14-08-15_Sr.IPLCO_JEE-Main_RPTM-3_ Syllabus

Mathematics:

Ellipse And Hyperbola In Standard Form, Their Foci, Directrices And Eccentricity,

Parametric Equations, Equations Of Tangent And Normal, Locus Problems

Physics:

W.P.E& Circular Motion

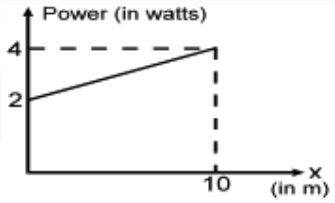
Chemistry:

Benzene: Preparation, Reactions, Electrophilic aromatic substitution,

Alkyl halides, Haloarenes: Preparation, properties and reactions

PHYSICS

1. A particle A of mass $\frac{10}{7}kg$ is moving in the positive direction of x. Its initial position is x = 0 & initial velocity is 1 m/s. The velocity at x = 10 is: (use the graph given)



1) 4 m/s 2) 2 m/s 3) $3\sqrt{2}\,m/s$ 4) $100/3\,m/s$

2. Work done by static friction on an object:

1) may be positive 2) must be negative

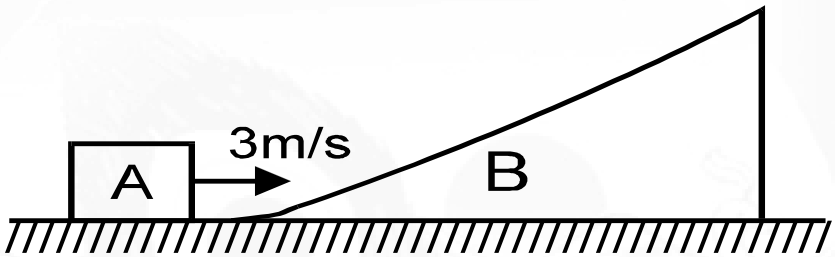
3) must be zero 4) none of these

3. In the figure shown the potential energy U of a particle is plotted against its position ' x ' from origin. Then which of the following statement is correct. A particle at:

1) x_1 is in stable equilibrium 2) x_2 is in stable equilibrium

3) x_3 is in stable equilibrium 4) none of these

4. In the figure shown A is of mass 1 kg and B is mass 2 kg. A moves with velocity 3 m/s and rises on B. All the surfaces are smooth. By the time A reaches the highest point on B:



1) work done by A on B is zero

2) work done by gravity on B is positive

3) work done by A on B is 1 Joules

4) work done by B on A is 1 Joule

5. Power delivered to a body varies as $P = 3\ t^2$. Find out the change in kinetic energy of the body from t = 2 to t = 4 sec.

1) 56 J 2) 65 J 3) 20 J 4) zero

6. A horse drinks water from a cubical container of side 1 m. The level of the stomach of horse is at 2 m from the ground. Assume that all the water drunk by the horse is at a level of 2 m from the ground. Then minimum work done by the horse in drinking the entire water of the container is (Take $\rho_{water} = 1000$ kg/m^3 and g = 10 m/s^2) :

1) 10 kJ 2) 15 kJ 3) 20 kJ 4) zero

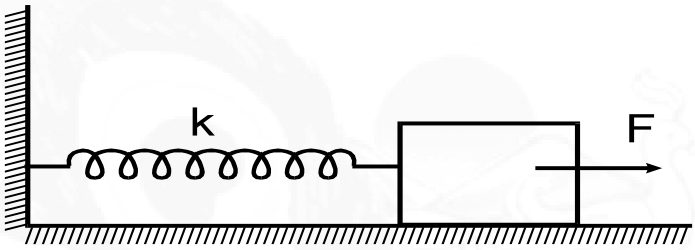
7. A particle is projected vertically upwards with a speed of 16 m/s, after some time, when it again passes through the point of projection, its speed is found to be 8 m/s. It is known that the work done by air resistance is same during upward and downward motion. Then the maximum height attained by the particle is (Take g = 10 m/s^2) :

