PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 73

Physics

1. Imagine an atom made of a proton and a hypothetical particle of double the mass of the electron but having the same change as

the electron. Apply the Bohr atom model and consider all possible transitions of this hypothetical particle of the first excited level. the longest wavelength photon that will be emitted has wavelength [given in terms of the Rydberg constant R for the hydrogen atom] equal to

A. $\frac{9}{5R}$

B. $\frac{36}{5R}$

C. $\frac{18}{5R}$

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

Answer: C

Watch Video Solution

2. A spherical ball A of mass 4 kg, moving along a straight line strikes another spherical ball B of mass 1 kg at rest. After the collision, A and B move with velocities $v_1 ms^{-1}$ and $v_2 ms^{-1}$ respectively making angles of 30° and 60° with respect to the original direction of motion of A. The ratio $\frac{v_1}{v_2}$ will be

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

B. $\frac{4}{\sqrt{3}}$

C. $\frac{1}{\sqrt{3}}$

D. $\sqrt{3}$

Answer: A

Watch Video Solution

3. A body of mass 1 kg starts moving from rest $t = 0$ in a circular path of radius 8 m. Its kinetic energy varies with time as $k = 2t^2 J$

then magnitude of centripetal acceleration (in m/s^2) at $t = 2s$ is.

A. Tangential acceleration $= 4ms^{-2}$

B. Power of all force at t = 2 s is 8 W

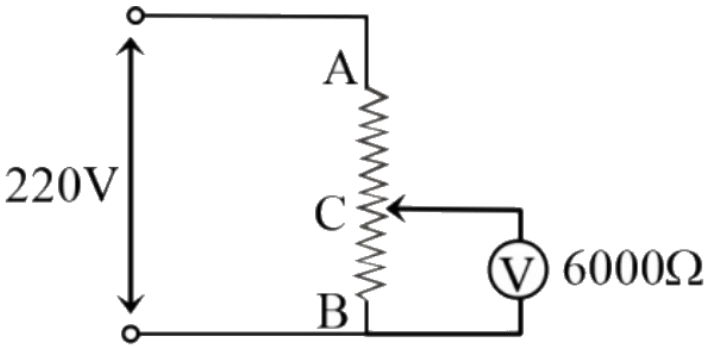
C. First - round is completed in 2 s.

D. Tangential force at t = 2 s is 4 N.

Answer: B

Watch Video Solution

4. A potential difference of 220 V is applied across a rheostat of 12000Ω. The voltmeter V has a resistance of 6000Ω and distance BC is one - fourth of the distance from A to B. The error in the reading of voltmeter is approximately -



A. $27\ \%$

B. $10\ \%$

C. $40\ \%$

D. $15\ \%$

Answer: A

 Watch Video Solution

5. The RMS value of AC which when passed through a resistor produces heat, which is twice that produced by a steady current of 1.414A in the same resistor is

A. $2A$

B. 3.46 A

C. 2.818 A

D. 1.732 A

Answer: A

 Watch Video Solution

6. Two spheres A and B of radius 'a' and 'b' respectively are at same electric potential. The

ratio of the surface charge densities of A and B is

A. $\frac{b}{a}$

B. $\frac{a}{b}$

C. $\frac{a^2}{b^2}$

D. $\frac{b^2}{a^2}$

Answer: A

Watch Video Solution

7. Two uniformly long charged wires with linear densities λ and 3λ are placed along X and Y axis respectively. Determined the slope of electric field at any point on the l ine $y = \sqrt{3}x$

A. $3\sqrt{3}$

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

C. $\frac{1}{3\sqrt{3}}$

D. $\sqrt{3}$

Answer: C

Watch Video Solution

8. A particle A of mass 'm' and charge 'q' is accelerated by a potential difference of 50 V. Another particle B of mass '4 m' and charge 'q' is accelerated by a potential difference of 2500 V. The ratio of de-Broglie wavelengths $\frac{\lambda_A}{\lambda_B}$ is close to :

A. 0.07

B. 10.00

C. 4.47

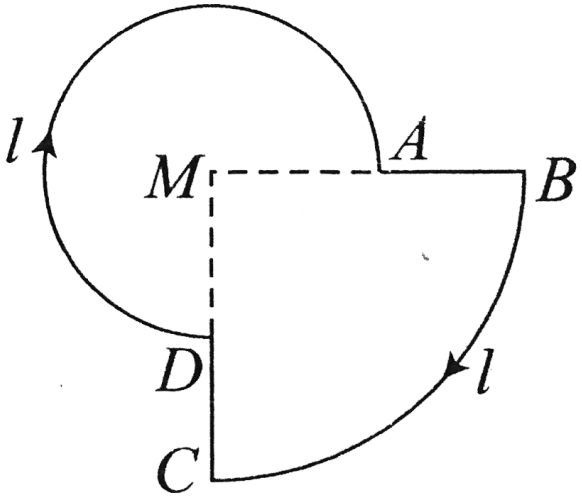
D. 14.14

Answer: D

Watch Video Solution

9. A current I is flowing thorugh the loop. The direction of the current and the shpae of the loop are as the shown in the figure. The magnetic fild at the centre of the loop is $\frac{\mu_0 I}{R}$ times

