

JEE-Main-21-01-2026 (Memory Based)
[EVENING SHIFT]
Physics

Question: A big drum of radius 'r' had a block of mass 'm' stucked to its wall & it has coefficient of friction ' μ ' & rotating with ' ω ' rad/s. For what value of ' ω ' will the block stick to the wall?

Answer: ($\omega = \sqrt{\frac{g}{\mu r}}$)

Solution:

$$f = mg.$$

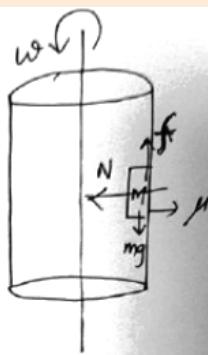
$$N = \frac{mv^2}{r} = m\omega^2 r$$

$$\mu N = mg.$$

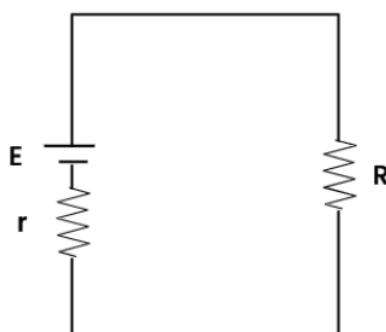
$$\mu \cdot \mu r \omega^2 r = mg$$

$$\omega^2 = \frac{g}{\mu r}$$

$$\Rightarrow \boxed{\omega = \sqrt{\frac{g}{\mu r}}}$$



Question: In a circuit there is a battery with internal resistance r and Emf E , which is connected to external load resistance R as shown. Find value of R so that maximum power dissipated across R .



Options:

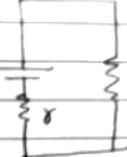
- (a) $R = r$
- (b) $R = r/2$
- (c) $R = \sqrt{2} r$
- (d) $R = 2r$

Answer: (a)

Solution:

Current, $I = \frac{E}{R+r}$

Power, $P = I^2 R$

$$= \frac{E^2 \cdot R}{(R+r)^2}$$


for max. Power:-

$$\frac{dP}{dR} = 0$$

$$\Rightarrow \frac{E^2 (R+r)^2 - 2R(R+r)}{(R+r)^2} = 0$$

$$\Rightarrow R = r$$

Question: A spherical ball of radius 6 mm falls through a viscous fluid and attains terminal velocity of 20 m/s. If another spherical ball of same material and density but of radius 3 mm falls through the same fluid, Find V_T .

Answer: (5 m/s)

Solution:

$$V_T \propto r^2$$

$$r_1 = 6 \text{ mm}, V_1 = 20 \text{ m/s}$$

$$r_2 = 3 \text{ mm}, V_2 = ?$$

$$\frac{V_2}{V_1} = \left(\frac{r_2}{r_1} \right)^2 = \left(\frac{3}{6} \right)^2 = \frac{1}{4}$$

$$\Rightarrow V_2 = V_1 \times \frac{1}{4} = 20 \times \frac{1}{4} = \underline{\underline{5 \text{ m/s}}}$$

Question: A particle of mass $m = 9.1 \times 10^{-31} \text{ kg}$ and charge $e = 1.6 \times 10^{-19} \text{ C}$ is accelerated through a potential difference of 1.2 V. If $h = 6.63 \times 10^{-34} \text{ J}$, Find its de-Broglie wavelength.

Answer: (11.21 nm)

Solution:

$$\lambda = \frac{h}{P} = \frac{h}{\sqrt{2meV}}$$

$$= 6.63 \times 10^{-34}$$

$$\sqrt{2 \times 9.1 \times 10^{-31} \times 1.6 \times 10^{-19} \times 1.2}$$

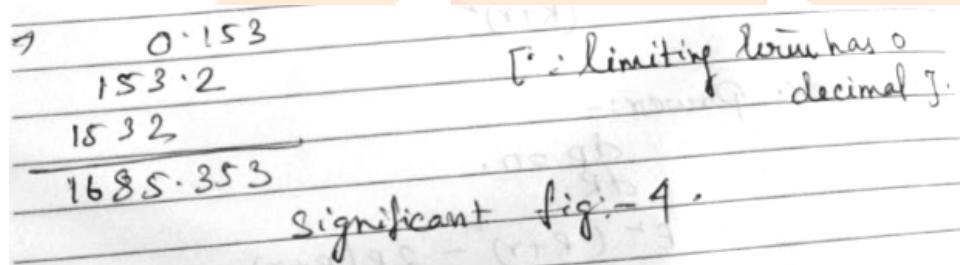
Question: What will be significant figure of summation of 0.153, 153.2 and 1532?

