubled at the same angle of projection, then the range will be

A. $2R$

B. $R/2$

C. R

D. $4R$

Answer: D

Watch Video Solution

188. If the initial velocity of a projectile be doubled, keeping the angle of projection same, the maximum height reached by it will

A. Remain the same

B. Be doubled

C. Be quadrupled

D. Be halved

Answer: C

Watch Video Solution

189. In the motion of a projectile freely under gravity, its

A. Total energy is conserved

B. Momentum is conserved

C. Energy and momentum both are conserved

D. None is conserved

Answer: A

Watch Video Solution

190. The range of a projectile for a given initial velocity is maximum when the angle of projection is 45°. The range will be minimum, if the angle of projection is

A. 90°

B. 180°

C. 60°

D. 75°

Answer: A

Watch Video Solution

191. Find the angle of projection of a projectile for which the horizontal range and maximum height are equal.

A. 45°

B. $\theta = \tan^{-1}(0.25)$

C. $\theta = \tan^{-1} 4$ or $(\theta = 76^{\circ})$

D. 60°

Answer: C

Watch Video Solution

192. A ball is thrown upwards and returns to the ground describing a parabolic path. Which of the following quantities remains constant ?

A. Kinetic energy of the ball

B. Speed of the ball

C. Horizontal component of velocity

D. Vertical component of velocity

Answer: C

Watch Video Solution

193. At the top of the trajectory of a projectile, the directions of its velocity and acceleration are

A. Perpendicular to each other

B. Parallel to each other

C. Inclined to each other at an angle of 45°

D. Antiparallel to each other

Answer: A

Watch Video Solution

194. An object is thrown along a direction inclined at an angle of 45° with the horizontal direction. The horizontal range of the particle is equal to

A. Vertical height

B. Twice the vertical height

C. Thrice the vertical height

D. Four times the vertical height

Answer: D

Watch Video Solution

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

A. $8m / \sec$

B. $6m / \sec$

C. $10m / \sec$

D. Not obtainable from the data

Answer: C

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196. Referring to above question, the angle with the horizontal at which the projectile was projected is

A. $\tan^{-1}(3/4)$

B. $\tan^{-1}(4/3)$

C. $\sin^{-1}(3/4)$

D. Not obtainable from the data

Answer: B

View Text Solution

197. Referring to the above two questions, the acceleration due to gravity is given by

A. $10m / \sec^2$

B. $5m / \sec^2$

C. $20m / \sec^2$

D. $2.5m / \sec^2$

Answer: A

View Text Solution

198. The range of a projectile launched at an angle of 15° with horizontal is 1.5km. The range of projectile when launched at an angle of 45° to the horizontal is

A. $1.5km$

B. $3.0km$

C. $6.0km$

D. $0.75km$

Answer: B

Watch Video Solution

199. A cricketer hits a ball with a velocity $25m/s$ at 60° above the horizontal. How far above the ground it passes over a fielder 50 m from the bat (assume the ball is struck very close to the ground)

A. $6.60m$

B. $9.0m$

C. $11.6m$

D. $12.7m$

Answer: A

Watch Video Solution

200. A stone is projected from the ground with velocity $25m/s$. Two seconds later, it just clears a wall 5 m high. The angle of projection of the stone is $(g = 10m/\sec^2)$

A. 30°

B. 45°

C. 50.2°

D. 60°

Answer: A

Watch Video Solution

201. Galileo writes that for angles of projection of a projectile at angles $(45 + \theta)$ and $(45 - \theta)$

, the horizontal ranges described by the projectile are in the ratio of (if $\theta \leq 45$)

A. $2:1$

B. $1:2$

C. $1:1$

D. $2:3$

Answer: C

Watch Video Solution

202. A projectile thrown with a speed v at an angle θ has a range R on the surface of earth. For same v and θ, its range on the surface of moon will be

A. $R/6$

B. $6R$

C. $R/36$

D. $36R$

Answer: B

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203. The greatest height to which a boy can throw a stone is (h). What will be the greatest distance on horizontal surface upto which the boy can throw the stone with the same speed ? Neglect the air friction.

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

B. h

C. $2h$

D. $3h$

Answer: C

Watch Video Solution

204. The horizontal range is four times the maximum height attained by a projectile. The angle of projection is

A. 90°

B. 60°

C. 45°

D. 30°

Answer: C

Watch Video Solution

205. A ball whose kinetic energy is E , is projected at an angle of $45(\circ)$ to the horizontal . The kinetic energy of the ball at the highest point of its flight will be

A. Zero

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

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

D. E

Answer: B

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206. A particle of mass m is projected with a velocity v making an angle of 45° with the horizontal. The magnitude of the angular momentum of the projectile abut the point of projection when the particle is at its maximum height h is.

A. Zero

B. $mv^3 / (4\sqrt{2}g)$

C. $mv^3 / (\sqrt{2}g)$

D. $mv^2 / 2g$

Answer: B

Watch Video Solution

207. A particle reaches its highest point when it has covered exactly one half of its horizontal range. The corresponding point on the displacement -time graph is charecterized by :

A. Negative slope and zero curvature

B. Zero slope and negative curvature

C. Zero slope and positive curvature

D. Positive slope and zero curvature

Answer: B

Watch Video Solution

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

A. Maximum

B. Minimum

C. Zero

D. g

Answer: D

Watch Video Solution

209. When a body is thrown with a velocity u making an angle θ with the horizontal plane, the maximum distance covered by it in horizontal direction is

A. $\frac{u^2 \sin\theta}{g}$

B. $\frac{u^2 \sin 2\theta}{2g}$

C. $\frac{u^2 \sin 2\theta}{g}$

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

Answer: C

Watch Video Solution

210. A football player throws a ball with a velocity of 50 metre/sec at an angle 30 degrees from the horizontal. The ball remains in the air for $\left(g = 10m/s^2\right)$

