
LIVE
JEE MAIN 2024
ATTEMPT – 01 , 27TH JAN 2024 , SHIFT - 02
PAPER DISCUSSION

JEE MAIN 2024 LIVE PAPER DISCUSSION

PHYSICS

Does kinetic friction and static friction depend on surface of contact and material of surface

Area

Area
I

A Only on surface

B Only on material

C both material on surface ✓

If only surface nature is mentioned

D None of these

Assertion : angular velocity of moon revolving about earth is more than angular velocity of earth revolving around Sun.

Reason : Time taken by moon to revolve around earth is less than time taken by earth to revolve around sun.

A. Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are the true but Reason (R) is not a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

D. Assertion (A) is false and Reason (R)

$T = \frac{2\pi}{\omega}$

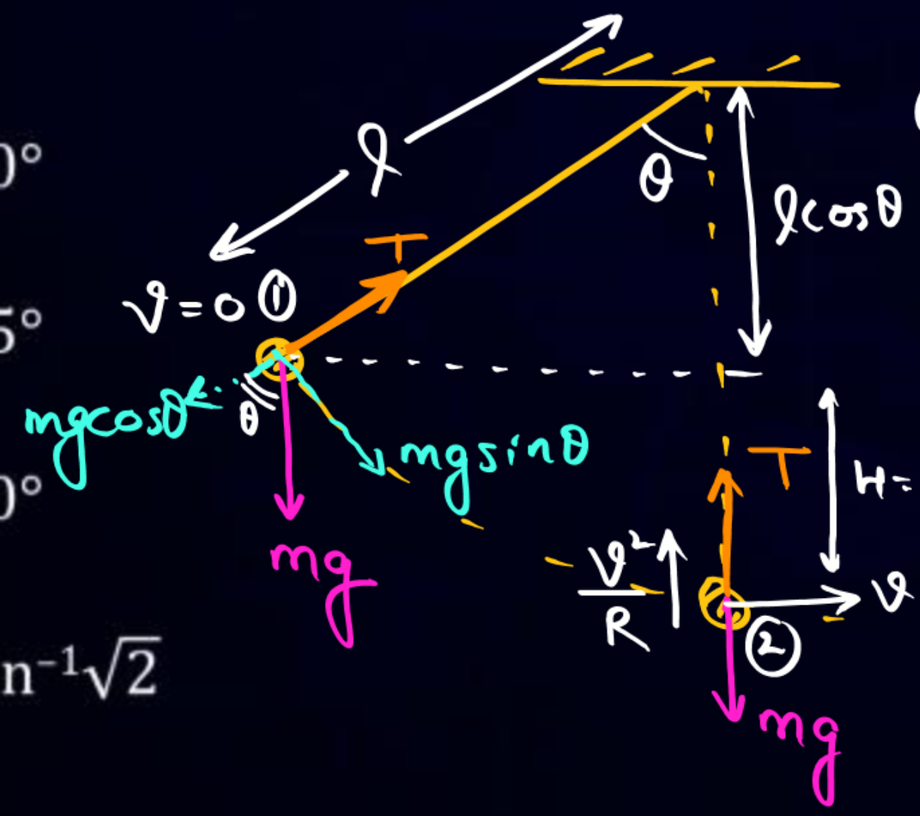
A pendulum is given velocity such that it acceleration at mean and extreme position are same, then find maximum angle of deflection.

A) $30°$

B) $45°$

C) $60°$

D) $\tan^{-1}\sqrt{2}$



At Extreme pοnn. ⟶

$a_c = 0 \mid mg\sin\theta = m a_t \Rightarrow a_t = g\sin\theta$

At mean pοnn. ⟶

$a_t = 0$, $a_c = \frac{v^2}{R}$

$\frac{v^2}{R} = g\sin\theta \Rightarrow \frac{2gH}{R} = g\sin\theta$

W.E theo. b/w ① & ② —

$W_{mg} + W_T = \Delta K.E \Rightarrow mgH + 0 = \frac{1}{2}mv^2 - 0 \Rightarrow v = \sqrt{2gH}$

