



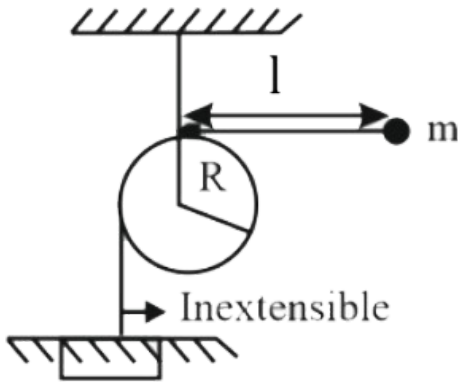
PHYSICS

BOOKS - NTA MOCK TESTS

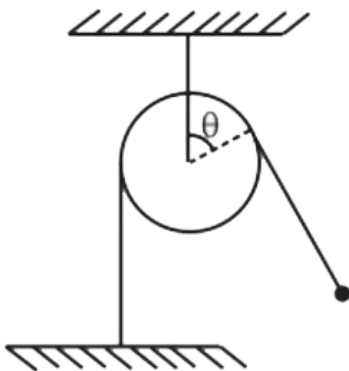
NTA JEE MOCK TEST 34

Physics

1. The initial configuration of the system is as shown in the figure.



The string and the pulley are light. The bob is released and the string starts wrapping around the pulley. (The pulley is held in place by a force applied at the centre)



Find the rate r at which the length of the string

wrapped around the pulley increases (as a function of θ

).

$$\text{A. } r = \frac{R}{(l - R\theta)} \sqrt{[2g(l - R\theta)\sin\theta]}$$

$$\text{B. } r = \frac{R}{(l - R\theta)} \sqrt{2g[(l - R\theta)\sin\theta + R\cos\theta]}$$

C.

$$r = \frac{R}{(l - R\theta)} \sqrt{2g[(l - R\theta)\sin\theta + R(1 - \sin\theta)]}$$

D.

$$r = R \frac{1}{(l - R\theta)} \sqrt{2g[(l - R\theta)\sin\theta + R(1 - \cos\theta)]}$$

Answer: D



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2. A point source emits sound equally in all directions in a non-absorbing medium. Two point P and Q are at distance of $2m$ and $3m$ respectively from the source.

The ratio of the intensities of the wave at P and Q is :

A. 9:4

B. 2:3

C. 3:2

D. 4:9

Answer: A



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3. The limit of resolution of a 100 cm telescope for $\lambda = 5000\text{\AA}$ is equal to

A. 61×10^{-8} rad

B. 6.1×10^{-8} rad

C. 12.2×10^{-8} rad

D. 122×10^{-8} rad

Answer: A



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4. If Δr_1 represents the difference in radii of stationary orbitals for $n = 3$ and $n = 4$ in a hydrogen atom and

Δr_2 represents the difference in radii of stationary orbits for $n = 8$ and $n = 9$, then the value of $\frac{\Delta r_1}{\Delta r_2}$ is

A. 0.71

B. 0.41

C. 2.43

D. 14.82

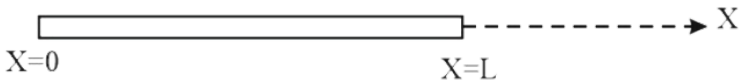
Answer: B



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5. Find the x coordinate of the centre of mass of the non - uniform rod of length L givne below. The origin is

taken at the left end of the rod. The density of the rod as a function of its x -coordinates is $\rho = ax^2 + bx + c$, where a , b and c are constants.

