PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 44

Physics

1. In a hypothetical atom, if transition from $n = 4$ to $n = 3$ produces visible light then the

possible transition to obtain infrared radiation is:

A. n=5 to n=3

B. n=4 to n=2

C. n=3 to n=1

D. n=5 to n=4

Answer: D

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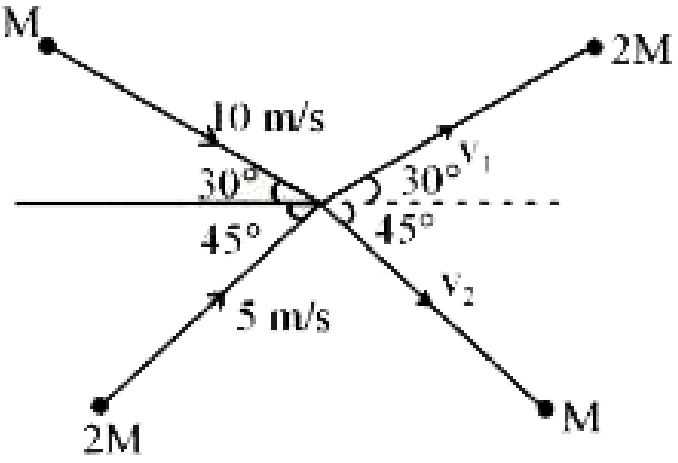
2. Two particles of masses M and 2M, moving as shown, with speeds of 10 m/s and 5 m/s, collide elastically at the origin. After the collision, they move along the indicated diretions with speeds v_1 and v_2 respectively. The value of v_1 and v_2 are nearly:



A. $6.5ms^{-1}$ and $3.2ms^{-1}$

B. $3.2ms^{-1}$ and $12.6ms^{-1}$

C. $13.02ms^{-1}$ and $19.7ms^{-1}$

D. $3.2ms^{-1}$ and $6.3ms^{1}$

Answer: C

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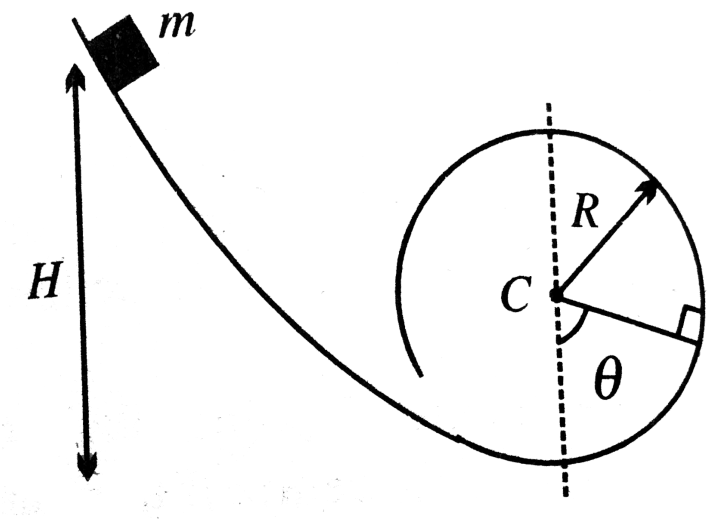
3. A particle of mass m is released from a height H on a smooth curved surface which ends into a vertical loop of radius R, as shown.

Choose the correct alernative(s) if $H = 2R$.



A. the particle reaches the top of the loop with zero velocity

B. the particle reaches the top of the loop with a non- zero velocity

C. the particle breaks off at a height h=r from base

D. the particle breaks off at a height $r < h < 2r$

Answer: D

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4. A very small sphere having a charge q, uniformly distributed throughout its volume,

is placed at the vertex of a cube of side a. The electric flux through the cube is

