PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 102

Physics

1. Taking the wavelength of first Balmer line in hydrogen spectrum ($n = 3$ to $n = 2$) as 660 nm, the wavelength of the 2^{nd} Balmer line ($n = 4$ to $n = 2$) will be:

A. 889.2 nm

B. 488.9 nm

C. 388.9 nm

D. 642.7 nm

Answer: B

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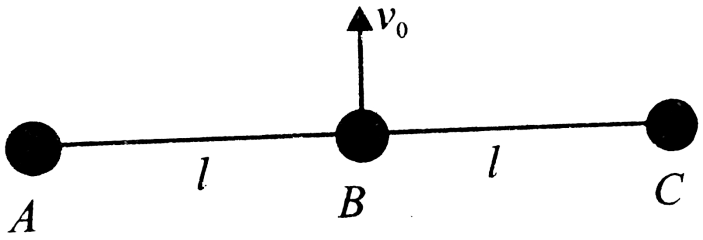
2. Three identical balls are connected by light inextensible strings with each other as shown and rest over a smooth horizontal table. Length of each string is l.

At moment $t = 0$, ball B is imparted a velocity v_0 perpendicular to the strings and then the system is left on its own.



Calculate the velocity of B just before A collides with ball C.

A. $\frac{v_0}{3}$

B. $\frac{2v_0}{3}$

C. $\frac{2v_0}{3}$

D. $\frac{2v_0}{9}$

Answer: B

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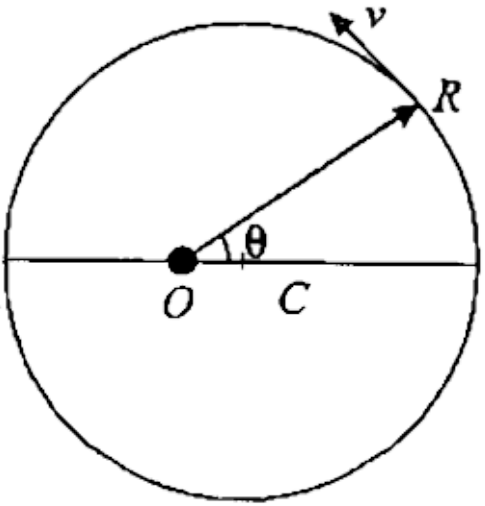
3. A particle is revolving in a circular path as shown in figure in the horizontal plane such that the angular velocity of the particle about the point O is constant and is equal to $1 rad/s$. Distance of the particle from O is given by $R = R_0 - \beta t$ where R_0 and β are

constant. The speed of the particle as a function of



time is:

A. $\sqrt{\beta^2 + 1}$

B. $(R_0 - \beta t)$

C. $\sqrt{\beta^2 + (R_0 - \beta t)^2}$

D. β

Answer: C

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4. In an experiment to measure the internal resistance of a cell by potentiometer, it is found that the balance point is at a length of 2 m when the cell is shunted by a 4Ω resistance and at 3 m when cell is shunted by a 8Ω resistance. The internal resistance of cell is -

A. 12Ω

B. 8Ω

C. 16Ω

D. 1Ω

Answer: B

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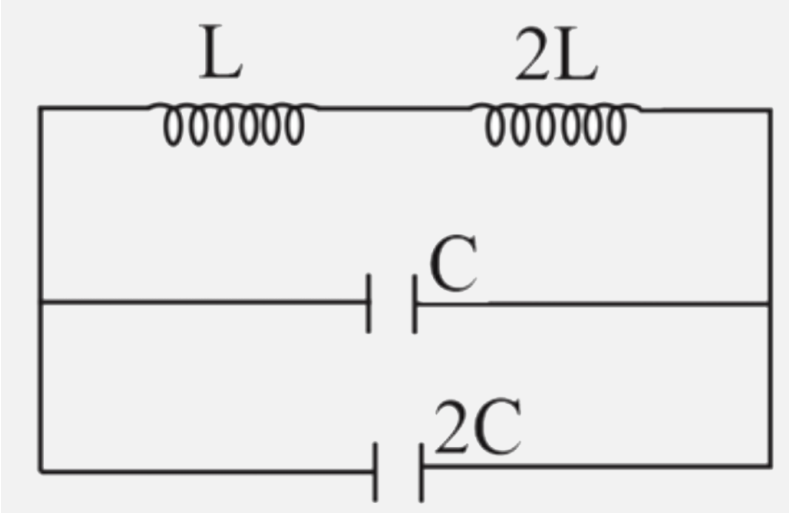
5. The frequency of oscillation of current in the inductor is -



