PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 41

Physics

1. A hydrogen atom makes a transition from $n = 2$ to $n = 1$ and emits a photon. This photon strikes a doubly ionized lithium atom $(Z = 3)$ in excited state and completely removes the orbiting electron. The

least quantum number for the excited stated of the ion for the process is:

A. 2

B. 4

C. 5

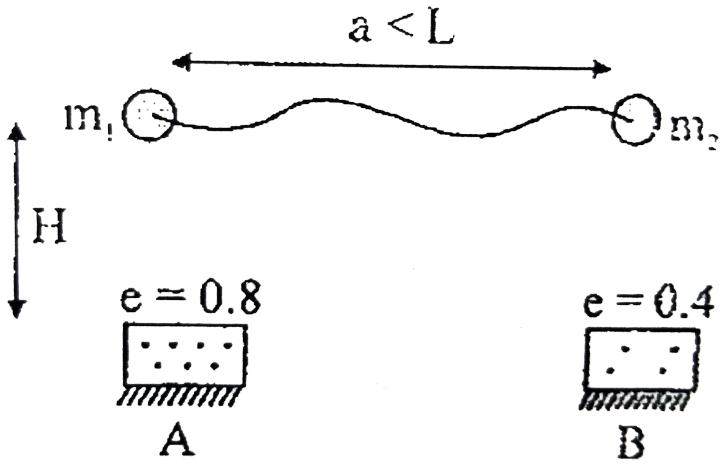
D. 3

Answer: B

Watch Video Solution

2. Two masses m_1, and m_2 are connected by a string of length L. They are held in horizontal plane at a

height H above two fixed heavy plates A and B made of different material placed on the floor. Initially distance between two masses is $a < L$. When the masses are released under gravity they make collision with A and B with co-efficient of resitution 0.8 and 0.4 respectively. The time after collision when the string becomes tight is



A. $t = \frac{5}{2}\sqrt{\frac{l^2 - a^2}{2gh}}$

B. $t = \frac{5}{4}\sqrt{\frac{l^2 - a^2}{2gh}}$

C. $t = \frac{5}{2}\sqrt{\frac{la}{2gh}}$

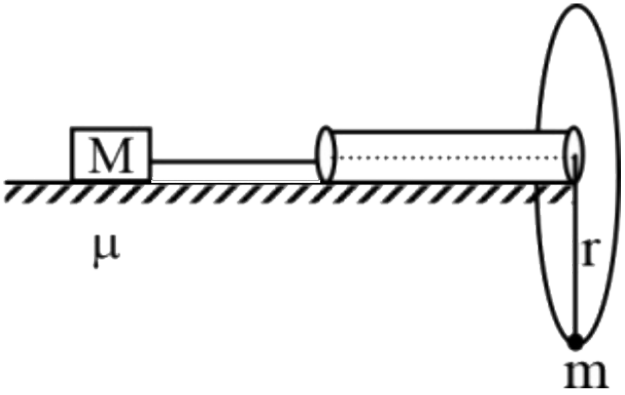
D. $t = \frac{5}{4}\sqrt{\frac{la}{2gh}}$

Answer: A

Watch Video Solution

3. The figure below shows a block of mass M connected to an ideal string which passes through a thin fixed smooth pipe. On the other end, a particle of mass m is connected which revolves in a vertical circle of radius r. If the coefficient of friction between M and

the surface is $\mu = \frac{2}{3}$, then for what minimum value of M, the block of mass m can undergo complete vertical circular motion?



A. $M_{\min} = 6m$

B. $M_{\min} = 9m$

C. $M_{\min} = 3m$

D. $M_{\min} = 15m$

Answer: B

Watch Video Solution

4. A magnetic compass needl oscillates 30 times per minute at a place where the dip is 45° and 40 times per minute where the dip is 30° if B_1 and B_2 are respectively the total magnetic field due to the earth at the two places then the ratio B_1 / B_2 is best given by

A. 3.6

B. 1.8

C. 1.2

D. 0.7

Answer: D

Watch Video Solution

5. A planet revolves about the sun in an elliptical orbit of semi-major axis $2 \times 10^{12} m$. The areal velocity of the planet when it is nearest to the sun is $4.4 \times 10^{16} m / s$. The least distance between the planet and the sun is $1.8 \times 10^{12} m / s$. The minimum speed of the planet in km / s is $10K$. determine the value of K.

