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PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 61

Physics

1. As par Bohr model, the minimum energy (in eV) required to remove an electron from the

ground state of doubly ionized Li atom $(Z = 3)$ is

A. 40.8

B. 13

C. 122.4

D. 1.51

Answer: C

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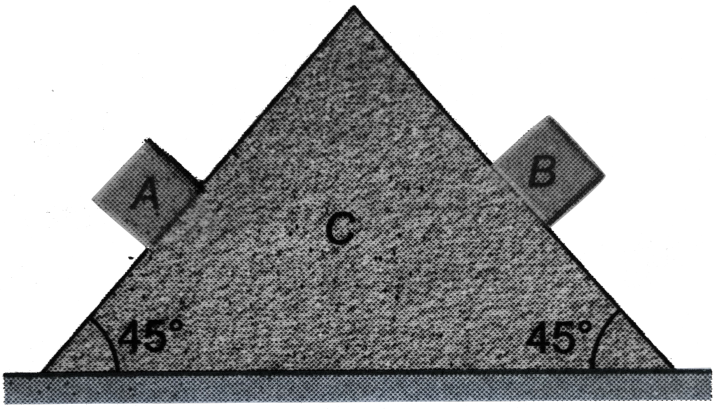
2. Two blocks A and B of equal masses are released on two sides of a fixed wedge C as shown in figure. Find the acceleration of centre of mass of blocks A and B. Neglect friction.



A. $\frac{g}{2}$, downwards

B. g, downwards

C. $\frac{g}{2}$, upwards

D. $\frac{3}{4}g$, downwards

Answer: A

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3. A thin magnetic needle oscillates in a horizontal plane with a period T. It is broken into n equals parts. The time period of each part will be

A. T

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

C. nT

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

Answer: B

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4. Two cylindrical conductors with equal cross-sections and different resistivites ρ_1 and ρ_2 are point end to end. Find the charge at the

boundary of the conduction if a current I flows from conductor 1 to conductor 2

A. $\varepsilon_0(\rho_2 - \rho_1)l$

B. $\varepsilon_0(2\rho_2 + \rho_1)l$

C. $2\varepsilon_0(\rho_1 - \rho_2)l$

D. $\varepsilon_0(\rho_1 + \rho_2)l$

Answer: A

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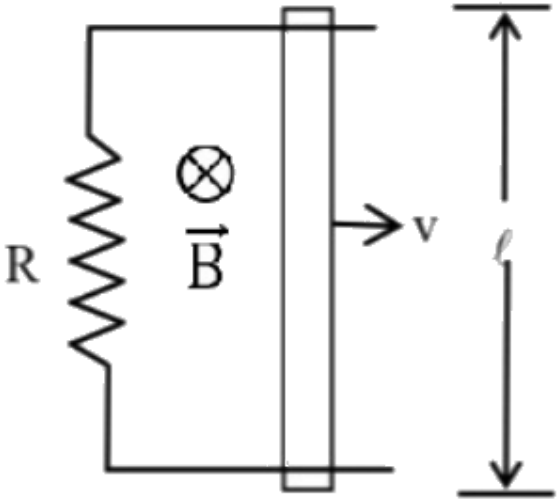
5. A conducting rod of resistance r moves uniformly with a constant speed v in a uniform magnetic field. If the rod keeps moving uniformly, then the amount of force required is



A. $\frac{vB^2l^2}{R}$

B. $\frac{2vB^2l^2}{(R+r)}$

C. $\frac{vB^2l^2}{(R+r)}$

D. zero

Answer: C

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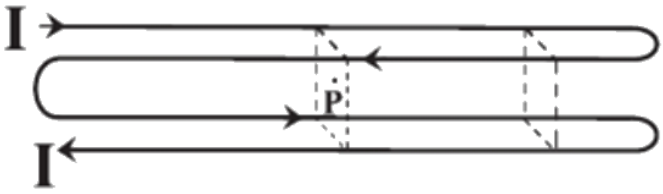
6. Four very long wires are arranged as shown in the figure, so that their cross - section forms a square, with connections at the ends so that current I flow through all four wires.

Length of each side of the formed such square is b. The magnetic field at the central point P (centre of the square) is



A. $\frac{\mu_0 I}{\pi b}$

B. $\frac{2\mu_0 I}{\pi b}$

C. 0

D. $\frac{\mu_0 I}{\sqrt{2}\pi b}$

Answer: B

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7. A superconducting loop of radius R has self inductance $L.A$ uniform & constant magnetic field B is applied perpendicular to the plane of the loop.Initially current in this loop is zer.The loop is rotated about its diameter by 180° .Find the current in the loop after rotation.

