PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 109

Physics

1. The ground state energy of hydrogen atom is $-13.6eV$. If the electron jumps to the

ground state from the 3^{rd} excited state, the wavelength of the emitted photon is

A. $875Å$

B. $1052Å$

C. $752Å$

D. $1026Å$

Answer: D

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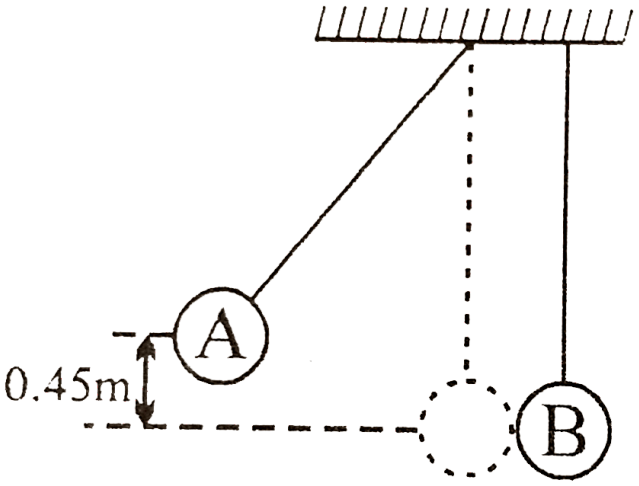
2. Two massless string of length 5 m hang from the ceiling very near to each other as shown in the figure. Two balls A and B of masses $0.25kg$ and $0.5kg$ are attached to the string. The ball A is released from rest at a height $0.45m$ as shown in the figure. The collision between two balls is completely elastic. Immediately after the collision, the kinetic energy of ball B is $1J$ The velocity of

ball A just after the collision is



A. $5\ \mathrm{m\ s^{-1}}$ to the right

B. $5\ \mathrm{m\ s^{-1}}$ to the left

C. $1\ \mathrm{m\ s^{-1}}$ to the right

D. $1\ \mathrm{m\ s^{-1}}$ to the left

Answer: D

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3. What is the value of linear velocity, if $\vec{\omega} = 3\hat{i} - 4\hat{j} + \hat{k}$ and $\vec{r} = 5\hat{i} - 6\hat{j} + 6\hat{k}$?

A. $6\hat{i} + 2\hat{j} - 3\hat{k}$

B. $-18\hat{i} - 13\hat{j} + 2\hat{k}$

C. $18\hat{i} + 13\hat{j} - 2\hat{k}$

D. $8\hat{i} - 2\hat{j} + 8\hat{k}$

Answer: B

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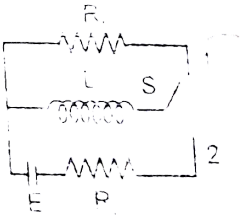
4. In the circuit shown switch S is connected to position 2 for a long time and then joined to position 1.The total heat produced in resistance R_2 is:

(B) $\frac{LE^2}{2R_1^2}$

(D) $\frac{LE^2(R_1+R_2)^2}{2R_1^2R_2^2}$



A. $\frac{LE^2}{2R_2^2}$

B. $\frac{LE^2}{2R_1^2}$

C. $\frac{LE^2}{2R_1R_2}$

D. $\frac{LE^2(R_1+R_2)^2}{2R_1^2R_2^2}$

Answer: A

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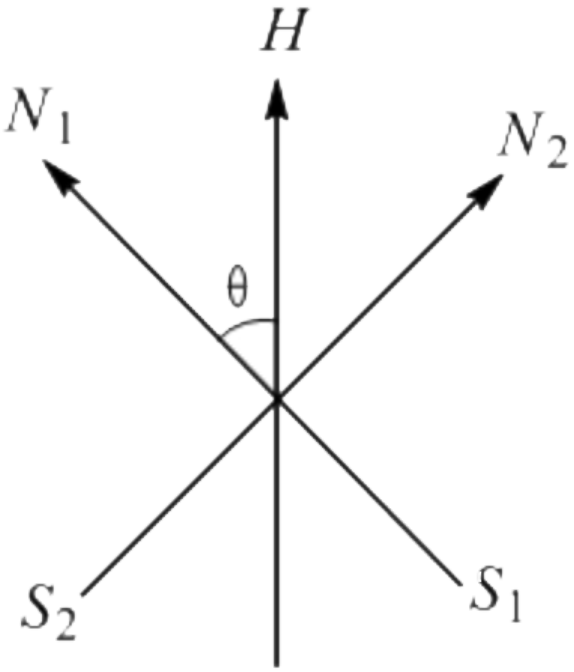
5. Two magnets of equal mass are joined at 90° each other as shown in figure. Magnet N_1S_1 has a magnetic moment $\sqrt{3}$ times that of N_2S_2. The arrangement is pivoted so that it

is free to rotate in horizontal plane. When in equilibrium, what angle should N_1S_1 make with magnetic meridian?