A. $v_{\min} = 40 kmS^{-1}$

B. $v_{\min} = 30 kmS^{-1}$

C. $v_{\min} = 10 kmS^{-1}$

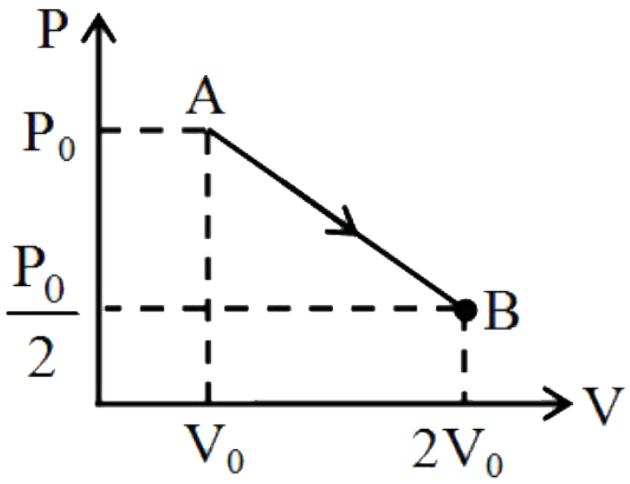
D. $v_{\min} = 20kmS^{-1}$

Answer: A

Watch Video Solution

6. An ideal monoatomic gas undergoes an expansion from state A to state B following a process which is shown in the indicator diagram. If initially during the expansion, the gas was absorbing heat and later on it was rejecting heat, then what was the volume of the

gas when it started rejecting the heat?



A. $V = \frac{3}{2}V_0$

B. $V = \frac{8}{5}V_0$

C. $V = \frac{15}{8}V_0$

D. $V = \frac{12}{7}V_0$

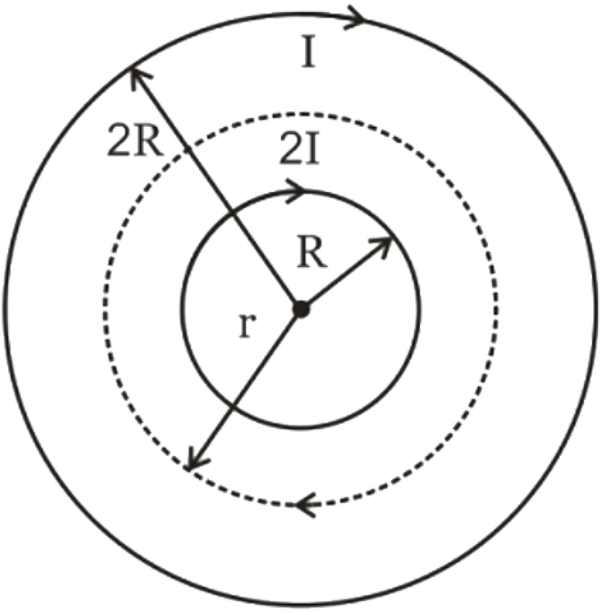
Answer: C

Watch Video Solution

Watch Video Solution

7. Two long coaxial solenoids of radius R and 2R have equal number of turns per unit length. They carry time-varying currents. $i_1 = 2kt$ and $i_2 = kt$ respectively, in the same direction. A point charge released between the solenoids at a distance r, is seen

to move along a circular path. Then the value of r is



A. $r = R\sqrt{2}$

B. $r = 3R/2$

C. $r = R\sqrt{3}$

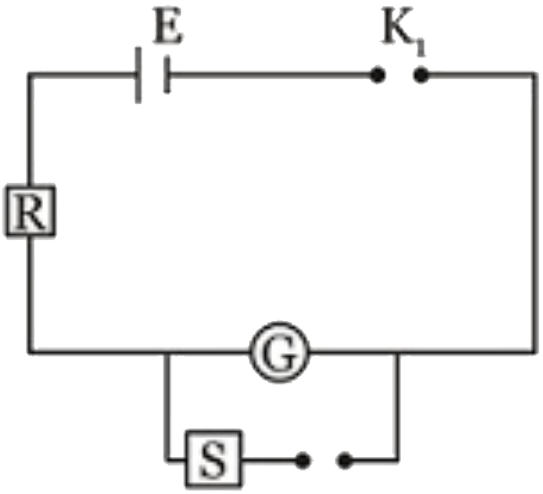
D. It can be any value between R and $2R$

