PHYSICS

BOOKS - BITSAT GUIDE PHYSICS (HINGLISH)

CIRCULAR MOTION

Practice Exercise

1. In circular motion

A. radial acceleration is non-zero

B. radia velocity is zero

C. body is in equallibrium

D. All of the above

Answer:

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2. A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle.

The motion of the particle takes place in a plane. It follows that

A. its velocity is contatnt

B. its acceleration is constant

C. its kinetic energy is constant

D. It does not move on a circular path

Answer:

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3. A stone of a mass m tied to a string of length /is rotated in a circle with the other end of the string as the centre. The speed of the stone is V. If the string breaks, the stone will

A. move towards the centre

B. move away from the centre

C. move along a tangent

D. stop

Answer:

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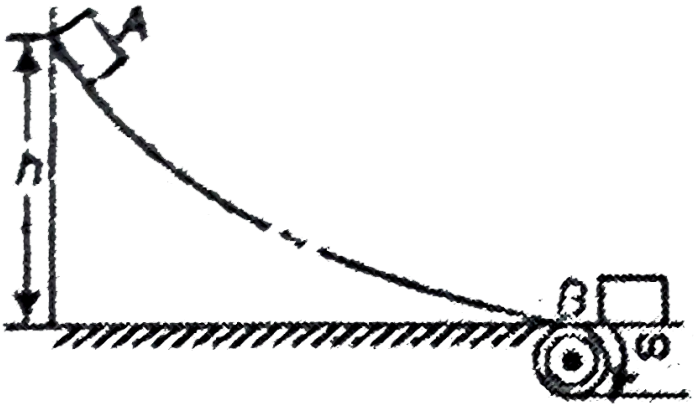
4. Particles are released from rest A and slide down the smooth surface of hight h to a conveyor B. The correct angular veleocity ω of the coneyor pulley of radius r to prevent any sliding on the belt as the particles transfer to the conveyor is



A. $\sqrt{2gh}$

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

C. $\frac{\sqrt{2gh}}{r}$

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

Answer:

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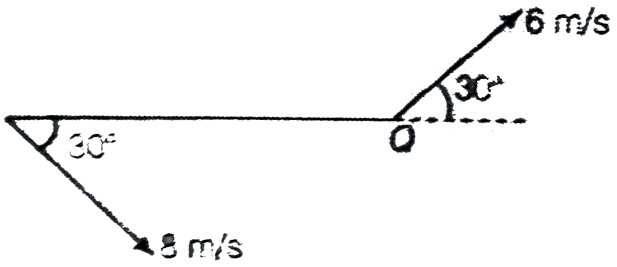
5. Two moving particles P and Q are 10 m apart at a certain instatn. The velocity of P is 8 m/sm

making an angle of 30° with the line joining P abd Q and that of Q is 6m/s making an angle 30° with PQ as shwon in figure.



Then, angular velocity of P wiht respect to Q is

A. zero

B. $0.1rad/s$

C. $0.4rad/s$

D. $0.7rad/s$

Answer:

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6. A solid body rotest about a stationary axis, so that its angular velocity depends on the rotational angle ϕ as $\omega = \omega_0 - k\phi$ where ω_0 and K are postitive constatns. At the moment $t = 0, \phi = 0$ Find the dependence of rotaions angle.

A. $k\omega_0 e^{-kt}$

B. $\frac{\omega_0}{k} e^{-kt}$

C. $\frac{\omega_0}{k}\left(1 - e^{-kt}\right)$

D. $\frac{k}{\omega_0}\left(e^{-kt-1}\right)$

Answer:

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7. The position of paint P is r=a cos $\theta\hat{i} + b\sin\theta\hat{j}$, where a and b ar constants and θ is angle between r and x axis . If the rate of

increasing of θ Is ω Find the equation of path of particle.