1) 8 m 2) 4.8 m 3) 17.6 m 4) 12.8 m

8. A man places a chain (of mass 'm' and length 'ℓ') on a table slowly. Initially the lower end of the chain just touches the table. The man drops the chain when half of the chain is in vertical position. Then work done by the man in this process is :

1) $-\text{mg}\frac{\ell}{2}$ 2) $-\frac{mg\ell}{4}$ 3) $-\frac{3mg\ell}{8}$ 4) $-\frac{mg\,\ell}{8}$

9. A block attached to a spring, pulled by a constant horizontal force, is kept on a smooth surface as shown in the figure. Initially, the spring is in the natural state. Then the maximum positive work that the applied force F can do is : [Given that string does not break]

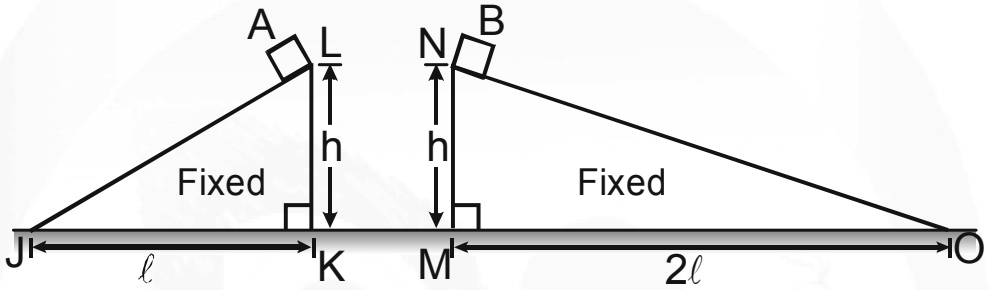


1) $\frac{F^2}{K}$ 2) $\frac{2F^2}{K}$ 3) ∞ 4) $\frac{F^2}{2K}$

10. The potential energy for a force field is given by U (x,y) = cos (x + y). The force acting on a particle at position given by coordinates $\left(0, \frac{\pi}{4}\right)$ is

1) $-\frac{1}{\sqrt{2}}(\hat{i}+\hat{j})$ 2) $\frac{1}{\sqrt{2}}(\hat{i}+\hat{j})$ 3) $\left(\frac{1}{2}\hat{i}+\frac{\sqrt{3}}{2}\hat{j}\right)$ 4) $\left(\frac{1}{2}\hat{i}-\frac{\sqrt{3}}{2}\hat{j}\right)$

11. Two identical blocks A and B are placed on two inclined planes as shown in diagram. Neglect air resistance and other friction



Read the following statements and choose the correct options.

Statements I: Kinetic energy of 'A' on sliding to J will be greater than the kinetic energy of B on falling to M**.**

Statements II: Acceleration of 'A' will be greater than acceleration of 'B' when both are released to slide on inclined plane

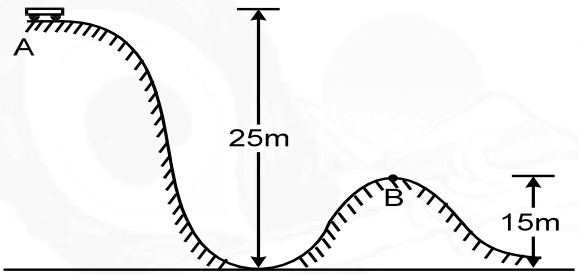
Statements III: Work done by external agent to move block slowly from position B to O is negative

1) only statement I is true 2) only statement II is true

3) only I and III are true 4) only II and III are true

12. Figure shows the roller coaster track. Each car will start from rest at point A and will roll with negligible friction. It is important that there should be at least some small positive normal force exerted by the track on the car at all points, otherwise the car would leave the track. With the above fact, the minimum safe value for the radius of curvature at point B is

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



1) 20 m 2) 10 m 3) 40 m 4) 25 m

13. A fire hose has a diameter of 2.5 cm and is required to direct a jet of water to a height of at least 40 m. The minimum power of the pump needed for this hose is :

