PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 84

Physics

1. A ball of mass m moving horizontally at a speed v collides with the bob of a simple pendulum at rest. The mass of the bob is also

m. If the collision is perfectly inelastic and both balls sticks, the height to which the two balls rise after the collision will be given by:

A. $\frac{v^2}{8g}$

B. $\frac{v^2}{2g}$

C. $\frac{2v^2}{g}$

D. $\frac{v^2}{g}$

Answer: A

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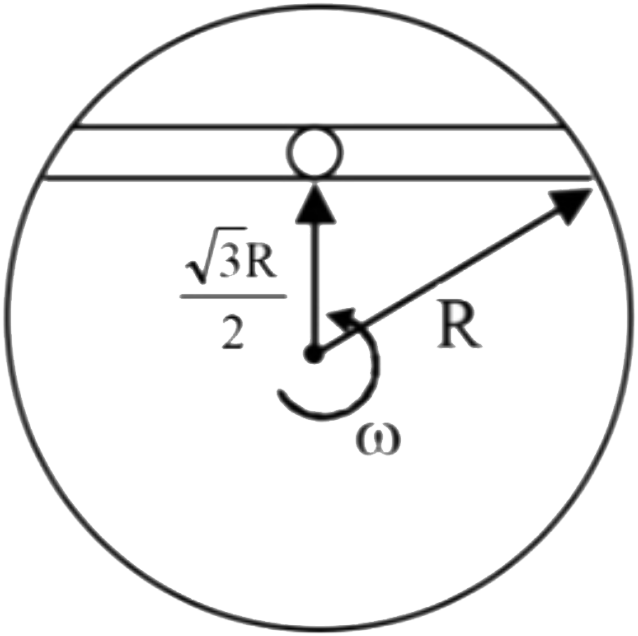
2. A horizontal disk is rotating with angular velocity ω about a vertical axis passing through its centre. A ball is placed at the centre of groove and pushed slightly. The velocity of the ball when it comes out of the groove -



A. $\frac{\sqrt{3}}{2}\omega R$

B. $\frac{\omega R}{2}$

C. ωR

D. $\frac{\omega R}{\sqrt{2}}$

Answer: A

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3. There are two solenoid of same length and inductance L but their diameters differ to the extent that one can just fit into the other. They

are connected in three different ways in series.

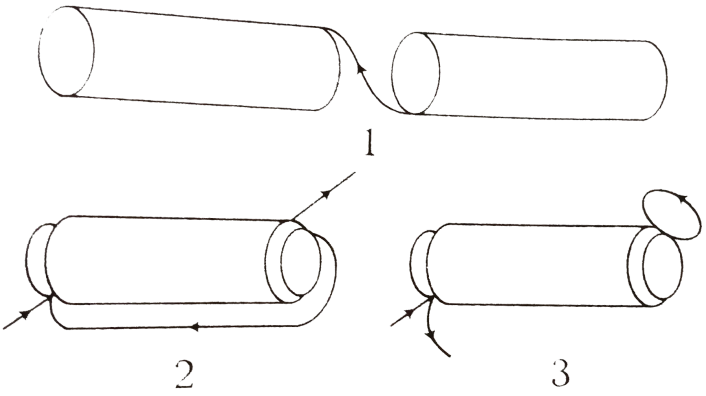
(1) They are connected in series but separated by large distance.

(2) They are connected in series with one inside the other and senses of the turns coinciding.

(3) Both are connected in series with one inside the other with senses of the turns opposites,

as depicted in figures 1, 2 and 3 respectively. The total inductance of the solenoids in each

of the case 1, 2 and 3 are respectively.