Answer: A

Watch Video Solution

8. In an experiment to determine the resistance of a galvanometer by half deflection method, the circuit shown is used. In one set of readings , if $R = 10\Omega S = 4\Omega$, then the resistance of the

galvanometer is



A. $\frac{20}{3}\Omega$

B. $\frac{40}{3}\Omega$

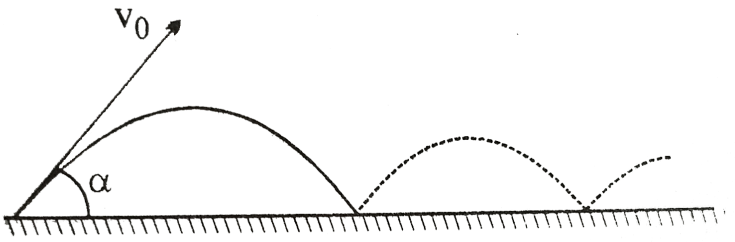
C. $\frac{50}{3}\Omega$

D. $\frac{70}{3}\Omega$

Answer: A

Watch Video Solution

9. A particle of mass 'm' is projected with velocity v_0 at an angle 'α' with the horizontal. The coefficient of restitution for any of its impact with the smooth ground is e.



Find total time taken by the particle before it stops moving vertically?

A. $T = \dfrac{2v_0 \sin\alpha(1+e)}{g(1-e)}$

B. $T = \dfrac{2v_0 \sin\alpha(1-e)}{g(1+e)}$

C. $T = \dfrac{2v_0 \sin\alpha}{g(1-e)}$

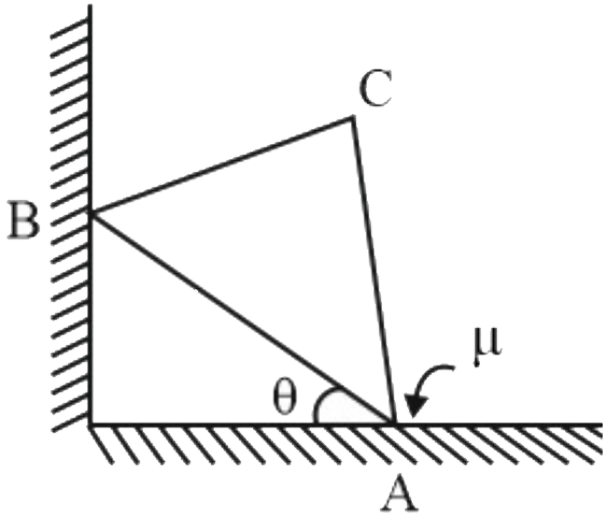
D. $T = \dfrac{2v_0 \sin\alpha}{g(1+e)}$

Answer: D

Watch Video Solution

10. A thin uniform equilateral plate rests in a vertical plane with one of its vertex A on a rough horizontal floor and another vertex B on a smooth vertical wall. If the coefficient of friction $\mu = \dfrac{1}{\sqrt{3}}$, then the least angle θ its base AB can make with the horizontal

surface is



A. $\theta = \cot^{-1}\left[\mu + \frac{1}{\sqrt{3}}\right]$

B. $\theta = \tan^{-1}\left[\mu + \frac{1}{\sqrt{3}}\right]$

C. $\theta = \tan^{-1}\left[2\mu + \frac{1}{\sqrt{3}}\right]$

D. $\theta = \cot^{-1}\left[2\mu + \frac{1}{\sqrt{3}}\right]$

Answer: D

Watch Video Solution

11. The intensity of γ - radiation from a given source is I. On passing through 36 mm of lead, it is reduced to $I/8$. Assuming that the intensity in trasmitted radiation varies expontially with the thickness of the material, then the thickness of lead, which will reduce the intensity to $I/2$ will be

A. 6 mm

B. 9 mm

C. 18 mm

D. 12 mm

Answer: D

Watch Video Solution

12. A photoelectric surface is illuminated successively by monochromatic light of wavelength λ and $\frac{\lambda}{2}$. If the maximum kinetic energy of the emitted photoelectrons in the second case is 3 times that in the first case, the work function at the surface of material is

A. $\frac{hc}{3\lambda}$

B. $\frac{hc}{4\lambda}$

C. $\frac{hc}{2\lambda}$

D. $\frac{3hc}{3\lambda}$

Answer: A

Watch Video Solution

13. The ratio of surface tensions of mercury and water is given to be 7.5 while the ratio of their densities is 13.6. Their contact angles, with glass, are close to 135° and 0°, respectively. It is observed that mercury gets depressed by an amount h in a capillary tube of radius r_1 while water rises the same amount h in a capillary tube of radius r_2. The ratio, (r_1/r_2), is then close to

