PHYSICS

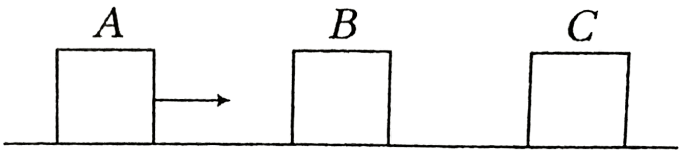
BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 30

Physics

1. Three identical blocks A, B and C are placed on horizontal frictionless surface. The blocks B and C are at rest. But A is approaching

towards B with a speed of $10ms^{-1}$



The coefficient of restitution for all collision is 0.5. The speed of the block C just after collision is

A. $5.6ms^{-1}$

B. $6ms^{-1}$

C. $8ms^{-1}$

D. $10ms^{-1}$

Answer: A

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2. In Young's double - slit experiment intensity at a point is $(3/4)^{\text{th}}$ of the maximum intensity. The possible angular position of this point is

A. $\sin^{-1}\left(\frac{\lambda}{3d}\right)$

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

C. $\sin^{-1}\left(\frac{\lambda}{6d}\right)$

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

Answer: C

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3. The focal length of a mirror is given by $\frac{1}{v} - \frac{1}{u} = \frac{2}{f}$. If equal errors α are made inmeasuring u and v. Then relative error in f is

A. $\frac{p}{2}\left(\frac{1}{u} + \frac{1}{v}\right)$

B. $p\left(\frac{1}{u} + \frac{1}{v}\right)$

C. $\frac{p}{2}\left(\frac{1}{u} - \frac{1}{v}\right)$

D. $p\left(\frac{1}{u}-\frac{1}{v}\right)$

Answer: B

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4. Two rods, one of aluminium and the other made of steel, having initial length l_1 and l_2 are connected together to from a single rod of length l_1+l_2. The coefficients of linear expansion for aluminium and steel are α_a and α_s and respectively. If the length of

each rod increases by the same amount when their temperature are raised by t^0C, then find the ratio $l_1/(l_1+l_2)$

A. $\frac{\alpha_s}{\alpha_a}$

B. $\frac{\alpha_a}{\alpha_s}$

C. $\frac{\alpha_s}{(\alpha_a+\alpha_s)}$

D. $\frac{\alpha_a}{(\alpha_a+\alpha_s)}$

Answer: C

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5. Show that the minimum length of antenna required to transmit a radio signal of frequency 10 MHz is 7.5m.

A. 8.5 m

B. 6 m

C. 4 m

D. 7.5 m

Answer: D

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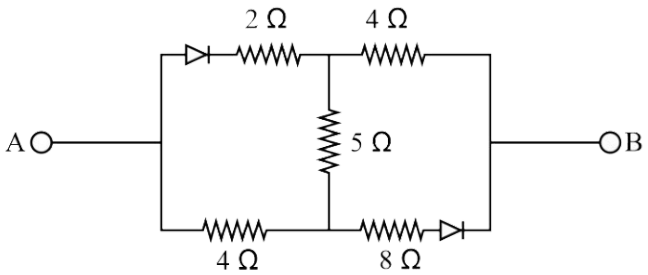
6. The part of a circuit shown in the figure consists of two ideal diodes and a few resistors. The equivalent resistance of the circuit between A and B is



A. 4Ω

B. 13Ω

C. 4Ω or 13Ω

D. 4Ω or zero

Answer: C

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7. A disc of mass 2 kg and radius 0.2 m is rotating with angular veocity $30\,\mathrm{rad\,s^{-1}}$. What is angular velocity, if a mass of 0.25 kg is put on periphery of the disc?