A. $\frac{q}{\varepsilon_0}$

B. $\frac{q}{3\varepsilon_0}$

C. $\frac{q}{6\varepsilon_0}$

D. $\frac{q}{8\varepsilon_0}$

Answer: D

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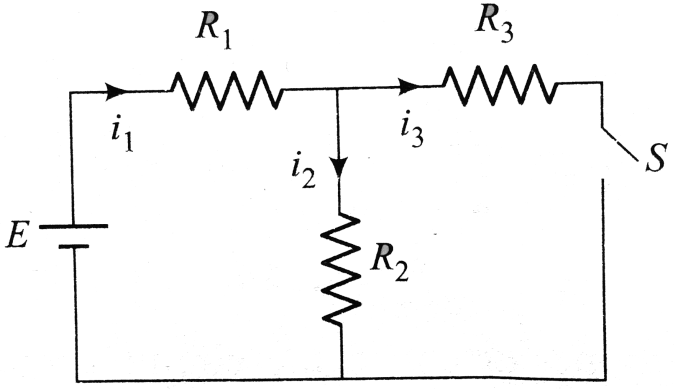
5. In the circuit shows in Fig $E = 15V$, $R_1 = 1\Omega$, $R_2 = 1\Omega$, $R_3 = 2\Omega$, and $L = 1.5H$. The currents flowing through R_1, R_2,and R_3 are i_1, i_2, and i_3, respectively.



Immediately after connecting switch S,

A. $i_1 = 0A$ and $\dfrac{di_3}{dt} = 0As^{-1}$

B. $i_1 = 0A$ and $\dfrac{di_3}{dt} \neq 0As^{-1}$

C. $i_3 = 0A$, and rate at which magnetic energy stored is not zero

D. None of these

Answer: B

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6. A non-conducting ring of radius $0.5m$ carries a total charge of 1.11×10^{-10}C distributed non-uniformly on its circumference producing an electric field E everywhere is

space. The value of the integral $\int_{l=\infty}^{l=0} -E.\,dI(l=0$ being centre of the ring) in volt is

A. $+2$

B. -1

C. -2

D. Zero

Answer: A

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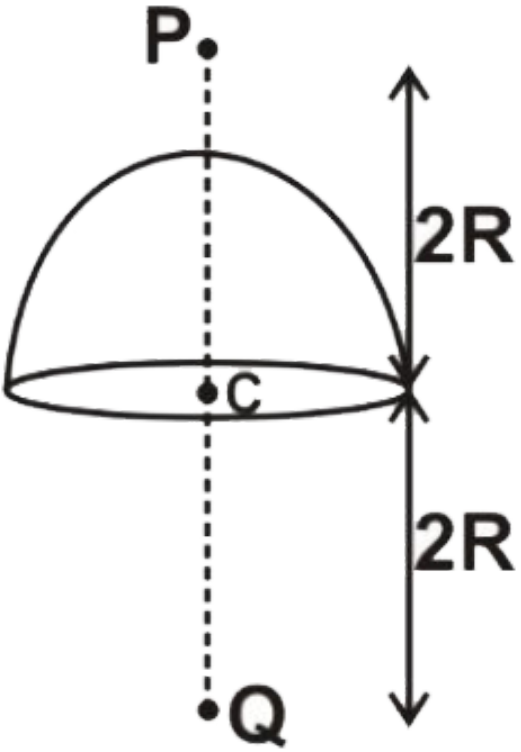
7. If gravitational field due to uniform thin hemispherical shell at point P is I, then the magnitude of gravitational field at Q is (Mass of hemispherical shell is M, radius is R)



A. $\frac{GM}{2R^2} - I$

B. $\frac{GM}{2R^2} + I$

C. $\frac{GM}{4R} - I$

D. $2I - \frac{GM}{2R^2}$

Answer: A

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8. Three discs, A, B and C having radii 2m, 4m and 6m respectively are coated with carbon black on their outer surfaces. The wavelengths

corresponding to maximum intensity are $300nm, 400nm$ and $500nm$, respectively. The power radiated by them are Q_A, Q_B and Q_C respectively

(a) Q_A is maximum (b) Q_B is maximum (c) Q_C is maximum (d) $Q_A = Q_B = Q_C$

A. Q_A is maximum

B. Q_B is maximum

C. Q_C is maximum

D. $Q_A = Q_B = Q_C$

Answer: B

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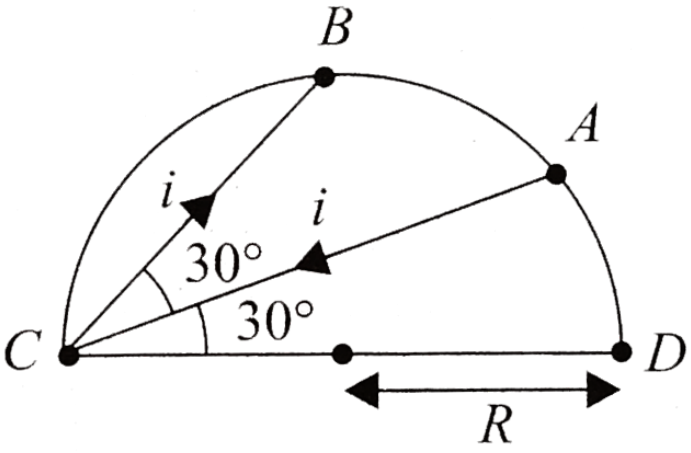
9. A current carrying wire is placed in the grooves of an insulating semicircular disc of radius 'R', as shown in Fig. The current enters at point A and leaves from point B. Determine the magnetic field at Point D.



