PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 28

Physics

1. A proton collides with a stationary deuteron to form a $.^{3}He$ nucleus. For this reaction to take place , the proton must have a minimum

kinetic energy K_0 . If instead , a deuteron collides with a stationary proton to make a $.^3He$ nucleus , then it must have minimum kinetic energy equal to

A. $2K_0$

B. $1.5K_0$

C. K_0

D. $\frac{K_0}{2}$

Answer: A

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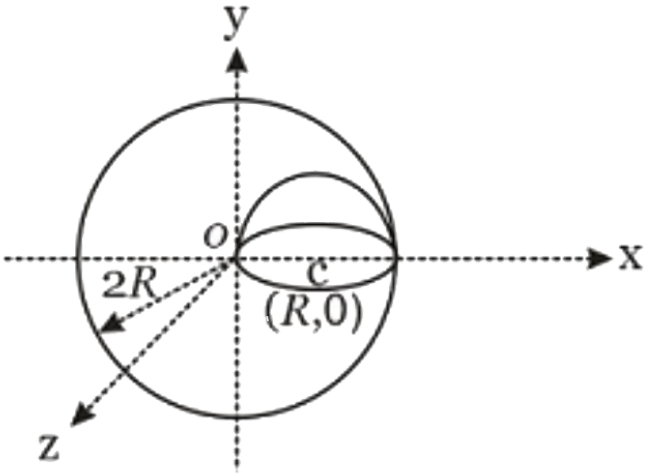
2. A hemispherical cavity of radius R is created in a solid sphere of radius 2R as shown in the figure . Then y -coordinate of the centre of mass of the remaining sphere is



A. $Y_{\mathrm{CM}} = -\frac{R}{15}$

B. $Y_{\mathrm{CM}} = -\frac{R}{40}$

C. $Y_{CM} = -\frac{R}{30}$

D. $Y_{CM} = -\frac{R}{20}$

Answer: B

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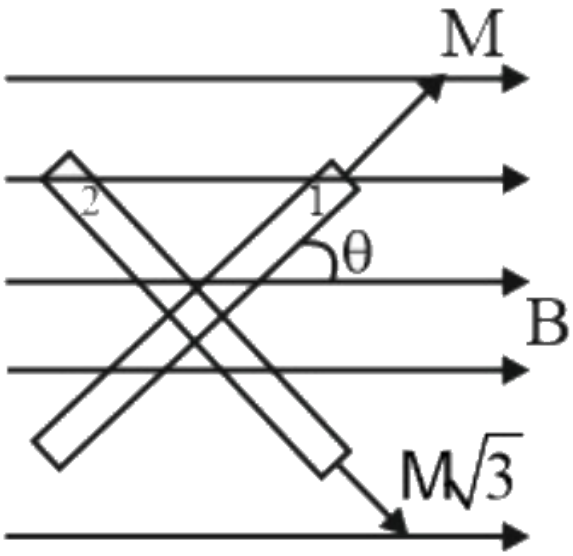
3. Two short bar magnets of dipole moments M and $M\sqrt{3}$ are joined at right angles to form a cross as depicted in the figure . The value of θ for which the system remains in equilibrium

