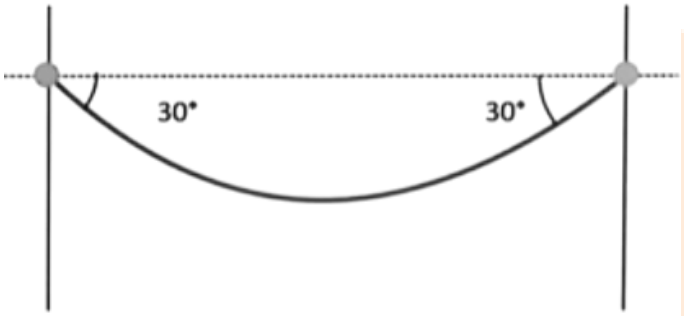
JEE-Main-24-01-2026 (Memory Based)
[EVENING SHIFT]
Physics

Question: A uniform rope is supported by two level pin support as shown in the figure. Mass of the rope is m. Find the tension at midpoint.



Options:

(a) mg

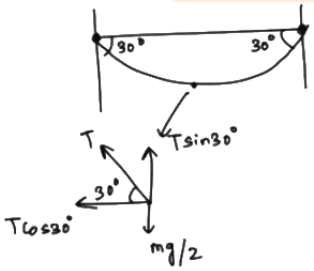
(b) $\frac{mg\sqrt{3}}{2}$

(c) $\frac{mg}{4}$

(d) $\frac{mg}{2}$

Answer: (b)

Solution:



$T\sin 30^\circ = mg/2$ — (i)

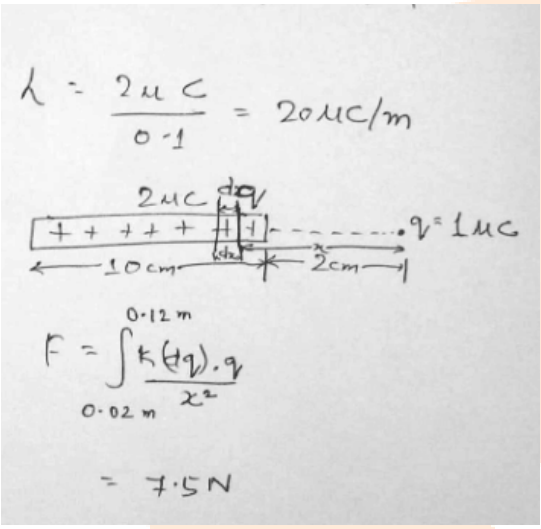
$T' = T\cos 30^\circ$ — (ii)

$\frac{T'}{\frac{mg}{2}} = \cot 30^\circ$

$T' = \frac{mg}{2} \times \sqrt{3} \Rightarrow \left(\frac{mg\sqrt{3}}{2}\right)$

Question: Find force on charge q = 1 μC as due to uniformly charged rod as shown in the figure.

Options:
(a) 7.5 N
(b) 20 N
(c) 2 N
(d) 18 N
Answer: (a)
Solution:



Question: In a vernier callipers; vernier scale has 50 divisions & they coincide with 48 main scale divisions. Then what is the least count of vernier callipers?
Options:
(a) 0.4 mm
(b) 0.04 mm
(c) 0.004 mm
(d) 0.004 mm
Answer: (b)
Solution:

Sol:- Let 1 MSD = 1mm.

Given 50 VSD = 48 MSD

$\therefore$ 1 VSD $= \frac{48}{50}$ MSD

$= \frac{24}{25}$ MSD.

$\therefore$ 1 VSD $= \frac{24}{25}$ mm.

Now. L.C = 1MSD − 1VSD

$= 1 - \frac{24}{25} = \frac{1}{25}$ mm

$\therefore$ LC = 0.04mm

Question: The 5th harmonic of closed organ pipe coincides with the 1st harmonic of open pipe. Find the ratio of t_C/t_0.