$$\frac{2H}{R} = \sin\theta$$

$$\frac{2}{\ell}(\ell - \ell\cos\theta) = \sin\theta$$

$$2(1 - \cos\theta) = \sin\theta$$

$$2 - 2\cos\theta = \sin\theta$$

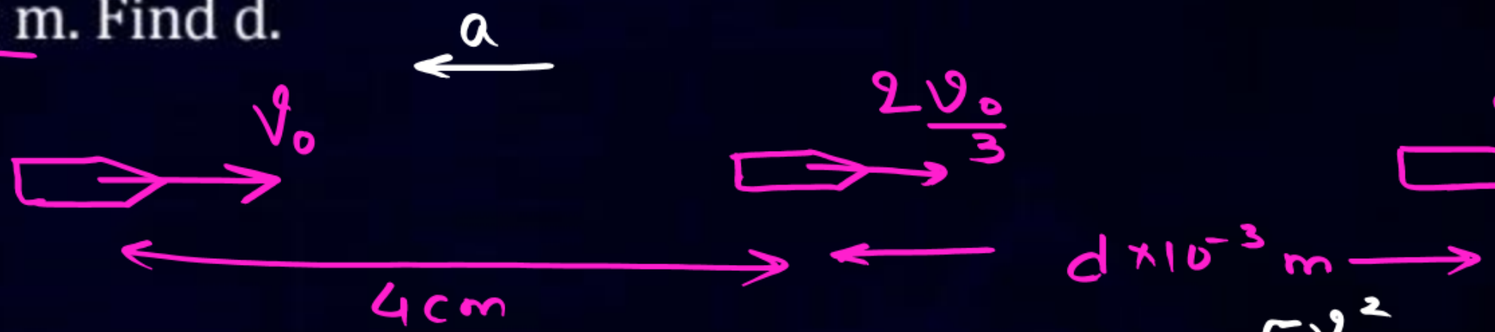
$$\sin\theta + 2\cos\theta = 2$$

$$\sqrt{5}\sin\left\{\theta + \tan^{-1}\left(\frac{2}{1}\right)\right\} = 2$$

$$\sin(\theta + \tan^{-1}2) = \frac{2}{\sqrt{5}} \Rightarrow \theta = \sin^{-1}\frac{2}{\sqrt{5}} - \tan^{-1}2$$

$$\left[A\sin\theta + B\cos\theta = \sqrt{A^2+B^2}\sin(\theta+\phi)\right.$$
$$\left.\phi = \tan^{-1}\frac{B}{A}\right]$$

A bullet gets embedded in a fixed target. It is found that bullet losses 1/3rd of its velocity in traveling 4 cm into target and losses remaining kinetic energy while traveling further d × 10–3 m. Find d.



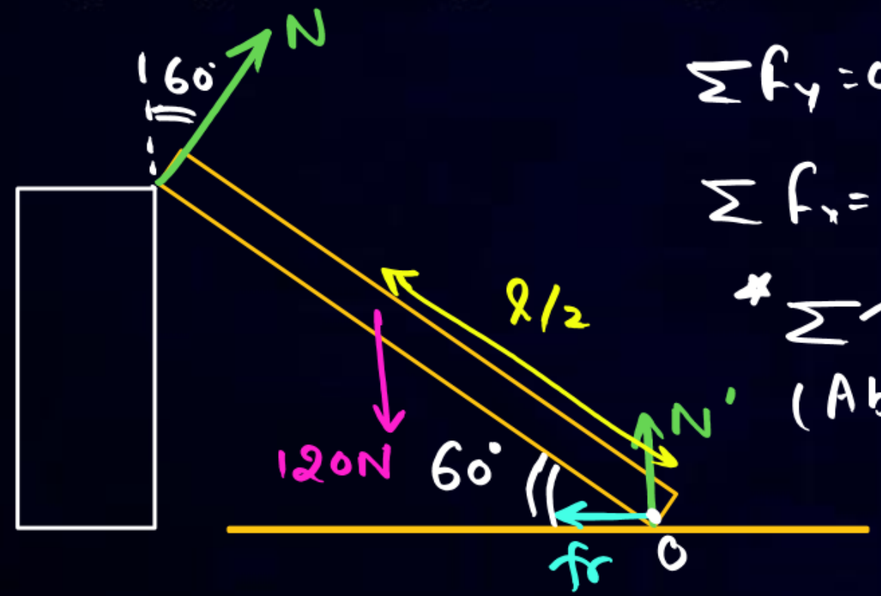
$$\left(\frac{2v_0}{3}\right)^2 - v_0^2 = 2(-a)\cdot(4\times10^{-2}) \Rightarrow +\frac{5v_0^2}{9} = +8a\times10^{-2}$$

$$0^2 + \left(\frac{2v_0}{3}\right)^2 = 2(+a)\times d\times10^{-3} \qquad \frac{v_0^2}{9} = \frac{8a\times10^{-2}}{5}$$

$$\frac{4v_0^2}{9} = 2a\times d\times10^{-3} \Rightarrow 4\times\frac{8a}{5}\times10^{-2} = 2ad\times10^{-3}$$

$$2\times\frac{16}{5}\times10^{-1} = d \Rightarrow d = 32$$

A person is standing on horizontal ground. A rod of mass 12 kg is touching a shoulder of person and other end is resting on ground. Angle made by rod with horizontal is 60°. Reaction force applied by person on rod is