A. $\frac{\mu_0 l}{8\pi R\sqrt{3}}$

B. $\frac{\mu_0 l}{4\pi R\sqrt{3}}$

C. $\frac{\sqrt{3}\mu_0 l}{4\pi R}$

D. none of these

Answer: B

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10. A particle is projected at time t=0 from a point P on the ground with a speed v_0, at an angle of 45° to the horizontal. Find the

magnitude and direction of the angular momentum of the particle about P at time $t = v_0 / g$

A. $0.25mv_0^3 / g$

B. $0.35mv_0^3 / g$

C. $0.50mv_0^3 / g$

D. $0.60mv_0^3 / g$

Answer: B

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11. Which, among the following, is a correct statement?

A. binding energy of a nucleus is always negative

B. binding energy of a nucleus may be positive

C. higher value of binding energy per nucleon means the nucleus is more unustable

D. higher value of binding energy per nucleon means the nucleus is more stable

Answer: D

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12. Light of wavelength 4000Å is allowed to fall on a metal surface having work function 2 eV. The maximum velocity of the emitted

electrons is

$\left(h = 6.6 \times 10^{-34} Js\right)$

A. $1.35 \times 10^5 ms^{-1}$

B. $2.7 \times 10^5 ms^{-1}$

C. $6.2 \times 10^5 ms^{-1}$

D. $8.1 \times 10^5 ms^{-1}$

Answer: C

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13. The workdone in increasing the size of a soap film from $10cm \times 6cm$ to $10cm \times 11cm$ is $3 \times 10^{-4} J$. The surface tension of the film is

A. $1.5 \times 10^{-2} Nm^{-1}$

B. $3.0 \times 10^{-2} Nm^{-1}$

C. $6.0 \times 10^{-2} Nm^{-1}$

D. $11.0 \times 10^{-2} Nm^{-1}$

Answer: B

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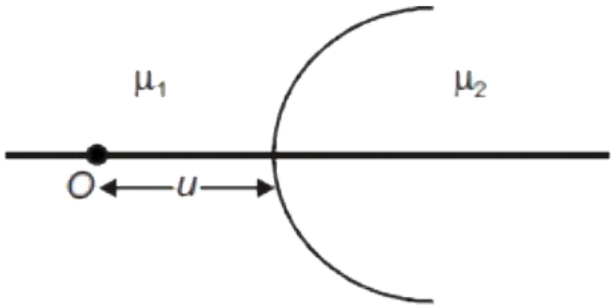
14. The diagram shows a spherical surface which separates two media of refractive index, μ_1 and μ_2. Respectively. Now, a point object is placed on the principal axis as shown in the figure. Then



A. Real image will form if $\mu_1 > \mu_2$ and for all values of u

B. Real image for some values of u if $\mu_1 > \mu_2$

C. Virtual image will form if $\mu_1 > \mu_2$

D. Virtual image will form if $\mu_1 < \mu_2$

Answer: C

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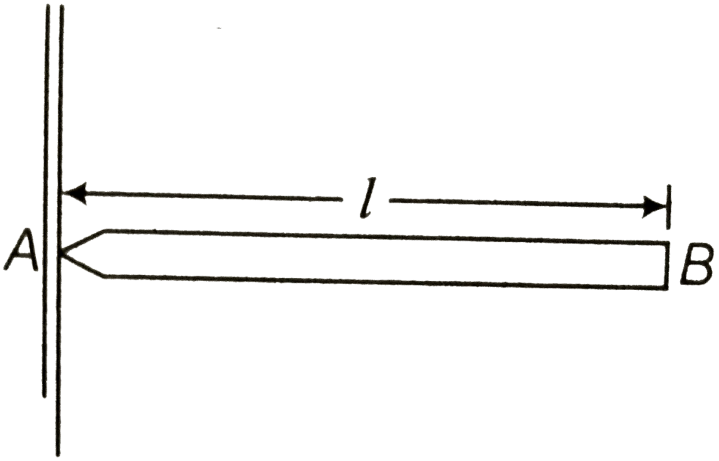
15. A uniform rod AB of length l and mass m is free to rotate about point A. The rod is released from rest in the horizontal position. Given that the moment of inertia of the rod about A is $\frac{ml^2}{3}$, the initial angular acceleration of the rod will be