Options:

(a) 4/3

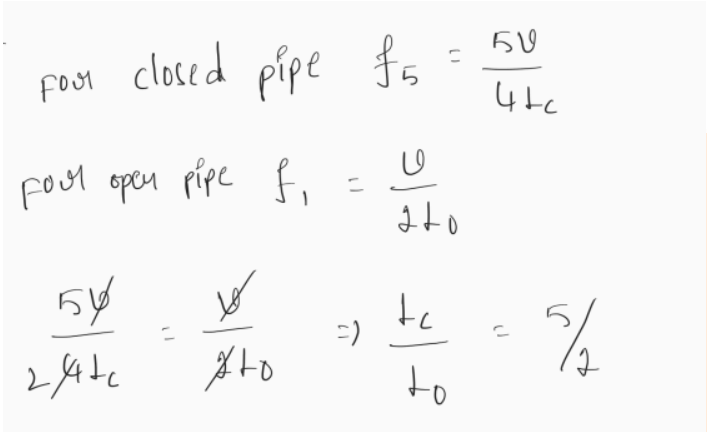
(b) 2/3

(c) 5/2

(d) 3/4

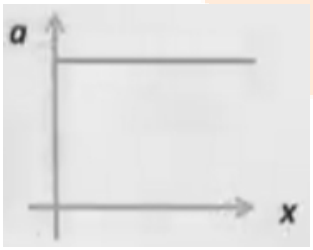
Answer: (c)

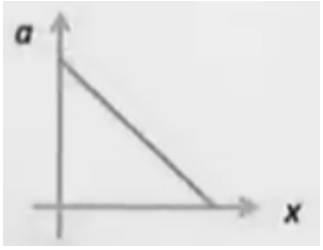
Solution:

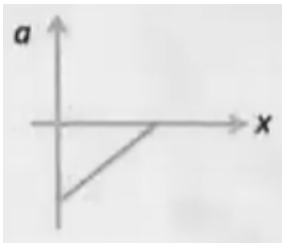


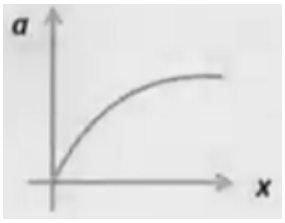
Question: Velocity of particle varies with position as shown in the below graph. Find the correct variation of acceleration with position.

Options:

(a) 

(b) 

(c) 

(d) 

Answer: (c)

Solution:

Ans:- $a = \frac{dv}{dt} \Rightarrow v\frac{dv}{dx}$.

$\frac{dv}{dx} = \left(-\frac{v_0}{x_0}\right) \Rightarrow \frac{v}{v_0} + \frac{x}{x_0} = 1.$

$\frac{v}{v_0} = 1 - \frac{x}{x_0}$

$v = \frac{v_0}{x_0}(x_0 - x)$

$v = \frac{-v_0}{x_0}(x - x_0)$

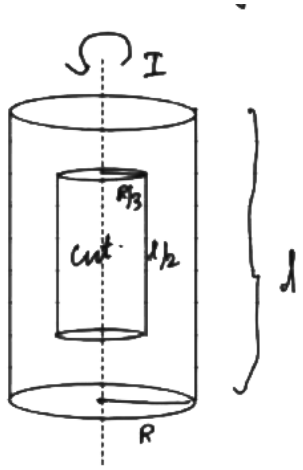
$a = \frac{dv}{dt} \Rightarrow v\frac{dv}{dx}$

$= -\frac{v_0}{x_0}(x - x_0)$

$= \left(\frac{v_0}{x_0}\right)^2 (x - x_0)$

$a = -ve$

Question: A solid cylinder of radius R/3 and length l/2 is cut from a solid cylinder of radius 'R' and length 'l'. Find the ratio of moment of inertia of new solid to old solid about axis passing through centre & parallel to length.



Options:

(a) $\frac{161}{162}$

(b) $\frac{162}{161}$

(c) $\frac{81}{161}$

(d) $\frac{81}{82}$

Answer: (a)

Solution:

$\frac{I_{new}}{I_{old}} = ?$

Now:- Initially; $\boxed{I_{old} = \frac{MR^2}{2}}$

Let mass of cylinder be M.