A. $24\,\mathrm{rad\,s^{-1}}$

B. $36\,\mathrm{rad\,s^{-1}}$

C. $15\,\mathrm{rad\,s^{-1}}$

D. $26\ \mathrm{rad\ s^{-1}}$

Answer: A

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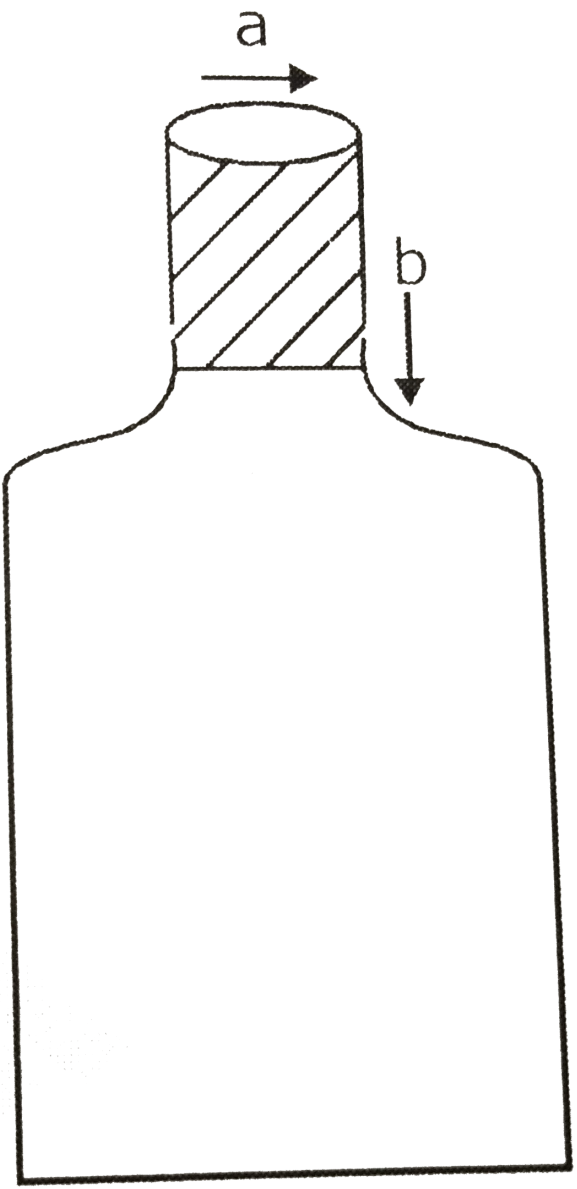
8. A bottle has an opening of radius a and length b. A cork of length b and radius $(a + \Delta A)$ is compressed to fit into the opening completely (See figure). If the bulk modulus of cork is B and frictional coefficient between the bottle and cork is then the force

needed to push the cork into the bottle is :



A. $(\pi\mu Bb)$ a

B. $(2\pi\mu Bb)\Delta a$

C. $(\pi\mu Bb)\Delta a$

D. $(4\pi\mu Bd)\Delta a$

Answer: D

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9. Lights of wavelenths $\lambda_1 = 340nm$ and $\lambda_2 = 540nm$ are incident on a metallic surface. If the ratio of the maximum speeds of

electrons ejected is 2, the work function of the metal is

A. 2 eV

B. 1.8 eV

C. 1 eV

D. 1.5 eV

Answer: B

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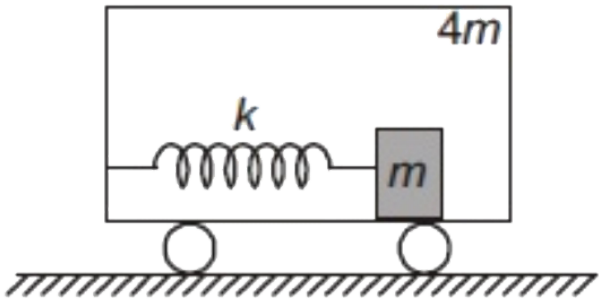
10. A block of mass m is attached to a cart of mass 4m through spring of spring constant k as shown in the figure. Friction is absent everywhere. The time period of oscillations of the system, when spring is compressed and then released, is