in a uniform external magnetic field B, is



A. $\theta = 30^\circ$

B. $\theta = 45^\circ$

C. $\theta = 60^\circ$

D. $\theta = 15^\circ$

Answer: C

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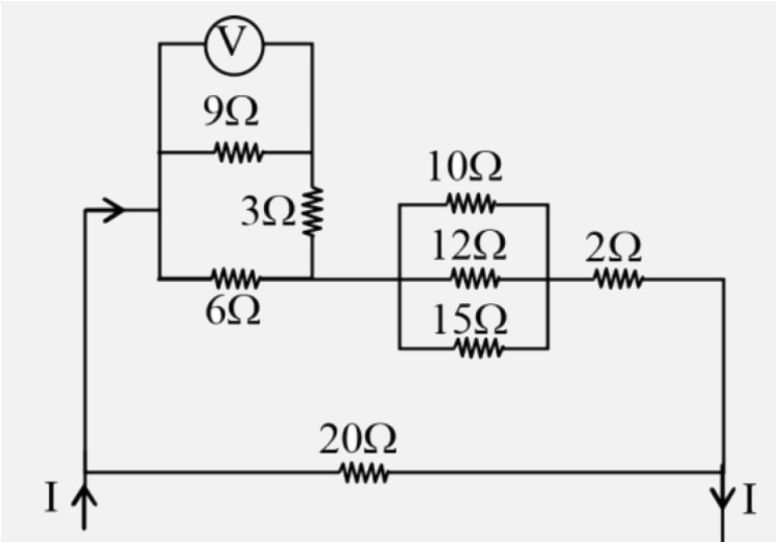
4. In the given circuit , the voltmeter reading is 4.5 V. Assuming that the voltmeter is ideal , current thorough 12Ω resistance is -



A. $1A$

B. $0.5A$

C. $0.25A$

D. $0.1A$

Answer: B

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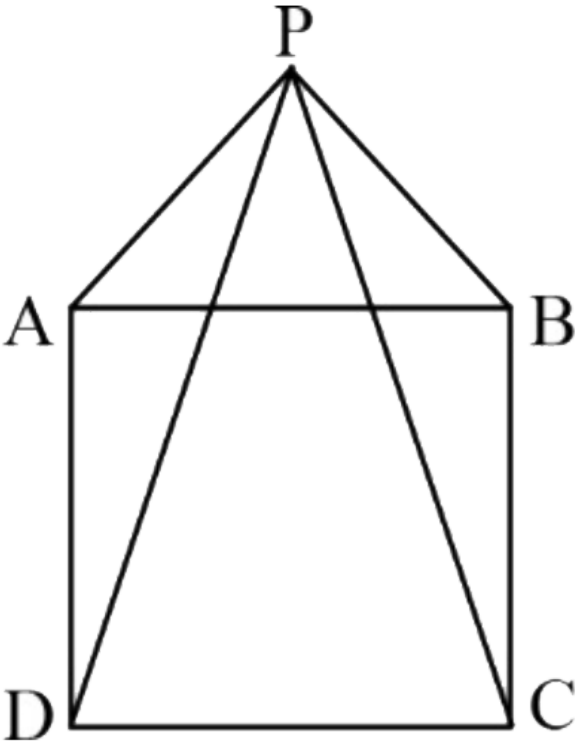
5. Find the equivalent resistance about any branch of the base of the square pyramid shown . Assume resistance of each branch is R

.



A. $\frac{7R}{15}$

B. $\frac{8R}{15}$

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

D. none of these

Answer: B

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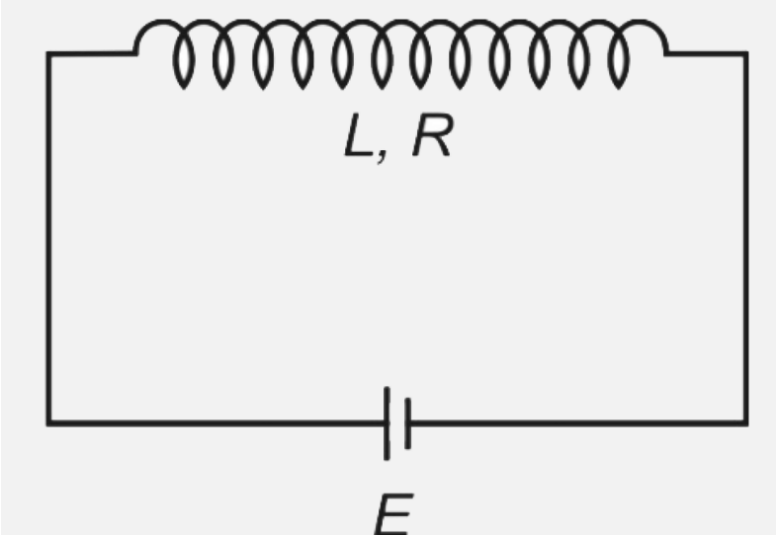
6. A solenoid of inductance L and resistance R has a soft iron core . It is connected to a battery of E.M.F M as shown in the figure and allowed to attain its steady state.