$\Sigma F_y = 0 \longrightarrow N\cos 60^\circ + N' = 120$

$\Sigma F_x = 0 \longrightarrow N\sin 60^\circ = fr$

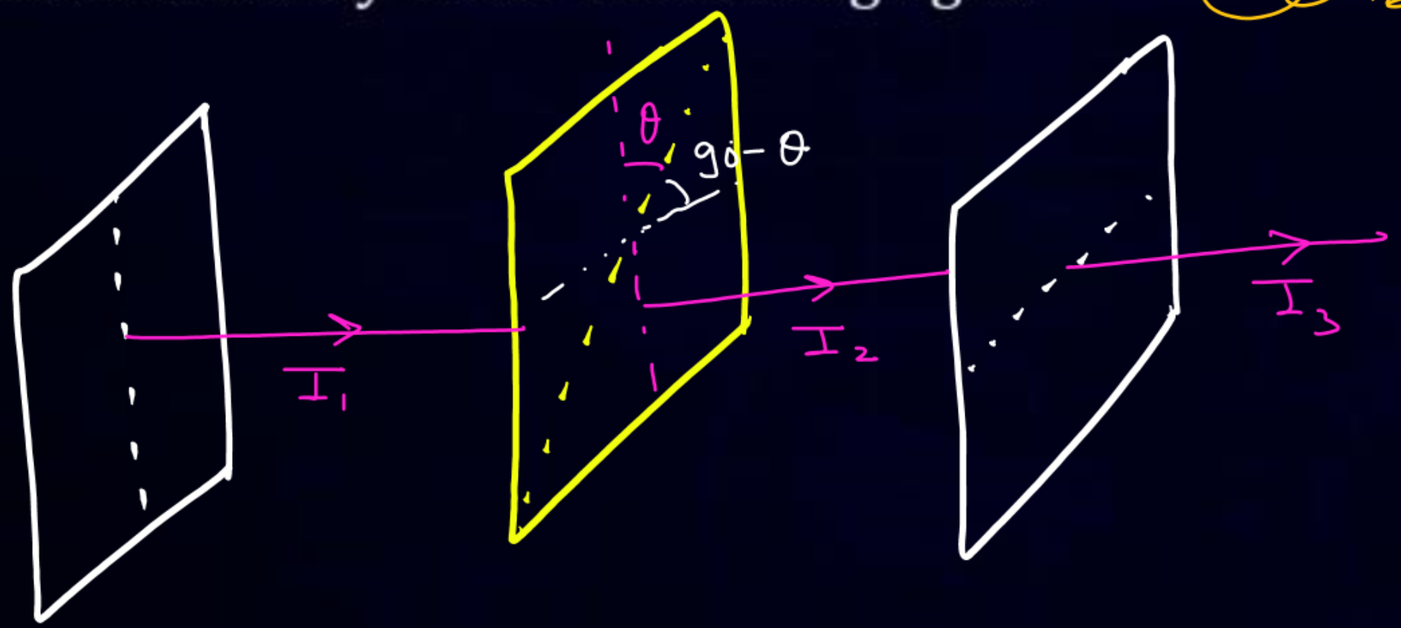
$*\Sigma \tau = 0 \longrightarrow mg \times \frac{\ell}{2}\cos 60^\circ = N \times \ell$ (Abt. O)

$120 \times \frac{1}{2} \times \frac{1}{2} = N$

$N = 30N$

Between two polaroid placed in crossed position, a third polaroid is introduced. By what angle (in degree) the introduced polaroid placed should be rotated to get maximum intensity of the out coming light.

45° Any



$$I_2 = I_1 \cos^2\theta$$

$$I_3 = I_2 \cos^2(90^\circ - \theta)$$

$$I_3 = I_1 \cos^2\theta \cdot \sin^2\theta \cdot$$

$$= \frac{1}{4} I_1 (2\sin\theta\cos\theta)^2$$

$$I_3 = \frac{I_1}{4} \sin^2 2\theta$$

$2\theta = 90^\circ$

$\theta = 45^\circ$

A particle covers 80 m is last 2 s from A to b in free fall then distance of A from Starting point is :