A. $2.5\,\text{sec}$

B. $1.25\,\text{sec}$

C. $5\,\text{sec}$

D. $0.625\,\text{sec}$

Answer: C

Watch Video Solution

211. A body of mass $0.5kg$ is projected under the gravity with a speed of $98m/s$ at an angle of 30° with the horizontal. The change in momentum (in magnitude) of the body when it strikes the ground is

A. $24.5N - s$

B. $49.0N - s$

C. $98.0N - s$

D. $50.0N - s$

Answer: B

Watch Video Solution

212. A body is projected at such an angle that the horizontal range is three times the greatest height. The angle of projection is

A. $25^{\circ} 8'$

B. $33^\circ 7'$

C. $42^\circ 8'$

D. $53^\circ 8'$

Answer: D

Watch Video Solution

213. A gun is aimed at a target in a line of its barrel. The target is released and allowed to fall under gravity at the same instant the gun is fired. The bullet will

A. Pass above the target

B. Pass below the target

C. Hit the target

D. Certainly miss the target

Answer: C

Watch Video Solution

214. Two bodies are projected with the same velocity. If one is projected at an angle of 30° and the other at an angle of 60° to the horizontal, the ratio of the maximum heights reached is

A. $3 : 1$

B. $1 : 3$

C. $1 : 2$

D. $2 : 1$

Answer: B

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215. If the range of a gun which fires a shell with muzzle speed V is R , then the angle of elevation of the gun is

A. $\cos^{-1}\left(\frac{V^2}{Rg}\right)$

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

C. $\frac{1}{2}\left(\frac{V^2}{Rg}\right)$

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

Answer: D

Watch Video Solution

216. 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. $125m$

B. $50m$

C. $100m$

D. $150m$

Answer: A

Watch Video Solution

217. If a body A of mass M is thrown with velocity V at an angle of 30° to the horizontal and another body B of the same mass is thrown with the same speed at an angle of 60° to the horizontal. The ratio of horizontal range of A to B will be

A. $1:3$

B. $1:1$

C. $1:\sqrt{3}$

D. $\sqrt{3}:1$

Answer: B

Watch Video Solution

218. A bullet is fired from a cannon with velocity 500 m/s. If the angle of projection is 15° and $g = 10m/s^2$. Then the range is

A. $25 \times 10^3 m$

B. $12.5 \times 10^3 m$

C. $50 \times 10^2 m$

D. $25 \times 10^2 m$

Answer: B

Watch Video Solution

219. A ball thrown by a boy is caught by another after 2 sec . some distance away in the same level. If the angle of projection is 30°, the velocity of projection is

A. $19.6 m / s$

B. $9.8 m / s$

C. $14.7 m / s$

D. None of these

Answer: A

Watch Video Solution

220. A particle covers 50 m distance when projected with an initial speed. On the same surface it will cover a distance, when projected with double the initial speed

A. $100m$

B. $150m$

C. $200m$

D. $250m$

Answer: C

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221. A ball is thrown upwards at an angle of 60° to the horizontal. It falls on the ground at a distance of 90 m . If the ball is thrown with the same initial velocity at an angle 30°, it will fall on the ground at a distance of

A. $30m$

B. $60m$

C. $90m$

D. $120m$

Answer: C

Watch Video Solution

222. Four bodies A,B,C and D are projected with equal velocities having angles of projection $15^\circ, 30^\circ, 45^\circ$ and 60° with the horizontal respectively. The body having the shortest range is

A. A

B. B

C. C

D. D

Answer: A

Watch Video Solution

223. For a projectile, the ratio of maximum height reached to the square of flight time is $(g = 10ms^{-2})$

A. $5:4$

B. $5:2$

C. $5:1$

D. $10:1$

Answer: A

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224. A stone projected with a velocity u at an angle (theta)with the horizontal reaches maximum heights H_1. When it is projected with velocity u at an angle $\left(\frac{\pi}{2} - \theta\right)$ with the horizontal, it reaches maximum height H_2. The relations between the horizontal range R of the projectile, H_1 and H_2, is

A. $R = 4\sqrt{H_1 H_2}$

B. $R = 4(H_1 - H_2)$

C. $R = 4(H_1 + H_2)$

D. $R = \frac{H_1^2}{H_2^2}$

Answer: A

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225. An object is projected with a velocity of $20\frac{m}{s}$ making an angle of 45° with horizontal. The equation for the trajectory is $h = Ax - Bx^2$ where h is height, x is horizontal distance, A and B are constants. The ratio A:B is (g $= ms^{-2}$)

A. $1:5$

B. $5:1$

C. $1:40$

D. $40:1$

Answer: D

Watch Video Solution

226. Which of the following sets of factors will affect the horizontal distance covered by an converted by an athlete in a long- jump event?

A. Speed before he jumps and his weight

B. The direction in which he leaps and the initial speed

C. The force with which he pushes the ground and his speed

D. None of these

Answer: B

Watch Video Solution

227. A ball thrown by one player reaches the other in $2s$. The maximum height attained by the ball above the point of projection will be about.

A. $10m$

B. $7.5m$

C. $5m$

D. $2.5m$

Answer: C

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228. In a projectile motion, velocity at maximum height is

A. $\frac{u\cos\theta}{2}$

B. $u\cos\theta$

C. $\frac{u\sin\theta}{2}$

D. None of these

Answer: B

Watch Video Solution

229. If two bodies are projected at 30° and 60° respectively, with the same velocity, then

A. Their ranges are same

B. Their heights are same

C. Their times of flight are same

D. All of these

Answer: A

Watch Video Solution

230. A body is thrown with a velocity of $9.8m/s$ making an angle of 30° with the horizontal. It will hit the ground after a time

A. $1.5s$

B. $1s$

C. $3s$

D. $2s$

Answer: B

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

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

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

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

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

Answer: A

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232. For a given velocity, a projectile has the same range R for two angles of rpojection if

t_1 and t_2 are the times of flight in the two cases then

A. $t_1 t_2 \propto R^2$

B. $t_1 t_2 \propto R$

C. $t_1 t_2 \propto \frac{1}{2}$

D. $t_1 t_2 \propto \frac{1}{R^2}$

Answer: B

Watch Video Solution

233. A body of mass m is thrown upwards at an angle θ with the horizontal with velocity v. While rising up the velocity of the mass after t second will be

A. $\sqrt{(v\cos\theta)^2 + (v\sin\theta)^2}$

B. $\sqrt{(v\cos\theta - v\sin\theta)^2 - gt}$

C. $\sqrt{v^2 + g^2 t - (2v\sin\theta)gt}$

D. $\sqrt{v^2 + g^2 t^2 - (2v\cos\theta)gt}$

Answer: C

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Watch Video Solution

234. A cricketer can throw a ball to a maximum horizontal distance of 100m. With the same speed how much high above the ground can the cricketer throw the same ball?