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

B. $\frac{g(l)}{2}$

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

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

Answer: D

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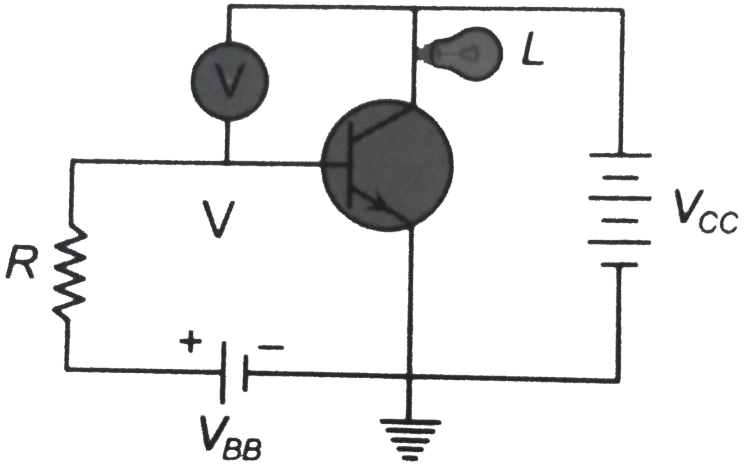
16. In the following circuit, a voltmeter V is connected across a lamp L. What change would occure in voltmeter reading if the

resistance R is reduced in value?



A. Increases

B. Decreases

C. Remains same

D. None of these

Answer: A

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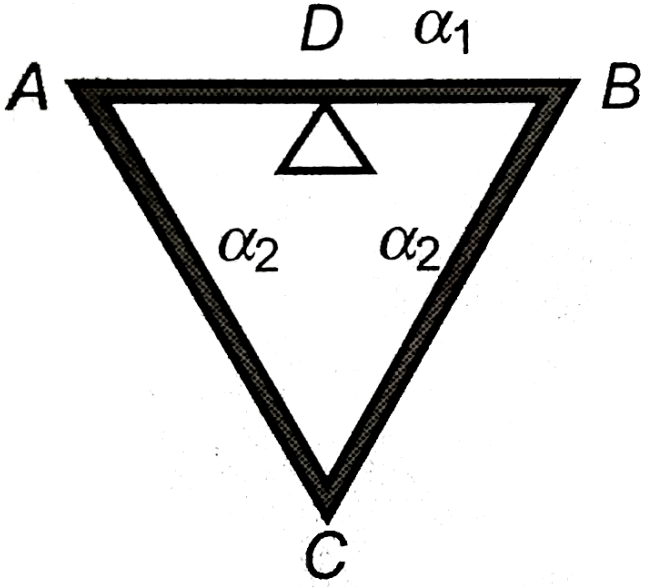
17. Three rods of equal of length are joined to from an equilateral triangle ABC. D is the midpoint of AB. The coefficient of linear expansion is α_1 for AB and α_2 for AC and BC . If the distance DC remains constant for

small changes in temperature,



A. $\frac{l_1}{l_2} = 2\sqrt{\frac{\alpha_2}{\alpha_1}}$

B. $\frac{l_1}{l_2} = 2\sqrt{\frac{\alpha_1}{\alpha_2}}$

C. $\frac{l_1}{l_2} = \sqrt{\frac{\alpha_1}{\alpha_2}}$

D. $\frac{l_1}{l_2} = \sqrt{\frac{\alpha_2}{\alpha_1}}$

Answer: A

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18. Dimensions of permeability are

