PHYSICS

BOOKS - NTA MOCK TESTS

NTA NEET SET 42

Physics

1. The distance of closest approach of an alpha-particle fired towards a nucleus with momentum p is r. What will be the distance of

closest approach when the momentum of alpha-particle is $2p$?

A. 2r

B. 4r

C. $\frac{r}{2}$

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

Answer: D

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2. The binding energies of the atoms of elements A and B are E_a and E_b, respectively. Three atoms of the element B fuse to give one atom of element A. this fusion process is accompanied by release of energy E. then, E_a, E_b are related to each other as

A. $E_a + E = 3E_0$

B. $E_a = 3E_b$

C. $E_a = 3E_b + E$

D. $E_a + 3E_b = E$

Answer: C

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3. A ball strikes a smooth horizontal ground at an angle of 45° with the vertical. What cannot be the possible angle of its velocity with the vertical after the collision. (Assume e $\leq$ 1).

A. 45°

B. 30°

C. 53°

D. 60°

Answer: B

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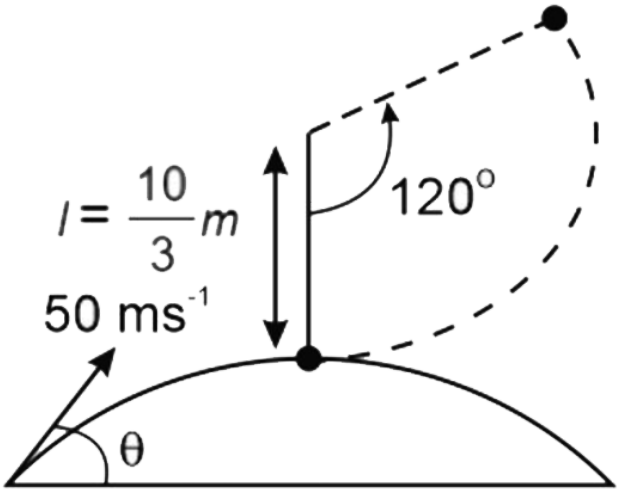
4. A bullet of mass m is fired with a velocity of $50ms^{-1}$ at an angle θ with the horizontal . At the highest point of its trajectory , it collides head on with a body connected to massless string of length l and gets embedded in the bob of mass 3m. After the collision , the string

moves to an angle of 120° .What is the angle θ ?



A. $\cos^{-1}\left(\frac{4}{5}\right)$

B. $\cos^{-1}\left(\frac{5}{4}\right)$

C. $\sin^{-1}\left(\frac{4}{5}\right)$

D. $\sin^{-1}\left(\frac{5}{4}\right)$

Answer: A

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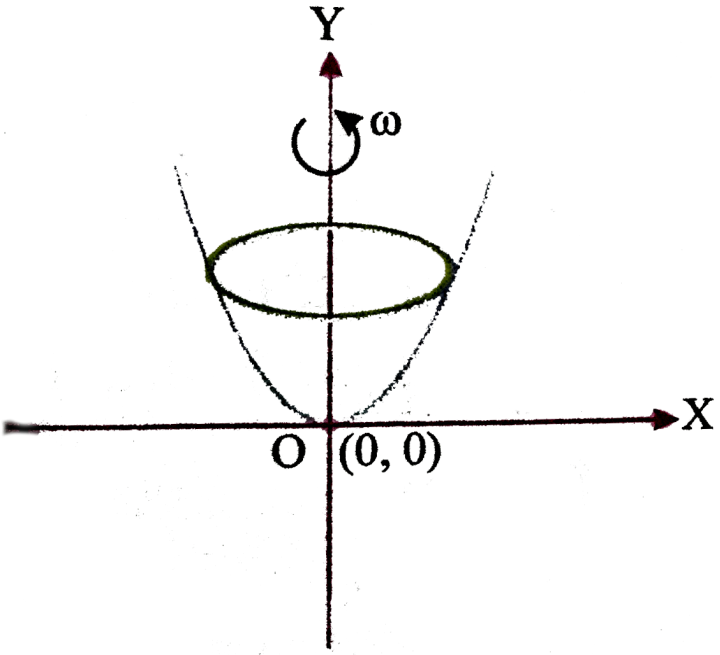
5. In the given figure, a smooth parabolic wire track lies in the xy-plane (vertical). The shape of track is defined by the equation $y = x^2$. A ring of mass m which can slide freely on the wire track, is placed at the position $A(1, 1)$. The track is rotated with constant angular speed ω such that there is no relative slipping between the ring and the track. The value of ω