& Volume mass density $\Rightarrow \rho = \frac{M}{V}$

$\therefore \boxed{M = \rho \cdot \pi R^2 l}$

Now mass of removed cylinder = $\rho \times$ Vol. of rem. cylinder.

$$= \frac{M}{\pi R^2 l} \times \pi \left(\frac{R}{3}\right)^2 \left(\frac{l}{2}\right)$$

$$= \frac{M}{18}.$$

$\therefore$ Moment of inertia of removed cylinder :-

$$I_{removed} = \frac{1}{2} \times \frac{M}{18} \times \left(\frac{R}{3}\right)^2 = \frac{MR^2}{324}.$$

Thus; M.I of remaining i.e.,

$$I_{new} = I_{old} - I_{rem} = \frac{MR^2}{2} - \frac{MR^2}{324}$$

$$\boxed{I_{new} = \frac{161 MR^2}{324}.}$$

$$\therefore \boxed{\frac{I_{new}}{I_{old}} = \frac{\frac{161 MR^2}{324}}{\frac{MR^2}{162}} = \frac{161}{162}}$$

Question: An electron make transition from higher energy orbit (n_2) to loser energy orbit (n_1) in Li^{+2} ion such that $n_1 + n_2 = 4$ & $n_2 - n_1 = 2$. Determine the wavelength emitted in the dimension (in nm)

Options:

(a) 11.4 nm

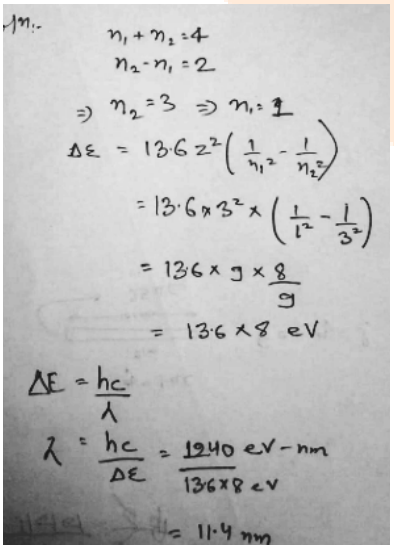
(b) 12.9 nm

(c) 9.2 nm

(d) 16.7 nm

Answer: (a)

Solution:



Question: A bob of mass 'm' is connected to a massless inextensible string of length 1 m. It is suspended as shown and released from an angle of 30° with vertical, Find the velocity of bob at Lowest point ($g = 10\ m/s^2$)

Options:

(a) 1 m/s

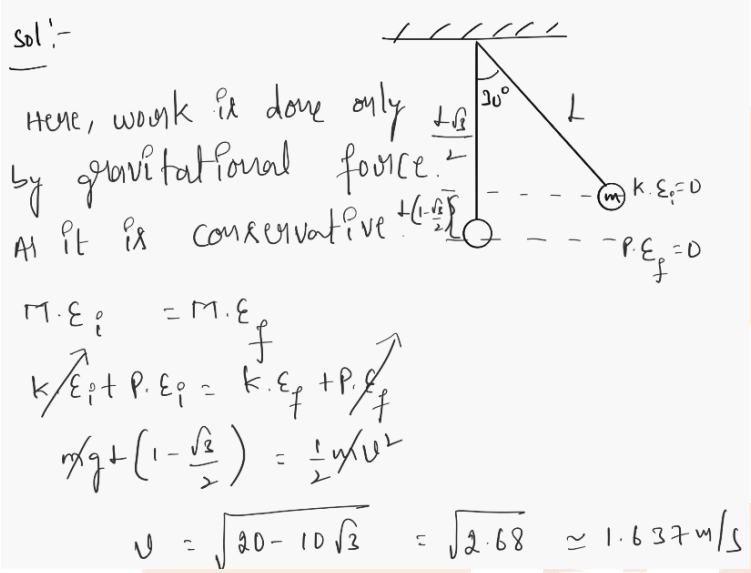
(b) 1.6 m/s

(c) 2.6 m/s

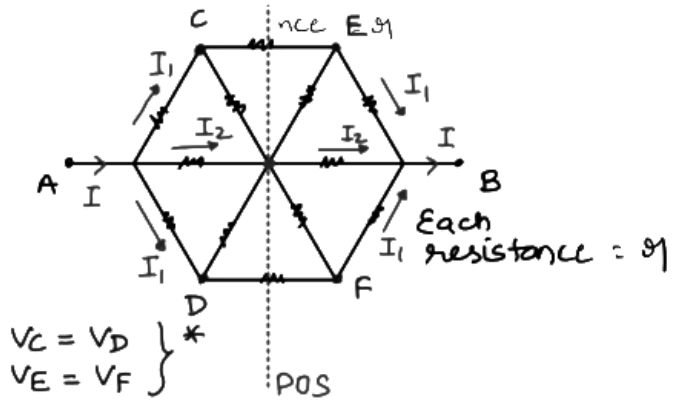
(d) 3 m/s

Answer: (b)

Solution:



Question: A regular hexagon is formed by six identical resistors, each of resistance R. Find the equivalent resistance between two opposite vertices A and B of the hexagon.



Options:

(a) 4R/5

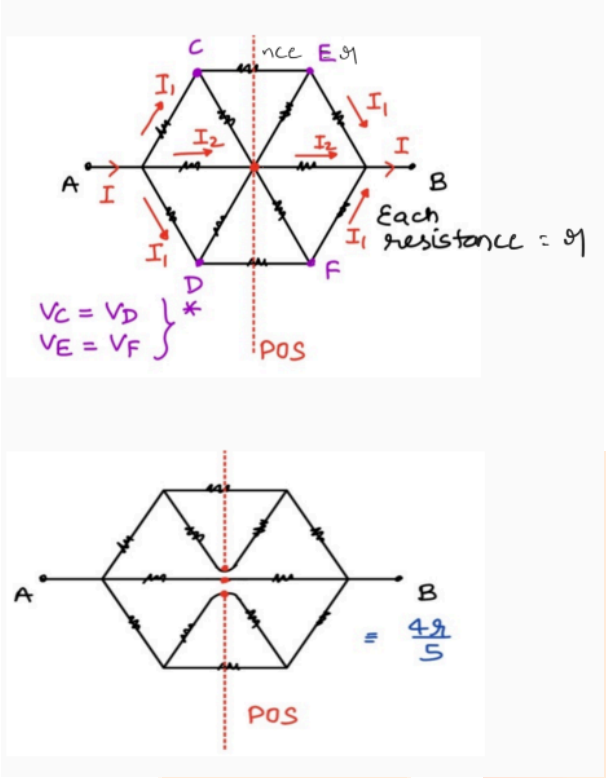
(b) R/2

(c) 3R/2

(d) 2R

Answer: (a)

Solution:



Question: A metal surface has a work function ϕ = 2.4 eV is illuminated by two different radiations of energies 4 eV & 6 eV. What is the ratio of wavelength of emitted photons.

Options:

(a) 2/3

(b) 3/2

(c) 9/4

(d) 4/9

Answer: (c)

Solution:

Sol:- Given work function; $\phi = 2.4eV$

i.e $E_1 = 4eV$; $E_2 = 6eV$.

From photo electric eqn:-

Energy of emitted photons $= E - \phi$.

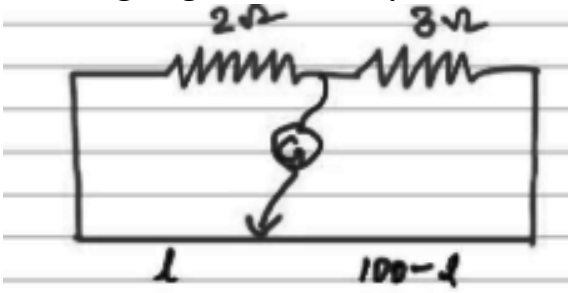
$\therefore E_1' = 4 - 2.4 = 1.6eV$ | $E_2' = 6 - 2.4 = 3.6eV$

Also we Know:- $E = \frac{12400}{\lambda} eV$.