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

B. $\left[MLT^{-2}\right]$

C. $\left[ML^{0}T^{-1}\right]$

D. $\left[A^{-1}MLT^{-2}\right]$

Answer: A

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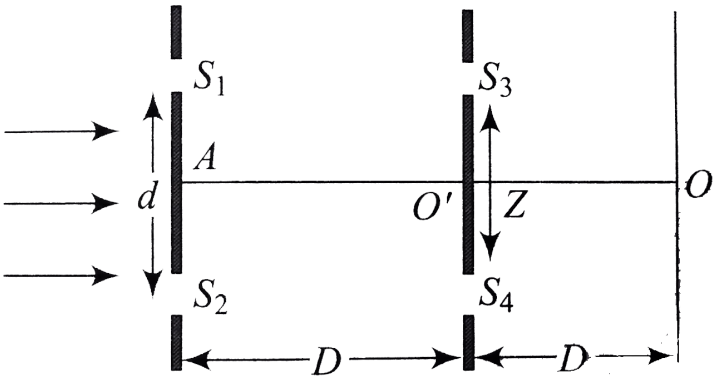
19. In the arrangement shown in Fig., slits S_1 and $S_4$are having a variable separation Z. Point O on the screen is at the common perpendicular bisector of S_1S_2 and S_3S_4.



The minimum value of Z for which the intensity at O is zero is

A. $\frac{\lambda D}{d}$

B. $\frac{2\lambda D}{d}$

C. $\frac{\lambda D}{2d}$

D. $\frac{\lambda D}{3d}$

Answer: A

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20. Astronomers have observed that light coming from far away starts do not show the same spectrum as observed on Earth. Each

wavelength is shifted slightly towards the red end of the spectrum. It is observed that the 1^{st} line of Lyman series shows 121 nm on Earth, but from the star it shows 122nm. The speed of the star with respect to Earth is close to

A. $2.5 \times 10^6 ms^{-1}$

B. $2 \times 10^6 ms^{-1}$

C. $1.5 \times 10^6 ms^{-1}$

D. $0.5 \times 10^6 ms^{-1}$

Answer: A

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21. A wire of length L and 3 identical cells of negligible internal resistance are connected in series. Due to the current, the temperature of the wire is raised by ΔT in a time t. A number N of similar cells is now connected in series with a wire of the same material and cross-section but of length 2L. The temperature of the wire is raised by the same amount ΔT in the same time t. the value of N is

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22. A boy weighing 50kg eats bananas. The energy constant of banan is 100cal , if this energy is used to lift the body from ground, then the height through which his lifted is

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23. A galvanometer of resistance 25Ω is connected to a battery of 2V along with a resistance of 3000Ω. In this case, a full - scale deflection of 30 units is obtained in the

galvanometer. In order or reduce this deflection to 10 units, how much more resistance $(\text{in } \Omega)$ should be added to the circuit in series?

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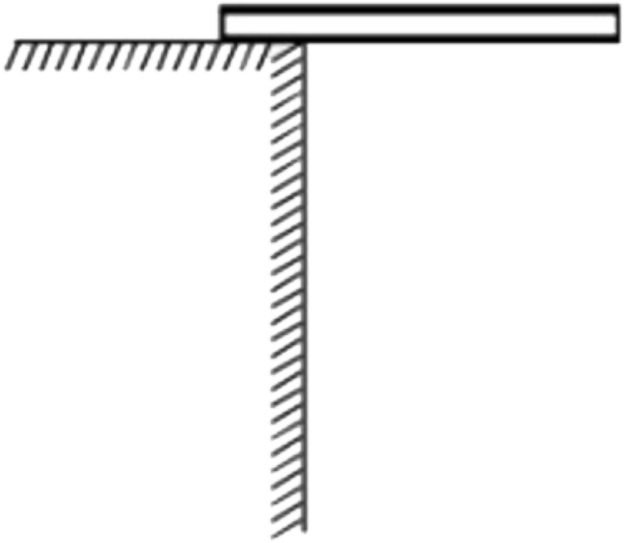
24. One - fourth length of a uniform rod is placed on a rough horizontal surface and it starts rotating about the edge as soon as we release it. The rod starts slipping on the edge when it has turned through an angle θ. If the

coefficient of friction between rod and surface is μ, and it satisfies the relation $x \tan\theta = 4\mu$, then what is the value of x? $[\text{Take } g = 10m/s^2]$



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25. Two particles P_1 and P_2 are performing SHM along the same line about the same meabn position , initial they are at their position exterm position. If the time period of each particle is 12 sec and the difference of their amplitude is $12cm$ then find the minimum time after which the seopration between the particle becomes $6cm$

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