PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 96

Physics

1. Light of wavelength 600 nm is incident normally on a slit of width 0.2 mm. The

angular width of central maxima in the diffraction pattern is

A. $6 \times 10^{-3} rad$

B. $4 \times 10^{-3} rad$

C. $2.4 \times 10^{-3} rad$

D. $4.5 \times 10^{-3} rad$

Answer: A

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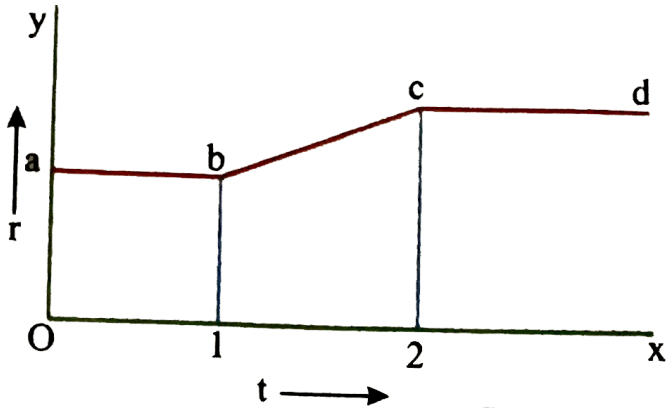
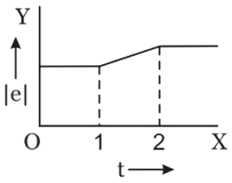
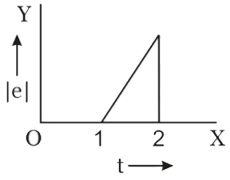
2. A flexible wire bent in the form of a circle is place in a uniform magnetic field perpendicularly to the plane of the coil. The radius of the coil changes as shown in Figure. The graph of magnetude of induced emf in the coil is represented by



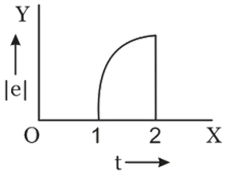
A.



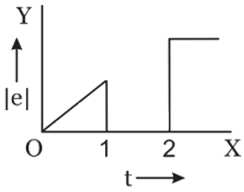
B.



C.



D.



Answer: B

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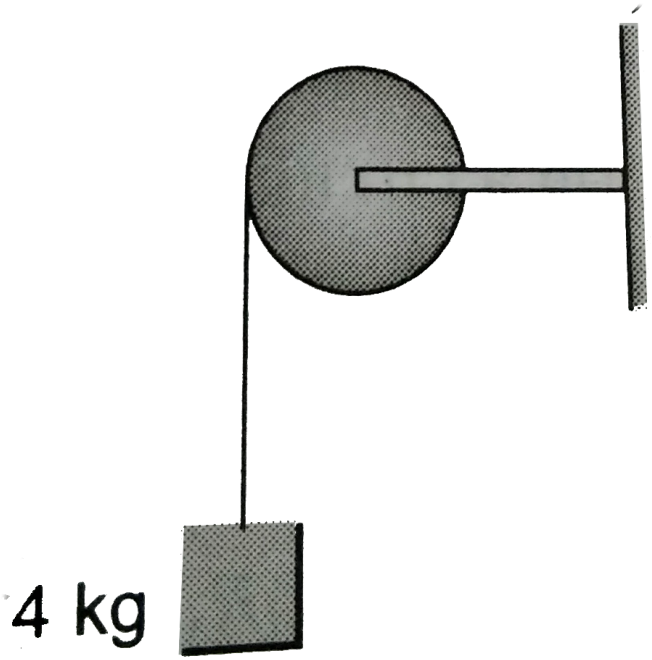
3. A wheel of radius $0.4m$ can rotate freely about its axis as shown in the figure. A string is wrapped over its rim and a mass of $4kg$ is hung. An angular acceleration of $8rad/s^2$ is produced in it due to the torque. Then, the moment of inertia of the wheel is (

$g = 10m/s^2$)