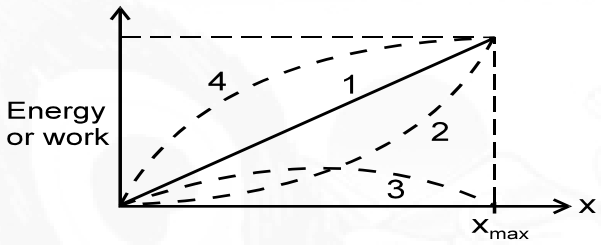
1) 21.5 kW 2) 40 kW 3) 36.5 kW 4) 48 kW

14. A particle with total energy E moves in one dimension in a region where the potential energy is U(x). The acceleration of the particle is zero where

1) U(x) = E 2) U(x) = 0 3) $\frac{dU(x)}{dx} = 0$ 4) $\frac{d^2U(x)}{dx^2} = 0$

Q.no.15 to 17 based on paragraph.

A spring lies along an x axis attached to a wall at one end and a block at the other end. The block rests on a frictionless surface at x = 0. A force of constant magnitude F is applied to the block that begins to compress the spring, until the block comes to a maximum displacement x_{max}.



15. During the displacement, which of the curves shown in the graph best represents the kinetic energy of the block.

1) 1 2) 2 3) 3 4) 4

16. During the displacement, which of the curves shown in the graph best represents the work done on the spring block system by the applied force.

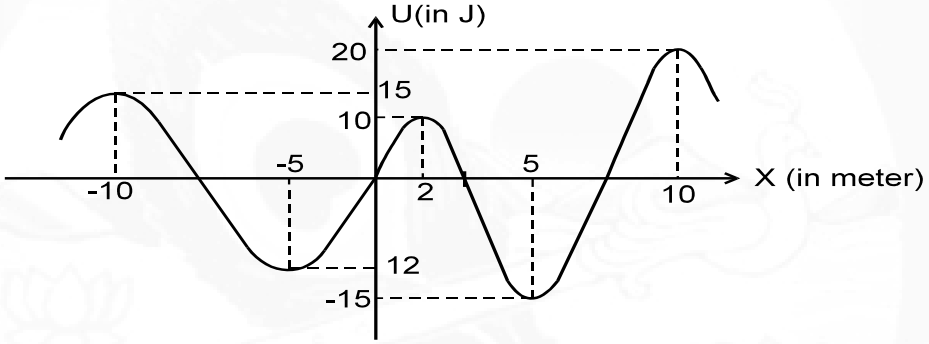
1) 1 2) 2 3) 3 4) 4

17. During the first half of the motion, applied force transfers more energy to the

1) kinetic energy 2) potential energy

3) equal to both 4) depends upon mass of the block

18. In the figure the variation of potential energy of a particle of mass m = 2kg is represented w.r.t. its x-coordinate. The particle moves under the effect of this conservative force along the x-axis. Which of the following statements is incorrect about the particle :



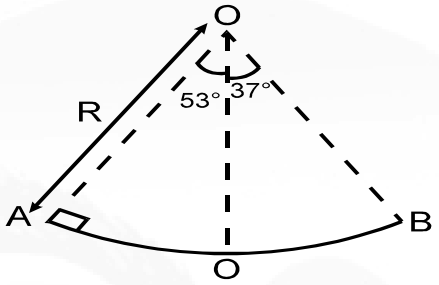
1) If it is released at the origin it will move in negative x-axis.