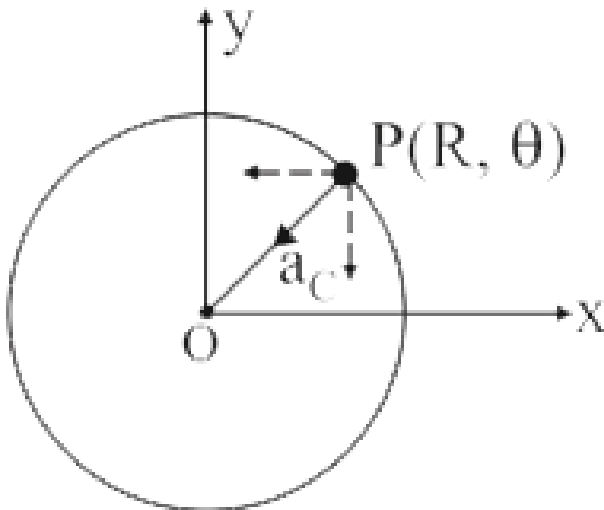


- A. $\frac{2aL^2 + 3bL^2 + 6cL}{2(3aL^2 + 4bL + 8c)}$
- B. $\frac{4aL^3 + 3bL^2 + 2cL}{2(3aL^2 + 2bL + c)}$
- C. $\frac{3aL^2 + 4bL^2 + 2cL}{4aL^2 + 6bL + 8c}$
- D. $\frac{3aL^3 + 4bL^2 + 6cL}{2(2aL^2 + 3bL + 6c)}$

Answer: D

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6. For a particle in uniform circular motion the acceleration \vec{a} at a point $P(R, \theta)$ on the circle of radius R is : (here θ is measured from the x- axis)



A. $\frac{v^2}{R} \hat{i} + \frac{v^2}{R} \hat{j}$

B. $-\frac{v^2}{R} \cos \theta \hat{i} + \frac{v^2}{R} \sin \theta \hat{j}$

C. $-\frac{v^2}{R} \sin \theta \hat{i} - \frac{v^2}{R} \cos \theta \hat{j}$

$$D. -\frac{v^2}{R} \cos \theta \hat{i} - \frac{v^2}{R} \sin \theta \hat{j}$$

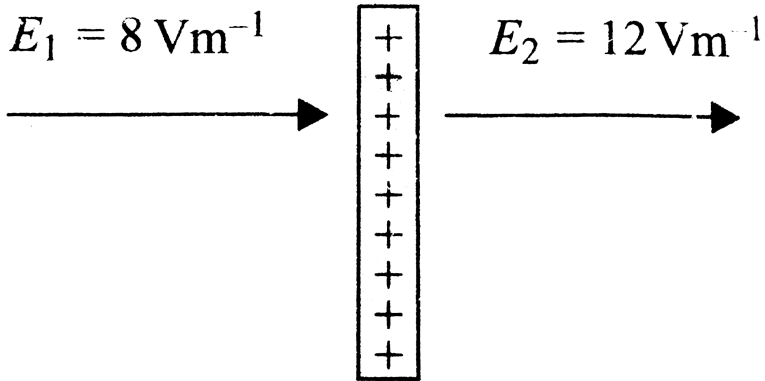
Answer: C



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7. The electric field on two sides of a large charged plate is shown in figure. The charge density on the plate in SI units is given by (ϵ_0 is the permittivity of

free space in SI units).



A. $2\epsilon_0$

B. $4\epsilon_0$

C. $10\epsilon_0$

D. zero

Answer: B



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8. A coil takes 15 min to boil a certain amount of water, another coil takes 20 min for the same process. Time taken to boil the same amount of water when both coil are connected in series

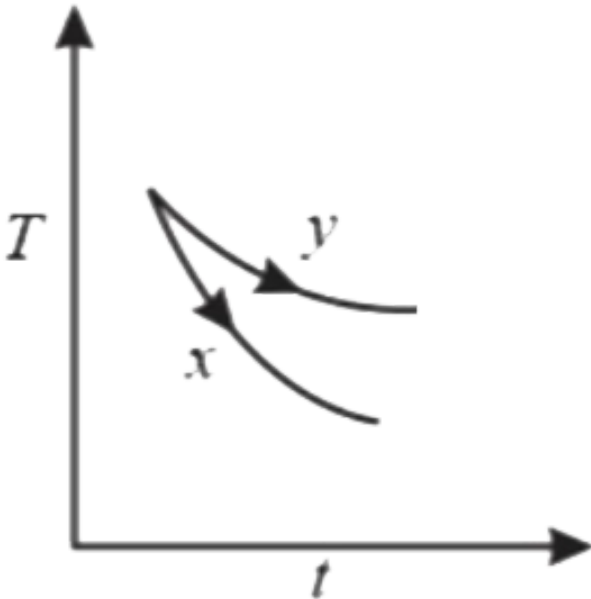
- A. 5 minutes
- B. 8.6 minutes
- C. 35 minutes
- D. 30 minutes