A. zero

B. $\frac{B\pi R^2}{L}$

C. $\frac{2B\pi R^2}{L}$

D. $\frac{B\pi R^2}{2L}$

Answer: C

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8. Air is filled in a bottle and it is corked at $35^\circ C$. If the cork can come out at 3 atmospheric pressure, then upto what temperature should the bottle be heated to remove the cork ?

A. $325.5^\circ C$

B. $851^\circ C$

C. $651^\circ C$

D. None of these

Answer: C

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9. A cylindrical conductor of radius R carrying current i along the axis such that the magnetic field inside the conductor varies as

$B = B_0 r^2 (0 < r \leq R)$, then which of the following in incorrect?

A. Current density at distance 'r' from central axis of the conductor is $J(r) = \frac{2B_0 r}{\mu_0}$

B. Current density at distance 'r' from central axis of the conductor is $J(r) = \frac{3B_0 r}{\mu_0}$

C. Half of the total current would be confined within the radius of $\frac{R}{(2)^{\frac{1}{3}}}$ of

the conductor

D. For $r > R$ magnetic field would vary as

$$B(r) = \frac{B_0 R^3}{r}$$

Answer: A

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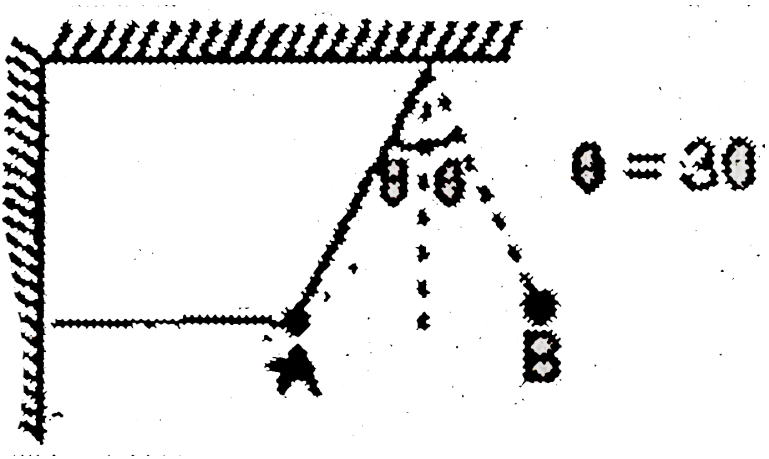
10. A ball is held at rest in position A by two light cords. The horizontal cord is now cut and the ball swings to the position B. What is the ratio of the tension in the cord in position B

to that in position A?



A. $\sin^2 \beta$

B. $\cos^2 \beta$

C. $\tan^2 \beta$

D. $\cos \beta$

Answer: B

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11. A radioactive material decays by simultaneous emission of two particle from the with respective half - lives 1620 and 810 year . The time , in year , after which one - fourth of the material remains is

A. 1080 years`

B. 2340 years

C. 4860 years

D. 3240 years

Answer: A

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12. What is the time period of the seconds pendulum, on a planet similar to earth, but mass and radius three times as that of the earth?

A. 2 s

B. 6 s

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

D. $2\sqrt{3}s$

Answer: D

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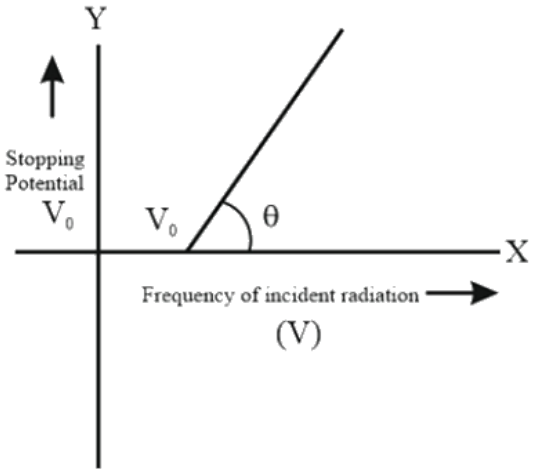
13. The graph between frequency of incident radiations and stopping potential for a given photosensitive material as follows.



What information can be obtained from the value of the intercept on the potential axis ?