A. Circle

B. Parabola

C. Ellipse

D. Stratight line

Answer:

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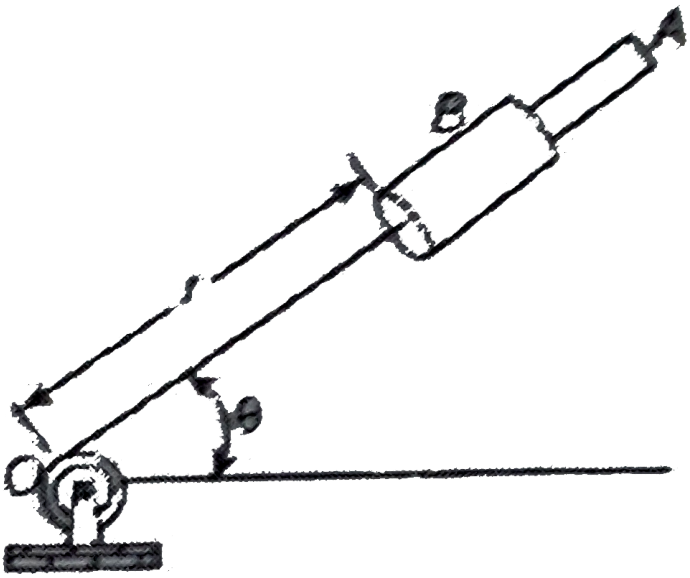
8. The angular displacement of the rod is defied a s0 $= \frac{3}{20}t^2$ where θ is in radian and t is in second. The collar B slides along the rod in such a way that its distance from O is $r = 0.9 - 0.12t^2$ where r is in metre and t is secnd The velocity of collar at $\theta = 30^\circ$ is



A. $0.45m/s$

B. $0.48m/s$

C. $0.52m/s$

D. $0.27m/s$

Answer:

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9. Two buses A and B are moving around concentric circular pathe of radii r_A and r_B If the two buses complete the circular paths in

the sme time. The ratio on their linear speeds is

A. 1

B. r_A / R_B

C. r_B / r_A

D. None

Answer:

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10. A stone of mass $0.3kg$ attched to a $1.5m$ long stirng is whirled around in a horizontal cirlcle at a speed of 6 m/s The tension in the string is

A. 10 N

B. 20 N

C. $7.2N$

D. None of these

Answer:

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11. A cyslist goes round a circular path of length 4000 m in 20 second. Calculate the angle through which he bends from vertical in order to maintain the balance

A. $\sin^{-1}(0.64)$

B. $\tan^{-1}(0.64)$

C. $\cos^{-1}(0.64)$

D. None of these

Answer:

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12. Fing the maximum speed with which an automobile can round a curve of radius 8 m without slipping of the road is unbanked and he coefficient of friction between the orad an the tyres is $0.8\left(g = 10m/^2\right)$

A. 8 m/s

B. 10 m/s

C. 20 m/s

D. None of these

Answer:

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13. A tube of length L is filled completely with an incompressible liquid of mass M and closed at both ends. The tube is then roted 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:

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14. A point on the periphery of a rotating disc has its acceleration vector making angle of 30° with the velocity . The ratio $(a_c/a_t(a_c$ "is centripetal acceleration and a_1 is tangential acceleration ") equals

A. $\sin 30^\circ$

B. $\cos 30^\circ$

C. $\tan 30^\circ$

D. None

Answer:

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15. A car of 1400 kg kis moving on a circular path of radius 30 m with a speed of 40 km/h. When the drive applies the breaks and the carf conntinues to move along the circular path, what is the maximum deceleration possible if the types are limited to a horozontal friction of $10.6kN$?

A. $10m/s^2$

B. $6.36m/s^2$

C. $4m / s^2$

D. None

Answer:

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16. A cyslist is traveilling on a circular section of highway of radius 2500 ft at the speed of 60 mile/h. The cyclist suddenly applies the brakes causing the bicycle to slow down at constant rate. Knowing that after 8 second,the speed

has been reduced to 45 mile/h. The acceleration of the bicyle immediately after the breakes have been applied. is

A. $2ft/s^2$

B. $4.14ft/s^2$

C. $3.10ft/s^2$

D. $2.75ft^2/s$

Answer:

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17. A road of width 20 m froms an arc of radius 15 m,its outer edge is 2 m higher than its inner edge. Calculate for what velocity the road is banked?