A. $100m$

B. $80m$

C. $60m$

D. $50m$

Answer: D

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235. A cricketer can throw a ball to a maximum horizontal distance of 100 m. The speed with which he throws the ball is (to the nearest integer)

A. $30ms$

B. $42ms$

C. $32ms$

D. $35ms$

Answer: C

Watch Video Solution

236. A ball is projected with an velocityV_0 at an angle of elevation 30°. Mark of the correct statement.

A. Kinetic energy will be zero at the highest point of the trajectory

B. Vertical component of momentum will be conserved

C. Horizontal component of momentum will be conserved

D. Gravitational potential energy will be minimum at the highest point of the trajectory

Answer: C

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237. Neglecting the air resistance, the time of flight of a projectile is determined by

A. U_{vertical}

B. $U_{\text{horizontal}}$

C. $U = U^2_{\text{vertical}} + U^2_{\text{horizontal}}$

D. $U = U\left(U^2_{\text{vertical}} + U_{\text{horizontal}}\right)^{1/2}$

Answer: A

Watch Video Solution

238. A ball is thrown from a point with a speed 'v^(0)' at an elevation angle of θ . From the same point and at the same instant , a person starts running with a constant speed $\frac{'v_0'}{2}$ to catch the ball . Will the person be able to catch the ball ? If yes, what should be the angle of projection θ ?

A. Yes, 60°

B. Yes, 30°

C. No

D. Yes, 45°

Answer: A

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239. A stone is thrown at an angle θ to the horizontal reaches a maximum height H. Then the time of flight of stone will be:

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

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

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

D. $\dfrac{\sqrt{2H\sin\theta}}{g}$

Answer: B

Watch Video Solution

240. The horizontal range of a projectile is $4\sqrt{3}$ times its maximum height. Its angle of projection will be

A. 45°

B. 60°

C. 90°

D. 30°

Answer: D

Watch Video Solution

241. A ball is projected upwards from the top of a tower with a velocity $50ms^{-1}$ making an angle 30° with the horizontal. The height of tower is 70m. After how many seconds from the instant of throwing, will the ball reach the ground. $(g = 10ms^{-2})$

A. $2s$

B. $5s$

C. $7s$

D. $9s$

Answer: C

Watch Video Solution

242. Two bodies are thrown up at angles of 45° and 60°, respectively, with the horizontal. If both bodies attain same vertical height, then the ratio of velocities with which these are thrown is

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

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

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

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

Answer: C

Watch Video Solution

243. At what point of a projectile motion acceleration and velocity are perpendicular to each other

A. At the point of projection

B. At the point of drop

C. At the topmost point

D. Any where in between the point of projection and topmost point

Answer: C

Watch Video Solution

244. An object is projected at an angle of 45° with the horizontal. The horizontal range and the maximum height reached will be in the ratio.

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: D

Watch Video Solution

245. The maximum horizontal range of a projectile is 400 m . The maximum value of height attained by it will be

A. $100m$

B. $200m$

C. $400m$

D. $800m$

Answer: A

Watch Video Solution

246. A particle is acted upon by a force of constant magnitude which is always perpendiculr to the velocity of the particle. The motion of the particle takes place in a plane. It follows that

A. Velocity is constant

B. Acceleration is constant

C. Kinetic energy is constant

D. It moves in a circular path

Answer: C::D

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247. A tube of length L is filled completely with an incomeressible liquid of mass M and closed at both the ends. The tube is then rotated in a horizontal plane about one of its ends with a uniform angular velocity ω. The force exerted by the liquid at the other end is

A. $\frac{Ml\omega^2}{2}$

B. $ML\omega^2$

C. $\frac{ML\omega^2}{4}$

D. $\frac{ML^2\omega^2}{2}$

Answer: A

Watch Video Solution

248. The kinetic energy of a particle moving along a circle of radius R depends on the distance covered s as $K = \lambda s^2$, where λ is a constant. Find the force acting on the particle as a function of s.

A. $2a\dfrac{s^2}{R}$

B. $2as\left(1+\dfrac{s^2}{R^2}\right)^{1/2}$

C. $2as$

D. $2a\dfrac{R^2}{s}$

Answer: B

Watch Video Solution

249. A car is moving in a circular horizonta track of radius 10m with a constant speed of 10 m/s. A pendulum bob is suspended from the roof of the cat by a light rigid rod of length 1.00m. The angle made by the rod with track is

A. Zero

B. 30°

C. 45°

D. 60°

Answer: C

Watch Video Solution

250. A particle of mass in is moving in a circular with of constant radius r such that its contripetal accelenation a_c is varying with time t as $a_c = K^2 r t^2$ where K` is a constant . The power delivered to the particles by the force action on it is