Options:

- (a) 3
- (b) 4
- (c) 5
- (d) 6

Answer: (b)

Solution:



0.153
153.2
1532
1685.353

i.e. limiting term has 0 decimal fig.

Significant fig: - 4.

Question: The energy of an electron in n th bohr orbit is given by $E_n = -\frac{\epsilon_0}{n^2}$. For a certain excited state of hydrogen, the magnitude of electron's energy is formed to be

$$\frac{\epsilon_0}{25} \cdot \text{Find value of } \frac{2\pi L}{h}.$$

Answer: (5)

Solution:

$$E_n = \frac{\varepsilon_0}{n^2}$$

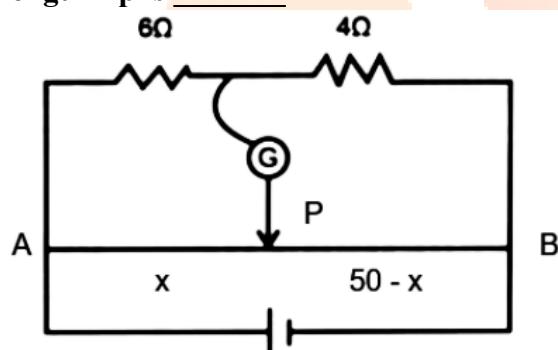
$$\Rightarrow 0.04 \varepsilon_0 = \frac{\varepsilon_0}{n^2}$$

$$\Rightarrow n = 5$$

$$\therefore L = \frac{n h}{2\pi}$$

$$n = \frac{2\pi L}{h} = 5$$

Question: The total length of potentiometer wire AB is 50 cm in the arrangement shown in the in fig. If 'P' is the point where the galvanometer shows zero reading Then the length AP is _____



Options:

- (a) 15
- (b) 20
- (c) 30
- (d) 25

Answer: (c)

Solution:

Sol: From wheatstone bridge concept.

$$\frac{6}{x} = \frac{4}{50-x}$$

$$300 - 6x = 4x$$

$$10x = 300$$

$$x = 30 \text{ cm}$$

Question: The Kinetic energy of a simple harmonic oscillating with angular frequency of 176 rad/s. The frequency of the simple harmonic oscillator is -

$$\text{Hz} \left(\pi = \frac{22}{7} \right)$$

Options:

- (a) 176
- (b) 14
- (c) 28
- (d) 88

Answer: (d)

Solution:

$$K.E = \frac{1}{2} m \omega^2 A^2 \cos^2 \omega t$$

$$= \frac{1}{4} \cancel{m} \omega^2 A^2 (1 + 2 \cos \omega t)$$

$$K.E \rightarrow \omega = 176 \text{ rad/s}$$

$$\text{SHM} \rightarrow \frac{\omega}{2} = 88 \text{ rad/s}$$

Question: Two spheres having equal mass m, charge q and radius R, are moving towards each other. Both have speed u at an instant when distance between their centers is 4R. Minimum value of u so that they touch each other is

Options:

(a) $\sqrt{\frac{q^2}{4\pi\epsilon_0 m R}}$

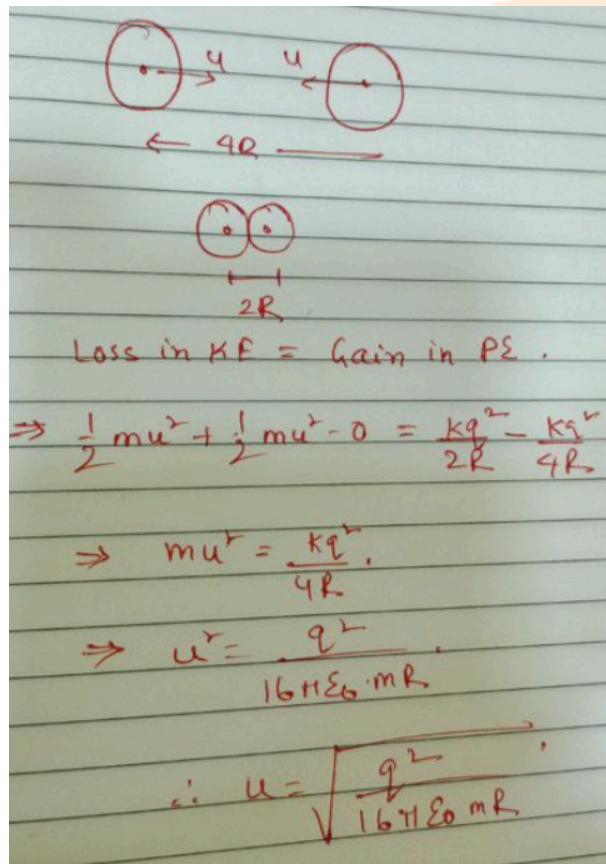
(b) $\sqrt{\frac{q^2}{16\pi\epsilon_0 m R}}$

(c) $\sqrt{\frac{q^2}{\pi\epsilon_0 m R}}$

(d) $\sqrt{\frac{q^2}{8\pi\epsilon_0 m R}}$

Answer: (b)

Solution:



$$\text{Loss in KE} = \text{Gain in PE}$$

$$\Rightarrow \frac{1}{2}mu^2 - \frac{1}{2}mu^2 = \frac{kq^2}{2R} - \frac{kq^2}{4R}$$

$$\Rightarrow mu^2 = \frac{kq^2}{4R}$$

$$\Rightarrow u^2 = \frac{kq^2}{16\pi\epsilon_0 m R}$$

$$\therefore u = \sqrt{\frac{kq^2}{16\pi\epsilon_0 m R}}$$

Question: The rms speed of O_2 molecules at $47^\circ C$ is equal to rms speed of H_2 molecules at _____ $^\circ C$?

Options:

- (a) $-100^\circ C$
- (b) $-253^\circ C$
- (c) $-20^\circ C$
- (d) $-235^\circ C$

Answer: (b)

Solution:

$$V_{rms} = \sqrt{\frac{3RT}{M}}$$

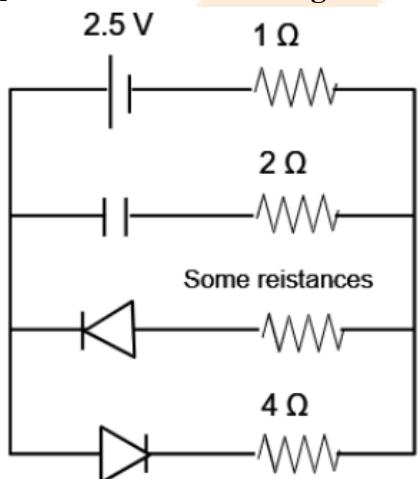
$$\sqrt{\frac{3R \times 120}{32}} = \sqrt{\frac{3R \times T}{2}}$$

$$\Rightarrow \frac{310}{32} = \frac{T}{2}$$

$$\Rightarrow T = 20 \text{ C}$$

$$T_c = (20 - 273)^\circ \text{C} \\ = -253^\circ \text{C}$$

Question: Find the charge on capacitor in steady state?



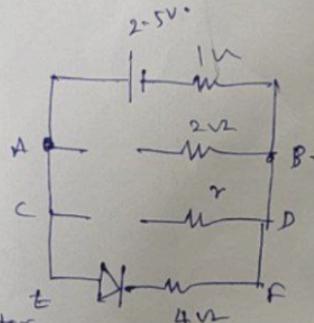
Answer: (10 μC)

Solution:

- Since Diode in CD is reverse biased so, CD can be ignored.
- At steady state no current flows through capacitor so AB also ignored.
- Now, from fig $Req = 5\Omega$.
- So, $I = \frac{2.5}{5} = 0.5 \text{ A}$.
- To find charge through 'capacitor' we require V_{AB} .

$$\Rightarrow V_{AB} = V_{EF} = 4(0.5) = 2V$$

$\therefore Q = 2C$



Question: Refractive index of right angled prism is $\sqrt{2}$. What should be the angle of incidence for a light ray such that emerging ray grazes out of the surface.