$S = v_{avg} \times t$

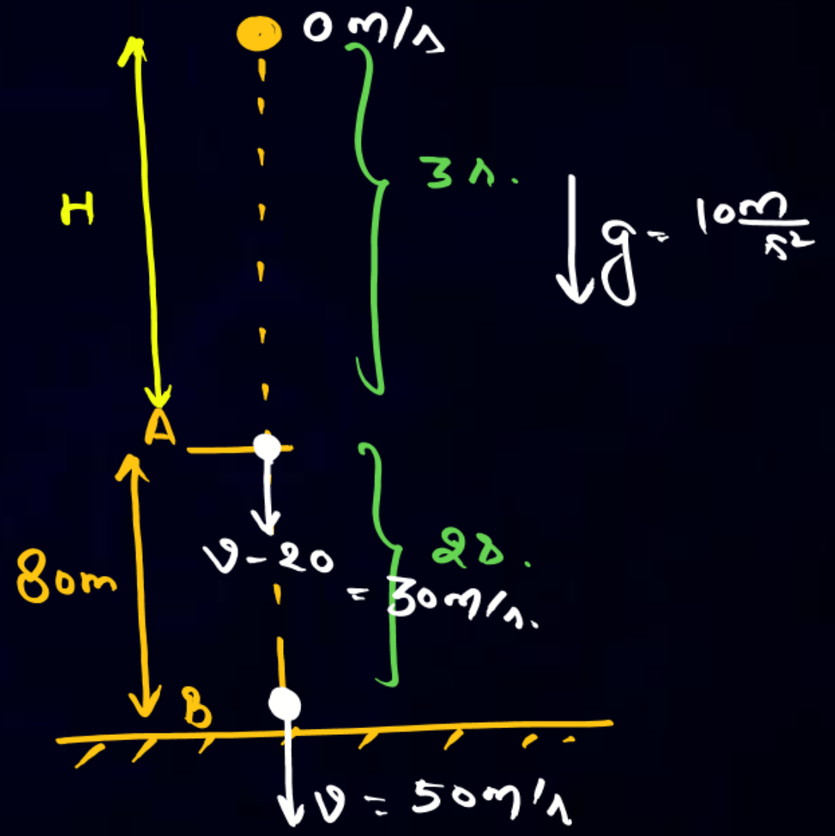
$80 = \left[\frac{v + (v-20)}{2}\right] \times 2$

$80 = 2v - 20$

$v = 50\ m/s$

$H = \left[\frac{0+30}{2}\right] \times 3$

$H = 45\ m$



Find total kinetic energy of 1 mole of oxygen gas at 27° C (take R = 25/3 J/(mol – K)

f = 5

273 + 27 = 300

A ✓ 6250 J

B 3125 J

C 12500 J

D 625 J

$$U = \frac{nfRT}{2} = \frac{1 \times 5 \times \frac{25}{3} \times 300}{2}$$

$$= 25 \times 25 \times 10$$

$$= 6250\ J$$

If the work function of a metal is 6.68 eV, then find the threshold frequency

A 1.9×10^{15} Hz

B 1.6×10^{15} Hz

C 2×10^{16} Hz

D 1.2×10^{15} Hz

$\phi = h\nu_0$

$\nu_0 = \frac{\phi}{h} = \frac{6.68\ eV}{4.14 \times 10^{-15}\ eV \cdot s}$

$= 1.6 \times 10^{+15}$ Hz.

If $\left(p-\frac{a}{V^2}\right)(V-b)=nRT$ where $P, V, R \& T$ are pressure, volume, universal gas constant and temperature, then $\left(\frac{a}{b^2}\right)$ has same dimensional formula as that of

[L^3]

A R

B PV

C RT

D P

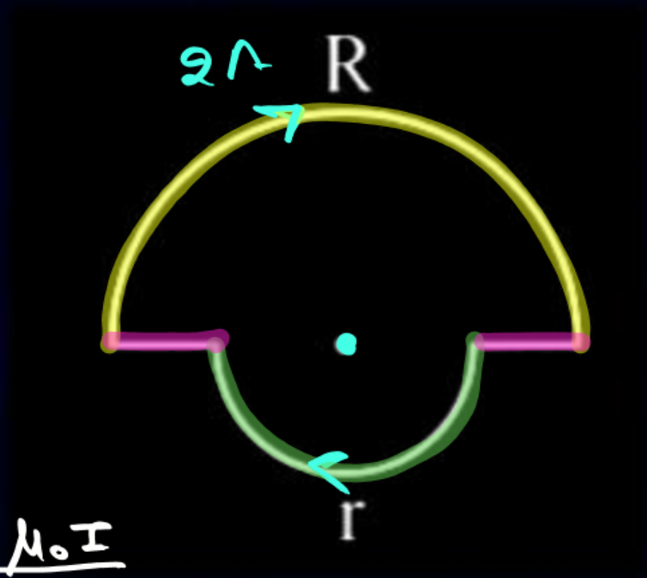
$[P]=\left[\frac{a}{V^2}\right] \Rightarrow [a]=[PV^2]$