A. $0, 4L_0, 2L_0$

B. $4L_0, 2L_0, 0$

C. $2L_0, 0, 4L_0$

D. $2L_0, 4L_0, 0$

Answer: D

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4. An electric dipole is situated in an electric field of uniform intensity E whose dipole moment is p and moment of inertia is I. If the dipole is displaced slightly from the equilibrium position, then the angular frequency of its oscilliations is

A. $\left(\frac{pE}{l}\right)^{1/2}$

B. $\left(\frac{pE}{l}\right)^{3/2}$

C. $\left(\frac{l}{pE}\right)^{1/2}$

D. $\left(\frac{p}{IE}\right)^{1/2}$

Answer: A

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5. A hypothetical planet in the shape of a sphere is completely made of an incompressible fluid and has a mass M and radius R. If the pressure at the surface of the planet is zero, then the pressure at the centre

of the planet is [G = universal constant of gravitation]

A. $P = \frac{3GM^2}{8\pi R^4}$

B. $P = \frac{3GM^2}{4\pi R^4}$

C. $P = \frac{3GM^2}{4\pi R^4}$

D. $P = \frac{3GM^2}{4\pi^2 R^4}$

Answer: A

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6. A 2 m long wire of resistance 4Ω and diameter 0.64 mm is coated with plastic insulation of thickness 0.66 mm. A current of 5A flows through the wire. Find the temperature difference across the insulation in the steady state. Thermal conductivity of plastic is $0.16 \times \left(10^{-2}\right) cal/scm.^{\circ} C.$

A. $1^{\circ} C$

B. $2^{\circ} C$

C. $3^{\circ} C$

D. $4^{\circ} C$

Answer: B

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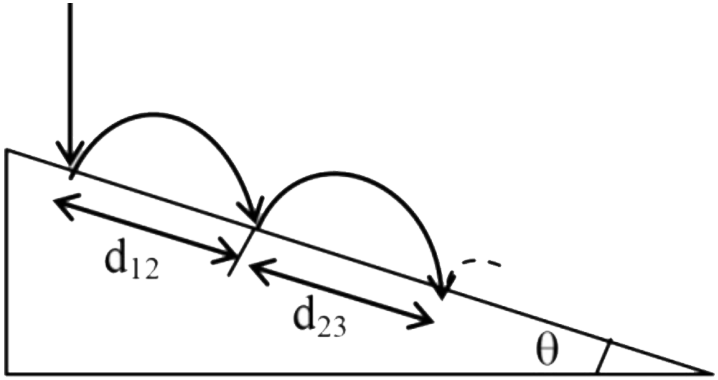
7. An elastic ball is dropped on a long inclined plane. If bounces, hits the plane again, bounces and so on. Let us Label the distance between the point of the first and second hit d_{12} and the distance between the points of second and the third hit is d_{23}. find the ratio

of d_{12}/d_{23}.



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

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

C. $\frac{4}{1}$

D. $\frac{1}{4}$

Answer: B

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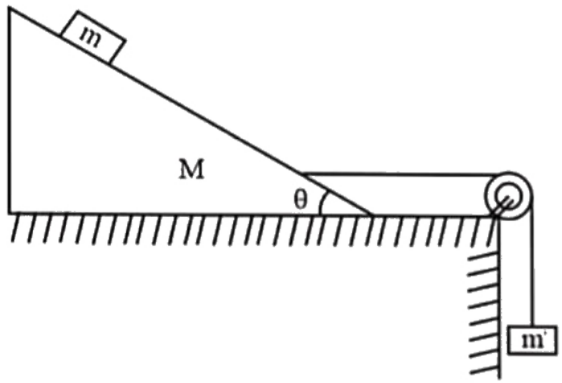
8. A hanging block of mass m' prevents the smaller block of mass m from slipping over a movable triangular block of mass M. All the surface are frictionless and the strings and the pulleys are light. Value of mass m' in terms of m, M and θ is



A. $\left[\frac{m+M}{\cot\theta-1}\right]$

B. $\left[\frac{m-M}{\cos\theta+1}\right]$

C. $\left[\frac{m-M}{\cot\theta-2}\right]$

D. $\left[\frac{m+M}{\cot\theta+2}\right]$

Answer: A

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9. There is a stream of neutrons with a kinetic energy of $0.0327eV$. If the half-life of neutrons is $700s$, what fraction of neutrons will decay

before they travel is distance of $10m$? Given mass of neutron $= 1.676 \times 10^{-27} kg$.