$\therefore \frac{E_1'}{E_2'} = \frac{\lambda_2}{\lambda_1} = \frac{1.6}{3.6} \Rightarrow \frac{\lambda_1}{\lambda_2} = \frac{36}{16}\frac{9}{4}$

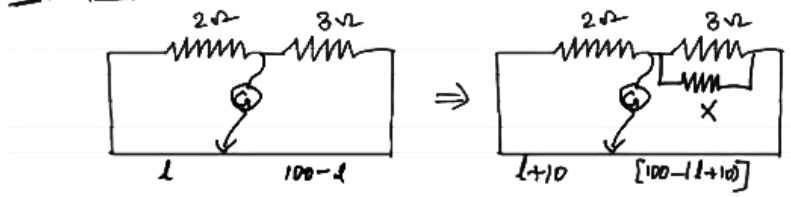
$\therefore \boxed{\frac{\lambda_1}{\lambda_2} = \frac{9}{4}}$

Question: A metre bridge has balancing length 'l' for resistance 2 Ω & 3 Ω on left & right segments respectively. When a shunt resistance of 'X' Ω is connected to 3 Ω; balancing length increased by 10 cm. Then find X =



Options:
(a) 6 Ω
(b) 4 Ω
(c) 3 Ω
(d) 2 Ω
Answer: (a)
Solution:

Sol:- Given:-



Using Wheatstone bridge balance condition:-

$$\frac{2}{l} = \frac{3}{100-l}$$

$$5l = 200$$

$$\boxed{l = 40\text{cm}}$$

Now:-

$$\frac{2}{l+10} = \frac{\frac{3x}{3+x}}{90-l}$$

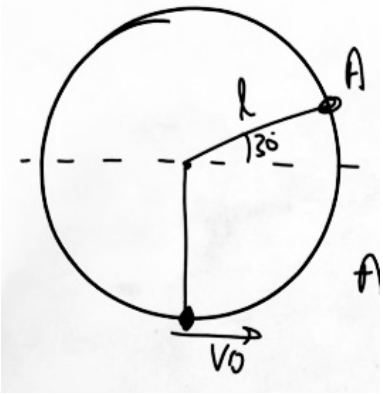
$$\Rightarrow \frac{2}{50} = \frac{\frac{3x}{3+x}}{50}$$

$$\therefore \quad 2 = \frac{3x}{3+x}$$

$$6 + 2x = 3x \quad \Rightarrow \boxed{x = 6\Omega}$$

Integer type

Question: Find the speed at the lowest point, so that tension in string becomes zero at point A.



Options:

(a) $\sqrt{\frac{7gl}{2}}$

(b) $\sqrt{\frac{9gl}{2}}$

(c) $\sqrt{3gl}$

(d) $\sqrt{\frac{gl}{2}}$

Answer: (a)

Solution:

Ans:- By Conservation of energy between point A and B;

$$\frac{1}{2}mv_0^2 = mg\left(l+\frac{l}{2}\right) + \frac{1}{2}mv_A^2$$

$$v_0^2 = 2g\left(\frac{3l}{2}\right) + v_A^2$$

Now; At the point A: $mg\cos 60^\circ = \frac{mv_A^2}{l}$

$$\Rightarrow v_A^2 = g \times \frac{1}{2} \times l \Rightarrow \frac{gl}{2}$$

$$v_0^2 = 3gl + \frac{gl}{2}$$

$$v_0^2 = \frac{7gl}{2}$$

$$v_0 = \sqrt{\frac{7gl}{2}}$$

Question: The current passing through the galvanometer of resistance 100 Ω is 5 mA and it becomes 1 mA after a shunt added. Find the resistance of shunt.