A. $\sqrt{10}m/s$

B. $\sqrt{14.7}m/s$

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

D. None of these

Answer:

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18. Three identical cars A,B and C are moving at the same speed on three bridges. The car A goes on a plane bridge, B on a bridge convex upward and C goes on a bridge concave upward. Let F_A, F_B and F_C be the normal forces exerted by the cars on the bridges when they are at the middle of bridges

A. F_A is maximum of the three forces

B. F_B is maximum of the three forces

C. F_C is maximum of the three forces

D. $F_A = F_B = F_C$

Answer:

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19. Two identical trains A and B move with equal speeds on parallel tracks along the equator. A moves from east to west and B moves from west to east. Which train will exert greater force on the track?

A. $N_1 > N_2$

B. $N_1 < N_2$

C. $N_1 = N_2$

D. None of these

Answer:

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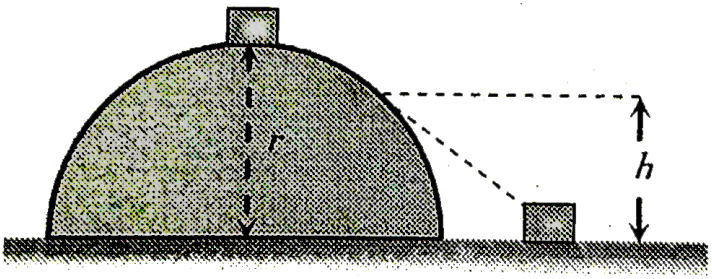
20. A small body of mass m slides down from the top of a hemisphere of radius r . The surface of block and hemisphere are frictionless. The height at which the body lose

contact with the surface of the sphere is



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

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

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

D. $\frac{1}{3}R$

Answer:

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21. A persong whants to drive on the verical surface of a large cylindrical wooden wll commonly know as death well in a circus. The radius of well is R and the coefficient of friction between the tyres of the motorcycle and the wall of the well is μ_s.The minimum speed, the motorcyclist must have in order to prevent slipping should be

A. $\sqrt{\left(\frac{Rg}{\mu_s}\right)}$

B. $\sqrt{\left(\frac{\mu_s}{Rg}\right)}$

C. $\sqrt{\left(\frac{\mu_s g}{R}\right)}$

D. $\sqrt{\left(\frac{R}{\mu_s g}\right)}$

Answer:

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22. A rod of length L is hinged from one end. It is brought to horizontal position and released. The angular velocity of the rod when it is in vertical position. Is

A. $\sqrt{\left(\frac{2g}{L}\right)}$

B. $\sqrt{\left(\frac{3g}{L}\right)}$

C. $\sqrt{\left(\frac{g}{2L}\right)}$

D. $\sqrt{\left(\frac{g}{L}\right)}$

Answer:

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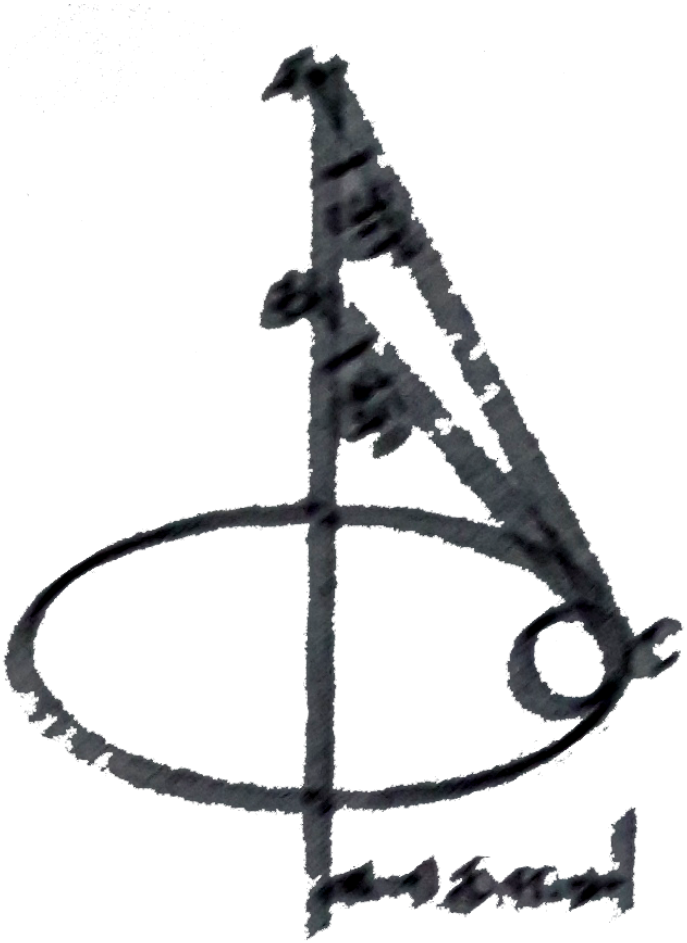
23. Two wires Ac an Bc are tied at C of small sphere of mass 5 kg Which reolves at ta