A. $\pi\sqrt{\frac{m}{k}}$

B. $2\pi\sqrt{\frac{m}{k}}$

C. $2\pi\sqrt{\frac{5m}{2k}}$

D. $4\pi\sqrt{\frac{m}{5k}}$

Answer: D

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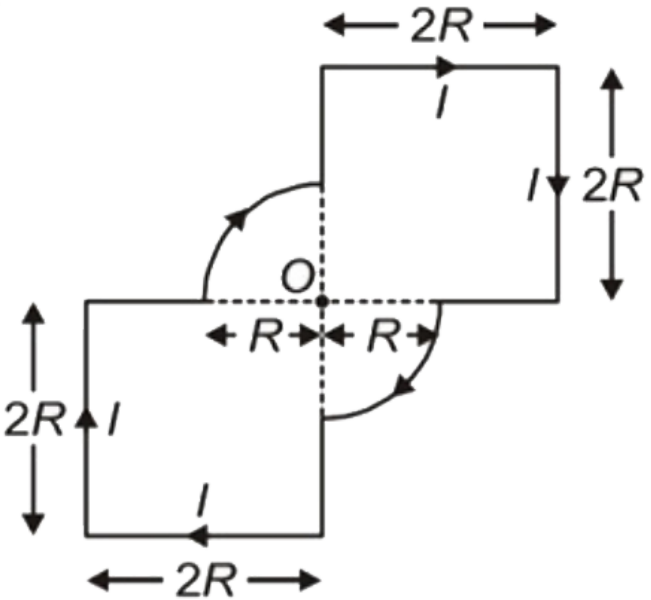
11. A current - carrying loop is shown in the figure. The magnitude of the magnetic field

produced at a point O is



A. $\frac{\mu_0 I}{4R}$

B. $\frac{\mu_0 I}{2R}\left(1+\frac{\sqrt{2}}{\pi}\right)$

C. $\frac{\mu_0 I}{4R}\left(1+\frac{\sqrt{2}}{\pi}\right)$

D. $\frac{\mu_0}{4R}\left(1+\frac{2\sqrt{2}}{\pi}\right)$

Answer: C

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12. Weight fo a body of a mass m decreases by 1% when it is raised to height h above the earth's surface. If the body is taken to depth h in a mine, change in its weight is

A. $0.5\ \%$, decrease

B. $2\ \%$, increase

C. $0.5\ \%$, increase

D. 2%, decrease

Answer: A

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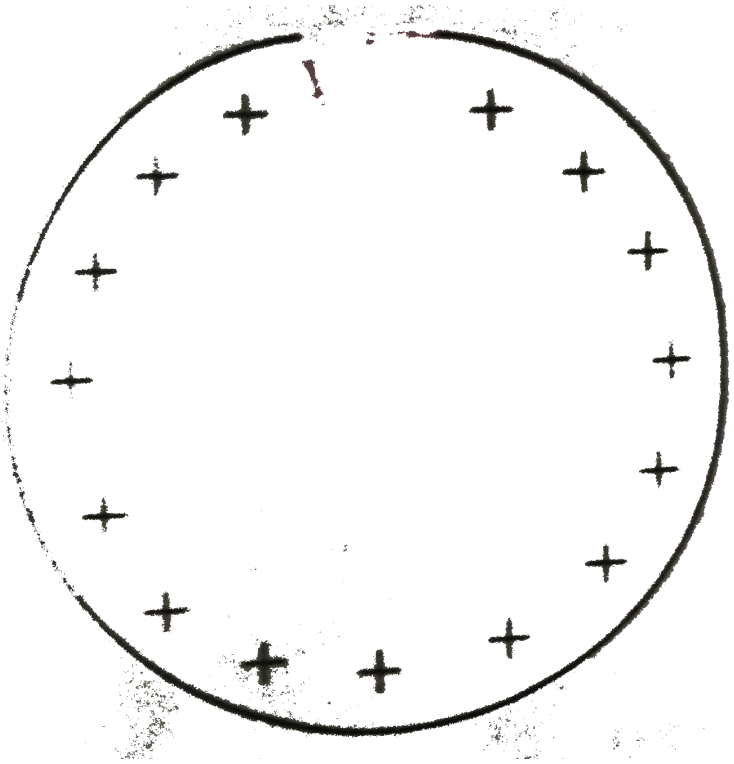
13. A ring of charge with radius $0.5m$ has 0.002π m gap. If the ring carries a charge of

