JEE MAIN 2025

PAPER DISCUSSION

Sub : PHYSICS
Attempt : 01
Date : 23rd Jan 2025
Shift : 02

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A projectile is projected at an angle of 60 degree with the horizontal with kinetic energy K. Find the kinetic energy of the projectile at the highest point.

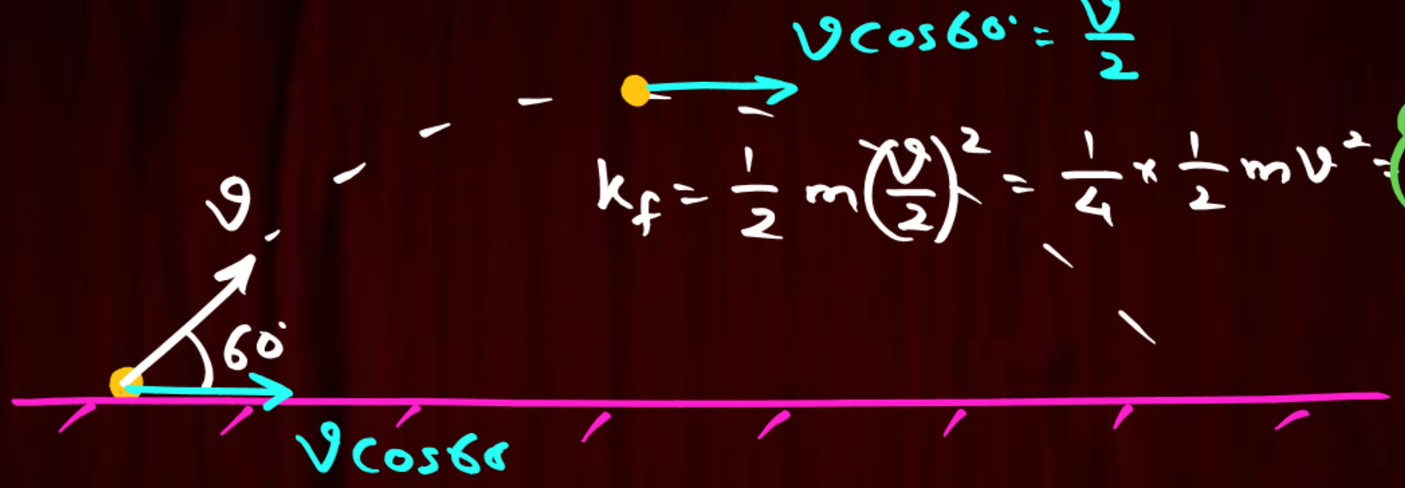
A K/3

B K/2

C K/4

D K/8

Common mistake.