is



A. $\sqrt{\frac{g}{2}}$

B. $\sqrt{g}$

C. $\sqrt{2g}$

D. $2\sqrt{g}$

Answer: C

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6. At a temperature of $30^{\circ} C$, the susceptibility of ferromagnetic material is found to be $'\chi'$ its susceptibility at $333^{\circ} C$ is

A. 0.5 X

B. 2 X

C. 11.1 X

D. 0.09 X

Answer: A

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7. A uniform copper wire of length $1m$ and cross section area $5 \times 10^{-7} m^2$ carries a current of $1A$. Assuming that are 8×10^{28} free electron per m^3 in copper, how long will an electron take to drift from one end of the wire an electron the other. Charge on an electron $= 1.6 \times 10^{-19} C$

A. $0.8 \times 10^3 s$

B. $1.6 \times 10^3 s$

C. $3.2 \times 10^3 s$

D. $6.4 \times 10^3 s$

Answer: D

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8. A galvanometer having a resistance of 20Ω and 30 divisions on both sides has figure of merit. 0.005 ampere /division. The resistance

that should be connected in series such that it can be used as a voltmeter upto 15 V , is :

A. 120Ω

B. 100Ω

C. 80Ω

D. 125Ω

Answer: C

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9. A telephone wire of length $200km$ has a capacitance of $0.014\mu Fperkm$. If it carries an AC of frequency $5kHz$ what should be the value of an inductor required to be connected in series so that impedence of the circuit is minimum ?

A. 0.35 mH

B. 3.5 mH

C. 2.5 mH

D. zero

Answer: A

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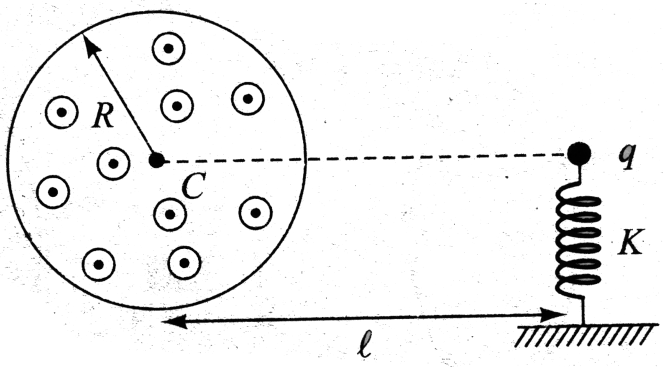
10. There is a horizontal cylindrical uniform but time-varying magnetic field increasing at a constant rate dB/dt as shown in Fig. 3.173. A charged particle having charge q and mass m is kept in equilibrium, at the top of a spring of spring constant K, in such a way that it is on the horizontal line passing through the center of the magnetic field as shown in the figure.