constant speed v in the horzontal circle of radius of 1.6 m. The minimum value of v is



A. $3.01 m / s$

B. $4.01m/s$

C. $8.2m/s$

D. $3.96m/s$

Answer:

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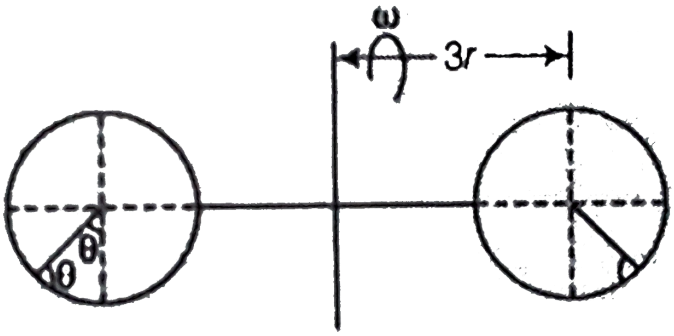
24. The small sphericla balls are free to move on the inner surface of the rotating spherical chamber of radius $R = 0.2m$ If the balls reach a steady at angular position $\theta = 45^\circ$, the

anglular speed ω of devices is



A. $8rad/s$

B. $2rad/s$

C. $3.64rad/s$

D. $9.34rad/s$

Answer:

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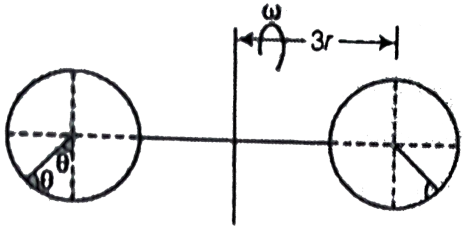
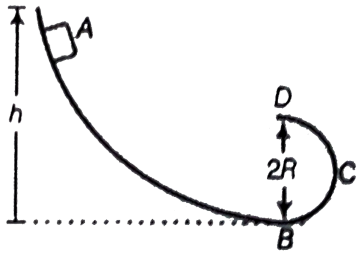
25. A frictionless track ABCD ends in a semicircular loop of radius R.A body slides down the track from point A which is at a value of R which is at a height h=5 cm. Maximum value of R for the body to successfully complete the loop is





A. 5 cm

B. $\frac{15}{4}cm$

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

D. 2 cm

Answer:

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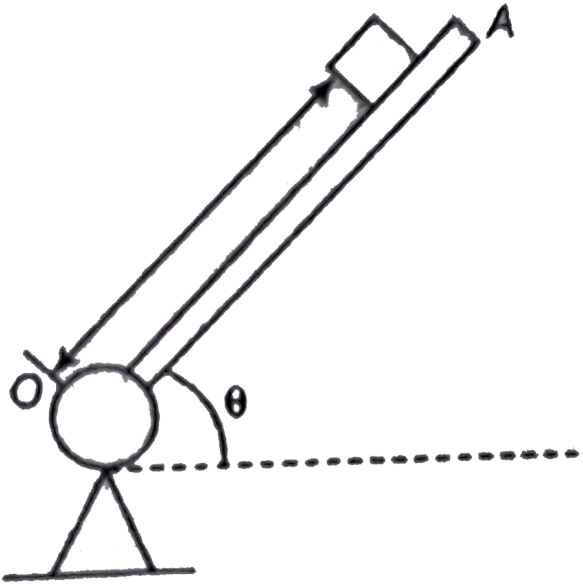
26. A rod OA rotates about a horizontal axis through O with a constant anti-clockwise velocity $\omega = 3rad/s.$ As it pases the

positions $\theta = 0^\circ$ a small block of mass m is placed on it at a radial distacne r=450 mm If the block is observed to slip at $\theta = 50^\circ$ the coefficient of static friction bewteen the block and the rod is (Given that , $\sin 50^\circ = 0766, \cos 50^\circ = 0.64$)