$=[ML^{-1}T^{-2}][L^6]$

$[a]=[ML^5T^{-2}]$

$\left[\frac{a}{b^2}\right]=\left[\frac{ML^5T^{-2}}{L^6}\right]=[ML^{-1}T^{-2}]$

In the circuit shown in figure R = π/2 m and r = π/4 m the current flowing in the circuit is 2 A, then find magnetic field at the centre O.



A ✓ 12×10^{-7} T

B 24×10^{-7} T

C 6×10^{-7} T

D Zero

$$B_c = B_1 + B_2 + B_3 \quad (B_2 \to O)$$

$$= \frac{\mu_0 I \theta}{4\pi R_1} + \frac{\mu_0 I \theta}{4\pi R_2}$$

$$= \frac{\mu_0 I \cancel{\pi}}{4\cancel{\pi}\left(\frac{\pi}{2}\right)} + \frac{\mu_0 I \cancel{\pi}}{4\cancel{\pi}\times\frac{\pi}{4}}$$

$$= \frac{\mu_0 I}{2\pi} + \frac{\mu_0 I}{\pi} = \frac{3}{2}\frac{\mu_0 I}{\pi}$$

$$= 6\times\left(\frac{\mu_0}{4\pi}\right)\times 2$$

$$= 12\times 10^{-7}$$

In a LCR series circuit inductor of $\frac{1}{10\pi}$ H, capacitor of $\frac{10^{-3}}{\pi}$ F and resistance of 10Ω is connected through a source of 220 V, 50 Hz. Find the Power factor of the circuit.

A. 1

B. 0.5

C. 0.37

D. 0

$X_L = \omega L$

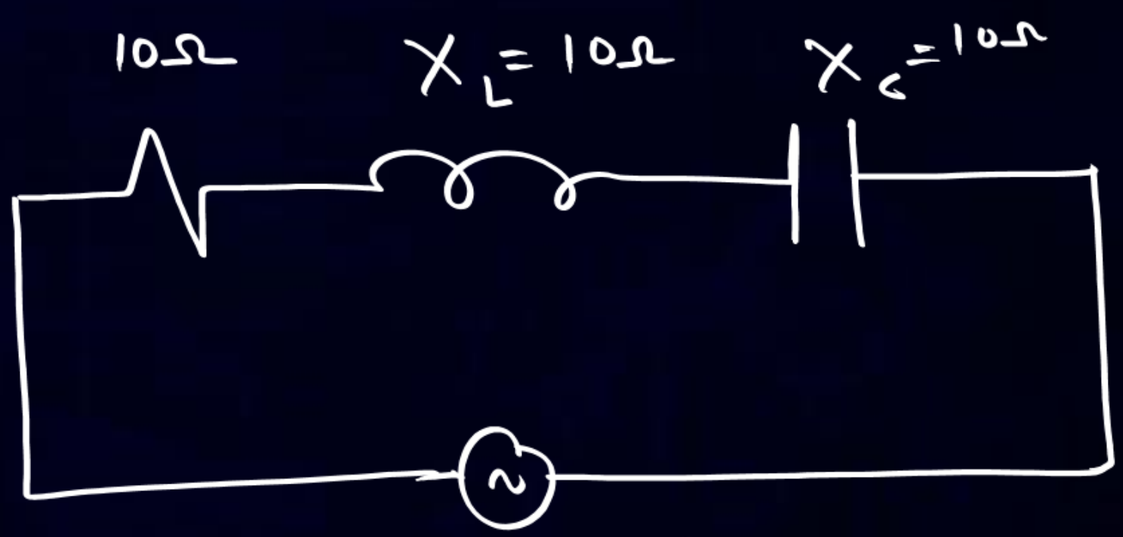
$= 100\pi \times \frac{1}{10\pi}$

$= 10\Omega$

$X_C = \frac{1}{\omega C}$

$= \frac{1}{100\pi \times \frac{10^{-3}}{\pi}}$

$X_C = 10\Omega$



$\omega = 2\pi f$

$\omega = 100\pi \frac{rad}{s}$

Current of 200 A deflects the coil of a moving coil galvanometer by 60°. find the current to cause deflection of $\pi/10$ rad.