A. Work function

B. KE of electrons

C. Stopping potential

D. Frequency of photon

Answer: A

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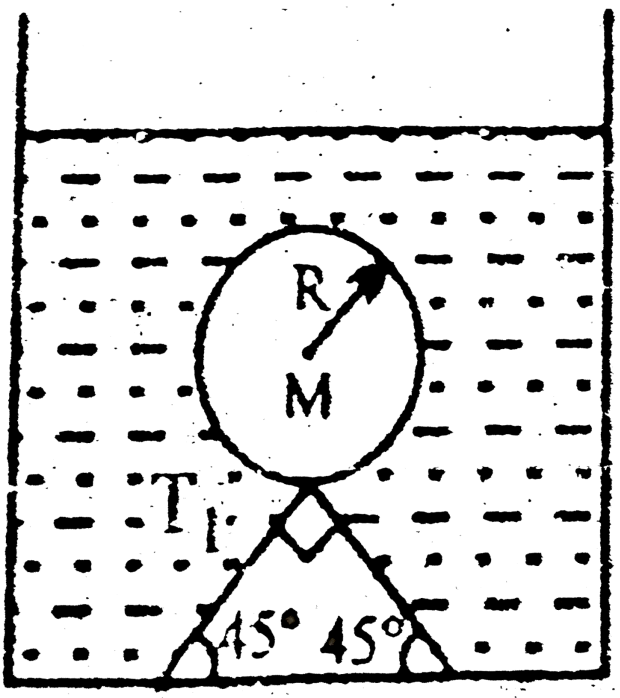
14. A hollow sphere of mass M and radius r is immersed in a tank of water (denstiy ρ_w). The sphere would float if it were set free. The sphere is tied to the bottom of the tank by two wires which makes angle 45° with the horizontal as shown in the figure. The tension

T_1 in the wire is :



A. $\dfrac{\frac{4}{3}\pi R^3 \rho_w g - Mg}{\sqrt{2}}$

B. $\dfrac{2}{3}\pi R^3 \rho_w g - Mg$

C. $\frac{\frac{4}{3}\pi R^3 \rho_w g - Mg}{2}$

D. $\frac{4}{3}\pi R^3 \rho_w g = Mg$

Answer: A

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15. The curvature radii of a concavo-convex glass lens are $20cm$and $60cm$. The convex surface of the lens is silvered .With the lens horizontal, the concave surface is filled with

water. The focal length of the effective mirror is ($\mu$of glass=1.5, $\mu$of water=$4/3$

A. $\frac{90}{13}cm$

B. $\frac{80}{13}cm$

C. $\frac{20}{3}cm$

D. $\frac{45}{8}cm$

Answer: A

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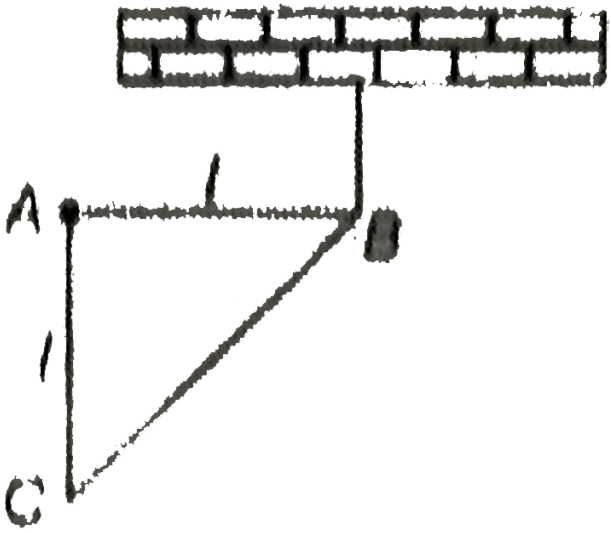
16. A right triangular plate ABC of mass m is free to rotate in the verticle plane about a fixed horizontal axis through A. It is supported by a string such that the side AB is horizontal. The reaction at the support A is



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

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

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

D. mg

Answer: B

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17. A radio transmitter operates at a frequency of $880kHz$ and a power of $10kW$. The number of photons emitted per second are

A. 1.72×10^{31}

B. 1.327×10^{25}

C. 1.327×10^{37}

D. 1.327×10^{45}

Answer: A

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18. A refrigerator absorbs 2000 cal of heat from ice trays. If the coefficient of performance is 4, then work done by the motor is

A. 2100 J

B. 4200 J

C. 8400 J

D. 500 J

Answer: A

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19. In Young's double slit experiment the two slits 0.12 mm apart are illuminated by monochromatic light of wavelength 420 nm.

The screen is 1.0 m away from the slits .

(a) Find the distance of the second (i) bright fringe , (ii) dark fringe from the central maximum .