Options:

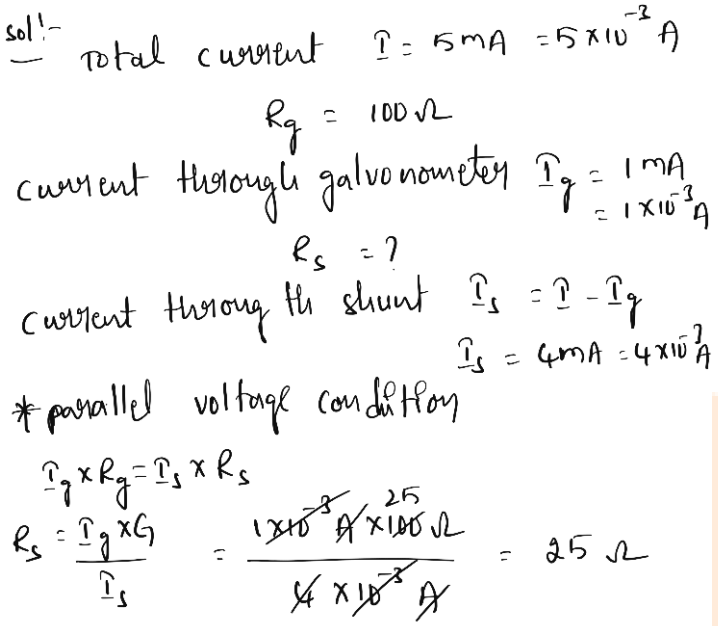
(a) 25

(b) 50 Ω

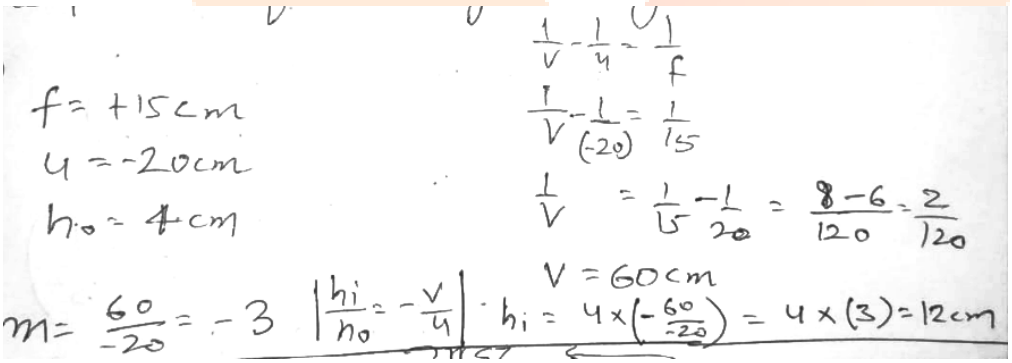
(c) 75 Ω

(d) 100 Ω

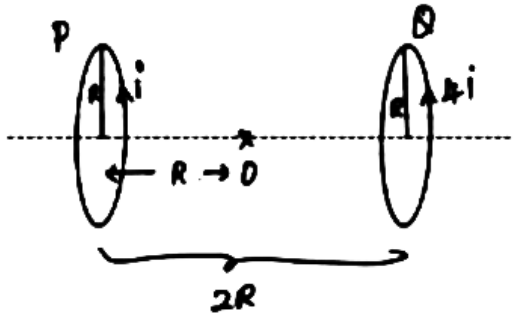
Answer: (a)
Solution:



Question: A converging lens has a focal length of +15 cm. An object with a height of 4 cm is placed 20 cm to the left of the lens. Using a cartesian coordinate system where the lens is at origin, calculate the position of the image along the x-axis.
Options:
(a) 15 cm
(b) 12 cm
(c) 20 cm
(d) 5 cm
Answer: (b)
Solution:



Question: Two rings of radius are separated by a distance '2R' as shown in fig. Then ring 'P' carries current 'i' & the ring Q carries 4i. Identify the direction of magnetic field due to two rings at mid point of distance between rings.