$+1C$ the electric field at the center is



A. $7.5 \times 10^7 NC^{-1}$

B. $7.2 \times 10^7 NC^{-1}$

C. $6.2 \times 10^7 NC^{-1}$

D. $6.5 \times 10^7 NC^{-1}$

Answer: B

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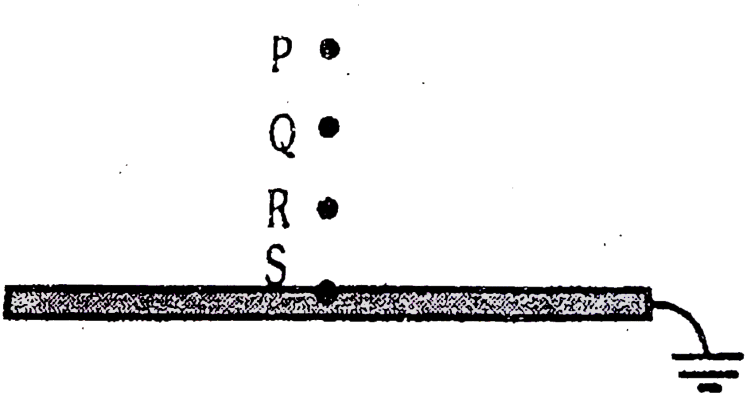
14. A positive point charge is placed at P in front of an earthed metal sheet S.Q and R are two points between P and S as shown in the diagram. If the electric field strength at Q and r are respectively E_Q and E_R, which one of the

following statement is / are false?



A. $E_Q = E_R$

B. $E_Q < E_R$

C. $E_Q > E_R$

D. $V_Q < V_R$

Answer: C

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15. A square coil of side $25cm$ having 1000 turns is rotated with a uniform speed in a magnetic field about axis perpendicular to the direction of the field. At an instant t, the e.m.f. induced in the coil is $e = 200 \sin 100\pi t$. The magnetic induction is

A. 0.02 T

B. $10^{-3}T$

C. 0.1 T

D. 0.01 T

Answer: D

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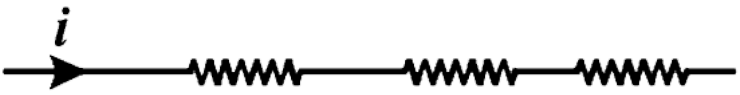
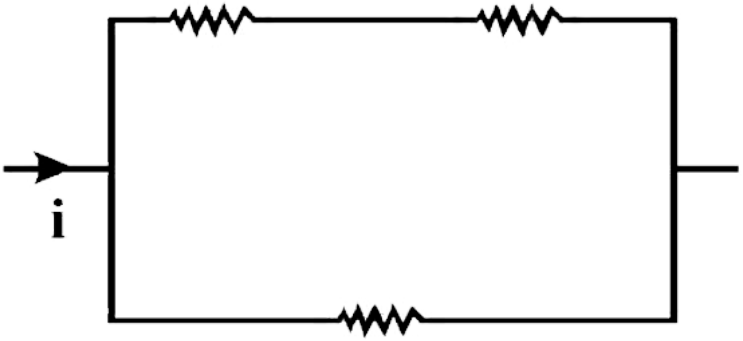
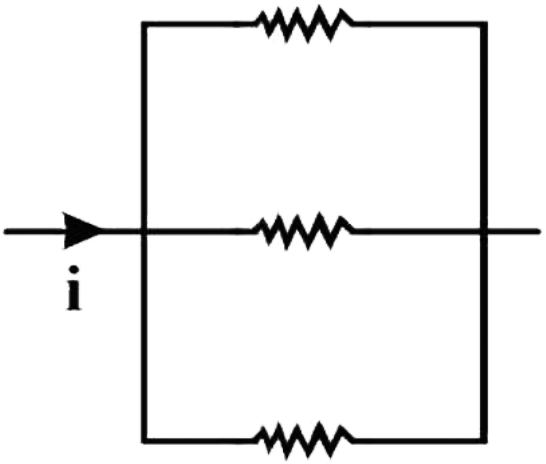
16. The three resistance of equal value are arranged in the different combination shown below. Arrange them in increasing order of power dissipation.