A. $2\pi mk^2r^2t$

B. mk^2r^2t

C. $\frac{mk^4r^2t^5}{3}$

D. Zero

Answer: B

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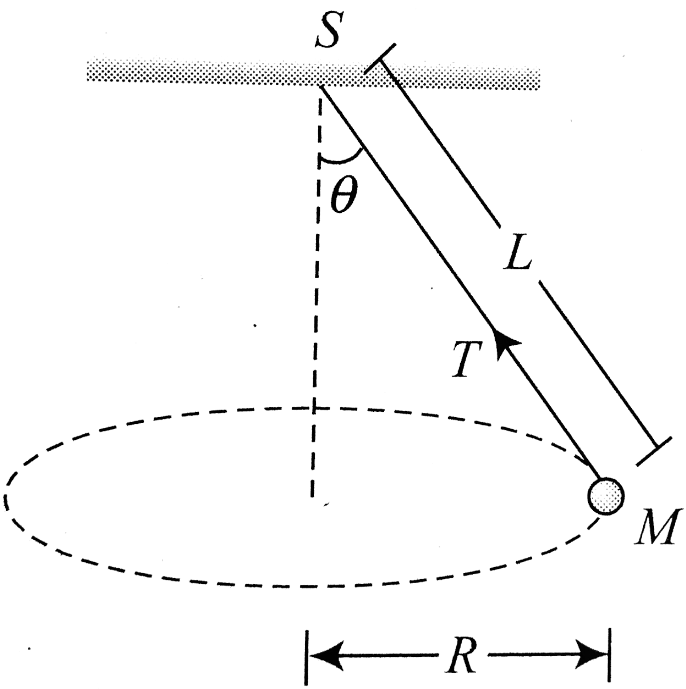
251. A string of length L is fixed at one end and carries a mass M at the other end. The string makes $2/\pi$ revolution per second around the vertical axis through the fixed end as shown in the figure, then tension in the string is.



A. ML

B. $2ML$

C. $4ML$

D. $16ML$

Answer: D

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252. 9A stone of mass 1 kg tied to a light inextensible string of $\text{length} L = \frac{10}{3} m$is whirling in circular path of radius L in a vertical plane. If the ratio of the maximum tension in the string to the minimum tension in the string is 4 and if g is taken to be 10m / sec2, the speed of the stone at the highest point of the circle is

A. $20m / \sec$

B. $10\sqrt{3}m / \sec$

C. $5\sqrt{2}m / \sec$

D. $10m / \sec$

Answer: D

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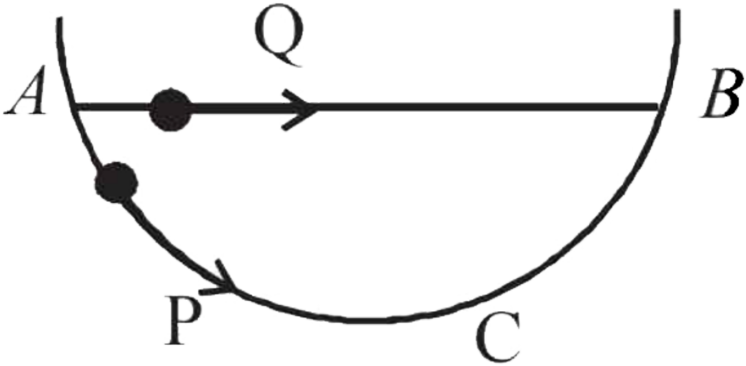
253. A particle P is sliding down a frictionless hemispherical bowl. It passes the point A at $t = 0$. At this instant of time, the horizontal component of its velocity is v. A bead Q of the same mass as P is ejected from A at $t = 0$ along the horizontal string AB, with the speed v. Friction between the bead and the string may be neglected. Let t_P and t_Q be the respective times taken by P and Q to reach the point B. Then:



A. $t_P < t_Q$

B. $t_P = t_Q$

C. $t_P > t_Q$

D. All of these

Answer: A

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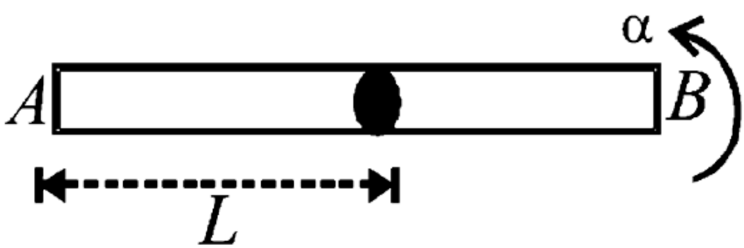
254. A long horizontal rod has a bead which can slide along its length and initially placed



at a

distance L from one end A of the rod. The rod is set in angular motion about A with constant angular acceleration α. if the coefficient of friction between the rod and the bead is μ, and gravity is neglected, then the time after which the bead starts slipping is

A. $\sqrt{\frac{\mu}{\alpha}}$

B. $\frac{\mu}{\sqrt{\alpha}}$

C. $\frac{1}{\sqrt{\mu\alpha}}$

D. Infinitesimal

Answer: A

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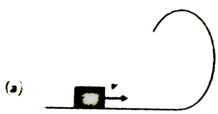
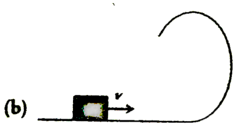
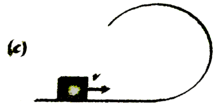
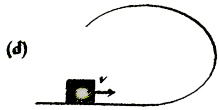
255. A small block is shot into each of the four tracks as shown below. Each of the tracks rises to the same height. The speed with which the block enters the track is the same in all cases. At the highest point of the track, the normal reaction is maximum in

A. 

B. 

C. 

D. 

Answer: A

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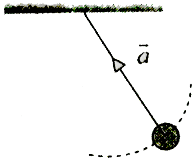
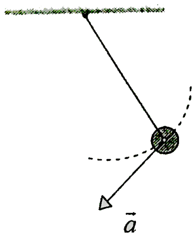
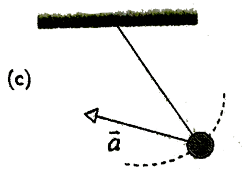
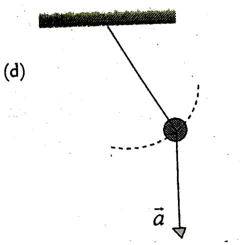
256. A simple pendulum is oscillating without damiping, When the displacement of the bob is less than maximum, its acceleration vector $\vec{a}$ is correctly show in:

A. 