Options:
(a) Towards P
(b) Towards Q
(c) 0
(d) Count be determinant
Answer: (a)
Solution:

Sol:- Magnetic field due to ring carrying current at a point on axis is $B_{axis} = \frac{\mu_0 i R^2}{2(x^2+R^2)^{3/2}}$

$B_P = \frac{\mu_0 i R^2}{2(R^2+R^2)^{3/2}} = \frac{\mu_0 i R^2}{4\sqrt{2}R^3} = \frac{\mu_0 i}{4\sqrt{2}R}$ (left)

$B_Q = \frac{\mu_0 (4i) R^2}{2(R^2+R^2)^{3/2}} = 4\cdot\frac{\mu_0 i R^2}{4\sqrt{2}R^3} = 4\frac{\mu_0 i}{4\sqrt{2}R}$ (left).

$\therefore B_{Net} = B_P + B_Q$.

Thus Net magnetic field will be towards left.
i.e., Towards P.

Question: A soap bubble of diameter 7 cm and 11 cm diameter is increased to 14 cm. If change in surface energy (15000 - x)μJ. Find x. (s = 0.09 N/m)
Options:
(a) 208
(b) 216
(c) 432
(d) 512
Answer: (b)
Solution:

change in Surface energy is given by $\Rightarrow \Delta U = 8\pi (R_2^2 - R_1^2) \times S$.

$\Rightarrow 8 \times 3.14 \times 4 \times 10^{-2} (147) \times 10^{-4}$

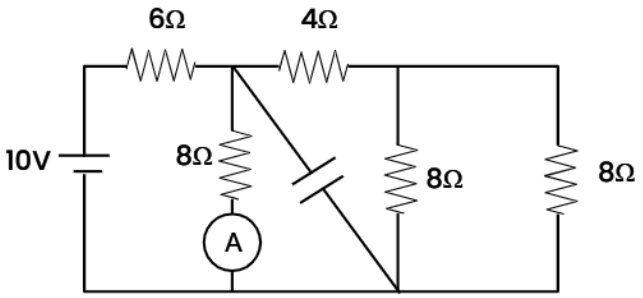
$\Rightarrow 8 \times 3.14 \times 4 \times 147 \times 10^{-6}$

$\Rightarrow 14770.56 \times 10^{-6}$ J

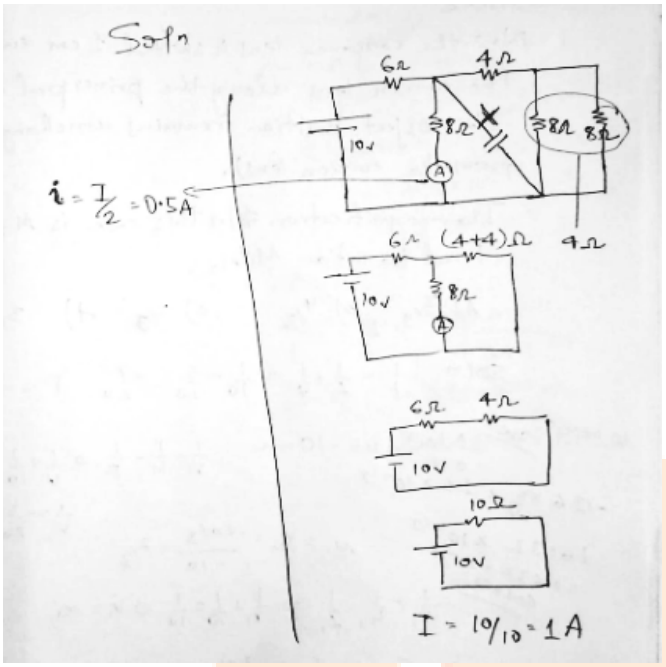
$\Rightarrow (15000 - 229.44) \times 10^{-6}$ J

$\simeq \boxed{x = 216}$ (closest answer)

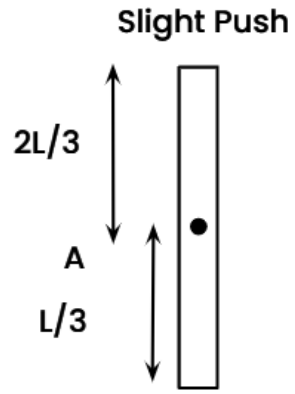
Question: Find current through ammeter (in A).