Answer: (90°)

Question: The ratio of Wavelength of 3rd line of Paschen Series, 2nd line of Balmer in H-atom

Options:

- 9/4
- 4/9
- 3/4
- 4/3

Answer: (a)

Solution:

$$\frac{1}{\lambda} = \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) Z^2 \quad (Z=1)$$

$$\frac{1}{\lambda_{\text{Paschen}}} = \left(\frac{1}{9} - \frac{1}{36} \right)$$

$$= \frac{36-9}{36 \times 9} = \frac{1}{12}$$

$\lambda_{\text{Paschen}} = 12$

$$\frac{1}{\lambda_{\text{Balmer}}} = \frac{1}{4} - \frac{1}{16}$$

$$= \frac{16-4}{16 \times 4}$$

$$\frac{1}{\lambda_{\text{Bal}}} = \frac{3}{16}$$

$\lambda_B = \frac{16}{3}$

$\frac{\lambda_P}{\lambda_B} = \frac{12}{16} \times 3 = \frac{9}{4}$

Question: If mass of the particle $m = 2 \text{ kg}$ and displacement of particle varies with the time as $x = at^2 + bt + \gamma$. Then find the work done in the time interval $t = 2 \text{ sec}$ to $t = 3 \text{ sec}$ ($\alpha = 1, \beta = 1, \gamma = 1$)

Answer: (24 J)

Solution:

$$V = \frac{dx}{dt} = 2\alpha t + \beta = 2t + 1$$

$$V_i = 5 \text{ m/s}, \quad V_f = 7 \text{ m/s.}$$

Work Energy theorem,

$$W = \Delta KE \quad (KE = \frac{1}{2}mv^2)$$

$$= \frac{1}{2}m(V_f^2 - V_i^2)$$

$$= \frac{1}{2} \times 2 (7^2 - 5^2) \Rightarrow 24 \text{ J.}$$

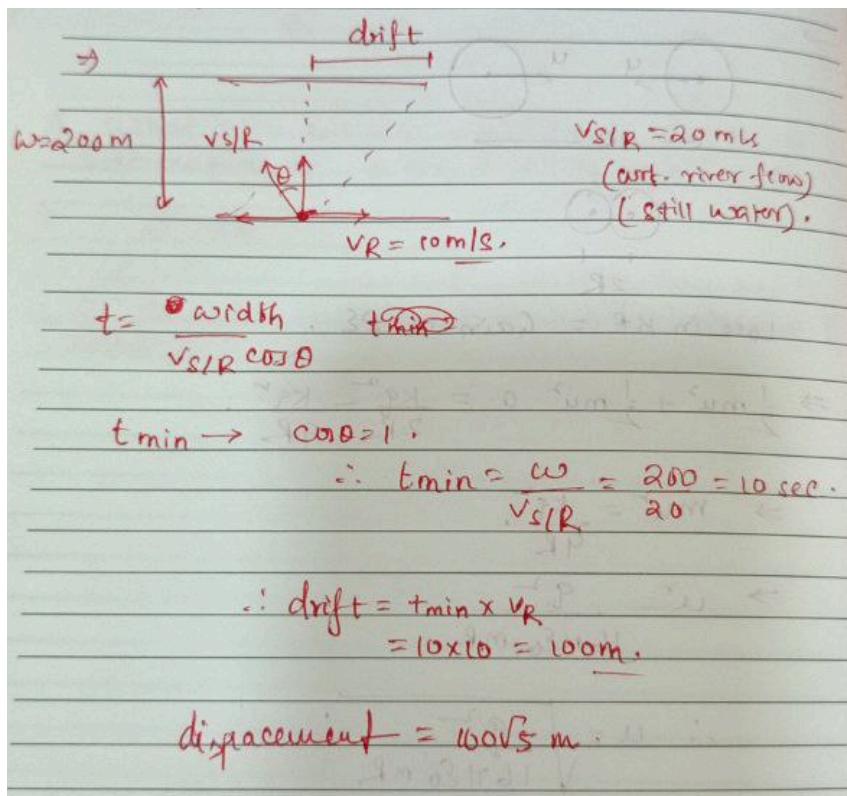
Question: Width of river is 200 m flowing with velocity 10 ms. A boat can move with speed of 20 m/sec. Wrt river flow. Find min time to cross river and displacement along river bank.