Answer: C



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9. The graph shown in the adjacent diagram represents the variation of temperature (T) of two bodies x and y having the same surface area, with time (t). Both of these bodies lose heat only due to the emission of radiation. Find the correct relation between the emissive and absorptive power of the two bodies.



A. $E_x > E_y$ and $a_x < a_y$

B. $E_x < E_y$ and $a_x > a_y$

C. $E_x > E_y$ and $a_x > a_y$

D. $E_x < E_y$ and $a_x < a_y$

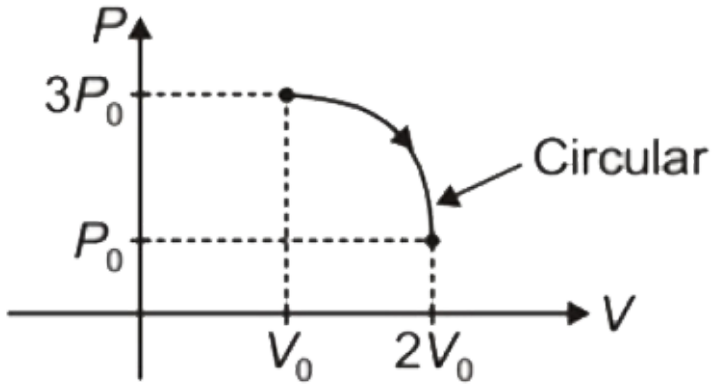
Answer: C



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10. One mole of an ideal diatomic gas is taken through a process whose $P - V$ diagram is shown in the

figure. The work done by the gas is



A. $\pi P_0V_0 + 2P_0V_0$

B. $\frac{\pi P_0V_0}{2} + P_0V_0$

C. $2\pi P_0V_0 + P_0V_0$

D. $\frac{\pi P_0V_0}{\sqrt{2}} + P_0V_0$

Answer: B



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11. A car accelerates from rest at a constant rate of 2ms^{-2} for some time. Then, it retards at a constant rate of 4ms^{-2} and comes to rest. If the total time for which it remains in motion is 3 s, Then the total distance travelled is

A. 2 m

B. 3 m

C. 4 m

D. 6 m

Answer: D



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12. What is the disintegration constant of radon if the number of its atoms diminishes by 18% in 24 h?

[Take $\ln (0.82) \approx -0.2$]

A. $2.3 \times 10^{-3} \text{ s}^{-1}$

B. $2.3 \times 10^{-4} \text{ s}^{-1}$

C. $2.3 \times 10^{-5} \text{ s}^{-1}$

D. $2.3 \times 10^{-6} \text{ s}^{-1}$

Answer: D



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13. Two cars move in the same direction along parallel roads. One of them is a $200m$, long travelling with a velocity of $20m/s$. The second one is $800m$ long travelling with a velocity of $7.5m/s$. How long will it take for the first car to overtake the second car?