$60^\circ = \frac{\pi}{3}$

$I \propto \theta$

$\frac{I_1}{I_2} = \frac{\theta_1}{\theta_2} \Rightarrow \frac{200}{I_2} = \frac{\pi/3}{\pi/10}$

$I_2 = \frac{200 \times 3}{10} = 60\,A$

During an adiabatic process the pressure of gas is proportional to cube of its absolute temperature the ratio of C_p/C_V is

$\gamma = \frac{3}{2}$.

$P \propto T^3$

$\frac{P}{T^3} = \text{Const.} \Rightarrow P T^{-3} = \text{Const}$

$PV = nRT$

$T = \frac{PV}{nR}$

$P \cdot (PV)^{-3} = \text{Const}$

$P^{-2} V^{-3} = \text{Const}$

$P V^{\frac{-3}{-2}} = \text{Const.}$

$P V^{3/2} = \text{Const.}$

γ

A ring and a solid sphere of same mass and radius are released from same point of inclined plane. Find the ratio of their KE when they reach to bottom without slipping

Gain in k.E = Loss in U.
= mgH.

A 1 : 2

B 1 : 1

C 2 : 1

D 1 : 5

Two bodies having mass 4 kg and mas 5 kg having same kinetic energy find the ratio of their linear momentum ?

$$P = \sqrt{2mk \cdot \epsilon}$$

$$\frac{P_1}{P_2} = \frac{\sqrt{2m_1(k \cdot \epsilon)}}{\sqrt{2m_2(k \cdot \epsilon)}} = \sqrt{\frac{m_1}{m_2}} = \sqrt{\frac{4}{5}} = \frac{2}{\sqrt{5}}$$

Assertion: If external force is removed, then body will try to regain its actual shape, this is called elasticity.
Reason: Due to intermolecular force, this happens

A. Assertion True, Reason True & Reason is correct explanation of assertion

B. Assertion True, Reason True & Reason is not correct explanation of assertion

C. Assertion True, Reason false

D. Assertion false, Reason True

Statement -1 : Their can be positive zero in vernier calliper

Statement-2 : Defect may occur during manufacturing of measuring instrument.

A Statement-1 is true, Statement-2 is false.

B Statement-1 is false, Statement-2 is true.

C Statement-1 and Statement-2 both true.

D Statement-1 and Statement-2 both false

+ve Z.E is subtracted to get true value.

Light of intensity $I = 6 \times 10^8 \ \frac{W}{m^2}$ is incident on an object kept in medium of refractive index $\mu = 3$ assuming 100% absorption. Find radiation pressure (N/m^2)?

$$P = \frac{I}{v} \ (\text{for complete absorption}) = \frac{6 \times 10^8}{(c/\mu)} = \frac{6 \times 10^8 \times 3}{3 \times 10^8} = 6$$

If the primary side of a transformer is connected with 230 V. 50 Hz AC supply and the ration of number of turns of primary to the secondary winding is 10 : 1 load resistance at secondary coil is 45 Ω then power secondary winding is output of the

A 11.5 watt

B 13 watt

C 16 watt

D 15.6 watt

$$\frac{V_1}{V_2} = \frac{N_1}{N_2}$$

$$\frac{230}{V_2} = \frac{10}{1}$$

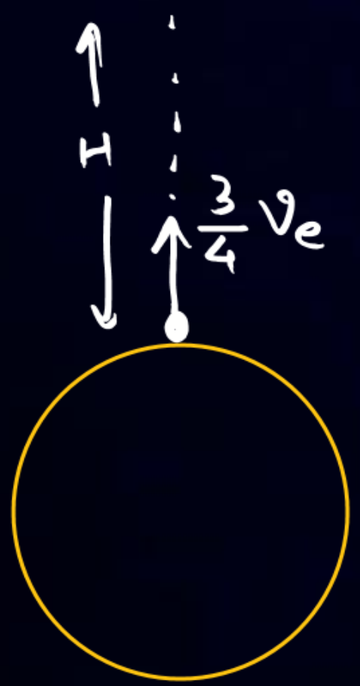
$$V_2 = 23\ V$$

$$P = \frac{V^2}{R}$$

$$= \frac{(23)^2}{45}$$

$$= \frac{23}{2}$$

A body is projected up with a velocity to 3th /4 of the ~~escape velocity~~ from the surface of the earth. The height it reaches from the surface of the earth is :



$$V = \sqrt{\frac{2GM}{R}}$$

Conv. of Energy

Gain in U = Loss in K.E

$$-\frac{GMm}{(R+H)} - \frac{GMm}{R} = \frac{1}{2}m\left(\frac{3}{4}V_e\right)^2 - 0$$

$$= \quad .$$

There exists a uniform electric field of $20\,\hat{i}$ N/C. A dipole of dipole moment $|\vec{P}| = 15$ c – m is placed at angle 30° with electric field. Torque on dipole is.