A. $3/5$

B. $2/3$

C. $4/5$

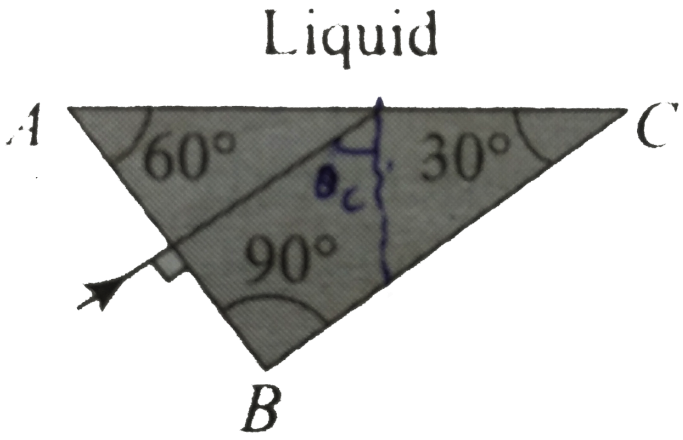
D. $2/5$

Answer: D

Watch Video Solution

14. Light is incident normally on face AB of a prism as shown in Figure. A liquid of refractive index μ is placed on face AC of the prism. The prism is made of glass of refractive indes $3/2$. Find the limits of μ for which

total internal reflection takes place on the face AC.



A. $\mu < \frac{3\sqrt{3}}{4}$

B. $\mu < \sqrt{\frac{5}{2}}$

C. $\mu = \sqrt{2}$

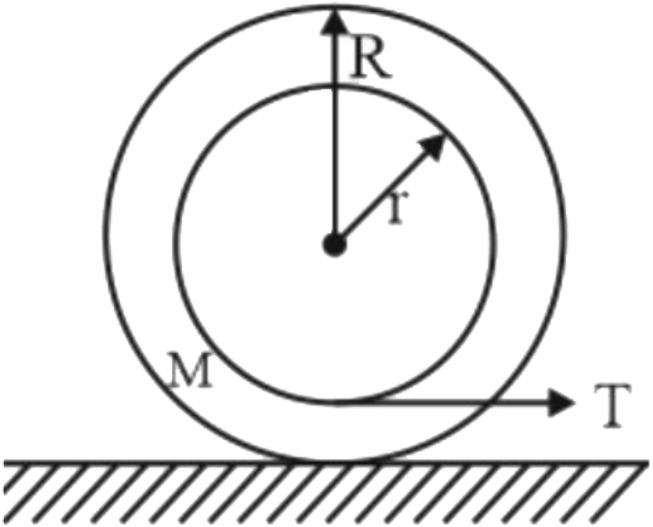
D. $\mu = \sqrt{3}$

Answer: A

Watch Video Solution

15. A spool of mass M = 3 kg and radius R = 20 cm has an axle of radius r = 10 cm around which a string is wrapped. The moment of inertia about an axis perpendicular to the plane of the spool and passing thorugh the centre is $\frac{MR^2}{2}$. If the coeffiecient of friction between the surface and the spool is 0.4 then the maximum tension which can be applied to the string for which the spool doesn't slip, is 9

$g = 10ms^{-2}]$



A. 24 N

B. 18 N

C. 9 N

D. 36 N

Answer: B

Watch Video Solution

16. A zener diode has a contact potential of 1 V in the absence of biasing. It undergoes Zener breakdown for an electric field of 10^6 V/m at the depletion region of p-n junction. If the width of the depletion region is 2.5 μm, what should be the reverse biased potential for the Zener breakdown to occur ?

A. 3.5 V

B. 2. 5 V

C. 1.5 V

D. 0.5 V

Answer: B

Watch Video Solution

17. Two rods A and B of identical dimensions are at temperature $30^\circ C$. If A is heated upto $180^\circ C$ and B $T^\circ C$, then new lengths are the same . If the ratio of the coefficients of linear expansion of A and B is 4:3,then the value of T is