A. 20 s

B. 40 s

C. 60 s

D. 80 s

Answer: D



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14. A narrow capillary tube when dipped in beaker containing water, the rise is 20 cm . If the area of cross section of the bore is reduced to $(1/4)^{th}$ value , water will rise to a height of

A. 10 cm

B. 20 cm

C. 40 cm

D. 80 cm

Answer: C



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15. A thin circular metal disc of radius 500.0 mm is set rotating about a central axis normal to its plane. Upon raising its temperature gradually, the radius increases to 507.5 mm. The percentage change in the rotational kinetic energy will be

A. 1.5 %

B. - 1.5 %

C. 3 %

D. - 3 %

Answer: D



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16. A spherical mirror is placed 10 cm below the level of water. A point object is placed in air 30 cm above the water surface on the axis of the mirror such that two images seen by an observer above the water surface coincide. The images are formed by partial reflection at the water surface and due to emerging light after reflection from the mirror. Find the focal length of the

mirror. $\left(\mu_{\text{water}} = \frac{4}{3}\right)$

A. $\frac{100}{3} \text{ cm}$

B. 75 cm

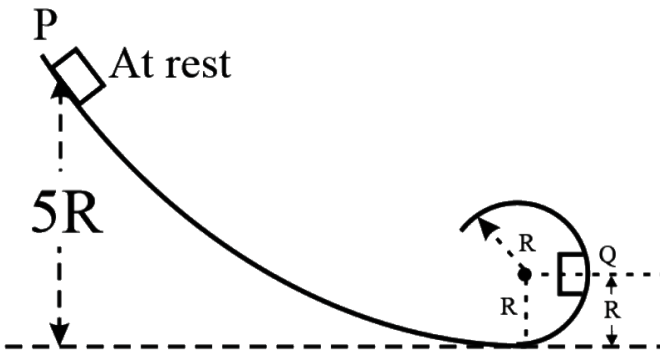
C. $\frac{100}{8} \text{ cm}$

D. 50 cm

Answer: B

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17. A small block of mass m slides along a smooth frictional track as shown in the figure. If it starts from rest at P, what is the resultant force acting on it at Q?



A. $\frac{100}{3}mg$

B. $\frac{100}{9}mg$

C. $\frac{200}{9}mg$

D. $\frac{50}{7}mg$

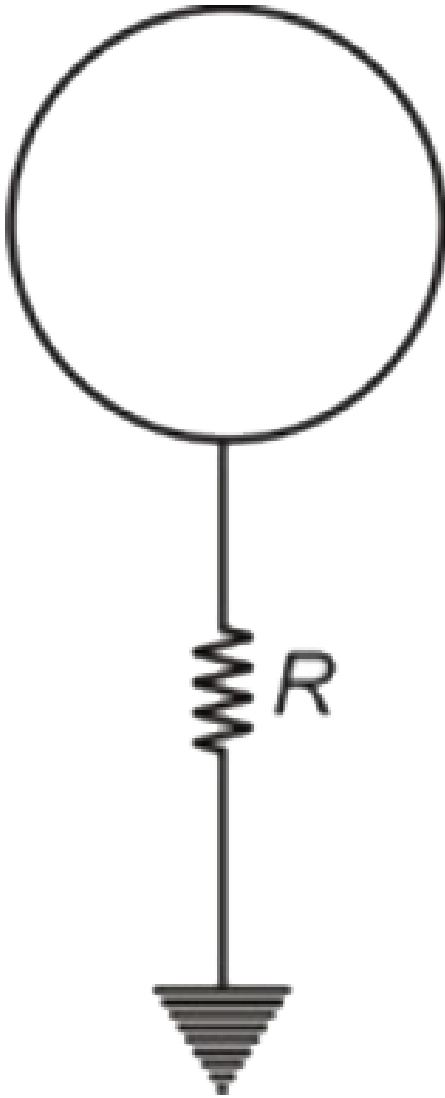
Answer: B



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18. A conducting balloon of the radius a is charged to potential V_0 and held at a large height above the earth ensures that charge distribution on the surface of the balloon remains unaffected by the presence of the earth. It is connected to the earth through a resistance R and a valve in the balloon is opened. The gas inside

the balloon escapes from value and the size of the balloon decreases. The rate of decrease in radius of the balloon is controlled in such a manner that potential of the balloon remains constant. Assume the electric permittivity of the surrounding air equals to that of free space (ϵ_0) and charge cannot leak to the surrounding air.