A. 3.96×10^{-6}

B. 3.90×10^{-6}

C. 3.85×10^{-6}

D. 4.86×10^{-6}

Answer: A

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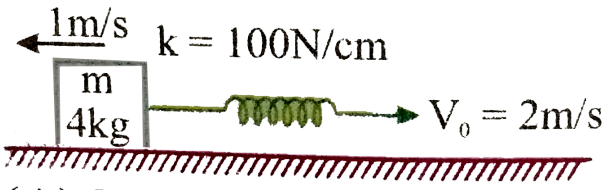
10. The spring block system lies on a smooth horizontal surface. The free endof the spring is being pulled towards right with constant speed $v_0 = 2m/s$. At $t = 0\,\text{sec}$, the spring of constant $k = 100N/cm$ is unsttretched and the block has a speed $1m/s$ to left. The maximum extension of the spring is.



(A) 2 cm (B) 4 cm (C) 6 cm

A. 2 cm

B. 4 cm

C. 6 cm

D. 8 cm

Answer: C

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11. The potential energy of a partical varies as .

$U(x) = E_0$ for $0 \leq x \leq 1$

$= 0$ for $x > 1$

for $0 \leq x \leq 1$ de- Broglie wavelength is λ_1

and for $x > 1$ the de-Broglie wavelength is λ_2. Total energy of the partical is $2E_0$. find $\frac{\lambda_1}{\lambda_2}$.

A. $\sqrt{3}$

B. $\sqrt{7}$

C. $\sqrt{2}$

D. $\sqrt{5}$

Answer: C

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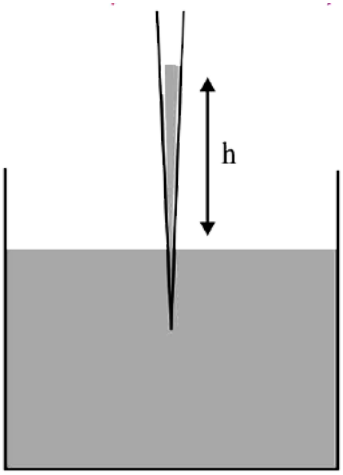
12. A glass capillary tube is of the shape of a truncated cone with an apex angle α so that its two ends have cross sections of different radii. When dipped in water vertically, water rises in it to a high h, where the radius of its cross section is b. If the surface tension of water is S, its density if ρ, and its contact angle with glass is θ, the value of h will be (g is the

acceleration due to gravity)



A. $\frac{2S}{b\rho g}\cos(\theta - \alpha)$

B. $\frac{2S}{b\rho g}\cos(\theta + \alpha)$

C. $\frac{2S}{b\rho g}\cos\left(\theta - \frac{\alpha}{2}\right)$

D. $\frac{2S}{b\rho g}\cos\left(\theta + \frac{\alpha}{2}\right)$

Answer: D

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13. A ray of light is incident on a surface of glass slab at an angle 45°. If the lateral shift produced per unit thickness is $1/\sqrt{3}$, the angle of refraction produced is