$K = \frac{1}{2} m v^2$ → $\frac{1}{2}$ × $\frac{1}{2}$ × v^2

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kTG & Thermo Easy

Find total work done from A to E

A. $-3P_0V_0$

B. $3P_0V_0$

C. $2P_0V_0$

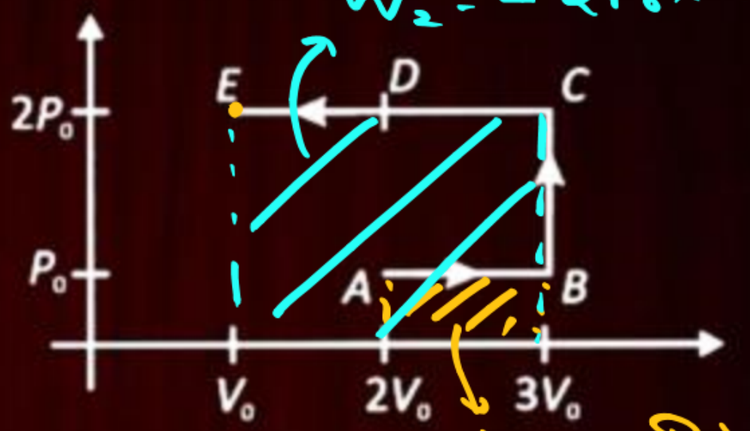
D. $5P_0V_0$

W.D = Area

$= W_1 + W_2$

$= P_0V_0 - 4P_0V_0$

$= -3P_0V_0$

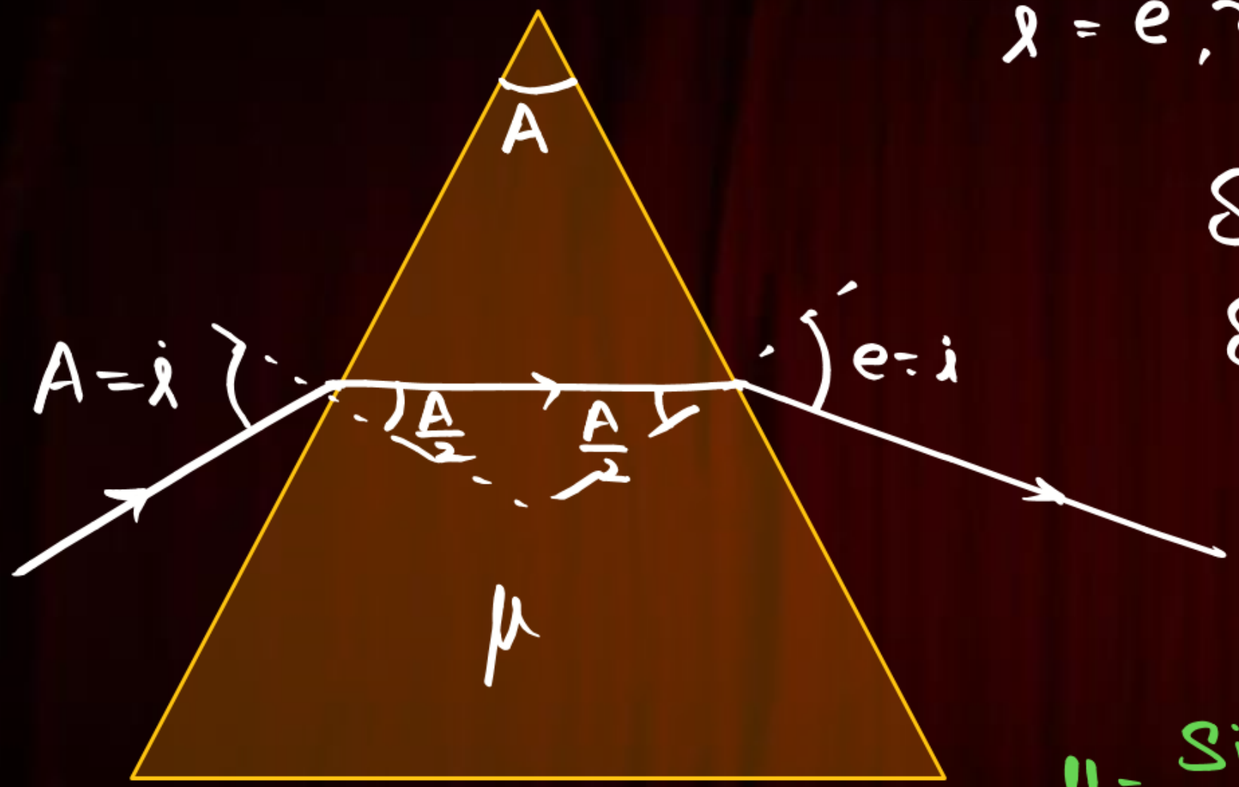


$W_2 = -2P_0 \times 2V_0 = -4P_0V_0$

$W_1 = +P_0V_0$

If angle of prism = angle of min. deviation Given $\mu = \sqrt{3}$, then angle of prism ?

$i = e, r_1 = r_2 = \frac{A}{2}$ Ray optics Medium



$\delta = i + e - A$

$\delta_{min} = 2i - A$

$A = 2i - A$

$i = A$

$\mu = \frac{\sin\left(\frac{\delta_{min}+A}{2}\right)}{\sin\left(\frac{A}{2}\right)} \rightarrow \sqrt{3} = \frac{\sin A}{\sin\frac{A}{2}}$

$\sin i = \mu \sin r_1$

$\sin A = \sqrt{3} \sin\frac{A}{2}$

$2\sin\frac{A}{2}\cos\frac{A}{2} = \sqrt{3}\sin\frac{A}{2}$

$\cos\frac{A}{2} = \frac{\sqrt{3}}{2}$

$\frac{A}{2} = 30$

$A = 60$ Ans

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Mosley's Law

Statement 1: Graph of frequency f of X ray and atomic number Z of heavy nucleus is straight line, in X ray emission.

Statement 2: Graph of square root of frequency $\sqrt{f}$ of X ray and atomic number Z of heavy nucleus is straight line, in X ray emission.