The compression in the spring will be



A. $\frac{1}{K}\left[mg - \frac{qR^2}{2l}\frac{dB}{dt}\right]$

B. $\frac{1}{K}\left[mg + \frac{qR^2}{l}\frac{dB}{dt}\right]$

C. $\frac{1}{K}\left[mg + \frac{2qR^2}{l}\frac{dB}{dt}\right]$

D. $\frac{1}{K}\left[mg + \frac{qR^2}{2l}\frac{dB}{dt}\right]$

Answer: D

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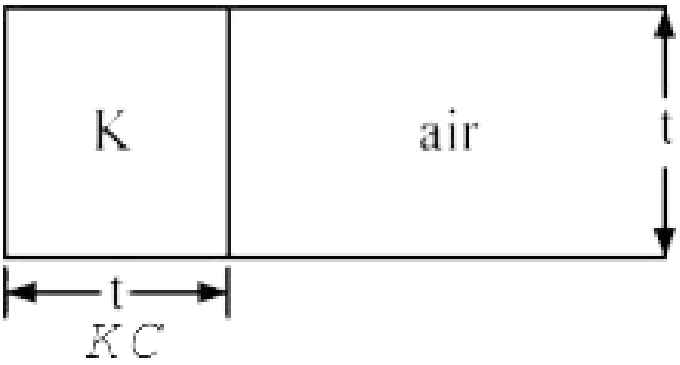
11. A parallel plate capacitor with air as the dielectric has capacitance C. A slab of dielectric constant K and having the same thickness as the separation between plates is introduced so as to fill one-fourth of the capacitor as shown in the figure. The new capacitance will

be :



A. $(K+3)\frac{C}{4}$

B. $(K+2)\frac{C}{4}$

C. $(K+1)\frac{C}{4}$

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

Answer: A

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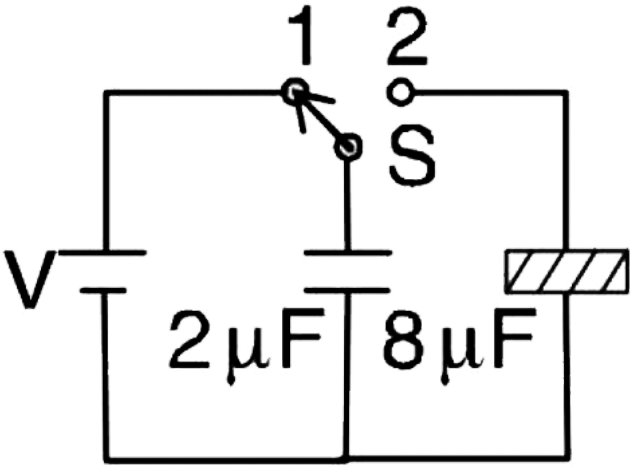
12. A $2\mu F$ capacitor is charged as shown in the figure. The percentage of its stored energy dissipated after the switch S is turned to position 2 is



A. $0\,\%$

B. $20\ \%$

C. $75\ \%$

D. $80\ \%$

Answer: D

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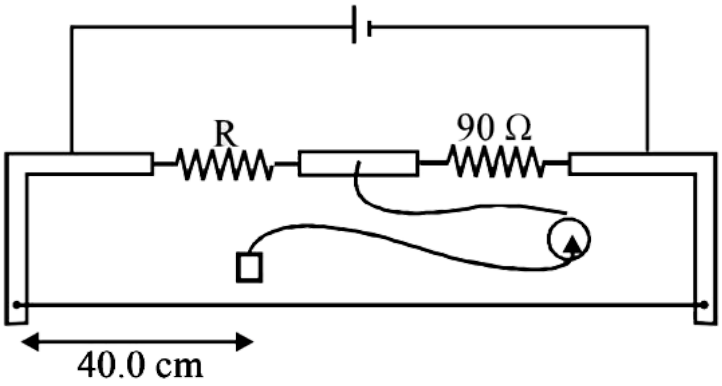
13. During an experiment with a metre bridge, the galvanometer shows a null point when the jockey is pressed at $40.0cm$ using a standard resistance of 90Ω, as shown in the figure. The

least count of the scale used in the metre bridge is 1mm. The unknown resistance is