Options:

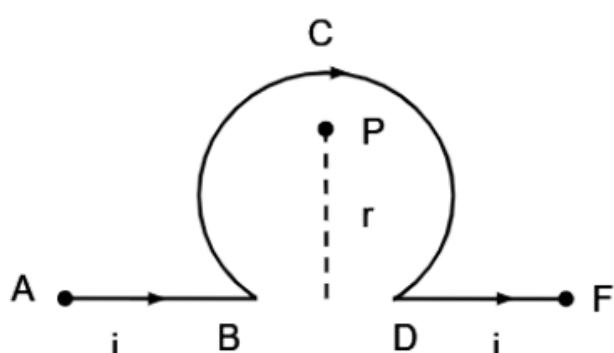
- (a) $100\sqrt{5}$ m
 (b) $10\sqrt{5}$ m
 (c) 100 m
 (d) 105 m

Answer: (a)

Solution:



Question: Current 'i' is passing through the given arrangement of conductors. Find 'B' at point 'P'.



Answer: (
$$B_P = \frac{\mu_0 i}{2\pi r} [1 - \pi] \odot \text{Tesla}$$
)

Solution:

$$\begin{aligned}
 B_p &= B_{AB} + B_{BCD} + B_{DE} \quad i \quad \overbrace{B} \quad \overbrace{D} \quad i \quad \overbrace{E} \\
 &= \frac{\mu_0 i}{2\pi r} - \frac{\mu_0 i}{2r} + \frac{\mu_0 i}{4\pi r} \quad \left(\begin{array}{l} AB \text{ and } DE \text{ are} \\ \text{infinitesimal wires and} \end{array} \right) \\
 &= \frac{\mu_0 i}{2\pi r} - \frac{\mu_0 i}{2r} \quad \left(\begin{array}{l} B_{BCD} \text{ is circular loop} \\ \dots \end{array} \right) \\
 \therefore B_p &= \frac{\mu_0 i}{2\pi r} [1 - \frac{1}{2}] \text{ Tesla} \quad \left(\begin{array}{l} B_{AB} \Rightarrow \text{O} \\ B_{BCD} \Rightarrow \text{X} \\ B_{DE} \Rightarrow \text{O} \end{array} \right)
 \end{aligned}$$

Question: In isobaric expansion work is 100 J. Find heat given to the gas ($\gamma = 1.4$).

Options:

- (a) 300
- (b) 350
- (c) 400
- (d) 450

Answer: (b)

Solution:

$$\begin{aligned}
 W &= 100 \text{ J} = nR\Delta T, \\
 \Delta Q &=? \\
 \Delta Q &= nC_p \Delta T. \quad \gamma = 1 + \frac{2}{f} \\
 &= \left(\frac{f}{2} + 1 \right) nR\Delta T. \quad 1.4 = 1 + \frac{2}{f} \\
 &= \left(\frac{f}{2} + 1 \right) \times 100. \quad \Rightarrow \frac{2}{f} = 0.4 \\
 &= \left(\frac{1}{2} \times 0.2 + 1 \right) \times 100 \quad \Rightarrow f = \frac{2}{0.4} \\
 &= \left(\frac{1}{0.4} + 1 \right) \times 100 \quad = \frac{1}{0.2} \\
 &= \left(1 + 0.4 \right) \times 100 \quad = \frac{1.4 \times 100}{0.4} \\
 &= \frac{1.40}{0.4} = \frac{1400}{4} \\
 &= 350.
 \end{aligned}$$