Options:
(a) 1
(b) 0.5
(c) 2
(d) 0.75
Answer: (a)
Solution:



Question: Find when rod becomes horizontal.



Options:

(a) $\sqrt{\frac{3g}{L}}$

(b) $\sqrt{\frac{2g}{L}}$

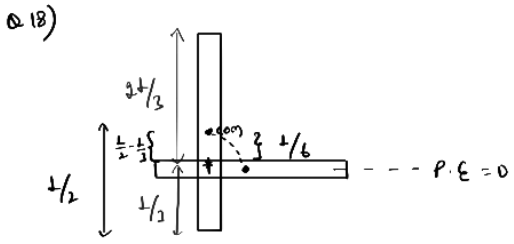
(c) $\sqrt{\frac{g}{L}}$

(d) $\sqrt{\frac{5g}{L}}$

Answer: (a)

Solution:

Q 18)



Sol:- At the work is done here by gravitational force alone.

$K.E_i + P.E_i = K.E_f + P.E_f$

$mg\frac{L}{6} = \frac{1}{2} I \omega^2$

$I = I_c + md^2$

$I = \frac{mL^2}{12} + \frac{mL^2}{36}$

$I = mL^2\left(\frac{4+1}{36}\right)$

$I = mL^2/9$

$\frac{mg}{6} = \frac{1}{2}\frac{mL^2}{9}\omega^2$

$\omega = \sqrt{\frac{3g}{L}}$

option A.

Question: A cube of side 8 cm having density 600 kg/m^3 is floating in a liquid of density 900 kg/m^3. Find height of cube inside liquid.

Options:

(a) $\frac{8}{3}$cm

(b) $\frac{16}{3}$cm

(c) $\frac{4}{3}$cm

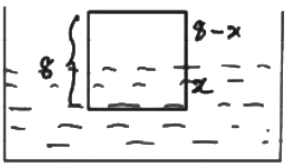
(d) $\frac{2}{3}$cm

Answer: (b)

Solution:

From Laws of floatation.

$\frac{V_{in}}{V} = \frac{\rho_s}{\rho_l}$



$\frac{A \times h_{in}}{A \times h} = \frac{600}{900}$ $\Rightarrow \boxed{x = \frac{16}{3}\text{cm}}$

$\frac{x}{8} = \frac{4^2}{9_3}$

Question: When monochromatic light of wavelength λ is incident on a photoelectric emitter, the stopping potential is 3.2 V. When light of wavelength 2λ is incident on the same emitter, the stopping potential becomes 0.7 V. Determine the value of λ.

Options:

(a) 242 nm

(b) 248 nm

(c) 348 nm

(d) 148 nm

Answer: (b)

Solution:

$$2.5\,eV = \frac{hc}{2\lambda}$$

$$2.5\,eV = \frac{1}{2}\left(\frac{1240}{\lambda(nm)}\right)$$

$$KE_{max} = \frac{hc}{\lambda} - \phi$$

$$3.2\,eV = \frac{hc}{\lambda} - \phi$$

$$0.7\,eV = \frac{hc}{2\lambda} - \phi$$

$$\lambda = 248\ nm$$

Question: Two nucleon reactions are given below:

$He_2^3 + n \rightarrow He_2^4 + 20$ MeV

$He_2^4 + n \rightarrow He_2^5 - 0.9$ meV

Find stability order of He_2^3, He_2^4, He_2^5.

Options:

(a) $He_2^5 > He_2^3 > He_2^4$

(b) $He_2^3 > He_2^4 > He_2^5$

(c) $He_2^4 > He_2^5 > He_2^3$

(d) $He_2^4 = He_2^5 > He_2^3$

Answer: (c)