A. $60 \pm 0.15\Omega$

B. $135 \pm 0.56\Omega$

C. $60 \pm 0.25\Omega$

D. $135 \pm 0.23\Omega$

Answer: C

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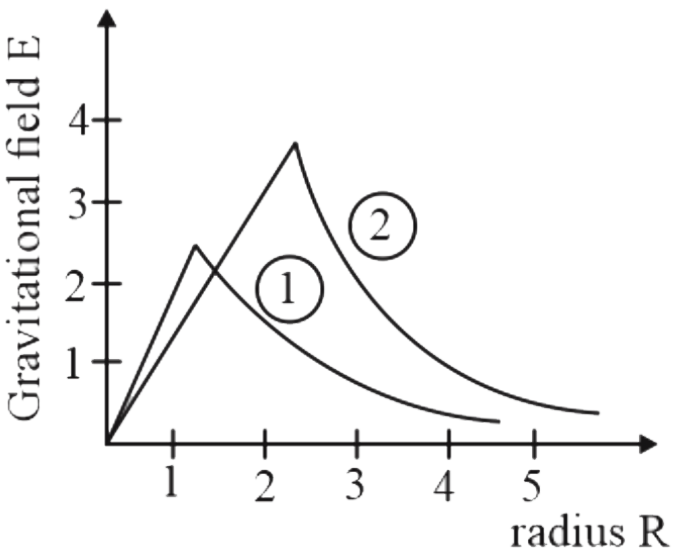
14. Consider two solid spheres of radii $R_1 = 1m, R_2 = 2m$ and masses M_1 and M_2 , respectively . The gravitational field due to sphere (1) and (2) are shown. The value of $\frac{M_1}{M_2}$

is :



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

B. $\frac{1}{6}$

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

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

Answer: B

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15. Two satellites , A and B , have masses m and 2m respectively . A is in a circular orbit of radius R , and B is in a circular orbit of radius 2R around the earth . The ratio of their energies , $\frac{K_A}{K_B}$ is :

A. 2

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

C. 1

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

Answer: C

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16. If a body coated black at 600 k surrounded by atmosphere at, 300 k has cooling rate $r1$ the same body at 900 k surrounded by the same atmosphere , will have cooling rate equal to

A. $\frac{16}{3}r1$

B. $\frac{18}{3}r0$

C. $16r0$

D. $4r0$

Answer: A

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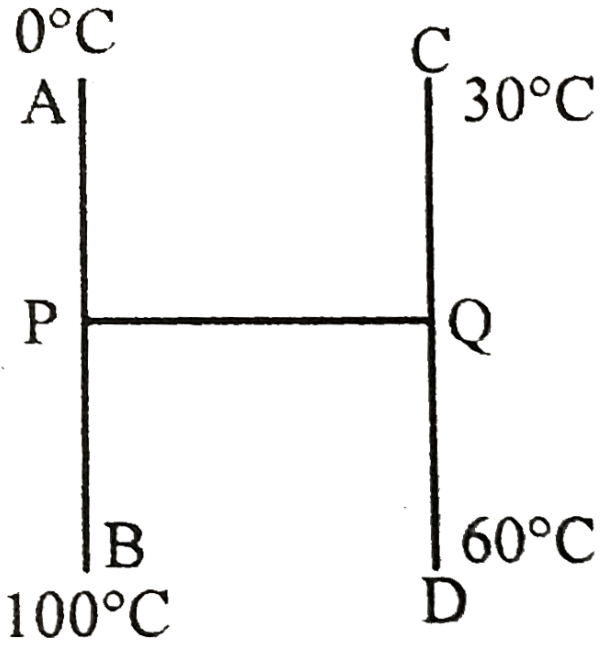
17. Three identical rods AB, CD and PQ are joined as shown. P and Q are mid points of AB and CD respectively. Ends A, B, C and D

are maintained at $0^\circ C$, $100^\circ C$, $30^\circ C$ and $60^\circ C$ respectively. The direction of heat flow in PQ is



A. From P to Q

B. From Q to P

C. Heat does not flow in PQ

D. Date not sufficient

Answer: A

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18. n moles of diatomic gas in a cylinder is at a temperature T . Heat is supplied to the cylinder such that the temperature remains constant but n moles of the diatomic gas get converted into monatomic gas . The change in the total kinetic energy of the gas is

A. 0

B. $\frac{5}{2}$ nRT

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

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

Answer: D

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19. An ideal gas mixture filled inside a balloon expands according to the relation $PV^{2/3} =$

constant. What will be the temperature inside the balloon

A. Increasing

B. Decreasing

C. Constant

D. Can't be said

Answer: A

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20. A solenoid has length $0.4m$, radius 1 cm and 400 turns of wire. If a current fo 5 A is passed through this solenoid, then what is the magnetic field inside the solenoid?