A. $2kgm^2$

B. $1kgm^2$

C. $4kgm^2$

D. $8kgm^2$

Answer: A

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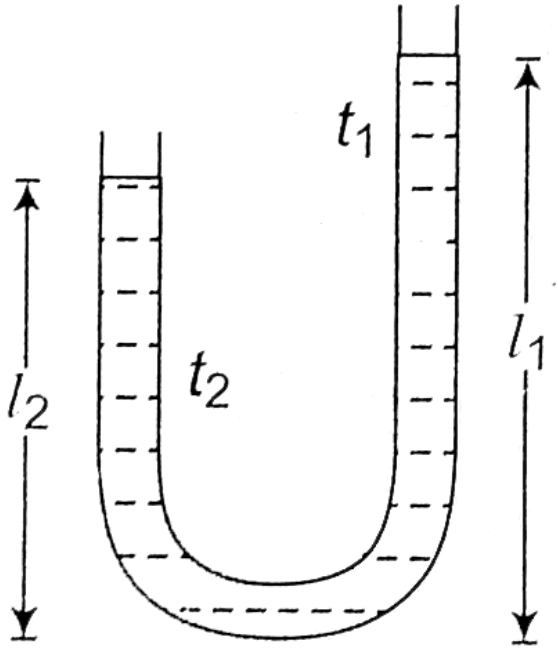
4. In a vertical U-tube containing a luquid, the two arms are maintained at different temperatures, t_1 and t_2 . The liquid coplumns in the two arms have heights l_1 and l_2 respectively. The coefficient of volume

expansion of the liquid is equal to



A. $\dfrac{l_2 - l_1}{l_1 t_1 - l_2 t_2}$

B. $\dfrac{l_1 - l_2}{l_1 t_2 - l_2 t_1}$

C. $\dfrac{l_2 - l_1}{l_1 t_2 - l_2 t_1}$

D. $\frac{l_2 - l_1}{l_2 t_2 - l_1 t_1}$

Answer: C

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5. Two long concentric cylindrical conductors of radii a and b $(b < a)$ are maintained at a potential difference V and carry equal opposite current I. Show that an electron with a particular velocity u parallel to the axis may

travel undeviated in the evacuated region between the conductors.

A. $\frac{4\pi V}{\mu_0 I \ln\left(\frac{b}{a}\right)}$

B. $\frac{2\pi V}{\mu_0 I \ln\left(\frac{a}{b}\right)}$

C. $\frac{2\pi V}{\mu_0 I \ln\left(\frac{b}{a}\right)}$

D. $\frac{8\pi V}{\mu_0 I \ln\left(\frac{a}{b}\right)}$

Answer: B

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6. A body of mass m = 1 kg is moving in a medium and experiences a frictional force F = -kv, where v is the speed of the body. The initial speed is $v_0 = 10ms^{-1}$ and after 10 s, its energy becomes half of the initial energy. Then, the value of k is

A. $10 \ln \sqrt{2}$

B. $\ln \sqrt{2}$

C. $\frac{1}{20} \ln 2$

D. 10 ln 2

Answer: C

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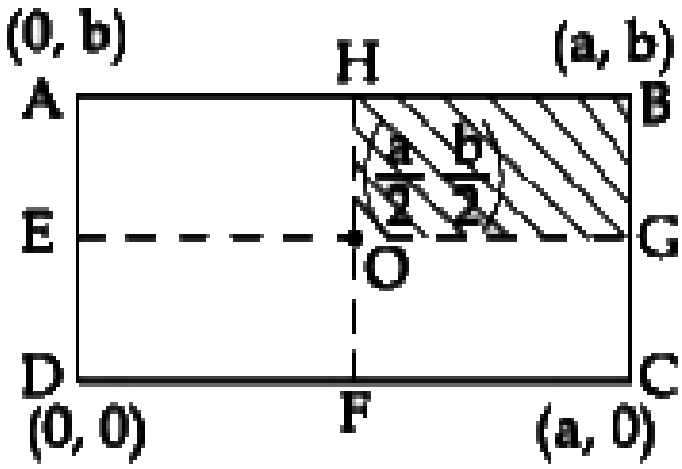
7. A uniform rectangular thin sheet $ABCD$ of mass M has length a and breadth b, as shown in the figure. If the shaded portion $HBGO$ is cut-off, the coordinates of the center of mass

of the remaining portion will be:



A. $\frac{5a}{12}, \frac{5b}{12}$

B. $\frac{5a}{3}, \frac{5b}{3}$

C. $\frac{2a}{3}, \frac{2b}{3}$

D. $\frac{3a}{4}, \frac{3b}{4}$

Answer: A

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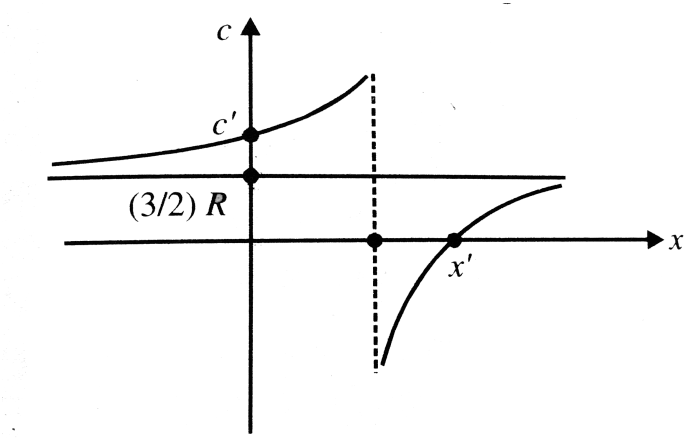
8. One mole of an ideal gas is taken along the process in which $PV' =$ constant. The graph shown represents the variation of molar heat capacity of such a gas with respect to x. The value of c' and $x'c$ respectively, are given by



A. $\frac{5}{2}R, \frac{5}{2}$

B. $\frac{5}{2}R, \frac{5}{3}$

C. $\frac{7}{2}R, \frac{7}{2}$

D. $\frac{5}{2}R, \frac{7}{5}$

Answer: B

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9. A small ball of mass 2×10^{-3} kg having a charge of $1\mu C$ is suspended by a string of length 0.8 m. Another identical ball having the

same charge is kept at the point of suspension. Determine the miniumum horizontal velocity which should be imparted to the lower ball, so that it can make complete revolution.

A. $6.2ms^{-1}$

B. $9.8ms^{-1}$

C. $11.6ms^{-1}$

D. $5.86ms^{-1}$

Answer: D

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10. If the area to be covered for TV telecast is doubles then height of transmitting antenna (TV tower) will have to be:

A. Doubled

B. Halved

C. Quadrupled

D. 16 times

Answer: A

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11. A square coil of edge l having n turns carries a current i. it is kept on a smooth horizontal plate. A uniform magnetic field B exists in a direction parallel to an edge the total mass of the coil is M. What should be the minimum value of B for which the coil will start tipping over?

A. $\left(\frac{mg}{nil}\right)^2$

B. $\frac{2mg}{nil}$

C. $\frac{mg}{2nil}$

D. $\frac{mg}{nil}$,

Answer: C

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12. A piece of burnt wood of mass 20 g is found to have a $.^{14}C$ activity of 4 decay s^{-1} . How long has the tree that this wood belonged to be dead ? Given $T_{\frac{1}{2}}$ of $.^{14}C = 5730$ year.

A. 1840

B. 1830

C. 1820

D. 1860

Answer: A

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13. A pendulum of length L carries a negative charge -q on the bob. A positive charge +q is

held at the point of support. Then, the time period of the bob is

A. Greater than $2\pi\sqrt{\frac{L}{g}}$

B. Less than $2\pi\sqrt{\frac{L}{g}}$

C. equal to $2\pi\sqrt{\frac{L}{g}}$

D. Equal to $2\pi\sqrt{\frac{2L}{g}}$

Answer: A

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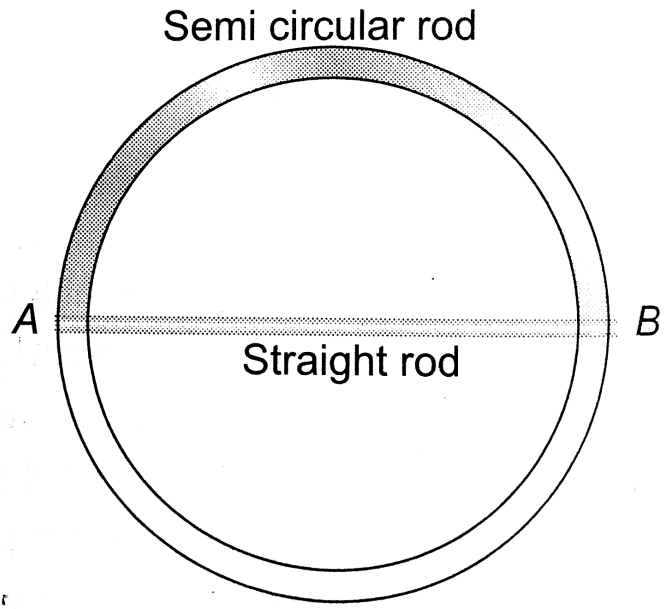
14. Two rods (one semi-circular and other straight) of same material and of same cross-sectional area are joined as shown in the figure. The point A and B are maintained at different temperature. Find the ratio of the heat transferred through a cross-section of a semi-circular rod to the heat transferred through a cross section of the straight rod in

a given time.