$(MA = R, MB = 2R, \angle DMA = 90^\circ)$



A. $\frac{5}{16}\frac{\mu_0 i}{R}$, but out of the plane of the paper

B. $\frac{5}{16}\frac{\mu_0 i}{R}$, but into the plane of the paper

C. $\frac{7}{16}\frac{\mu_o i}{R}$, but out of the plane of the paper

D. $\frac{7}{16}\frac{\mu_o i}{R}$, but into the plane of the paper

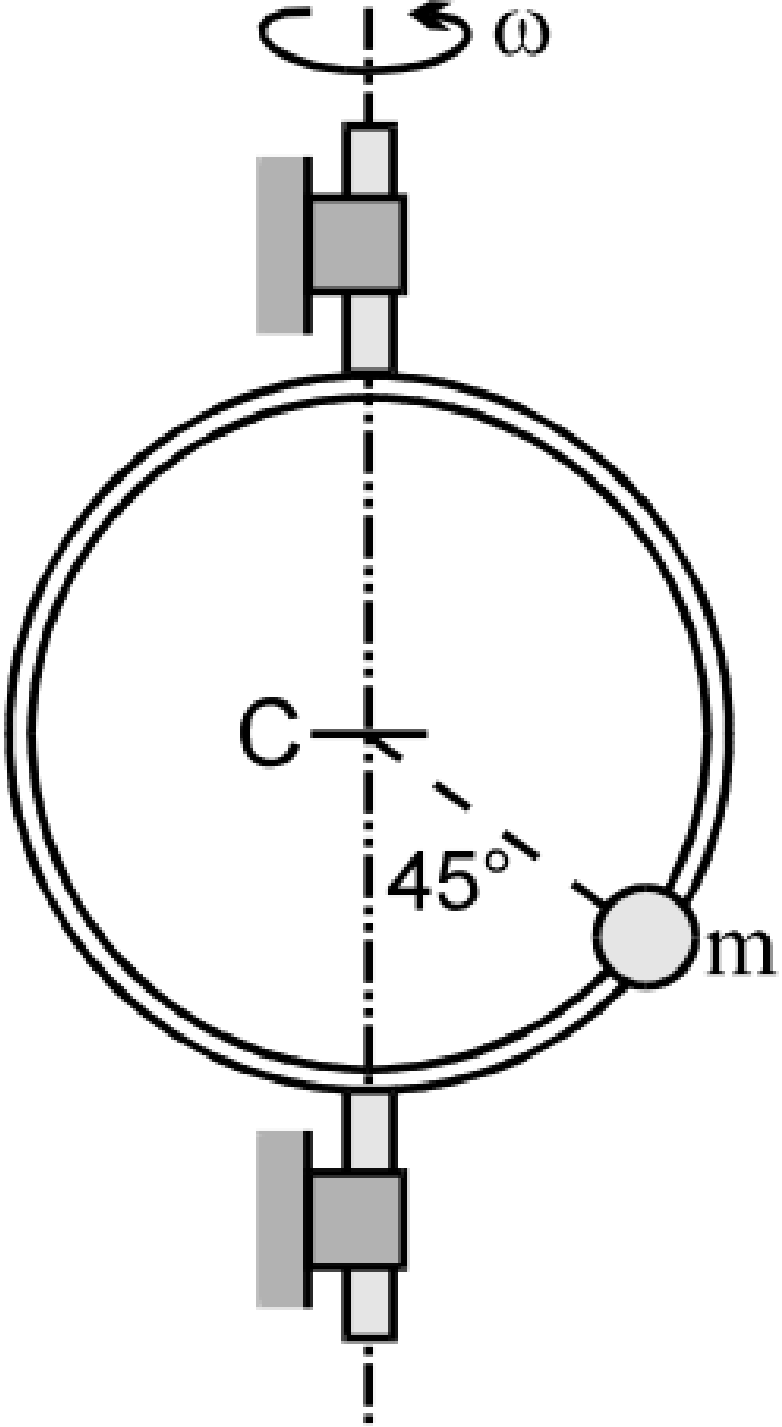
Answer: D

Watch Video Solution

10. A small bead of mass m = 1 kg is free to move on a circular hoop. The circular hoop has centre at C and radius r = 1 m and it rotates about a fixed vertical axis. The coefficient of friction between bead and hoop is $\mu = 0.5$. The maximum angular speed of the hoop for

which the bead does not have relative motion with respect to hoop, at the position shown in

figure is : (Take $g = 10 m / s^2$)