B. 

C. 

D. 

Answer: C

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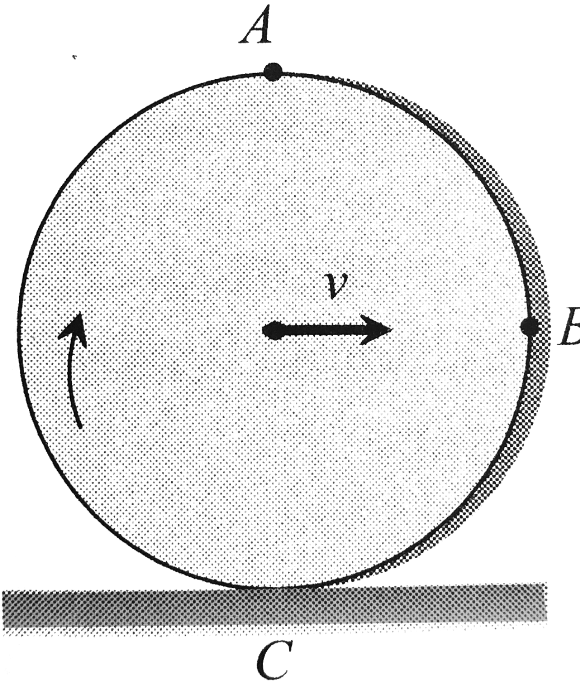
257. A solid disc rolls clockwise without slipping over a horizontal path with a constant speed v. Then the magnitude of the velocities of points A, B and C (see figure) with respect to a standing observer are, respectively,



A. v, v and v

B. $2v$, $\sqrt{2}v$ and zero

C. $2v$, $2v$ and zero

D. $2v$, $\sqrt{2}v$ and $\sqrt{2}v$

Answer: B

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258. A stone tied to a string of length L is whirled in a vertical circle with the other end of the string at the centre. At a certain instant of time the stone is at lowest position and has a speed u . Find the magnitude of the change in its velocity as it reaches a position, where the string is horizontal.

A. $\sqrt{u^2 - 2gL}$

B. $\sqrt{2gL}$

C. $\sqrt{u^2 - gl}$

D. $\sqrt{2(u^2 - gL)}$

Answer: D

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259. The driver of a car travelling at velocity v suddenly see a broad wall in front of him at a distance d. He should

A. Brake sharply

B. Turn sharply

C. (a) and (b)

D. None of the above

Answer: A

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260. Four persons K,L,M,N are initially at the four corners of a square of side d. Each person now moves with a uniform speed v in such a way that K always moves directly towards L, L directly towards M, M directly towards N, and N directly towards K. The four persons will meet at a time............. .

A. $\frac{d}{v}\sec$

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

C. $\frac{d}{\sqrt{2v}}\sec$

D. $\frac{d}{2v}\sec$

Answer: A

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261. The coordinate of a particle moving in a plane are given by $x(t) = a\cos(pt)$ and $y(t) = b\sin(pt)$ where $a, b(< a)$ and P are positive constants of appropriate dimensions . Then

A. The path of the particle is an ellipse

B. The velocity and acceleration of the particle are normal to each other at $t = \pi / (2p)$

C. The acceleration of the particle is always directed towards a focus

D. The distance travelled by the particle in time interval $t = 0$ to $t = \pi / (2p)$ is a

Answer: A::B

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262. A paricle is moving eastwards with a velocity of $5m / s$. In $10s$ the velocity changes to $5m/s$ northwards. Find the average acceleration in this time.

A. Zero

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

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

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

Answer:

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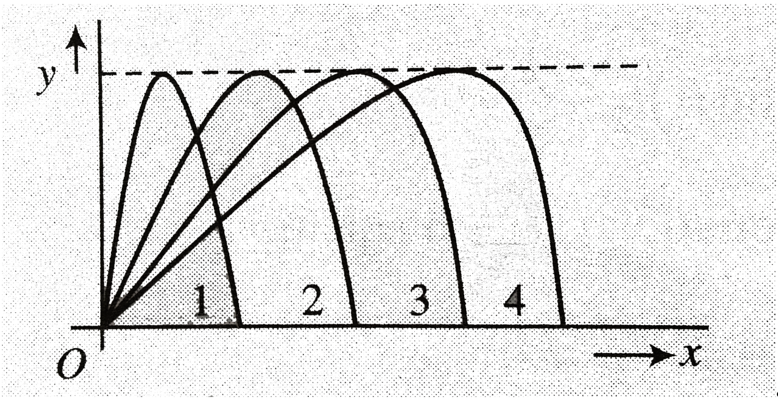
263. Figure shows four paths for a kicked football. Ignoring the effects of air on the flight, rank the paths according to the initial horizontal velocity component, highest first.



A. 1,2,3,4

B. 2,3,4,1

C. 3,4,1,2

D. 4,3,2,1

Answer: B

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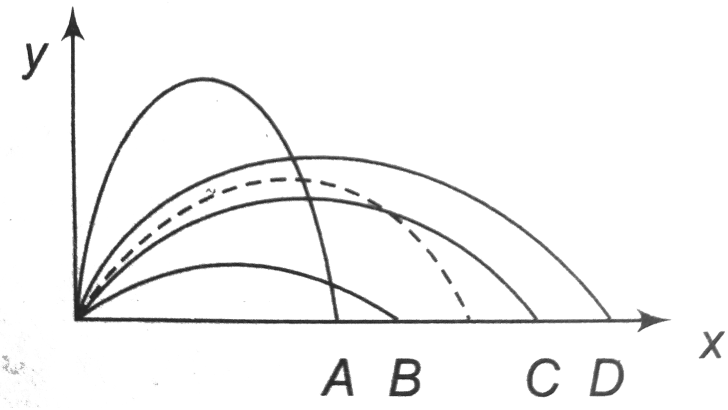
264. The path of a projectile in the absence of air drag is shown in the figure by dotted line. If the air resistance is not ignored then which one of the paths shown in the figure is appropriate for the projectile?