At an instant , the iron core is suddenly pulled out and because of it. inductance decreases to $\frac{L}{3}$.

The work done by an external agent in pulling out the iron core is

A. $\frac{LE^2}{R^2}$

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

C. $\frac{LE^2}{2R^2}$

D. $\frac{LE^2}{4R^2}$

Answer: A

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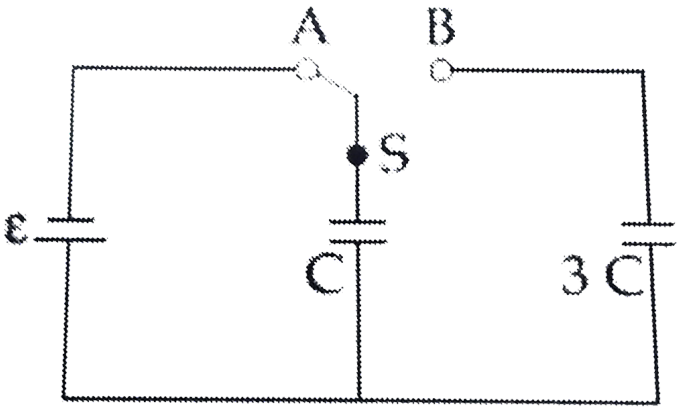
7. In the figure shown , after the switch 's' is turned from postion 'A' to postion 'B' the energy dissipated in the circuit in terms of

capactance 'C' and total charge 'Q' is :



A. $\frac{1}{8}\frac{Q^2}{C}$

B. $\frac{3}{8}\frac{Q^2}{C}$

C. $\frac{3}{4}\frac{Q^2}{C}$

D. $\frac{5}{8}\frac{Q^2}{C}$

Answer: B

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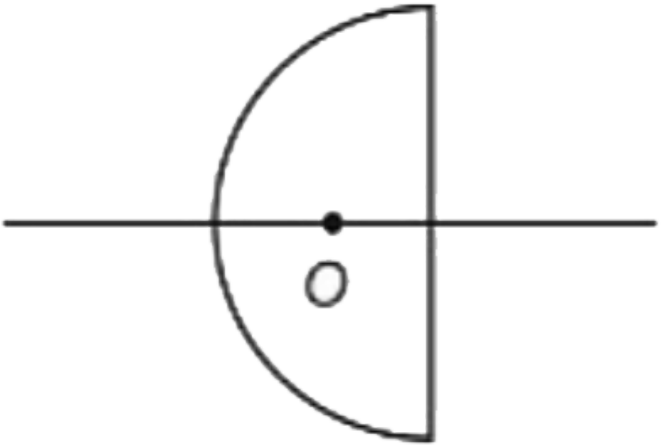
8. A glass hemisphere $(\mu = 1.5)$ has a radius of curvature of 16 cm. A small object O is located on its axis halfway between the plane and spherical surface. The distance between two images , when viewed along the axis from

the sides of the hemisphere is



A. $\frac{32}{15}cm$

B. $\frac{48}{15}cm$

C. $\frac{64}{15}cm$

D. $\frac{80}{15}cm$

Answer: C

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9. One mole of diatomic gas undergoes a process $P = \frac{P_0}{\left[1 + (V/V_0)^3\right]}$, where P_0 and V_0 are constants . The translational kinetic energy of the gas when $V = V_0$ is given by