A. $\frac{1}{3\sqrt{LC}}$

B. $\frac{1}{6\pi\sqrt{C}}$

C. $\frac{1}{\sqrt{LC}}$

D. $\frac{1}{2\pi\sqrt{LC}}$

Answer: B

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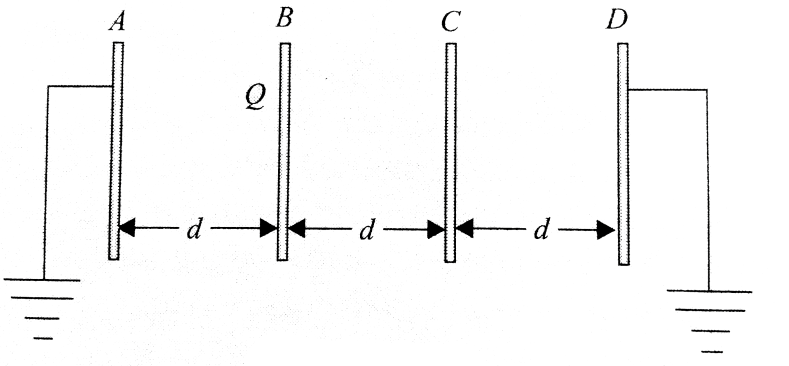
6. Four parallel large plates separated by equal distance d are arranged as shown in. The area of the plates is S Find the potential differnce between plats

B and C if plate B is given a charge Q.



A. $\frac{Qd}{3\varepsilon_0 S}$

B. $\frac{2Qd}{3\varepsilon_0 S}$

C. $\frac{Qd}{\varepsilon_0 S}$

D. $\frac{2Qd}{\varepsilon_0 S}$

Answer: A

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7. Two tangent galvanometers A and B have coils of radii $8cm$ and $16cm$ respectively and resistance $8ohm$ each. They are connected in parallel to a cell of emf $4V$ and negligible internal resistance. The deflections produced are 30° and 60° respectivley. A has 2 turns. What is the number of turns in B?

A. 18 truns

B. 12 turns

C. 6 turns

D. 2 turns

Answer: B

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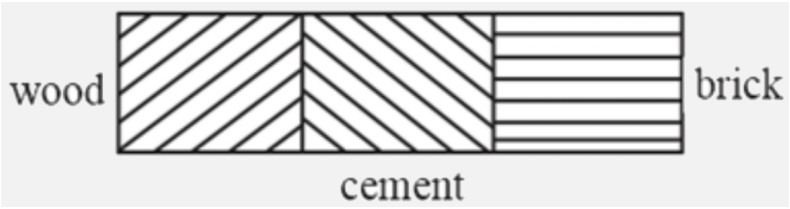
8. A electric heater is placed inside a room of total wall area $137m^2$ and maintained at a temperature $20^\circ C$ inside, outside temperature $-10^\circ C$. The walls are made up of three composite materials. The innermost layer is made up of wood of thickness 2.5 cm, the middle layer is of cement of thickness 1 cm and the exterior layer is 25 cm thick. Assuming there is no loss of heat through any other way, the power of the electric heater is (the thermal conductivity of wood, cement and brick are $0.125\ \mathrm{W\ m^2\ ^\circ C^{-1}}$, $1.5Wm^{-2\circ}C^{-1}$ and $1Wm^{-2\circ}C^{-1}$

respectively)



A. 9000 W

B. 8500 W

C. 8800 W

D. 9400 W

Answer: A

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9. 1 litre of a gas at STP is expanded adiabatically to 3 litre. Find work done by the gas. Given γ = 1.40 and $3^{1.4} = 4.65$

A. 48 J

B. 60.7 J

C. 90.5 J

D. 100.8 J

Answer: C

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10. A charged particle enters a uniform magnetic field with velocity vector at angle of 45° with the magnetic field. The pitch of the helical path followed by the particle is p. the radius of the helix will be

A. $\frac{p}{\sqrt{2}\pi}$

B. $\sqrt{2}p$

C. $\frac{p}{2\pi}$

D. $\frac{\sqrt{2}p}{\pi}$

Answer: C

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11. An particle is moving in xy - plane with a constant speed v_0 such that its y displacement is given by $y = \alpha e^{-\left(2\frac{v_x}{\sqrt{3}v_0}\right)}$, where v_x is component of velocity along the x - axis. If at some instant x component of it velocity is positive and the slope of the tangent on its path is $-\frac{1}{\sqrt{3}}$, then the displacement of the particle in y - direction at the instant is