A. $2:\pi$

B. $1:2$

C. $\pi:2$

D. $3:2$

Answer: A

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15. Time (T), velocity (C) and angular momentum (h) are chosen as fundamental quantities instead of mass, length and time. In terms of these, the dimensions of mass would be

A. $[M] = [T^{-1}C^{-2}h]$

B. $[M] = [T^{-1}C^{2}h]$

C. $[M] = \left[T^{-1}C^{-2}h^{-1}\right]$

D. $[M] = \left[TC^{-2}h\right]$

Answer: A

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16. Electrons with energy $80keV$ are incident on the tungsten target of an X - rays tube , k-shell electrons of tungsten have $72.5keV$ energy X- rays emitted by the tube contain only

A. A continuous X-ray spectrum (Bremsstrahlung) with a minimum wavelength of 0.155Å

B. A continuous X-ray spectrum (Bremsstrahlung) with all wavelengths

C. The characteristic X-ray spectrum of tungsten

D. A continuous X-ray spectrum (Bremsstrahlung) with a minimum wavelength of 0.155Å and the

characteristic X-ray spectrum of tungsten

Answer: D

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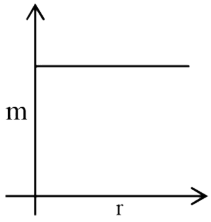
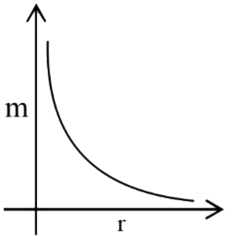
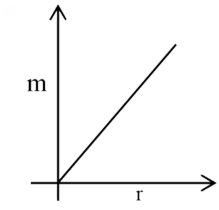
17. The graph between the mass of liquid inside the capillary and radius of capillary is

A. 

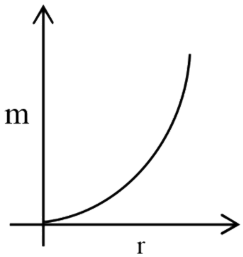
B.



C.



D.



Answer: C

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18. An observer whose least distance of distinct vision is 'd' views the his own face in a convex mirror of radius of curvature 'r' .Prove that magnification produced can not exceed $\frac{r}{d+\sqrt{d^2+r^2}}$

A. $\frac{r}{d+\sqrt{r^2+d^2}}$

B. $\frac{r}{d+\sqrt{r^2-d^2}}$

C. $\frac{r}{d-\sqrt{r+d}}$

D. $\frac{r}{d+\sqrt{d+r}}$

Answer: A

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19. If stopping potentials corresponding to wavelengths $4000\AA$ and $4500\AA$ are 1.3 V and 0.9 V, respectively, then the work function of the metal is

A. 0.3 eV

B. 1.3 eV

C. 2.3 eV

D. 5 eV

Answer: C

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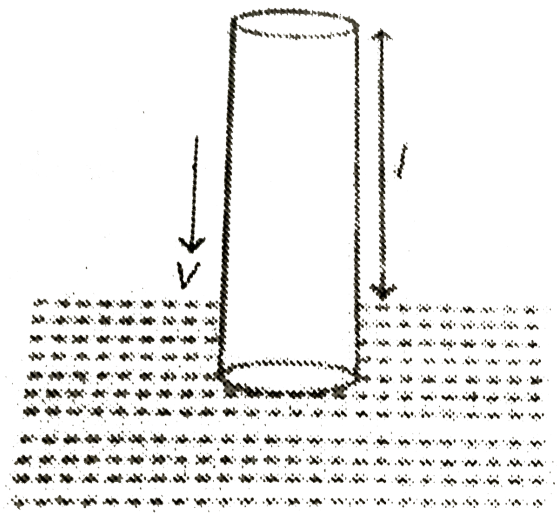
20. An open pipe of sufficient length is dipping in water with a speed v vertically. If at any instant l is lengths of tube avoca water. Then the rate at which fundamental frequency of

pipe changes , is (speed of sound = c)