A 250 Nm

B 150 Nm ✓

C 200 Nm

D 100 Nm

$$\vec{\tau} = \vec{P} \times \vec{E}$$

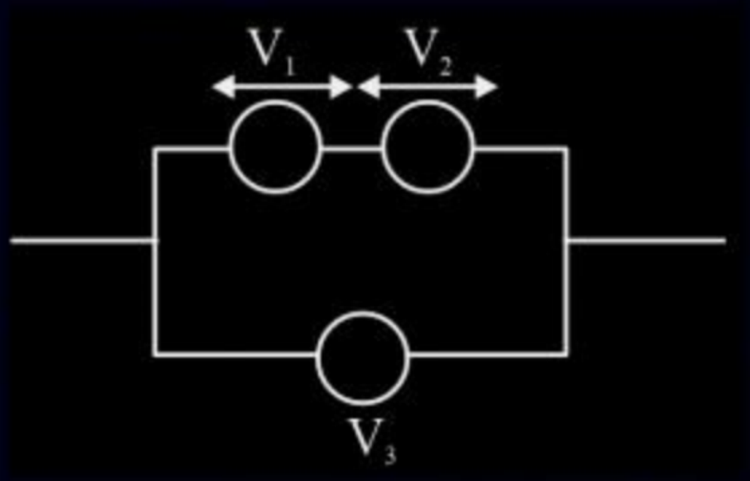
$$= PE\sin\theta$$

$$= 15 \times 20 \times \sin 30^\circ$$

$$= 150\ \text{N.m}$$

Three voltmeters are connected in a circuit as shown in the diagram. Find correct relation among their reading (V_1, V_2, V_3)

$V_1 + V_2 = V_3$.



A $V_1 > V_2 = V_3$

B $V_1 + V_2 = V_3$

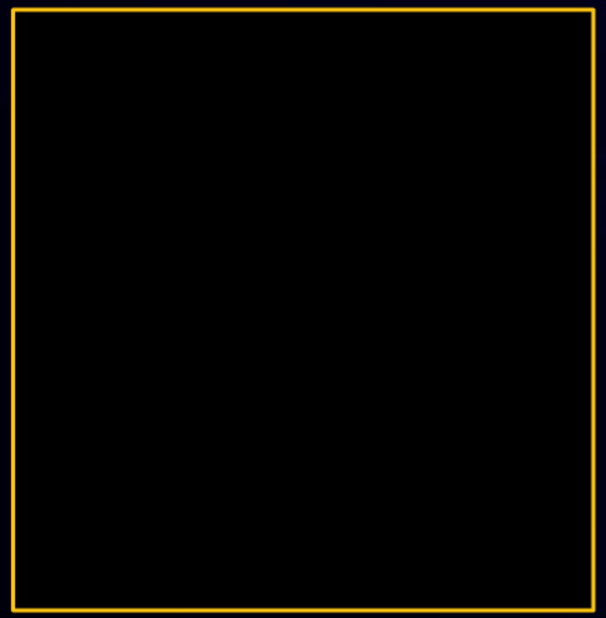
C $V_1 = V_2 = V_3$

D $V_1 + V_3 = V_2$

$^{13}C_6 \rightarrow {}^{12}C_6 + \text{Neutron}$

13.0045.... 12.0000. 1.008.

Energy required to release the neutron.



$\Delta U = |\Delta m| c^2$

$= (13.0045 - 12 + 1.008) c^2$

$= 13.0045 - 13.008$

$= 0.0035 \times 931 \text{ MeV}$

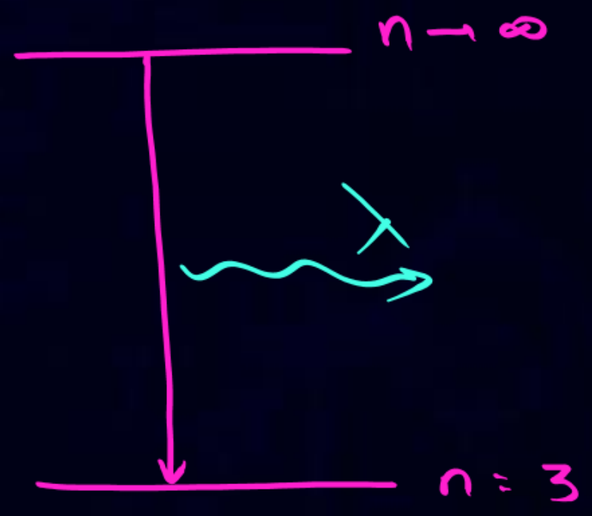
$= 3.2585$

An Electron in Hydrogen atom emits a photon of Paschen Series with maximum possible energy. what is the wavelength of the photon ?