ω
C
45°
m

A. $\left(5\sqrt{2}\right)^{\frac{1}{2}}$

B. $\left(10\sqrt{2}\right)^{\frac{1}{2}}$

C. $\left(15\sqrt{2}\right)^{\frac{1}{2}}$

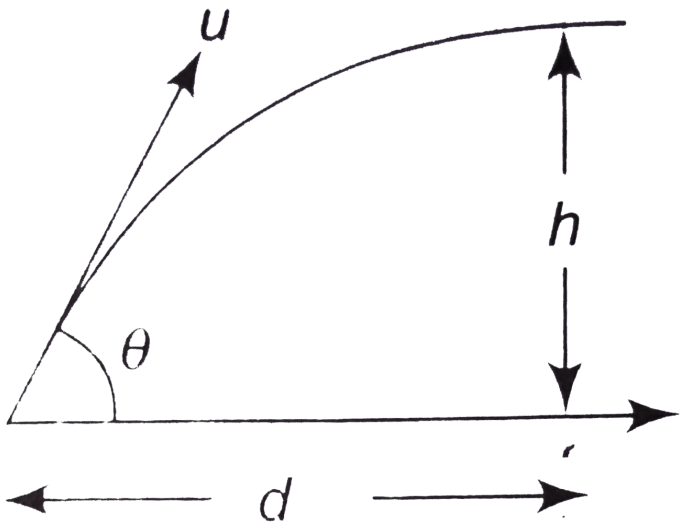
D. $\left(30\sqrt{2}\right)^{\frac{1}{2}}$

Answer: D

Watch Video Solution

11. If a stone s thrown at a point which is at a distance d away and at a height h above the point from where the stone starts, then what

is the value of initial speed u if the stone is lauched at angle θ?



A. $\frac{g}{\cos theat}\sqrt{\frac{d}{2(d\tan\theta - h)}}$

B. $\frac{d}{\cos\theta}\sqrt{\frac{g}{2(d\tan\theta - h)}}$

C. $\sqrt{\frac{gd^2}{h\cos^2\theta}}$

D. $\sqrt{\frac{gd^2}{(d-h)}}$

Answer: B

Watch Video Solution

12. Surface of certain metal is first illuminated with light of wavelength $\lambda_1 = 350$ nm and then, by light of wavelength $\lambda_2 = 540$ nm. It is found that the maximum speed of the photo electrons in the two cases differ by a factor of 2. The work function of the metal (in eV) is

close to :

(Energy of photon $= \frac{1240}{\lambda(\text{in nm})} Ev$

A. 2.5

B. 1.8

C. 5.6

D. 1.4

Answer: B

Watch Video Solution

13. An electron (mass $= 9.1 \times 10^{-31} kg$, charge $= 1.6 \times 10^{-19} C$) experiences no deflection if subjected to an electric field of $3.2 \times 10^{5} \frac{V}{m}$, and a magnetic fields of $2.0 \times 10^{-3} W \frac{b}{m^2}$. Both the fields are normal to the path of electron and to each other. If the electric field is removed, then the electron will revolve in an orbit of radius