A. $6.28 \times 10^{-4}T$

B. $6.28 \times 10^{-3}T$

C. $6.28 \times 10^{-7}T$

D. $6.28 \times 10^{-6}T$

Answer: B

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21. A particle of charge 'q' and mass 'm' is projected from the origin with velocity $\left(u_0\hat{i}+v_0\hat{j}\right)$ in a gravity free region where uniform electric field $-E_0\hat{i}$ and uniform magnetic field $-B_0\hat{i}$ exist. Find the condition so that the particle would return to origin at least for once .

A. $\frac{\mu_0 B_0}{2\pi E_0}$ is an integer

B. $\sqrt{u_0^2+v_0^2}\frac{B_0}{\pi E_0}$ is an integer

C. $\frac{v_0 B_0}{\pi B_0}$ is an integer

D. $\frac{\mu_0 B_0}{\pi E_0}$ is an integer

Answer: D

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22. The equations of motion of a projectile are given by $x = 36tm$ and $2y = 96t - 9.8t^2 m$. The angle of projection is

A. $\sin^{-1}\left(\frac{4}{5}\right)$

B. $\sin^{-1}\left(\frac{3}{5}\right)$

C. $\sin^{-1}\left(\frac{4}{3}\right)$

D. $\sin^{-1}\left(\frac{3}{4}\right)$

Answer: A

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23. A particle aimed at a target projected with an angle 15° with the horizontal is short of the target by 10m .If projected with an angle

of 45° is away from the target by 15m then the angle of projection to hit the target is

A. $\frac{1}{2}\sin^{-1}\left(\frac{1}{10}\right)$

B. $\frac{1}{2}\sin^{-1}\left(\frac{3}{10}\right)$

C. $\frac{1}{2}\sin^{-1}\left(\frac{9}{10}\right)$

D. $\frac{1}{2}\sin^{-1}\left(\frac{7}{10}\right)$

Answer: D

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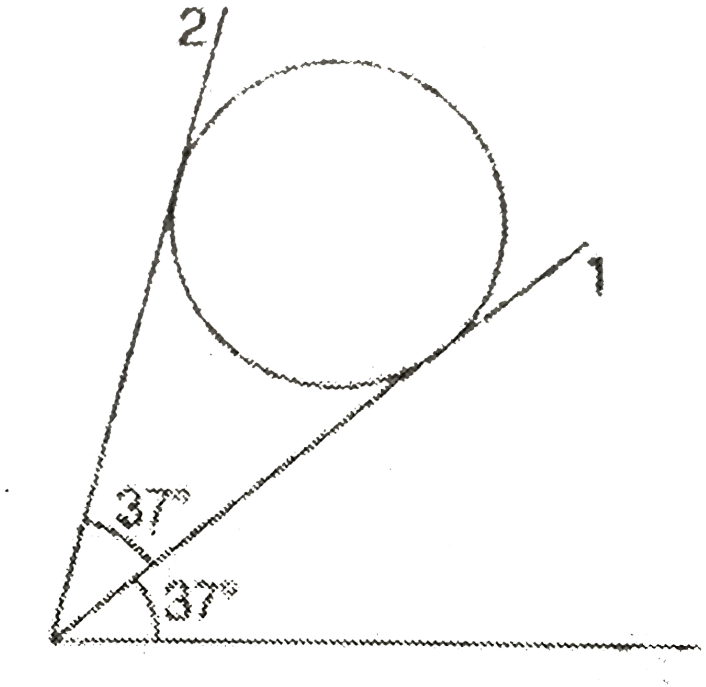
24. A sphere of mass m, is held between two smooth inclined walls. For $\sin 37^\circ = 3/5$, the normal reactions of the wall (2) is equal to