A. 75°

B. 60°

C. 30°

D. 45°

Answer: C

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6. An artificial satellite is moving in a circular orbit around the earth with a speed equal to half the magnitude of escape velocity from the earth. The height of the satellite above the surface of the earth is x R. Find the value of x.

A. R

B. 2 R

C. 3 R

D. 4 R

Answer: A

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7. A cup of tea cools from 65.5°C to $62.55^{\circ}C$ in one minute is a room at $225.^{\circ}C$. How long will the same cup of tea take to cool from

$46.5^\circ C$ to $40.5^\circ C$ in the same room ?

(Choose the nearest value in min).

A. 4 min

B. 2 min

C. 1 min

D. 3 min

Answer: A

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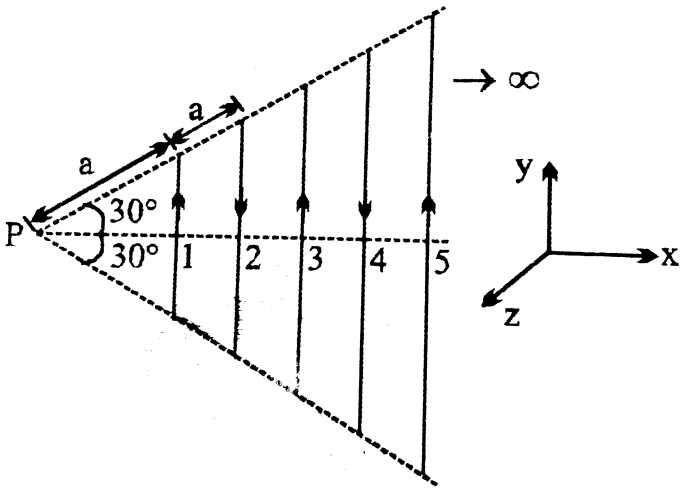
8. Infinite number of straight wires each carrying current I are equally placed as shown in the figure Adjacent wires have current in opposite direction Net magnetic field at point P is



A. $\frac{\mu_0 I}{4\pi}\frac{\ln 2}{\sqrt{3}a}\hat{k}$

B. $\frac{\mu_0 I}{4\pi}\frac{\ln 4}{\sqrt{3}a}\hat{k}$

C. $\frac{\mu_0 I}{4\pi}\frac{\ln 4}{\sqrt{3}a}\left(-\hat{k}\right)$

D. Zero

Answer: B

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9. A particle is thrown over a triangle from one end of a horizontal base and after grazing the vertex falls on the other end of the base. If α and β be the base angles and θ the angle

of projection, prove that $\tan\theta = \tan\alpha + \tan\beta$.

A. $\tan\alpha + \tan\beta$

B. $\sin\alpha + \sin\beta$

C. $\tan\alpha + \sin\beta$

D. $\cos\alpha + \cos\alpha$

Answer: A

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10. A radioactive nucleus (initial mass number A and atomic number Z) emits 3α-particles and 2 positrons. The ratio of number of neutrons to that of protons in the final nucleus will be

A. $\frac{A-Z-8}{Z-4}$

B. $\frac{A-Z-4}{Z-8}$

C. $\frac{A-Z-12}{Z-4}$

D. $\frac{A-Z-4}{Z-2}$

Answer: B

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11. A particle of mass m moving along x-axis has a potential energy $U(x) = a + bx^2$ where a and b are positive constant. It will execute simple harmonic motion with a frequency determined by the value of

A. b and m alone

B. b, a and m alone

C. b alone

D. b and a alone

Answer: A

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12. When light of wavelength 300 nm or less falls on aphotoelectric emitter A, photoelectrons are emitted. For another emitter B, light of wavelength 600 nm is sufficient for releasing photoelectorns. The ratio of the work function of emitter A to B is

A. $1:4$

B. $4:1$

C. $2:1$

D. $1:2$

Answer: C

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13. The edges of an aluminum cube are $10cm$ long. One face of the cube is firmly fixed to a vertical wall. A mass of $100kg$ is then attached

to the opposite face of the cube. Shear modulus of aluminum is $25 \times 10^9 Pa$, the vertical deflection in the face to which mass is attached is