A. 0.2

B. 0.55

C. 0.8

D. 1

Answer:

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27. Kinetic energy of a particle moving along a circle of radisu R depends on the distance covered as $K = as^2$ where a is a constant .

Find the force acting on the particle as a function of s.

A. $\frac{2a}{s}\sqrt{1+\left(\frac{s}{R}\right)^2}$

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

C. $2as\sqrt{1+\left(\frac{s}{R}\right)^2}$

D. $\frac{2s}{a}\sqrt{1+\left(\frac{R}{s}\right)^2}$

Answer:

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28. A projectile is projected at a angle 60° with horozontal with speed 10 m/s. The minimum radius of curvature of the trajectory described by the projectile is

A. $2.55m$

B. 2 m

C. 10 m

D. None of these

Answer:

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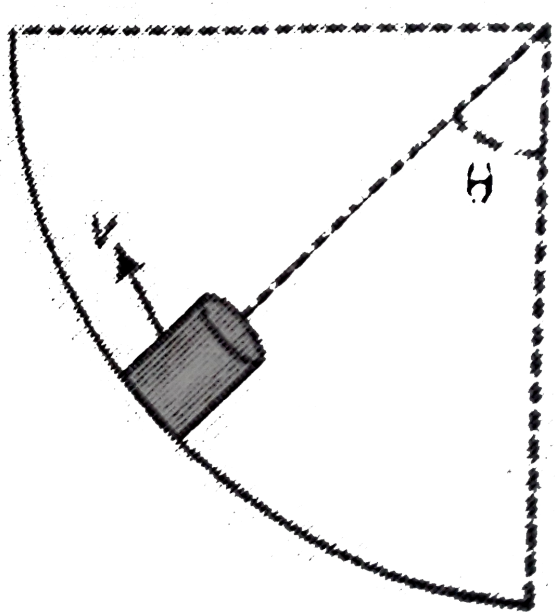
29. The skate board negotiates the circular surface of radius $4.5m$ At $\theta = 45^\circ$, its speed of centre of mass is 6 m/s The comnined mas of skate board an dthe person is 70 kg and his centre of mass is $0.75m$ from the surface. The normal reaction between the surface and the

skate board wheeol is



A. 500 N

B. 2040 N

C. 1045 N

D. zero

Answer:

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Bitast Archives

1. A body of mass m= 20 g is attached to an elastic spring of length L=50 cm and spring constant k=2 Nm^{-1}. The syste is revolved in a horizontal plan with a frequency v=30 rev/min. Find the radius of the circular motion and the tension in the spring .

A. $0.55m, 0.11N$

B. $0.5m, 0.52N$

C. $0.55m, 0.1N$

D. $0.9m, 0.2N$

Answer:

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2. A car is moving on a circular road of diameter 50 m with a speed of 5 m/s. It is suddenly accelerated at a rate of $1m/s^2$. If the

mass of he car is 500 kg, then the net force acting on the car is

A. 5 N

B. 1000 N

C. $500\sqrt{2}N$

D. $\frac{500}{\sqrt{2}}$

Answer:

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3. An inclined track ends in a circular loop of radius r. From what height on the track a particle should be released so that it completes the loop, assuming there is no friction ?

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

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

C. r

D. $\frac{5r}{2}$

Answer:

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4. A small ball descibes a horozontal circle on the smooth inner surface of a conical funnel. If the height of the plane of the circle above the vertex be 10 cm what is the speed of the particle?

A. 2 m/s

B. 4 m/s

C. 16 m/s

D. 1 m/s

Answer:

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5. 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:

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