A. $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

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

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

D. $\tan^{-1}\left(\sqrt{\frac{2}{\sqrt{3}-1}}\right)$

Answer: B

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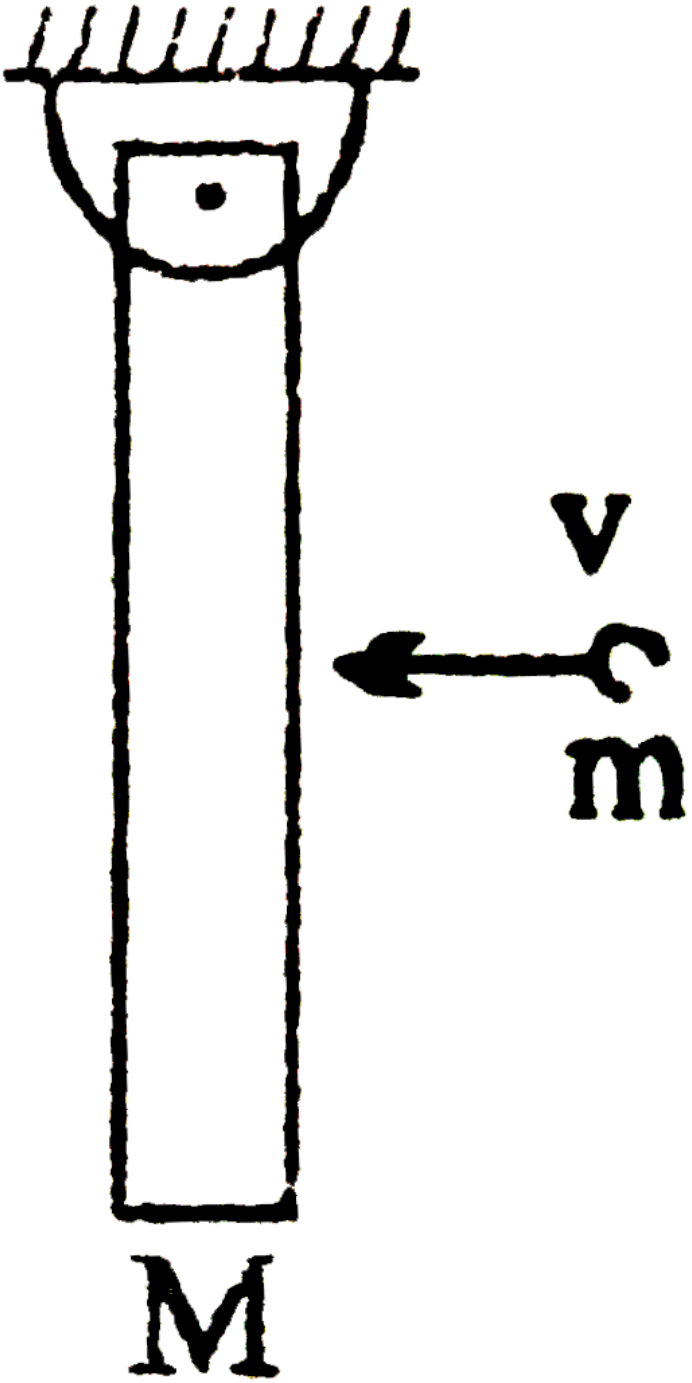
14. A uniform rod of mass M is hinged at its upper end. A particle of mass m moving horizontally strikes the rod at its mid point elastically. If the particle comes to rest after

collision find the value of M/m?


v
m
M

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

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

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

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

Answer: A

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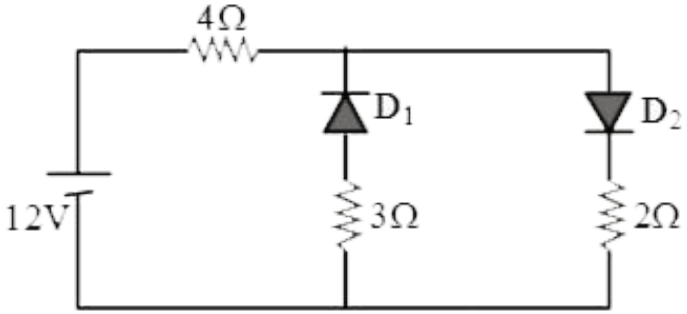
15. The circuit has two oppositely connected ideal diodes in parallel. What is the current

flowing in the circuit ?



A. 1.33 A

B. 1.71 A

C. 2.00 A

D. 2.71 A

Answer: C

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16. An ideal gas is expanded such that $PT^2 = a$ constant. The coefficient of volume expansion of the gas is

A. $\frac{1}{T}$

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

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

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

Answer: C

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17. If velocity, force and time are taken to be fundamental quantities find dimensional formula for (a) Mass, and (b) Energy.

A. $Q = kv^{-1}FT$

B. $Q = Kv^3FT^2$

C. $Q = 2Kv^{-2}FT$

D. $Q = -3Kv^2FT$

Answer: A

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18. In a biprism experiment with sodium light,bands of width $0.0195cm$ are observed at $100cm$ from slit.On introducing a convex lens $30cm$ away from the silt between biprism and screen,two images of the slit are seen$0.7cm$ apart of $100cm$ distance from the slit .Calcualte the wavelength of sodium light .