$$\frac{1}{\lambda} = R\left[\frac{1}{3^2} - \frac{1}{\infty^2}\right]$$

$$\frac{1}{\lambda} = \frac{R}{9}$$

$$\lambda = \frac{9}{R}$$



for max. wavelength

$$\frac{1}{\lambda} = R\left[\frac{1}{3^2} - \frac{1}{4^2}\right]$$

Closed organ pipe of length 1.5 m and an open organ pipe of length 3.5 m produced a beat frequency of 7 in their fundamental mode. find the speed of sound

A 330 m/s

B 404 m/s

C 294 m/s

D 350 m/s

$\frac{v}{4L_1}$ $\frac{v}{2L_2}$

$|f_1 - f_2| = 7$

$\left|\frac{v}{2L_1} - \frac{v}{4L_2}\right| = 7$

$v\left|\frac{1}{2\times3.5} - \frac{1}{4\times1.5}\right|$

$v\left|\frac{1}{7} - \frac{1}{6}\right| = 7$

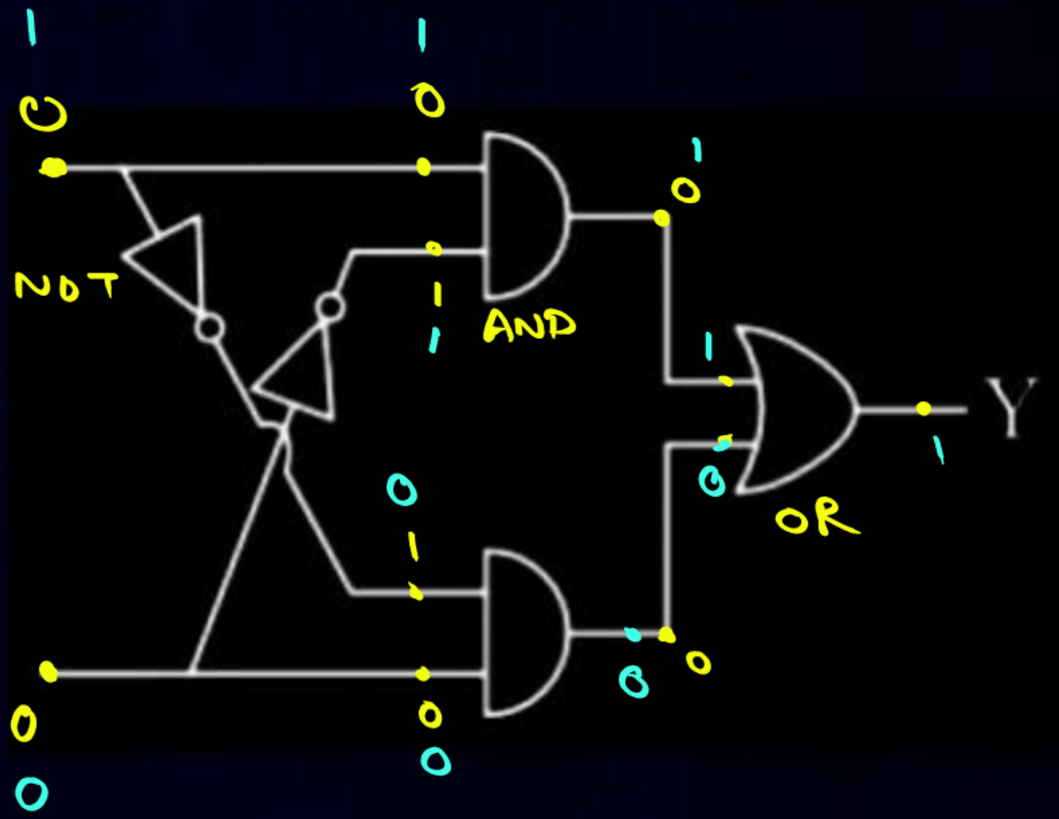
$v\left|\frac{6-7}{42}\right| = 7$

$v = 42 \times 7$

$= 294$ m/s.

Find the output Y.

A	B	Y
0	0	0
1	0	1
0	1	1
1	1	0




THANK
YOU