A. mg

B. $mg\sin 74^\circ$

C. $mg\cos 74^\circ$

D. None of these

Answer: A

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25. A steel wire can withstand a load up to $2940N$. A load of $150kg$ is suspended from a rigid support. The maximum angle through which the wire can be displaced from the mean position, so that the wire does not break

when the load pass through the position of equilibrium, is

A. 30°

B. 60°

C. 80°

D. 85°

Answer: B

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26. If the mass defect of ${}_5B^{11}$ is 0.081 u, its average binding energy (in MeV) is

A. 8.60 MeV

B. 6.85 MeV

C. 6.60 MeV

D. 5.86 MeV

Answer: B

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27. A radioactive sample S_1 having an activity of $5\mu Ci$ has twice the number of nuclei as another sample S_2 which has an activity of $10\mu Ci$. The half-lives of S_1 and S_2 can be

A. $4:1$

B. $1:4$

C. $1:2$

D. $2:1$

Answer: A

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28. The potential energy of a particle executing S.H.M. is 2.5 J, when its displacement is half of amplitude. The total energy of the particle will be

A. 2.5 J

B. 10 J

C. 12 J

D. 20 J

Answer: B

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29. A simple pendulum has time period (T_1). The point of suspension is now moved upward according to the relation $y = Kt^2, \left(K = 1m/s^2\right)$ where (y) is the vertical displacement. The time period now becomes (T_2). The ratio of $\frac{T_1^2}{T_2^2}$ is $\left(g = 10m/s^2\right)$.

A. $\frac{6}{5}$

B. $\frac{5}{6}$

C. 1

D. $\frac{4}{5}$

Answer: A

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30. If r_n is the radius of n^{th} orbit of hydrogen atom , then the relative change in the radius, when an electron jumps from n^{th} orbit to $(n-1)^{th}$ orbit is $(n>>1)$

A. Directly proportional to n

B. Inversely proportional to n

C. Inversely proportional to n^2

D. Independent of n

Answer: B

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31. When a certain photosensistive surface is illuminated with monochromatic light of frequency v, the stopping potential for the

photo current is $-V_0/2$. When the surface is illuminated by monochromatic light of frequency $v/2$, the stopping potential is $-V_0$. The threshold frequency gor photoelectric emission is :

A. $\frac{5v}{3}$

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

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

D. 2v

Answer: B

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32. An iron bar of length 10 m is heated from $0^\circ C$ to $100^\circ C$. If the coefficient of linear thermal expansion of iron is $10 \times 10^{-6}.^\circ C^{-1}$, then increase in the length of bar (in cm) is

A. 0.5 cm

B. 1.0 cm

C. 1.5 cm

D. 2.0 cm

Answer: B

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33. Water rises to a height of 16.3 cm in a capillary of height 18 cm above the water level. If the tube is cut at a height of 12 cm -

A. Water will come as a fountain from the capillary .

B. Water will stay at a height of 12 cm in capillary

C. The height of the water in the tube will be 10.3 cm

D. Water will flow down the sides of the capillary tube

Answer: B

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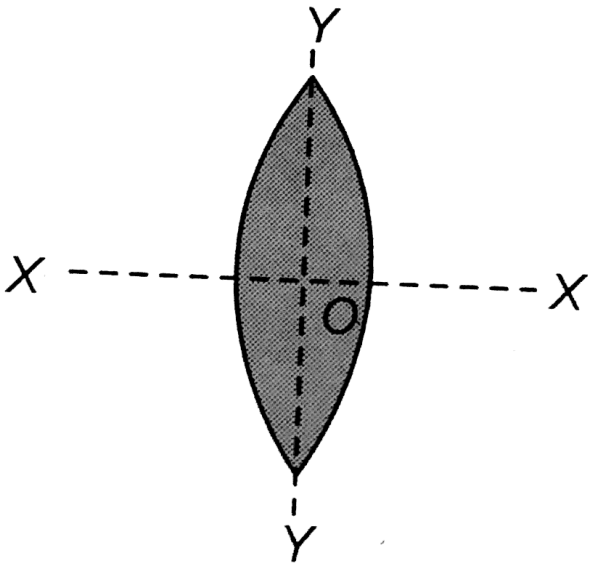
34. An equiconvex lens is cut into two halves along $(i)XOX'$ and $(ii)YOY'$ as shown in the figure. Let $f, f'f^{''}$ be the focal lengths of

the complete lens, of each half in case (i), and of each half in case (ii), respectively