A. $\lambda = 4450\text{Å}$

B. $\lambda = 4850\text{Å}$

C. $\lambda = 2650\text{Å}$

D. $\lambda = 6750\text{Å}$

Answer: B

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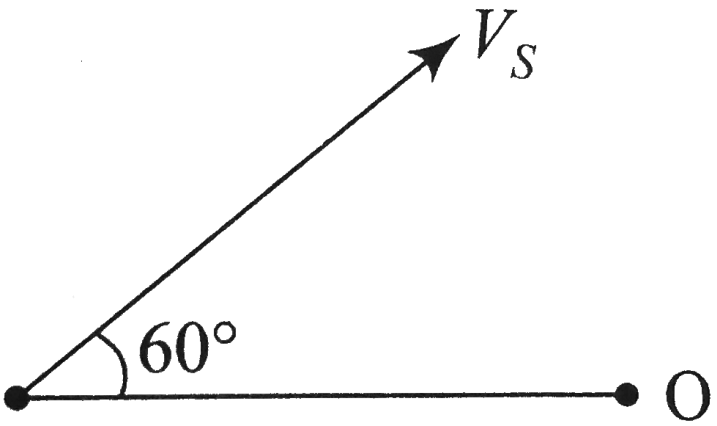
19.



A source of sound S emitting waves of

frequency $100Hz$ and an observer O are located at some distance from each other. The source is moving with a speed of $19.4ms^{-1}$ at an angle of 60° with the source observer line as shown in the figure. The observer is at rest. The apparent frequency observed by the observer (velocity of sound in air $330ms^{-1}$) is

A. 103 Hz

B. 106 Hz

C. 96 Hz

D. 100 Hz

Answer: A

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20. A $0.5kg$ block slides from the point A on a horizontal track with an initial speed $3m/s$ towards a weightless horizontal spring of length $1m$ and force constant $2N/m$. The part AB of the track is frictionless and the part BC has the coefficient of static and kinetic friction as '0.22' and 0.20 respectively. If the distances AB and BD are $2m$ and $2.14m$

respectively, find total distance through which the block moves before it comes to rest completely. `(g=10 m//s^(2)).

A. 2.5 m

B. 4.42 m

C. 4.24 m

D. 2.44 m

Answer: C

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21. K_α wavelength emitted by an atom of atomic number Z=11 is λ. Find the atomic number for an atom that emits K_α radiation with wavelength 4λ.

(a) Z=6 (b) Z=4

(c) Z=11 (d) Z=44.

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22. A galvanometer of resistance 30Ω is connected to a battery of emf 2 V with 1970Ω resistance in series. A full scale deflection of 20

divisions is obtained in the galvanometer. To reduce the deflection to 10 divisions, the resistance in series required is

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23. 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?

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24. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio C_P / C_V for the gas is

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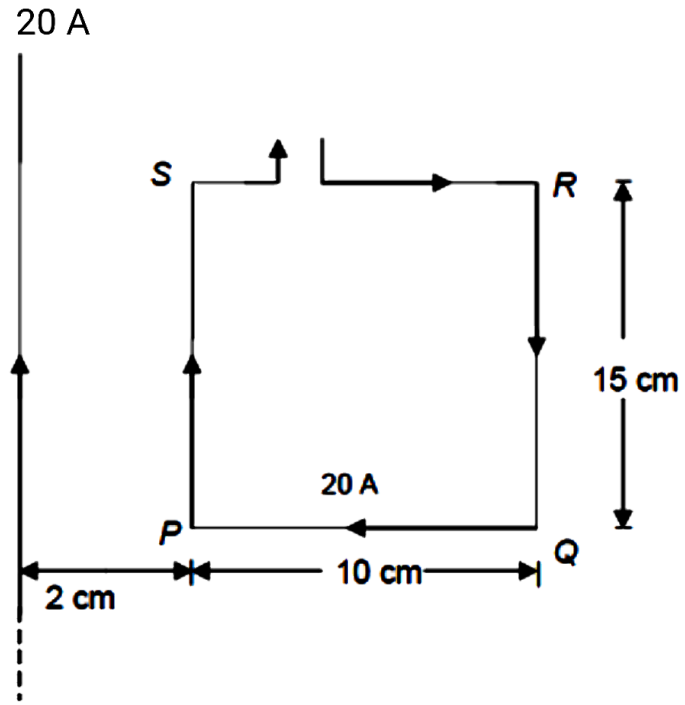
25. The resultant force (inμN) on the current loop PQRS due to a long current - carrying conductor (current = 20 A) will be



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