A. $\frac{cv}{2l^2}$

B. $\frac{cv}{4l^2}$

C. $\frac{c}{2v^2l^2}$

D. $\frac{c}{4v^2l^2}$

Answer: B

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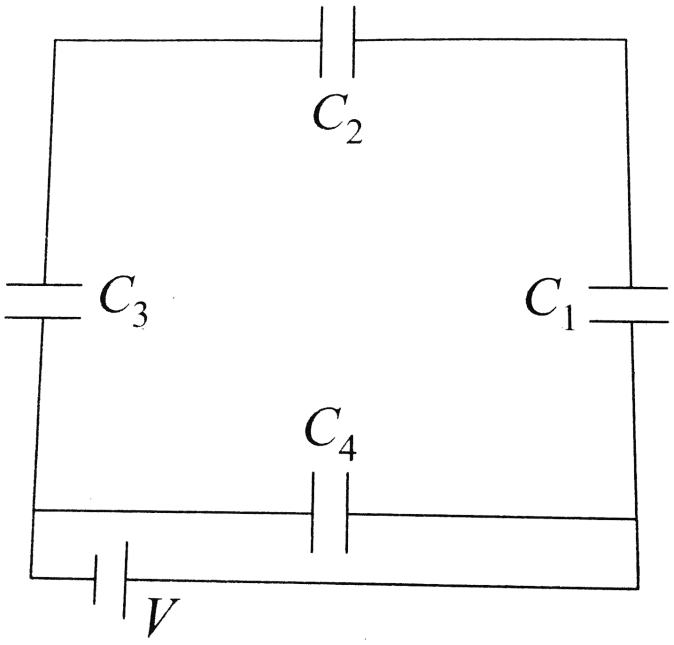
21. A network of four capacitors of capacity equal to $C_1 = C, C_2 = 2C, C_3 = 3C$ and $C_4 = 4C$ are connected to a battery as shown in the figure. The ratio o fthe charges on C_2 an

C_4 is



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22. A rocket has to be launched from earh in such a way that it never returns. If E is the

minimum energy delivered by the rocket launcher what should be the minimum energy that the launcher should have if the same rocket has launcher from the surface of the moon ? Assume that the density of the earth and the moob are equal and that the earth's volume is 64 times the volume of the moon

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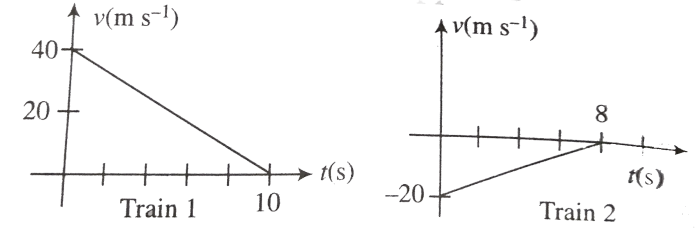
23. Two trains, which are moving along different tracks in opposite directions, are put

on the same track due to a mistake. Their drivers, on noticing the mistake, start slowing down the trains when the trains are 300 m apart. Graphs given in figure show their velocities as function of time as the trains slow down. The separation between the trains when both have stopped is



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24. The rear side of a truck is open and a box of mass $2kg$ is placed on the truck 8 $meters$ away from the open end. $\mu = 0.1$ and $g = 10m/s^2$. The truck starts from rest with an acceleration of $2m/s^2$ on a straight road. The box will fall off the truck when it is at distance from the starting point equal to

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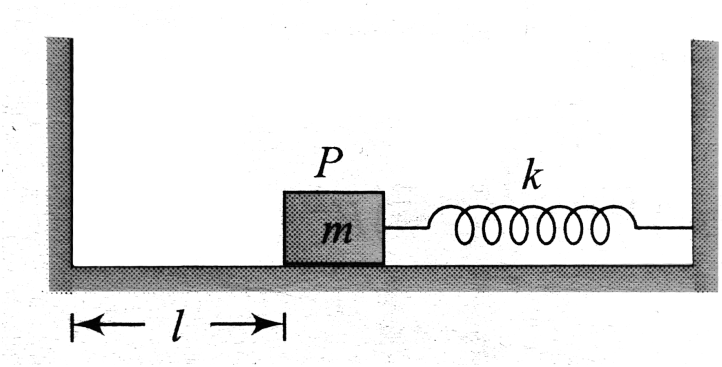
25. Figure shows a block P of mass m resting on a smooth floor at a distance l from a rigid

wall. Block is pushed towards right by a distance $3/2$ and released. When block passes from its mean position another block of mass m_1 is dropped over it, find the minimum value of m_1 so that the combined block just collides with the left wall.



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