2) If it is released at $x = 2 + \Delta$ where $\Delta \to 0$ then its maximum speed will be 5 m/s and it will perform oscillatory motion

3) If initially x = – 10 and $\vec{u} = \sqrt{6}\,\hat{i}$ then it will cross x = 10

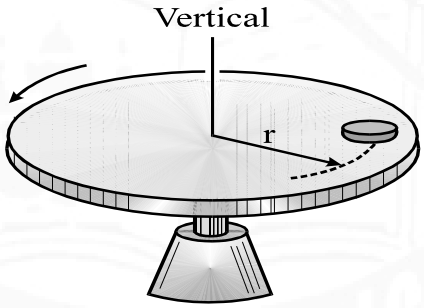
4) x = – 5 and x = + 5 are unstable equilibrium positions of the particle

19. A section of fixed smooth circular track of radius R in vertical plane is shown in the figure. A block is released from position A and leaves the track at B. The radius of curvature of its trajectory when it just leaves the track at B is:



1) R 2) $\frac{R}{4}$ 3) $\frac{R}{2}$ 4) none of these

20. A small coin of mass 40 g is placed on the horizontal surface of a rotating disc. The disc starts from rest and is given a constant angular acceleration α = 2 rad/s^2. The coefficient of static friction between the coin and the disc is μ_S = 3/4 and coefficient of kinetic friction is μ_k = 0.5. The coin is placed at a distance r = 1 m from the centre of the disc. The magnitude of the resultant force on the coin exerted by the disc just before it starts slipping on the disc is :



1) 0.2 N 2) 0.3 N 3) 0.4 N 4) 0.5 N

21. A circular road of radius R is banked for a speed v = 40 km/hr. A car of mass *m* attempts to go on the circular road, the friction co-efficient between the tyre & road is negligible:

1) the car cannot make a turn without skidding

2) if the car runs at a speed less than 40 km/hr, it will slip up the slope

3) if the car runs at the correct speed of 40 km/hr, the force by the road on the car is equal to mv^2/r

4) if the car runs at the correct speed of 40 km/hr, the force by the road on the car is greater than mg as well as greater than mv^2/r

22. A ring of mass $2\pi kg$ and of radius 0.25m is making 300rpm about an axis through its centre perpendicular to its plane. The tension (in newtons) developed in the ring is:

1) 50 2) 100 3) 175 4) 250

23. A car driver going at some speed suddenly finds a wide wall at a distance r. To avoid hitting the wall he should

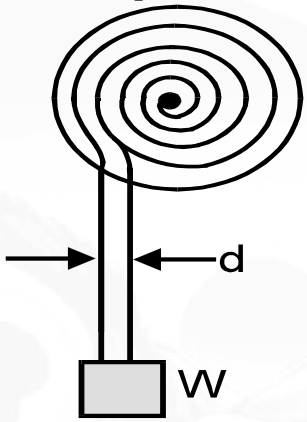
1) apply the brakes

2) should turn the car in a circle of radius r.

3) apply the brakes and also turn the car in a circle of radius r.

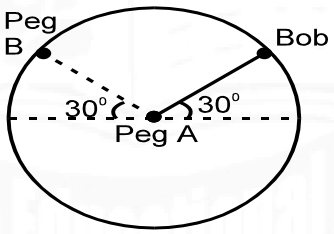
4) jump on the back seat.

24. A weight W attached to the end of a flexible rope of diameter d=0.75cm is raised vertically by winding the rope on a reel as shown. If the reel is turned uniformly at the rate of 2 r.p.s. What is the tension in rope. The inertia of rope may be neglected.



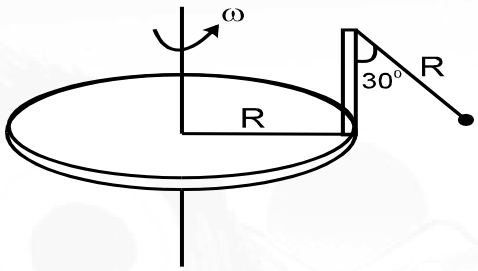
1) 1.019W 2) 0.51W 3) 2.04W 4) W

25. A bob is attached to one end of a string other end of which is fixed at peg A. The bob is taken to a position where string makes an angle of 30^0 with the horizontal. On the circular path of the bob in vertical plane there is a peg 'B' at a symmetrical position with respect to the position of release as shown in the figure. If V_c and V_a be the minimum speeds in clockwise and anticlockwise directions respectively, given to the bob in order to hit the peg 'B' then ratio $V_c : V_a$ is equal to :