A. $230^\circ C$

B. $200^\circ C$

C. $270^\circ C$

D. $270^\circ C$

Answer: A

Watch Video Solution

18. If L, C and R denote the inductance, capacitance and resistance respectively, the dimensional formula for C^2LR is

A. $\left[ML^{-2}T^{-1}I^0\right]$

B. $\left[M^0L^0T^3\right]$

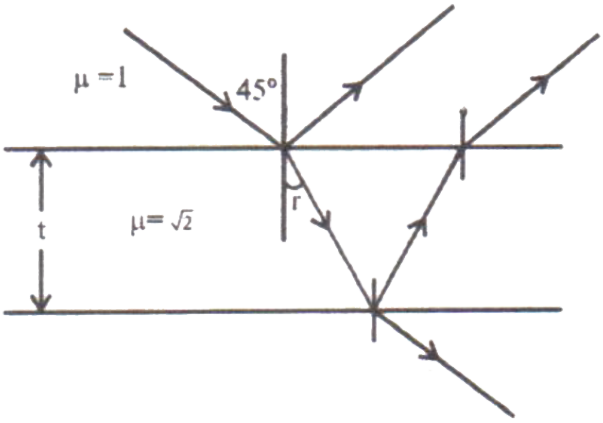
C. $\left[M^{-1}L^{-2}T^6I^2\right]$

D. $\left[M^0L^0I^0\right]$

Answer: B

Watch Video Solution

19. A ray of light is incident at an angle of 45° (ralative to the normal) on a thin film of a liquid with an index of refraction of $\sqrt{2}$. Assuming that the medium of both sides of the film is air, find the minimum thickness of the film required for constructive interference in the reflected light for sodium light of wavelenght 600 nm.



A. 122 nm

B. 212 nm

C. 173 nm

D. 320 nm

Answer: A

Watch Video Solution

20. Two sound waves of wavelengths 98cm and 100cm arrive at the same point,from two different source.The number of beats heard (per second) is (speed of sound is 392m/s)

A. 8 Hz

B. 4 Hz

C. 6 Hz

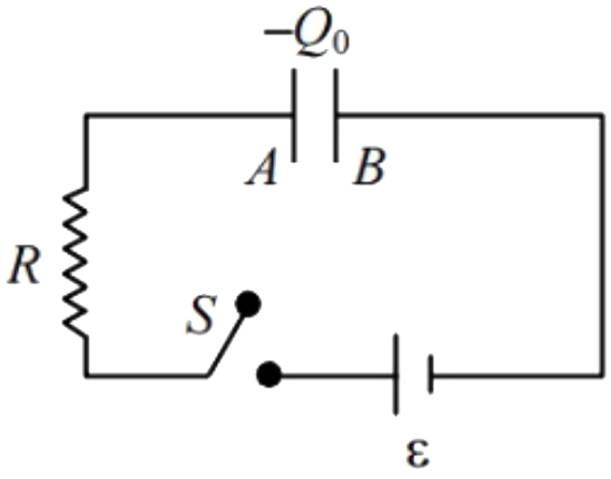
D. 12 Hz

Answer: A

Watch Video Solution

21. The figure shows an RC circuit with a parallel plate capacitor. Before switching on the circuit, plate A of the capacitor has a charge. $-Q_0$ while plate B has no net charge. If at $t = 0$, the switch is closed then after how much time (in seconds) will the net charge on

plate A becomes zero? [Given : $C = 1\mu F, Q_0 = 1mC, \varepsilon = 1000V$ and $R = \frac{2 \times 10^6}{1n3}\Omega$]



Watch Video Solution

22. A power transmission line feeds input power at 2400V to a step-down transformer and which delivers power at 240V with its primary windlings having 5000 turns . If the current in the primary coil of the

transformer is 5A and its efficiency is 80%, then what is the output current (in A)?

Watch Video Solution

23. The electric potential in a region is given as $V = -4ar^2 + 3b$, where r is distance from the origin, a and b are constants. If the volume charge density in the region is given by $\rho = na\varepsilon_0$, then what is the value of n?

Watch Video Solution

24. A metal is heated in a furnace where a sensor is kept above the metal surface to read the power radiated (P) by the metal. The sensor has scale that displays $\log_2, (P/P_0)$, where P_0 is constant. When the metal surface is at a temperature of $487^\circ C$, the sensor shows a value 1. Assume that the emissivity of the metallic surface remains constant. What is the value displayed by the sensor when the temperature of the metal surface is raised to $2767^\circ C$?

Watch Video Solution

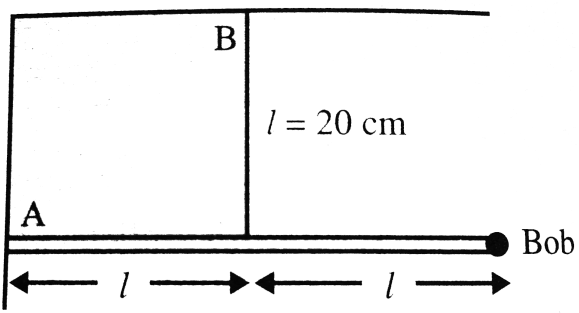


Fig. 4.207

25.

A weightless rigid rod with a small iron bob at the end is hinged at point A to the wall so that it can rotate in all directions. The rod is kept in the horizontal position by a vertical inextensible string of length $20cm$, fixed at its midpoint. The bob is displaced slightly perpenducular to the plane of the rod and string. Find period of small oscillations of the system in the form $\frac{\pi X}{10}s$ and fill the value of X.

Watch Video Solution