A. $3.92 \times 10^{-7} m$

B. $5.98 \times \ \times 10^{-7} m$

C. $2.72 \times 10^{-7} m$

D. $4.82 \times 10^{-7} m$

Answer: A

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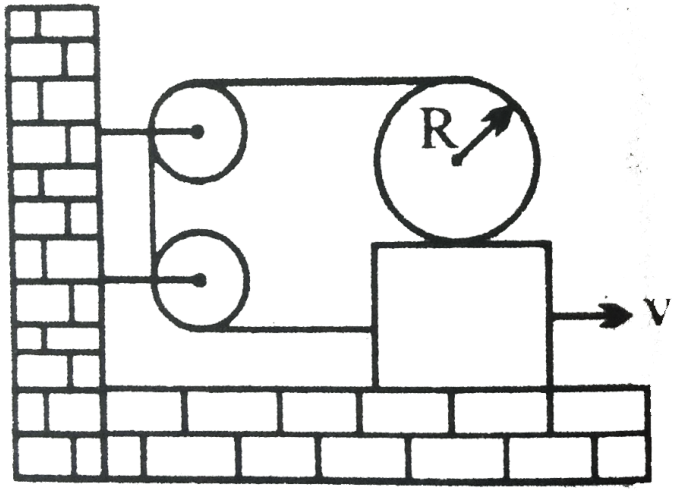
14. In the figure shown, the plank is being pulled to the right with a constant speed v. If the cylinder does not slip then:



A. The speed of centre of mass of the cylinder is 2v

B. The speed of the centre of mass of the cylinder is v

C. The angular velocity of the cylinder is $\frac{v}{r}$

D. The angular velocity of the cylinder is zero

Answer: C

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15. The contribution in the total current flowing through a semiconductor due to electrons and holes are $\frac{3}{4}$ and $\frac{1}{4}$ respectively. If the drift velocity of electrons is $\frac{5}{2}$ times that of holes at this temperature, then the ratio of concentration of electrons and holes is

A. $6:5$

B. $5:6$

C. $3:2$

D. $2:3$

Answer: A

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16. Determine the lengths of an iron rod and copper ruler at 0° C if the difference in their lengths at 50°C and 450°C is the same and is equal to 2 cm. the coefficient of linear expansion of iron $= 12 \times 10^{-6}/K$ and that of copper $= 17 \times 10^{-6}/K$.

A. 20.06m, 20.08m

B. 21.0 m, 7.00 m

C. 60.30 cm, 10.10 m

D. 11.09 m, 15.10 m

Answer: A

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17. What is the dimensional formula of gravitational constant ?

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

B. $\left[ML^{-1}T^{-1}\right]$

C. $\left[M^{-1}L^{3}T^{-2}\right]$

D. None of these

Answer: C

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18. At t=0, a transverse wave pulse in a wire is described by the function $y = 6/\left(x^2 - 3\right)$ where x and y are in metres. The function y(x,t) that describes this wave equation if it is

travelling in the positive x direction with a speed of $4.5m/s$ is

A. $y = \frac{6}{(x + 4.5t)^3 - 3}$

B. $y = \frac{6}{(x - 4.5t^2) + 3}$

C. $y = \frac{6}{(x + 4.5t)^2 - 3}$

D. $y = \frac{6}{(x - 4.5t)^2 + 3}$

Answer: D

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19. A uniform chain of length L and mass M is lying on a smooth table and one-third of its length is hanging vertically down over the edge of the table. If g is the acceleration due to gravity, the work required to pull the hanging part on to the table is

A. MgL

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

C. $\frac{MgL}{9}$

D. $\frac{MgL}{18}$

Answer: D

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20. The drift velocity of the electrons in a copper wire of length 2 m under the application of a potential difference of 220V is $0.5ms^{-1}$. Their mobility (in $m^2v^{-1}s^{-1}$)

A. 2.5×10^{-3}

B. 2.5×10^{-2}

C. 5×10^{2}

D. 4.5×10^{-3}

Answer: D

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21. When an object is viewed with a light of wavelength 6000Å under a microscope, its resolving power is 10^4. The resolving power of the microscope when the same object is viewed with a light of wavelength 4000Å, is $n \times 10^3$. The vlaue of n is

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22. What is the radius of the imaginary concentric sphere that divides the electrostatic field of a metal sphere of a radius 20 cm and change of $8\mu C$ in two regions of identical energy?

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23. If one mole of a monoatomic gas $(\gamma = 5/3)$ is mixed with one mole of a

diatomic gas $(\gamma = 7/5)$ the value of γ for the mixture is .

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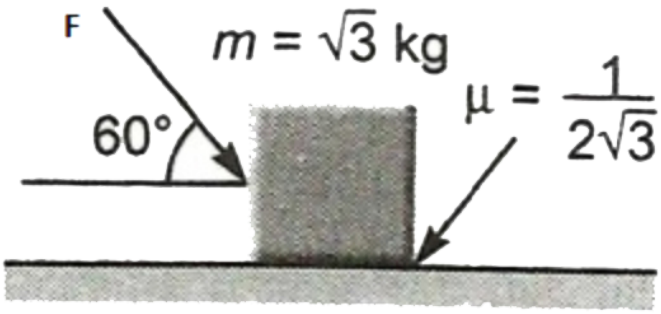
24. What is the maximum value of the force F (in newton) such that the block shown in the arrangement, does not move ?



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25. An object is placed at a distance of 15cm from a convex lenx of focal length 10cm. On the other side of the lens, a convex mirror is placed at its focus such that the image formed by the combination coincides with the object itself. The focal length of the convex mirror is

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