A. $\frac{5P_0V_0}{4}$

B. $\frac{3P_0V_0}{2}$

C. $\frac{35P_0V_0}{2}$

D. $\frac{5P_0V_0}{2}$

Answer: B

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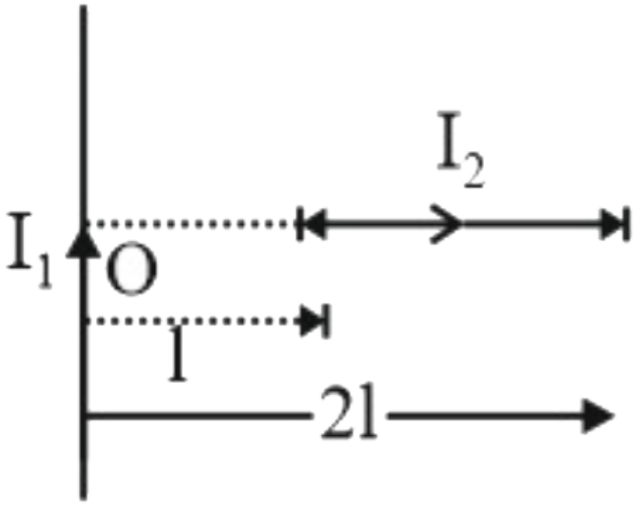
10. A finite carrying - current wire is placed in a plane along with very long ,straight conductor carrying current as shown in the figure. The torque on the finite current wire about point

O is



A. $2\frac{\mu_0}{\pi} I_1 I_2 1$

B. $\frac{\mu_0}{\pi} I_1 I_2 1$

C. $\frac{\mu_0}{2\pi} I_1 I_2 1$

D. $\frac{3\mu_0}{2\pi} I_1 I_2 1$

Answer: C

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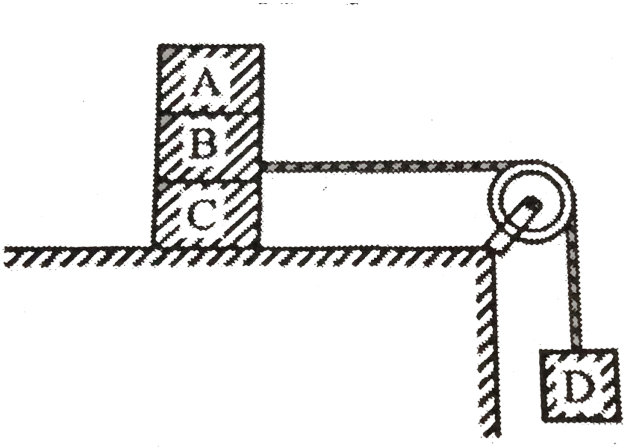
11. Three blocks of A, B and C of equal mass m are placed one over the other on a smooth horizontal ground as shown in figure. Cofficient of friction between any two blocks of A,B and C is 1/2. The maximum value of mass of block D so that the blocks A,B and C move

without slipping over each other is-



A. 6 m

B. 5 m

C. 3 m

D. 4 m

Answer: C

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12. Electromagnetic wave travel in medium at a speed of $2.0 \times 10^8 ms^{-1}$. The relative permeability of the medium is 1.0. Find the relative permitivity.

A. 2.25

B. 3.25

C. 3.70

D. 4.2

Answer: A

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13. The height of a mercury barometer is 75 cm at sea level and 50 cm at the top of a hill. Ratio of density of mercury to that of air is 10^4. The height of the hill is

A. 250 m

B. 2.5 km

C. 1.25 km

D. 750 m

Answer: B

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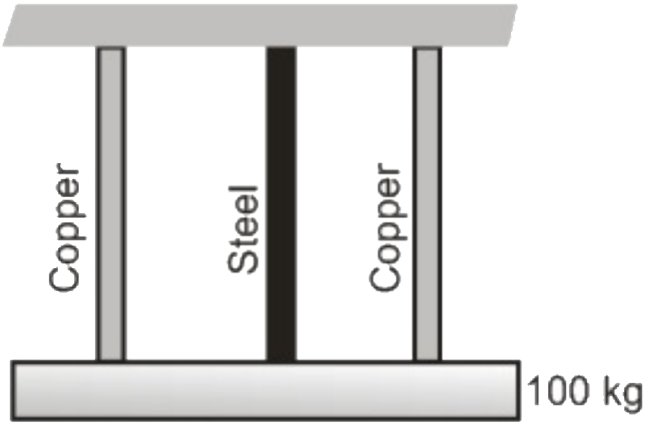
14. A heavy plank of mass 100 kg hangs on three vertical wires of equal length arranged symmetrically (see figure). All the wires have the same cross - section.