(b) How will the fringe pattern change if the screen is moved away from the slits ?

A. 7 mm

B. 5.25 mm

C. 6 mm

D. 10 mm

Answer: A

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20. Two uniform wires of a the same material are vibrating under the same tension. If the first overtone of the first wire is equal to the second overtone of the second wire and radius of the first wire is twice the radius of the second wire, then the ratio of the lengths of the first wire to second wire is

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

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

C. $\frac{1}{5}$

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

Answer: A

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21. A particle of mass 10 g moves along a circle of the radius $\frac{1}{\pi}$ cm with a constant tangential acceleration. What is the magnitude of this acceleration $\left(\text{in ms}^{-1}\right)$ if the kinetic nergy of the particle becomes equal to $8 \times 10^{-4} J$ by

the end of the second revolution after the beginning of the motion? (Particle starts from rest)

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22. A point source of light of power P_0 is placed at a distance of 4 m from the centre of a thin hemispherical shell as shown in the figure, The shell has a radius of 3 m and it behaves like a perfect black body. If the temperature of the hemisphere is related to

the power of the sourcec as $T^4 = \frac{p_0}{n\pi\sigma}$ where σ is the stefan's constant, then find the value of $\frac{n}{10}$.

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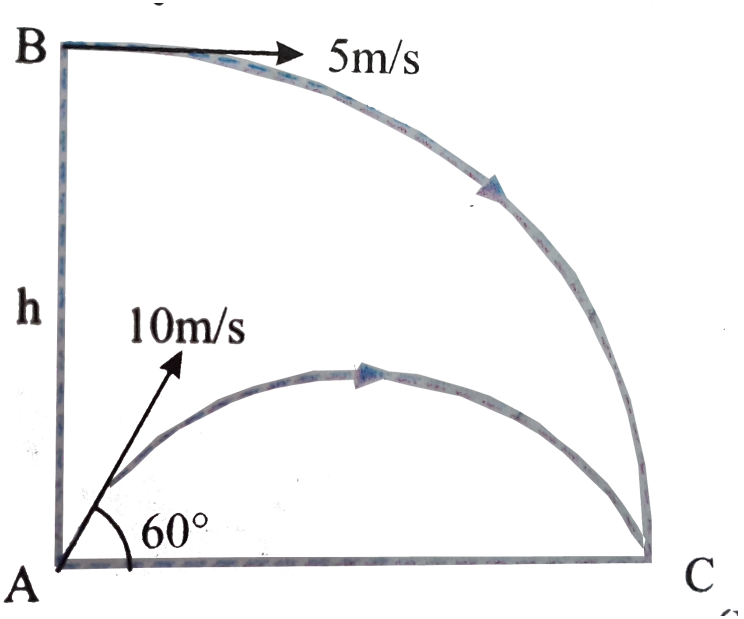
23. A particle A is projected from the ground with an initial velocity of $10m/s$ at an angle of 60° with horizontal. From what height should an another particle B be projected horizontally with velocity $5m/s$ so that both the particles collide in ground at point C if

both are projected simultaneously

$g = 10m/s^2$.



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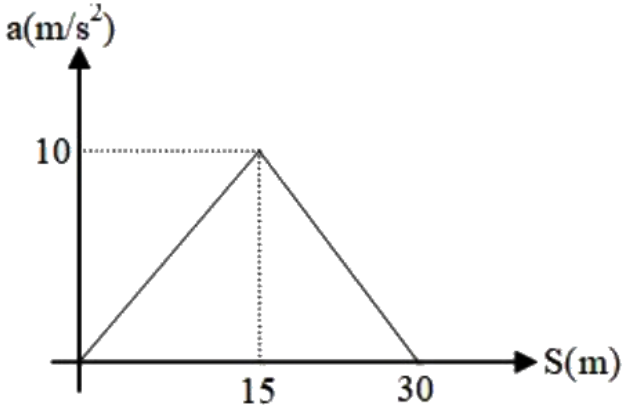
24. A particle moves along a straight line with a variable acceleration given in the

acceleration - displacement $(a - S)$ curve as shown in the figure. Determine the velocity $\left(\text{in ms}^{-1}\right)$ of the particle after it has travelled a distance of 30 m. The initial velocity is $10\ \text{ms}^{-1}$.



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25. A particle moves with a velocity of $\left(4\hat{i}-2\hat{j}+2\hat{k}\right)ms^{-1}$ under the influence of a constant force $\overrightarrow{F}=\left(10\hat{i}+3\hat{j}-2\hat{k}\right)N$. The instantaneous power applied to the particle is

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