Choose the correct statement from the following



A. f'= f, f'' = f

B. f' =2f,f''=2f

C. f'=f,f''=2f

D. f'=2f,f''=f

Answer: C

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35. Two thin lenses have a combined power of +9D.When they are separated by a distance of 20 cm, then their equivalent power becomes $+\frac{27}{5}$ D. Their individual powers (in dioptre) are

A. 4,5

B. 3,6

C. 2,7

D. 1,8

Answer: B

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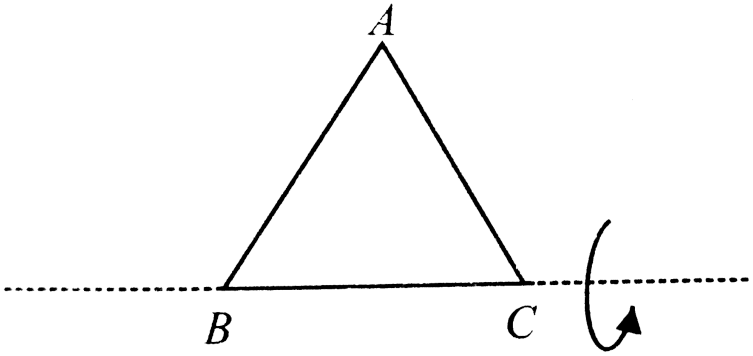
36. Three identical rods, each of mass m and length l, form an equaliteral triangle. Moment

of inertia about one of the sides is



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

B. $\frac{Ml^2}{4}$

C. $\frac{Ml^2}{2}$

D. none

Answer: C

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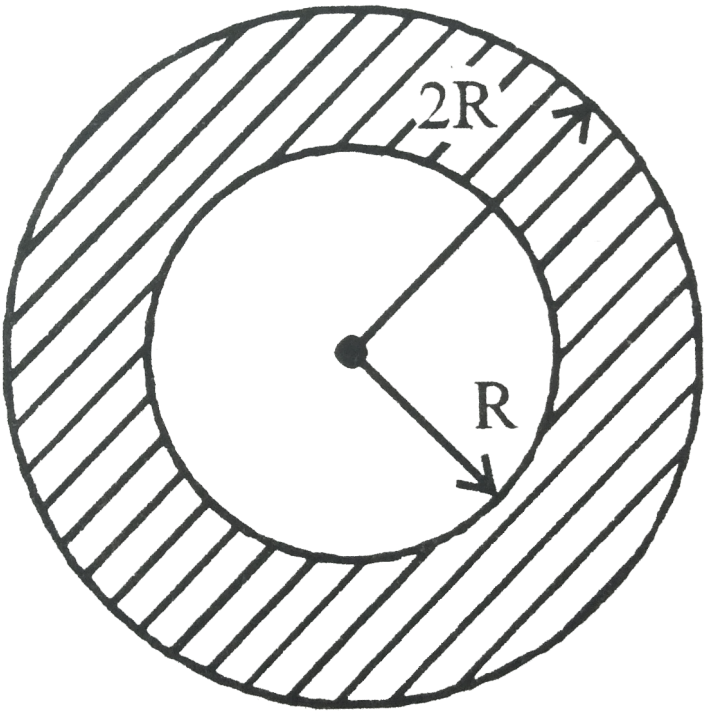
37. A hollow cylinder with inner radius R. Outer radius $2R$ mass M is rolling with speed of it's axis v. What is its kinetic energy ?