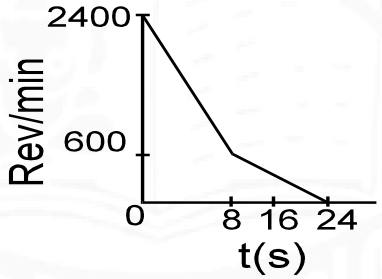
1) 1 : 1 2) 1 : $\sqrt{2}$ 3) 1 : 2 4) 1 : 4

26. A disc of radius R has a light pole fixed perpendicular to the disc at the circumference which in turn has a pendulum of length R attached to its other end as shown in figure. The disc is rotated with a constant angular velocity ω. The string is making an angle 30^0 with the rod. Then the angular velocity ω of disc is :



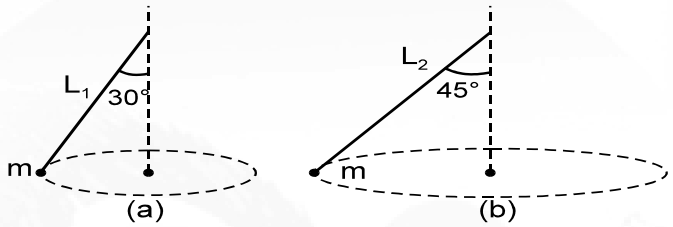
1) $\left(\frac{\sqrt{3}g}{R}\right)^{1/2}$ 2) $\left(\frac{\sqrt{3}g}{2R}\right)^{1/2}$ 3) $\left(\frac{g}{\sqrt{3}R}\right)^{1/2}$ 4) $\left(\frac{2g}{3\sqrt{3}R}\right)^{1/2}$

27. A table fan rotating at a speed of 2400 rpm is switched off and the resulting variation of the rpm with time is shown in the figure. The total number of revolutions of the fan before it come to rest is :



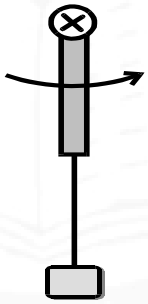
1) 420 2) 280 3) 190 4) 16800

28. Two particles tied to different strings are whirled in a horizontal circle as shown in figure. The ratio of lengths of the strings so that they complete their circular path with equal time period is :



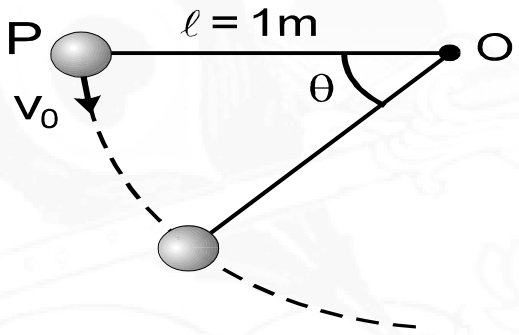
1) $\sqrt{\frac{3}{2}}$ 2) $\sqrt{\frac{2}{3}}$ 3) 1 4) None of these

29. One end of a light rod of length 1 m is attached with a string of length 1m. Other end of the rod is attached at point O such that rod can move in a vertical circle. Other end of the string is attached with a block of mass 2kg. The minimum velocity that must be given to the block in horizontal direction so that it can complete the vertical circle is ($g = 10\ m/s^2$).



1) $4\sqrt{5}$ 2) $5\sqrt{5}$ 3) 10 4) $3\sqrt{5}$

30. The sphere at P is given a downward velocity v_0 and swings in a vertical plane at the end of a rope of = 1m attached to a support at O. The rope breaks at angle 30° from horizontal, knowing that it can withstand a maximum tension equal to three times the weight of the sphere. Then the value of v_0 will be : ($g = \pi^2 m/s^2$)



1) $\frac{\pi}{2}$ m/s 2) $\frac{2\pi}{3}$ m/s 3) $\sqrt{\frac{3}{2}}\pi$ m/s 4) $\frac{\pi}{3}$ m/s