A. αe^{-1}

B. αe^{-2}

C. Zero

D. $\alpha^2 e$

Answer: A

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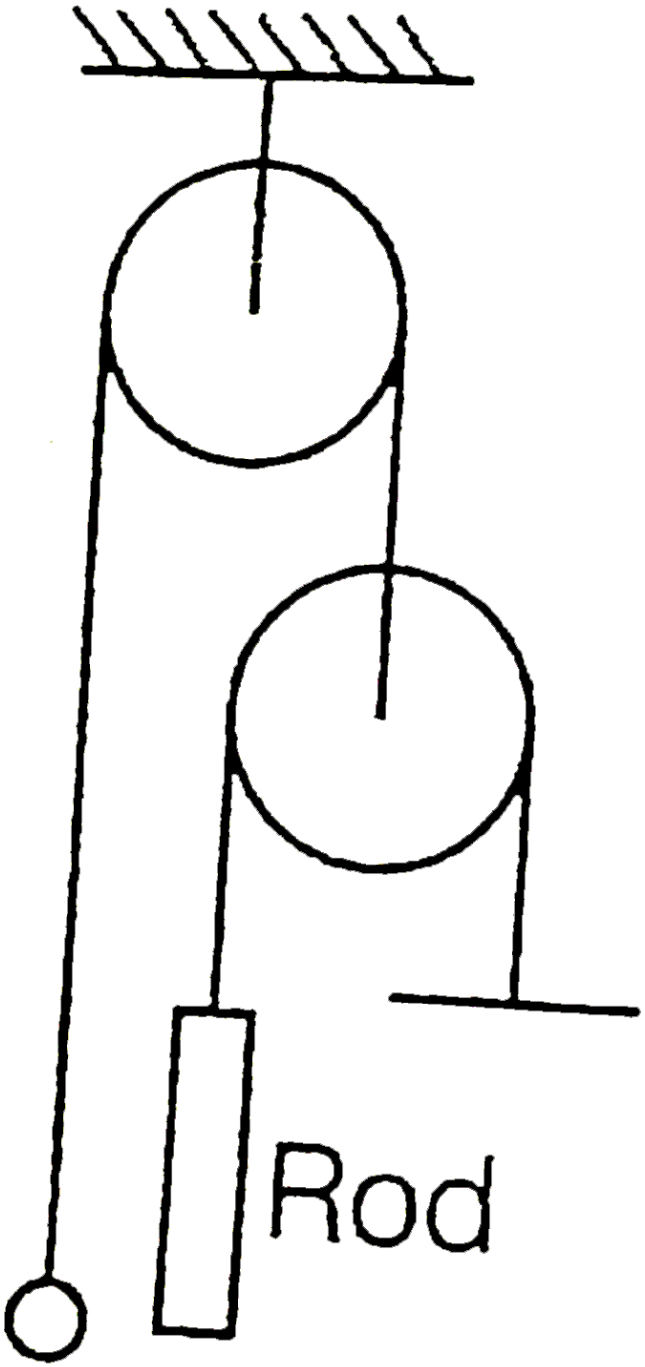
12. In the figure , mass of a ball is $\frac{9}{5}$ times mass of the rod, Length of rod is 1m.The level of ball is same as rod level.Find out time taken by the ball to reach at

upper end of rod.


Rod

A. 1.4 s

B. 2.45 s

C. 3.25 s

D. 5 s

Answer: A

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13. How much $.^{235}U$ is consumed in a day in an atomic powder house operating at $400MW$, provided the whole of mass $.^{235}U$ is converted into energy?

A. 0.394 g

B. 0.386 g

C. 0.382 g

D. 0.381 g

Answer: A

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14. Two particles A and B of same mass have their de - Broglie wavelength in the ratio $X_A : X_B = K : 1$. Their potential energies $U_A : U_B = 1 : K^2$. The ratio of their total energies $E_A : E_B$ is

A. $K^2 : 1$

B. $1 : K^2$

C. $K : 1$

D. $1 : K$

Answer: B

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15. A wooden stick of length L, radius R and density ρ has a small metal piece of mass m (of negligible volume) attached to its one end. Find the minimum value for the mass m (in terms of given parameters) that would make the stick float vertically in equilibrium in a liquid of density $\sigma(> \rho)$.

A. $2\pi R^2 L\rho\left(\sqrt{\frac{\sigma}{\rho}}-1\right)$

B. $\pi R^2 L\rho\left(\sqrt{\frac{2\sigma}{\rho}}-1\right)$

C. $\pi R^2 L\rho\left(\sqrt{\frac{\sigma}{\rho}}-1\right)$

D. $\pi R^2 L\rho\left(\sqrt{\frac{\sigma}{2\rho}}-1\right)$

Answer: C

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16. An object is kept at a distance of 16 cm from a thin lens and the image formed is real. If the object is kept at a distance of 6 cm from the same lens, the image

formed is virtual. If the size of the image formed are equal, the focal length of the lens will be

A. 21 cm

B. 11 cm

C. 15 cm

D. 17 cm

Answer: B

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17. A solid sphere of mass M, radius R and having moment of inertia about as axis passing through the

centre of mass as I, is recast into a disc of thickness t, whose moment of inertia about an axis passing through its edge and perpendicular to its plance remains I. Then, radius of the disc will be.