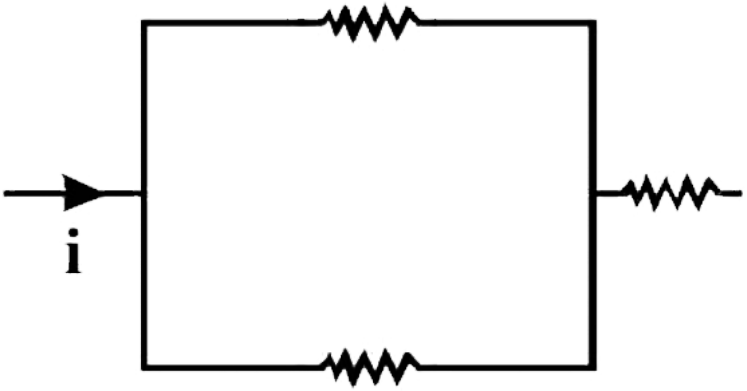
(I)

(II)





(IV)



A. III lt II lt IV lt I

B. II lt III lt IV lt I

C. I lt IV lt III lt II

D. I lt III lt II lt IV

Answer: A

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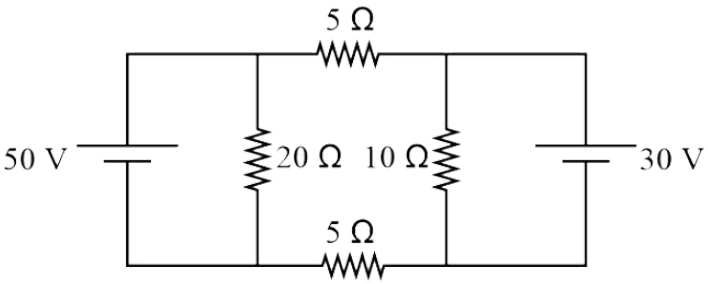
17. In the circuit shown, current (in A) through the 50 V and 30 V batteries are, resepctively



A. 2.5 and 3

B. 4.5 and 1

C. 5.5 and 2

D. 3.5 and 2

Answer: B

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18. At a place the true value of angle of dip is 60°. If dip circle is rotated by ϕ° from

magnetic meridian, the angle of dip is found to be $\tan^{-1}(2)$. Then the value of ϕ is

A. 45°

B. 15°

C. 60°

D. 30°

Answer: D

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19. Two bodies of same mass tied with an inelastic string of length l lie together. One of them is projected vertically upwards with velocity $\sqrt{6gl}$. Find the maximum height up to which the centre of mass system of the two masses rises.