A. B

B. A

C. D

D. C

Answer: A

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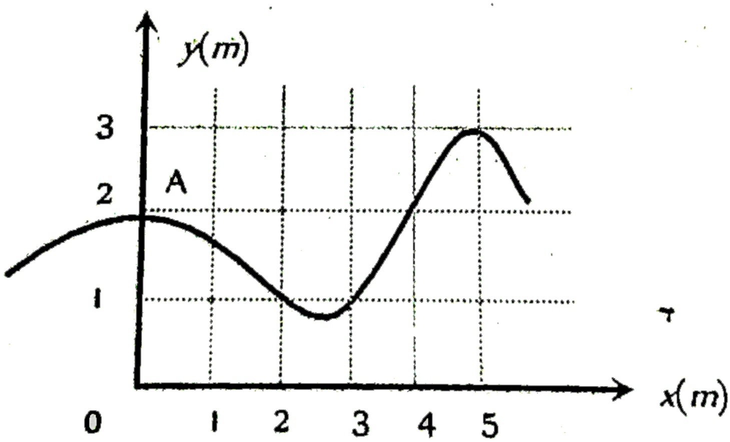
265. The trajectory of a particle moving in vast maidan is as shown in the figure. The coordinates of a position A are (0,2). The coordinates of another point at which the instantaneous velocity is same as the average velocity between the points are



A. (1,4)

B. (5,3)

C. (3, 4)

D. (4, 1)

Answer: B

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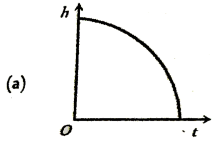
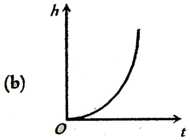
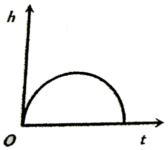
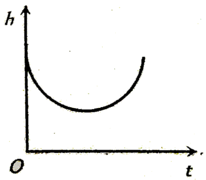
266. Which of the following is the graph between the height (h) of a projectile and time (t), when it is projected from the ground

A. 

B. 

C. 

D. 

Answer: C

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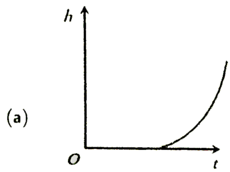
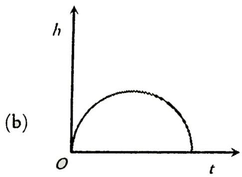
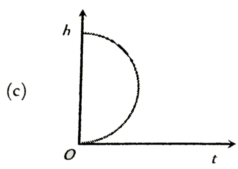
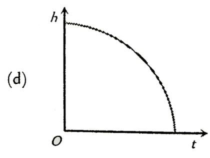
267. Which of the following is the altitude-time graph for a projectile thrown horizontally from the top of the tower

A. 

B. 

C. 

D. 

Answer: D

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268. Assertion : In projectile motion, the angle between the instantaneous velocity and acceleration at the highest point is 180°.

Reason : At the highest point, velocity of projectile will be in horizontal direction only.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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269. Assertion: Two particles of different mass, projected with same velocity at same angles. The maximum height attained by both the particle will be same.

Reason: The maximum height of projetile is independent of particle mass.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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270. Assertion: The maximum horizontal range of projectile is proportional to square of velocity.

Reason: The maximum horizontal range of projectile is equal to maximum height attained by projectile.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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271. Assertion: Horizontal range is same for angle of projection θ and $(90^\circ - \theta)$.

Reason : Horizontal range is independent of angle of projection.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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272. Assertion: For projection angle $\tan^{-1}(4)$, the horizontal range and the maximum height of a projectile are equal.

Reason: The maximum range of projectile is directely proportional to square of velocity and inversely proportional to acceleration due to gravity.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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273. Assertion : $-$ The trajectory of projectile in XY plane is quadratic in x and linear in y if x is independent of $X-$ coordinate.

Reason : $-$ $y-$coordinate of trajetory is independent of $x-$ coordinate.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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274. Assertion : In javelin throw, the athlete throws the projectile at an angle slightly more than 45°.

Reason : The maximum range does not depends upon angle of projection.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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275. Assertion: When the body is dropped or thrown horizontally form the same height, it would reach the ground at the same time.

Reason: Horizontal velocity has no effect on the vertical direction.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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276. Assertion: When the velocity of projection of a body is made n times, its time of flight becomes n times.

Reason: Range of projectile does not depend on the initial velocity of a body.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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277. Assertion: The height attained by a projectile is twenty five percentage of range, when projected for maximum range.

Reason: The height is independent of initial velocity of projetile.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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278. Assertion: When range of a projectile is maximum , its angle of projection may be 45° or 135°.

Reason: Whether $\theta is 45^{\circ}$ or 135°, value of range remains the same, only the sign changes.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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279. Assertion : In order to hit a target, a man should point his rifle in the same direction as target.

Reason : The horizontal range of the bullet is dependent on the angle of projectile with horizontal direction.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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280. STATEMENT-1: When a particle moves in a circle with a uniform speed, it velocity and acceleration both changes.

STATEMENT-2: The centripetal acceleration in circular motion is depdendent on angular velocity of the body.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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281. STATEMENT-1: During a turn, the value of centripetal force should be less than the limiting frictional force.

STATEMENT-2: The centripetal force is provided by the frictional force between the tire and the road.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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282. Assertion : When a vehicle takes a turn on the road, it travels along a nearly circular path.

Reason : In circular motion, velocity of vehicle remains same.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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283. Assertion : As the frictional force increases, the safe velocity limit for taking a turn on an unbanked road also increases.

Reason : Banking of roads will increase the value of limiting velocity.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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284. Assertion: If the speed of a body is constant, the body cannot have path other than a circular or straight line path.

Reson: It is not possible for a body to have a constant speed in an accelerted motion.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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285. Asseration : In circular motion work done by all the forces acting on the body is zero.