A. $R\sqrt{\frac{2}{15}}$

B. $\frac{2R}{\sqrt{15}}$

C. $\frac{4R}{\sqrt{15}}$

D. $\frac{R}{4}$

Answer: B

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18. For an amplitude modulated wave, the maximum amplitude is found to be 2 V. The modulation index is

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

B. $\frac{1}{3}$

C. $\frac{4}{3}$

D. $\frac{1}{2}$

Answer: A

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19. Two uniform brass rods A and B of lengths L and $2L$ and radii $2r$ and r respectively are heated to the same temperature. The ratio of the increase in the length of A to that of B is :

A. $1:1$

B. $1:2$

C. $2:1$

D. $1:4$

Answer: C

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20. Planck's constant (h), gravitational constant (G) and the speed of light (c) are taken as the fundamental quantities in a system. Find the dimensions of length and time in this system.

A. $\left[G^{\frac{1}{2}}h^{\frac{1}{2}}c^{\frac{-5}{2}}\right]$

B. $\left[G^{1}h^{2}c^{\frac{-5}{2}}\right]$

C. $\left[G^{\frac{1}{2}}h^{\frac{1}{2}}c^{-2}\right]$

D. $\left[G^{2}h^{\frac{1}{2}}c^{-2}\right]$

Answer: A

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21. If earth has uniform density, and radius 'R'. The value of acceleration due to gravity at distance d above the surface is same d below the surface. If $d = \left(\frac{\sqrt{x}-1}{2}\right)R$, then find x.

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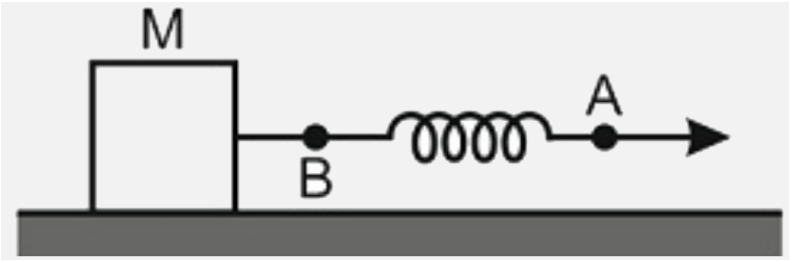
22. A block of mass M is placed on a smooth horizontal surface and it is pulled by a light spring as shown in the diagram. If the ends A and B of the spring are moving with 4 ms^{-1} and 2 ms^{-1} respectively and the rate at which spring energy is increasing is 20 Js^{-1}. then what is the value of

spring force (in N)?



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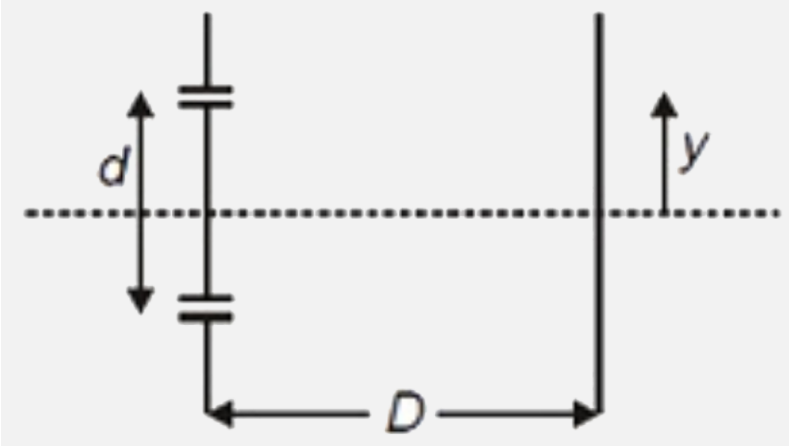
23. In YDSE a parallel beam of incident light consists of two wavelengths $\lambda_1 = 4000\text{Å}$ and $\lambda_2 = 5600\text{Å}$. The minimum distance y on the screen, measured from the central axis, where the bright fringe due to

two wavelengths coincide is $\frac{n\lambda_1 D}{d}$. Find n.



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24. A radar operates at wavelength 50.0 cm. If the beat frequency between the transmitted singal and the singal reflected from aircraft (Δv) is 1 kHz, then velocity of the aircraft will be :

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25. A rubber ball is dropped from a height of 5 m on a plane. If bounces back to a height of 1.8 m. Find the coefficient of the resitution for the collision.

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