A. 45 m

B. 4.5 m

C. 0.45 m

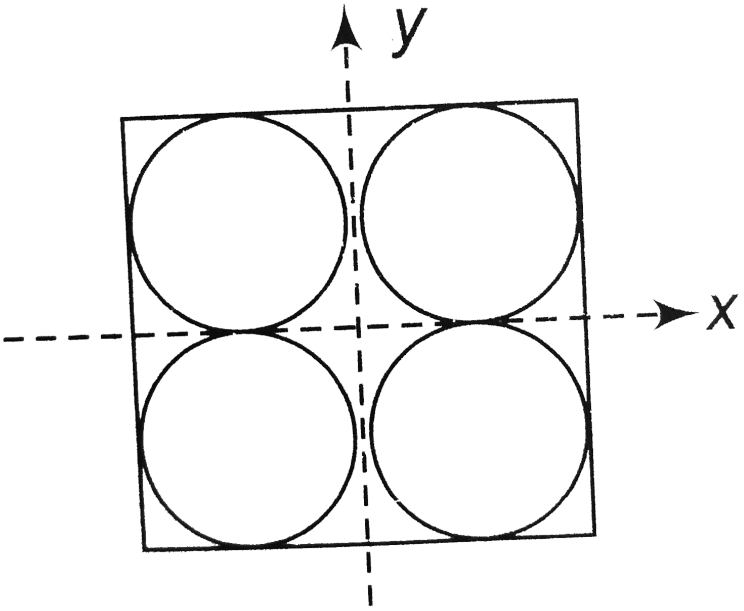
D. 0.045 m

Answer: C

Watch Video Solution

14. Four holes of radius R are cut from a thin square plate of side $4R$ and mass M. The moment of inertia of the remaining portion

about z-axis is :



A. $\frac{\pi}{12}MR^2$

B. $\left(\frac{4}{3}-\frac{\pi}{4}\right)MR^2$

C. $\left(\frac{4}{3}-\frac{\pi}{6}\right)MR^2$

D. $\left(\frac{8}{3}-\frac{10\pi}{16}\right)MR^2$

Answer: D

Watch Video Solution

15. Two identical containers A and B having same volume of an ideal gas at same temperature have mass of the gas as m_1 and m_2 respectively and $2m_1 = 3m_2$. The gas in each cylinder expands isomthermally to double of its volume. If change in pressure in A is $300Pa$, then the change in pressure in B is

A. 200 Pa

B. 300 Pa

C. 400 Pa

D. 500 Pa

Answer: A

 Watch Video Solution

16. The air column in a pipe closed at one end is made to vibrate in its second overtone by a tuning fork of frequency $440Hz$. The speed of

sound in air is $330ms^{-1}$. End corrections may be neglected. Let P_0 denote the mean pressure at any point in the pipe, and ΔP the maximum amplitude of pressure variation.

(a) What the length L of the air column.

(b) What is the amplitude of pressure variation at the middle of the column?

(c) What are the maximum and minimum pressures at the open end of the pipe?

(d) What are the maximum and minimum pressures at the closed end of the pipe?

A. $\frac{\Delta p_0}{\sqrt{2}}$

B. $\frac{\Delta p_0}{\sqrt{3}}$

C. $\frac{\Delta p_0}{2}$

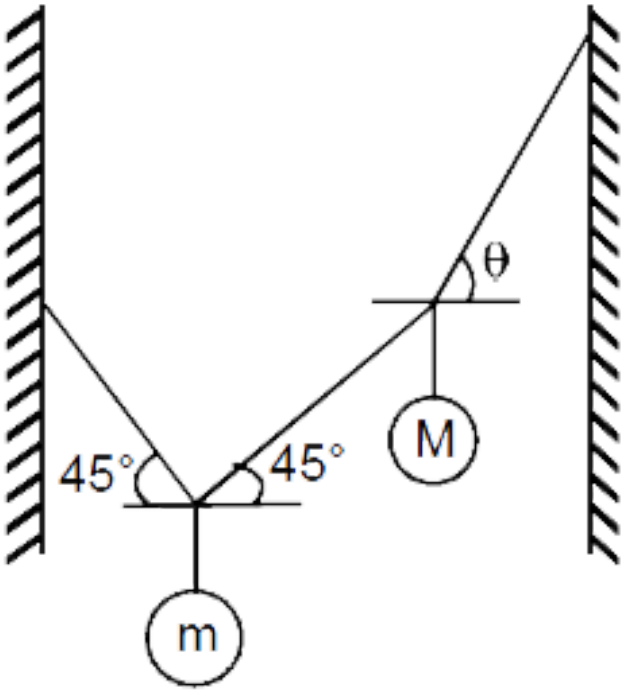
D. $\frac{\Delta p_0}{3}$

Answer: A

Watch Video Solution

17. Two masses m and M are attached to the strings as shown in the figure. If the system is

in equilibrium, then



A. $\tan\theta = 1 + \frac{2M}{m}$

B. $\tan\theta = 1 - \frac{2m}{M}$

C. $\tan\theta = 1 - \frac{M}{2m}$

D. $\tan\theta = 1 + \frac{m}{2M}$

Answer: A

Watch Video Solution

18. Activity of a radioactive sammple decreases to (1/3)rd of its original value in 3 days. Then, in 9 days its activity will become

A. $\frac{1}{27}$ of the original value

B. $\frac{1}{9}$ of the original value

C. $\frac{1}{8}$ of the original value

D. $\frac{1}{3}$ of the original value

Answer: A

Watch Video Solution

19. The glass of optical fibre has a refractive index 1.55 and cladding with another glass of refractive index 1.51. When the surrounding medium is air, the numerical aperture will be