The middle wire is of steel and the other two are of copper . The modulus of elasticity of

steel is assumed to be double that copper. Determine the tensions in the wire. (use $g = 9.8ms^{-2}$)



A. $T_{cu} = 245N, T_{\text{steel}} = 490N$

B. $T_{cu} = 235N, T_{\text{steel}} = 490N$

C. $T_{cu} = 205N, T_{\text{steel}} = 490N$

D. $T_{cu} = 295N, T_{\text{steel}} = 490N$

Answer: A

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15. The fraction of atoms of radioactive element that decays in 6 days is 7/8. the fraction that decays in 10 days will be

A. $\frac{77}{80}$

B. $\frac{71}{80}$

C. $\frac{31}{32}$

D. $\frac{15}{16}$

Answer: C

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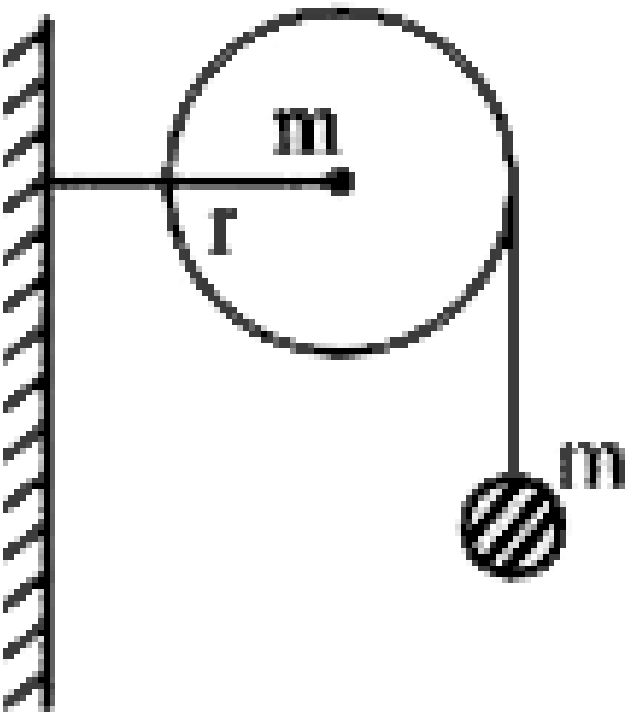
16. As shown in the figure, a bob of mass m is tied by a massless string whose other end is wound on a fly wheel Ring of radius r and mass m. When released from rest the bob starts falling vertically. When it has covered a

distance of h, the speed of the bob will be :



A. $\frac{1}{r}\sqrt{\frac{4gh}{3}}$

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

C. $\frac{1}{r}\sqrt{\frac{2gh}{3}}$

D. $r\sqrt{\frac{3}{4gh}}$

Answer: A

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17. Consider telecommunication through optical fibres. Which of the following statements is not true?

A. optical fibers can be of graded refractive index

B. optical fibers are subject are subjected to electro- magnetic interference from outside

C. optical fibers have extremely low transmission loss

D. optical fibers may have homogeneous core with a suitable cladding

Answer: B

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18. What is the conductivity of a semiconductor sample having electron concentration of $5 \times 10^{18} m^{-3}$ hole concentration of $5 \times 10^{19} m^{-3}$, electron mobility of $2.0 m^2 V^{-1} s^{-1}$ and hole mobility of $0.01 m^2 V^{-1} s^{-1}$?

(Take charge of electron as $1.6 \times 10^{-19} C$)

A. $1.83 (\Omega m)^{-1}$

B. $1.65 (\Omega m)^{-1}$

C. $1.20 (\Omega m)^{-1}$

D. $0.59 (\Omega m)^{-1}$

Answer: B

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19. Temperature of an ideal gas is 300 K . The final temperature of the gas when its volume changes from V to $2V$ in the process $p = \alpha V$ (here α is a positive constant) is