The rate at which radius r of the balloon changes with time is best represented by the equation

$$\text{A. } \frac{dr}{dt} = \frac{1}{4\pi\epsilon_0 R}$$

$$\text{B. } \frac{dr}{dt} = - \frac{1}{4\pi\epsilon_0 R}$$

$$\text{C. } \frac{dr}{dt} = \frac{1}{4\pi\epsilon_0 aR}$$

$$\text{D. } \frac{dr}{dt} = - \frac{r}{4\pi\epsilon_0 aR}$$

Answer: B



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19. An $N - P - N$ transistor is being used in CE mode for which the current transfer ratio is $\alpha = \frac{25}{26}$. The input resistance is 1000Ω and amplitude of A.C. input voltage is 10 mV. The amplitude of the amplified output collector current is

A. $25\mu A$

B. $250\mu A$

C. $125\mu A$

D. $50\mu A$

Answer: B



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20. A sound absorber attenuates the sound level by $20dB$. The intensity decreases by a factor of

A. 100

B. 1000

C. 10000

D. 10

Answer: A

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21. Two coherent light beams of intensity I and $4I$ are superposed. If the maximum and minimum possible intensities in the resulting beam are I_{\max} and I_{\min} , then $I_{\max} - I_{\min} = nI$. Find the value of n . Find the value of n .

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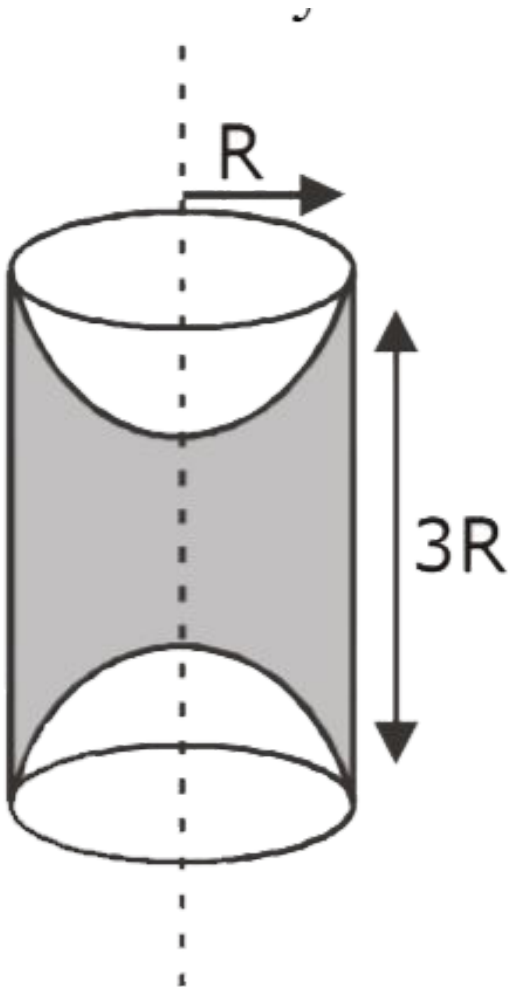
22. A screw gauge with a pitch of 1 mm has 100 divisions on its circular scale. What it is used to measure the diameter of a thin wire, the main scale reading is 3 mm and the circular scale reading is 45. If D is the diameter of the wire in mm, then find the value of D .



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23. A solid cylinder of radius R & length $3R$ is made of a material having density ρ . Now two hemispheres each of radius R is removed from two ends of cylinder as shown in figure. Determine the moment of inertia of

this object about axis of cylinder?



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24. Two seconds after projection, a projectile is travelling in a direction inclined at 30° to the horizontal. After one more second, it is travelling horizontally. Find the magnitude and direction of its velocity.



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25. A block is hanged from spring is a cage. Elogation is spring is $x_1 = 4\sqrt{2}nm$ and $x_2 = 3\sqrt{2}mm$ mm when cage moves up and down respectively with same acceleration. The expansion (in mm) in spring when

the cage moves horizontally with the same acceleration .



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