A. 0.625

B. 0.350

C. 0.528

D. 0.704

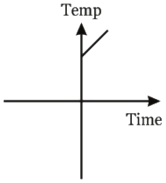
Answer: B

Watch Video Solution

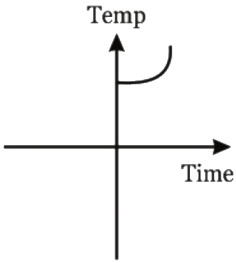
20. Liquid oxygen at $50K$ is heated to $300K$ at constant pressure of $1atm$. The rate of heating is constant. Which of the following

graphs represents the variation of temperature with time?

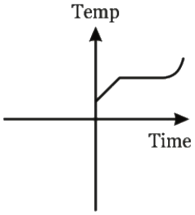
A.



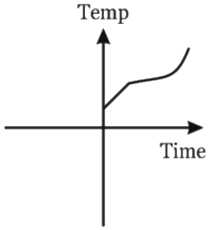
B.



C.



D.



Answer: C

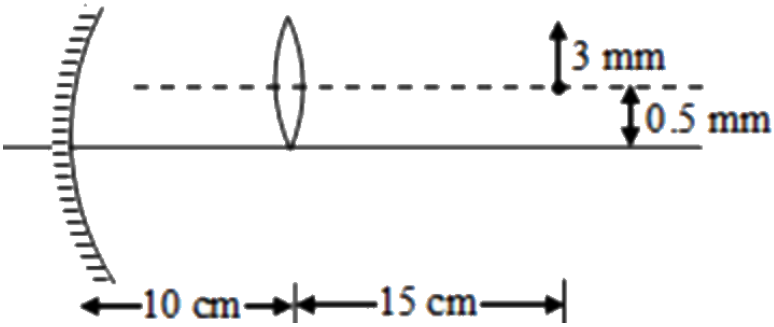
Watch Video Solution

21. Two spheres of same material have radius 1 m and 4 m and temperature 4000 K and 2000 K respectively. The energy radiated per second by the first sphere is

Watch Video Solution

22. A concave mirror of focal length 20 cm and a convex lens of focal length 10 cm are kept with their optic axes parallel but separated by 0.5 mm as shown in the figure. The distance between the the lens and mirror in 10 cm. An object of height 3 mm is placed on the optic axis of lens at a distance between the lens and mirror is 10 cm. An object of height 3 mm is placed on the optic axis of lens at a distance 15 cm from the lens. Find the length of the

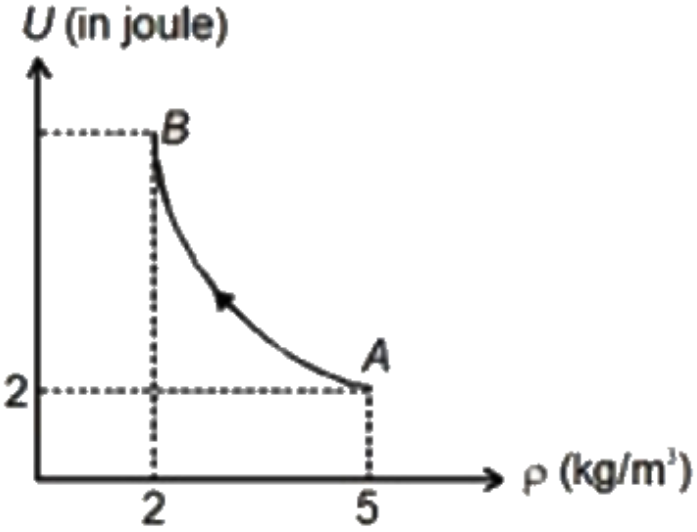
image formed the mirror in mm.



Watch Video Solution

23. Figure shows the variation of the internal energy U with the density ρ of an ideal monoatomic gas for a therodynamic process AB. Process AB is a part of arectangular hyperbola. Find the work done (in joule) by gas

in process AB.



Watch Video Solution

24. A stationary body explodes in to four identical fragments such that three of them fly mutually perpendicular to each other, each

with same $KE(E_0)$. The energy of explosion will be

Watch Video Solution

25. A lift ascends with constant acceleration $a = 1ms^{-2}$, then with constant velocity and finally, it stops under constant retardation $a = 1ms^{-2}$. If total distance ascended by the lift is 7 m, in a total time of the journey is 8 s. Find the time (in second) for which lift moves with constant velocity.

Watch Video Solution