Reason : Centripetal force and veloity are mutually perpendicular.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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286. Assertion : In circular motion, the centripetal and centrifugal force acting in opposite direction balance each other.

Reason : Centripetal and centrifugal forces don’t act at the same time.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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287. Assertion : If both the speed of a body and radius of its circular path are doubled, then centripetal force also gets doubled.

Reason : Centripetal force is directly proportional to both speed of a body and radius of circular path.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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288. Assertion : When an automobile while going too fast around a curve overturns, its inner wheels leave the ground first.

Reason : For a safe turn the velocity of automobile should be less than the value of safe limit velocity.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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289. Assertion : A safe turn by a cyclist should neither be fast nor sharp.

Reason : The bending angle from the vertical would decrease with increase in velocity.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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290. Assertion : Improper banking of roads causes wear and tear of tyres.

Reason : The necessary centripetal force is provided by the force of friction between the tyres and the road.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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291. Assertion : Cream gets separated out of milk when it is churned, it is due to gravitational force.

Reason : In circular motion gravitational force is equal to centripetal force.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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292. Assertion : Two similar trains are moving along the equatorial line with the same speed but in opposite direction. They will exert equal pressure on the rails.

Reason : In uniform circular motion the magnitude of acceleration remains constant but the direction continuously changes.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true

Answer: D

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293. Assertion : A coin is placed on phonogram turn table. The motor is started, coin moves along the moving table.

Reason : Rotating table is providing necessary centripetal force to the coin.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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294. Roads are banked on curves so that

A. The speeding vehicles may not fall outwards

B. The frictional force between the road and vehicle may be decreased

C. The wear and tear of tyres may be avoided

D. The weight of the vehicle may be decreased

Answer: A

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295. In uniform circular motion

A. Both velocity and acceleration are constant

B. Acceleration and speed are constant but velocity changes

C. Both acceleration and velocity changes

D. Both acceleration and speed are constant

Answer: C

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296. For a body moving in a circular path, a condition for no skidding if μ is the coefficient of friction, is

A. $\frac{mv^2}{r} \leq \mu mg$

B. $\frac{mv^2}{r} \geq \mu mg$

C. $\frac{v}{r} = \mu g$

D. $\frac{mv^2}{r} = \mu mg$

Answer: A

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297. A car is moving with a uniform speed on a level road. Inside the car there is a balloon filled with helium and attached to a piece of string tied to the floor. The string is observed to be vertical. The car now takes a left turn maintaining the speed on the level road. The balloon in the car will

A. Continue to remain vertical

B. Burst while taking the curve

C. Be thrown to the right side

D. Be thrown to the left side

Answer: D

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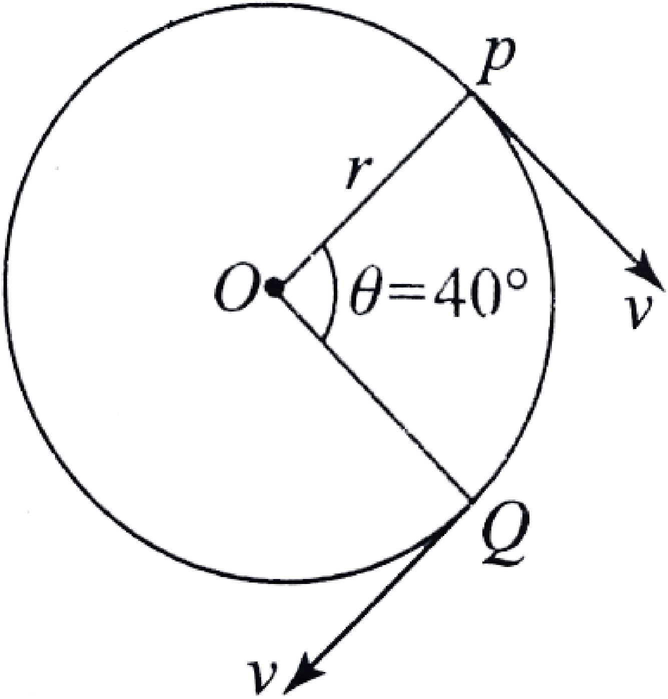

298.

A particle is moving on a circular path of radius r with uniform velocity v. The change in velocity when the particle moves from P to Q is $(\angle POQ = 40^\circ)$

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

B. $2v\sin 40^{\circ}$

C. $2v\sin 20^{\circ}$

D. $2v\cos 20^{\circ}$

Answer: C

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299. A body is revolving with a uniform speed v in a circle of radiusr . The tangential acceleration is

A. $\frac{v}{r}$

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

C. Zero

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

Answer: C

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300. A particle does uniform circular motion in a horizontal plane. The radius of the circle is

20 cm . The centripetal force acting on the particle is 10 N . It's kinetic energy is

A. $0.1J$

B. $0.2J$

C. $2.0J$

D. $1.0J$

Answer: D

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301. A body of mass m is suspended from a string of length l . What is minimum horizontal velocity that should be given to the body in its lowest position so that it may complete one full revolution in the vertical plane with the point of suspension as the centre of the circle

A. $v = \sqrt{2Ig}$

B. $v = \sqrt{3Ig}$

C. $v = \sqrt{4Ig}$

D. $v = \sqrt{5Ig}$

Answer: D

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302. A particle moves with constant angular velocity in circular path of certain radius and is acted upon by a certain centripetal force F . If the angular velocity is doubled, keeping radius the same, the new force will be

A. $2F$

B. F^2

C. $4F$

D. $F/2$

Answer: C

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303. In the above question, if the angular velocity is kept same but the radius of the path is halved, the new force will be

A. $2F$

B. F^2

C. $F/2$

D. $F/4$

Answer: C

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304. In above question, if the centripetal force F is kept constant but the angular velocity is doubled, the new radius of the path (original radius R) will be