A. 900 K

B. 1200 K

C. 300 K

D. 500 K

Answer: B

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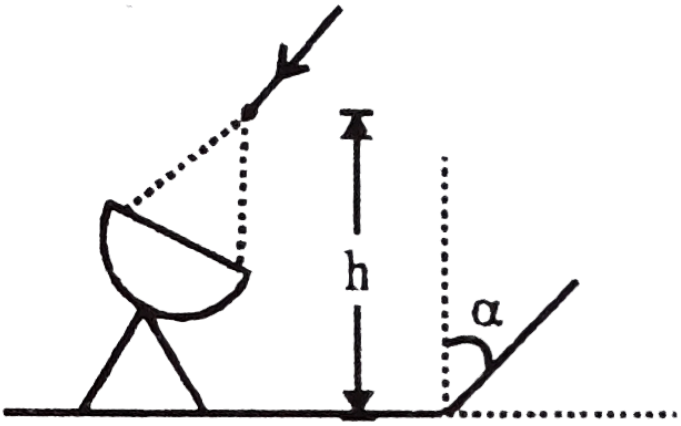
20. Radio waves coming at $\angle_{\alpha}$ to vetical are received by a radar after reflection from a nearby water surface and directly .what should be height of antenna from water surface so that it records a maximum intensity.

(Wavelength =λ)



A. $\frac{\lambda}{4\cos\alpha}$

B. $\frac{2\lambda}{4\cos\alpha}$

C. $\frac{3\lambda}{6\cos\alpha}$

D. $\frac{5\lambda}{7\cos\alpha}$

Answer: A

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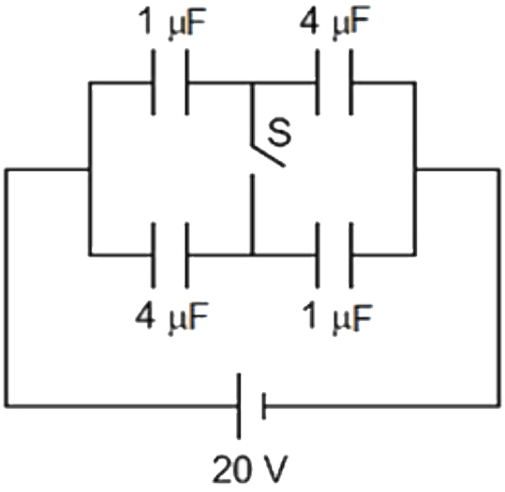
21. For the circuit shown in the figure , the charge flown through the switch after it is closed is n μC. Find the value of n.



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22. A heavy nuleus having mass number 200 gets disintegrated into two small fragmnets of mass numbers 80 and 120. If binding energy per nulceon for parent atom is $6.5MeV$ and for daughter nuceli is $7MeV$ and $8MeV$, respectivley , then the energy released in the decay will be.

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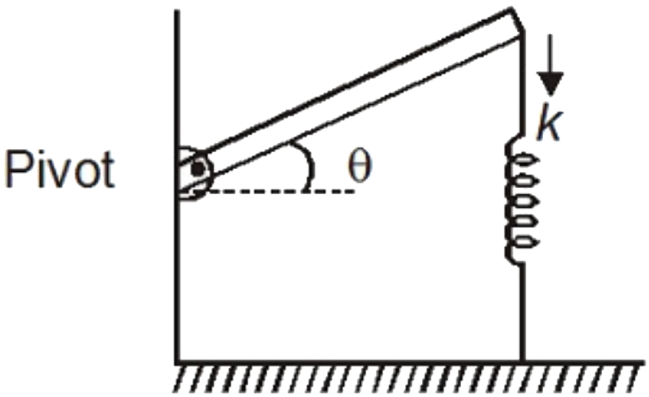
23. A horizontal rod of mass $m = \frac{3k}{\pi^2}$ kg and length L is pivoted at one end . The rod at the other end is supported by a spring of force constant k. The rod is displaced by a small angle θ from its horizontal equilibrium position and released . The time period (in second) of the subsequent simple harmonic

motion is



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24. In a car race sound signals emitted by two cars are detected by the detector on the straight track at the end point of the race. Frequency observer is 330 Hz and 360 Hz and

the original frequency is 300 Hz of both cars. Race ends with the separation of 100 m between the cars. Assume both cars move with constant velocity and velocity of sound is $330 m / s$. Find the time taken by wining car.

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25. A small particle of mass m and charge Q is dropped in uniform horizontal magnetic field B. The maximum vertical displacement of

particle is given by $h = \frac{nm^2g}{2Q^2B^2}$. Find the value n.

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