A. $\frac{3l}{4}$

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

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

D. l

Answer: D

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20. Steam at $100^\circ C$ is passed into 1.1 kg of water contained in a calorimeter of water equivalent 0.02 kg at $15^\circ C$till the temperature of the calorimeter and its contents rises to $80^\circ C$. The mass of the steam condensed in kilogram is

A. 0.130

B. 0.065

C. 0.260

D. 0.200

Answer: A

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21. A hydrogen like atom (atomic number z) is in a higher excited state of quantum number n. This excited atom can make a transition to the first excited state by successively emitting

two photons of energies $10.2eV$ and $17.0eV$ respectively. Alternatively the atom from the same excited state can make a transition to the second excited state by successively emitting 2 photons of energy $4.25eV$ and $5.95eV$ respectively. Determine the value of $(n+z)$

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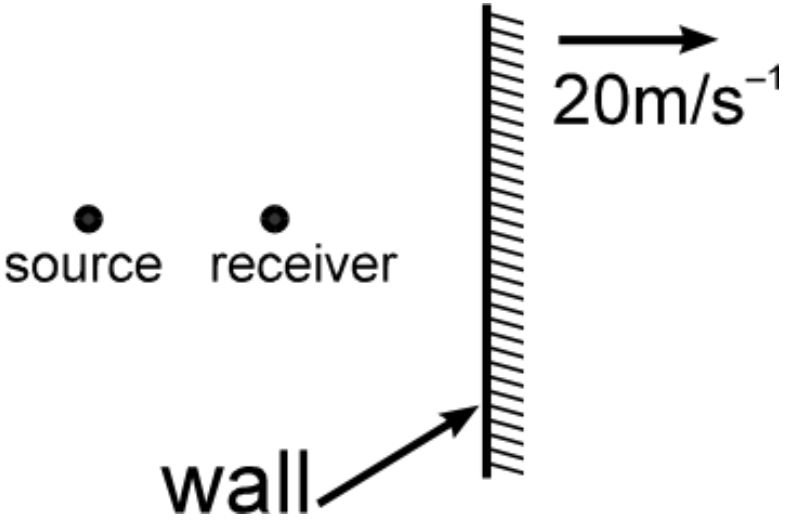
22. A source of sound of frequency 300 Hz and a receiver are located along the same line

normal to the wall as shown in the figure. Both the source and the receiver are stationary and the wall receeds from the source with velocity $20ms^{-1}$.If the beat frequency registered by the receiver is $\frac{240}{x}$ Hz then x is :

(Assume $V_{\text{sound}} = 300$ m/s).



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23. Diameter or aperture of a plano - convex lens is 6 cm and its thickness at the center is 3 mm. The image of an object formed is real and twice the size of the object. If the speed of light in the material of the lens is $2 \times 10^8 ms^{-1}$. The distance where the object is placed from the plano - convex lens is ..... $\times 15cm.$

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24. A vessel whose bottom has round holes with diameter of 1 mm is filled with water Assuming that surface tension acts only at holes, then the maximum height to which the water can be filled in vessel without leakage is (given surface tension of water is $75 \times 10^{-3} N/m$) and $g = 10 m/s^2$

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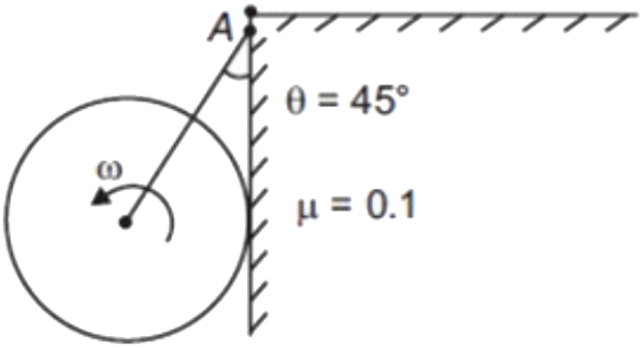
25. A solid spherical ball of radius $\frac{5}{9}m$ is connected to a point A on the wall with the help of a string which makes an angle $\theta = 45^\circ$ with the vertical. The sphere can rotate freely about its central axis and it is set into rotational motion against the vertical face of the wall with an angular velocity face of the wall with an angular velocity $100\,\mathrm{rad\,s^{-1}}$. In how much time (in s) will it come to rest ?

$[\mu = 0.1]$



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