A. $2R$

B. $R/2$

C. $R/4$

D. $4R$

Answer: C

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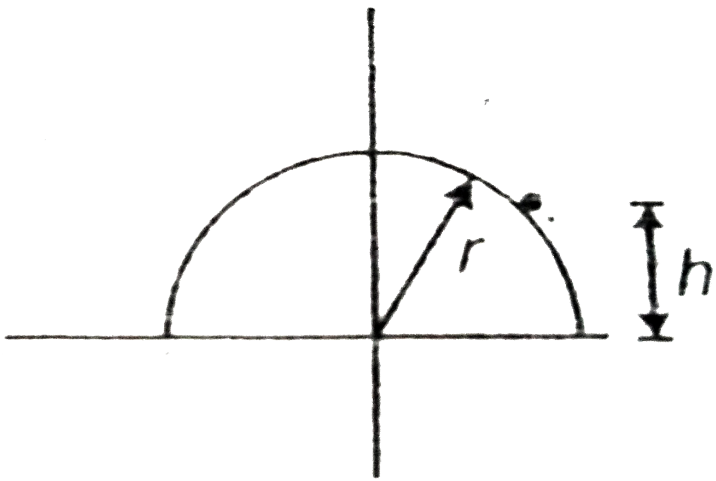
305. A small body of mass m slides without friction from the top of a hemisphere of radius r. At what height will the body be detached from the surface of hemisphere?



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

B. $\frac{2}{3}r$

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

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

Answer: B

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306. A body is mass m is rotating in a vertical circle of radius 'r' with critical speed. The difference in its $K.E$ at the top and at the bottom is

A. $\frac{mg}{r}$

B. $\frac{2mg}{r}$

C. $2mgr$

D. mgr

Answer: C

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307. A car is travelling with linear velocity v on a circular road of radius r. If it is increasing its speed at the rate of a metre/$\sec^2$, then the resultant acceleration will be

A. $\sqrt{\left\{\frac{v^2}{r^2}-a^2\right\}}$

B. $\sqrt{\left\{\frac{v^4}{r^2}+a^2\right\}}$

C. $\sqrt{\left\{\frac{v^4}{r^2}-a^2\right\}}$

D. $\sqrt{\left\{\frac{v^2}{r^2}+a^2\right\}}$

Answer: B

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308. A ball of mass 0.1 kg is suspended by a string. It is displaced through an angle of 60° and left. When the ball passes through the mean position, the tension in the string is

A. $19.6N$

B. $1.96N$

C. $9.8N$

D. Zero

Answer: B

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309. An aeroplane moving horizontally at a speed of $200m/s$ and at a height of $8.0 \times 10^3 m$ is to drop a bomb on a target. At what horizontal distance from the target should the bomb be released

A. $7.234km$

B. $8.081km$

C. $8.714km$

D. $9.124km$

Answer: B

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310. A body is projected horizontally from a height with speed $20\text{metres}/\text{sec}$. What will be its speed after 5 seconds $\left(g = 10\text{metres}/\text{sec}^2\right)$

A. $54\text{metres}/\text{sec}$

B. $20\text{metres}/\text{sec}$

C. $50\text{metres}/\text{sec}$

D. $70 \text{metres} / \text{sec}$

Answer: A

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311. A man standing on the roof of a house of height h throws one particle vertically downwards and another particle horizontally with the same velocity u . The ratio of their velocities when they reach the earth's surface will be

A. $\sqrt{2gh+u^2}:u$

B. $1:2$

C. $1:1$

D. $\sqrt{2gh+u^2}:\sqrt{2gh}$

Answer: C

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312. (A projectile projected at an angle 30° from the horizontal has a range R . If the angle of projection at the same initial velocity be 60°, then the range will be

A. R

B. $2R$

C. $R/2$

D. R^2

Answer: A

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313. At the highest point of the path of a projectile, its

A. Kinetic energy is maximum

B. Potential energy is minimum

C. Kinetic energy is minimum

D. Total energy is maximum

Answer: C

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314. A cricket ball is hit 30° with the horizontal with kinetic energy K. The kinetic energy at the highest point is

A. Zero

B. $K/4$

C. $K/2$

D. $3K/4$

Answer: D

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315. A cannon on a level plane is aimed at an angle θ above the horizontal and a shell is fired with a muzzle velocity v_0 towards a vertical cliff a distance D away. Then the height from the bottom at which the shell strikes the side walls of the cliff is

A. $D \sin \theta - \dfrac{gD^2}{2v_0^2 \sin^2 \theta}$

B. $D \cos \theta - \dfrac{gD^2}{2v_0^2 \cos^2 \theta}$

C. $D \tan \theta - \dfrac{gD^2}{2v_0^2 \cos^2 \theta}$

D. $D \tan \theta - \dfrac{gD^2}{2v_0^2 \sin^2 \theta}$

Answer: C

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316. A stone is projected from the ground with velocity $50\frac{m}{s}$ at an angle of 30°. It crosses a wall after 3 sec. How far beyond the wall the stone will strike the ground $\left(g = 10\frac{m}{\sec^2}\right.$?

A. $90.2m$

B. $89.6m$

C. $86.6m$

D. $70.2m$

Answer: C

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317. A body of mass m is projected at an angle of 45° with the horizontal. If air resistance is negligible, then total change in momentum when it strikes the ground is

A. 2mv

B. $\sqrt{mv}$

C. mv

D. $mv / \sqrt{2}$

Answer: B

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318. A ball of mass (m) is thrown vertically up. Another ball of mass $2m$ is thrown at an angle θ with the vertical. Both of them stay in air for the same period of time. What is the ratio of the height attained by two balls.

A. $2:1$

B. $1:\cos\theta$

C. $1:1$

D. $\cos\theta:1$

Answer: C

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319. A particle is projected with a velocity v such that its range on the horizontal plane is twice the greatest height attained by it. The range of the projectile is (where g is acceleration due to gravity)

A. $\frac{4v^2}{5g}$

B. $\frac{4g}{5v^2}$

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

D. $\frac{4v^2}{\sqrt{5g}}$

Answer: A

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