A. $\frac{5}{6}Mv^2$

B. $\frac{5}{2}Mv^2$

C. $\frac{1}{2}Mv^2$

D. $\frac{13}{16}Mv^2$

Answer: D

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38. A $n-p-n$ transistor conducts when

A. both collector and emitter are negative with respect to the base potential

B. both collector and emitter are positive with respect to the base potential

C. collector is positive and emitter is negative with respect to the base potential

D. collector positive and emitter is at same potential as the base potential

Answer: C

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39. A large parallel plate capacitor, whose plates have an area of $1m^2$ and are separated from each other by 1 mm, is being charged at a rate of $25Vs^{-1}$. If the dielectric constant 10, then the displacement current at this instant is

A. $25\mu A$

B. $11\mu A$

C. $2.2\mu A$

D. $1.1\mu A$

Answer: C

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40. A steel wire , of uniform area $2mm^2$, is heated up to $50^\circ C$ and is stretched by tying its ends rigidly . The change in tension , when the temperature falls from $50^\circ C$ to $30^\circ C$ is (Take

$Y = 2 \times 10^{11} Nm^{-2}, \alpha = 1.1 \times 10^{-5^\circ C-1}\Big)$

A. $1.5 \times 10^{10} N$

B. $5N$

C. $88N$

D. $2.510^{10} N$

Answer: C

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41. Number of particles is given by $n = -D\frac{n_2 - n_1}{x_2 - x_1}$ crossing a unit area perpendicular to X-axis in unit time, where n_1

and n_2 are number of particles per unit volume for the value of x meant to x_2 and x_1. Find dimensions of D called as diffusion constant

A. $\left[M^0LT^2\right]$

B. $\left[M^0L^2T^{-4}\right]$

C. $\left[M^0LT^{-3}\right]$

D. $\left[M^0L^2T^{-1}\right]$

Answer: D

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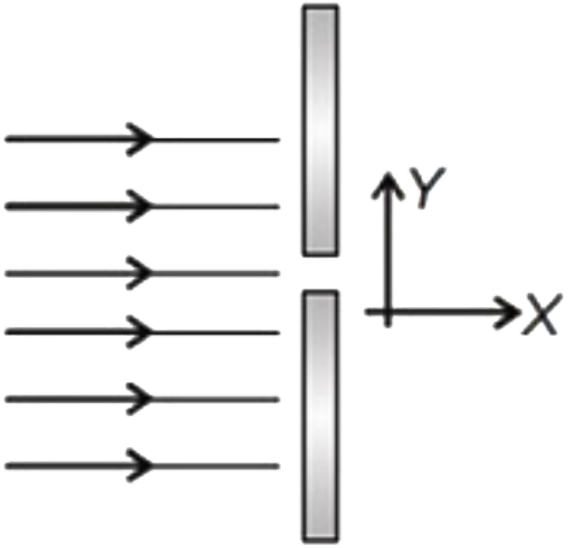
42. A parallel beam of electrons , travelling in x - direction , falls on a slit of width d (see the figure) . If after passing the slit, an electron acquires momentum P_y in the y direction, then for a majority of electrons passing through the slit , (h is Planck's constant)



A. $|P_y|d > h$

B. $|P_y|d > \ > h$

C. $|P_y|d < h$

D. $|P_y|d \cong h$

Answer: A

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43. A light of wavelength 6000Å is incident on a single slit . First minimum is obtained at a distance of 0.4 cm from the centre . If width of

the slit is 0.3 mm, the distance between slit and screen will be

A. 1.0 m

B. 1.5 m

C. 2.0 m

D. 2.3 m

Answer: C

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44. Two tuning forks A and B are sounded together and it results in beats with frequency of 4 beats per second . When A is loaded with wax, they again produces 4 beats per second . If frequency of A is 256 Hz, then the frequency of B is

A. 252 Hz

B. 262 Hz

C. (A) and (B) both

D. None

Answer: A

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45. A star is moving away from earth and shift in spectral line of wavelength 5700Å is 1.90Å. Velocity of the star is :

A. $50kms^{-1}$

B. $70kms^{-1}$

C. $85kms^{-1}$

D. $100kms^{-1}$

Answer: D

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