Ch:- Atomic Structure

$\sqrt{f} = A(Z-b)$

A. Statement 1 is correct and statement **2** is correct

B. ✓ Statement 1 is incorrect and statement 2 is correct

C. Statement 1 is correct and statement 2 is incorrect

D. Statement **1** is incorrect and statement **2** is incorrect

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$V \propto R$

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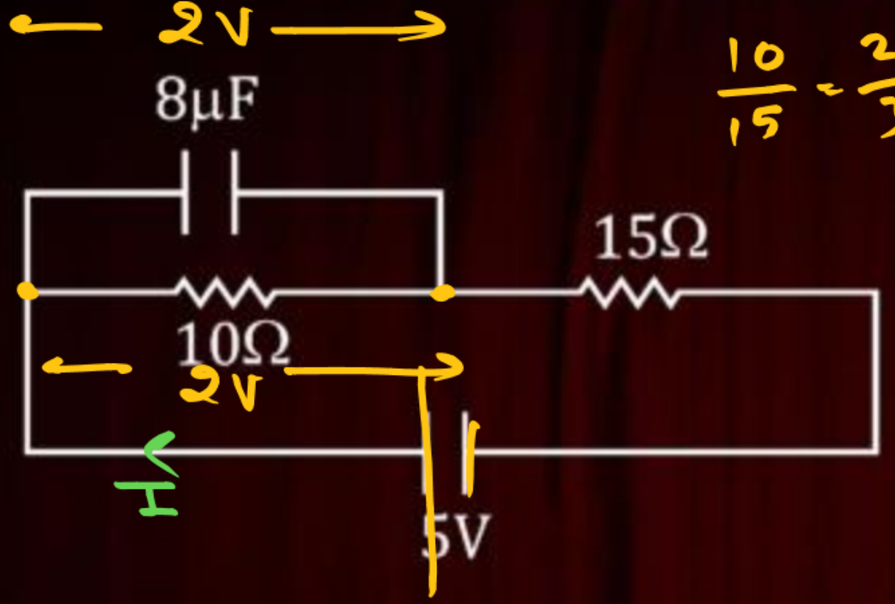
Current Electricity

(Lallu Q.)

Find charge on capacitor in steady state



$\frac{10}{15} = \frac{2}{3}$

5 V

2 : 3

$\frac{5 \times 2}{5} = 2V$

$\frac{5}{5} \times 3 = 3V$

$Q = CV = 8\mu F \times 2$

$= 16\mu C$

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250 Resonance. 25

In a series LCR circuit, inductance L = 100 mH and capacitance C = 10 nF. The angular frequency of the source when current has maximum amplitude in the circuit is.

[Alternating Current]
Easy

$$\omega = \frac{1}{\sqrt{LC}}$$

$$= \frac{1}{\sqrt{100\times10^{-3}\times10\times10^{-9}}}$$

$$= \sqrt{10^{5}} = \sqrt{10\times10^{4}}$$

$$\frac{1}{\sqrt{250\times10^{-3}\times25\times10^{-9}}}$$

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Kepler's Law

A satellite is nine times closer to earth compared to moon. Time period of moon is 27 days then period of satellite is

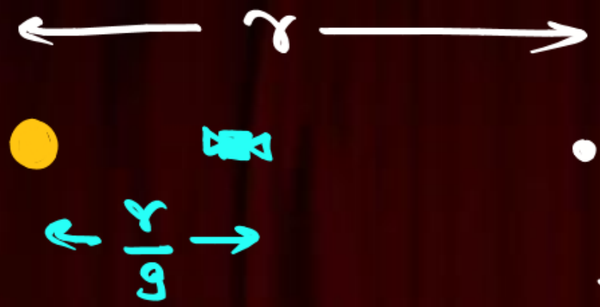
[Gravitation, Medium]

(A) 3 days

(B) 9 days

(C) 1 days ✓

(D) $3\sqrt{3}$ days



$T \propto r^{3/2}$

$$\frac{T_M}{T_S} = \left[\frac{R_M}{R_S}\right]^{3/2}$$

$$\frac{27}{T_S} = \left[\frac{r}{(r/9)}\right]^{3/2} \Rightarrow \frac{27}{T_S} = 27$$

$T_S = 1$ day.

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A mirror of focal length f is place in medium of refractive index μ. The focal length of mirror will become

[Ray optics, Easy]

(A) f

(B) $\frac{f}{(\mu-1)}$

(C) μf

→ common mistake

(D) $\frac{f}{\mu}$

The value of E_0 is 9.3 V/m and c is 3×10^8 m/s. Find the value of B.

[EM Wave, Easy]

$$E_0 = B_0 c$$

$$B_0 = \frac{E_0}{c} = \frac{9.3}{3 \times 10^8} = 3.1 \times 10^{-8}\ T$$

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Two charges +7C and – 4C are located at (–7, 0, 0) and (7, 0, 0), find electrostatic potential energy of the system. ($K = \frac{1}{4\pi 5_0} = 9 \times 10^9$ SI units)

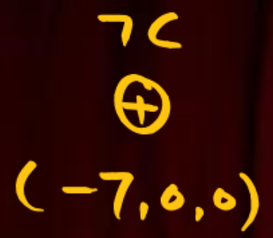
[Electrost pot. & Cap., Easy]

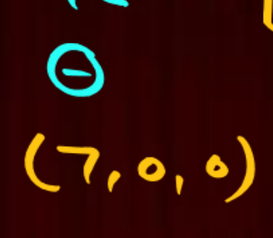
A. -6×10^9 J

B. -18×10^9 J

C. 18×10^9 J

D. 6×10^9 J





$$U = \frac{kQ_1Q_2}{r} = \frac{9\times10^9 \times 7\times(-4)}{11} = -18\times10^9 \text{ J}.$$

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A light of wavelength 'λ' is incident on a metal having work function φ = ~~1.4~~ 2.14 eV. The stopping potential measured for the photoelectric current setup is 2 V. Find the value of λ [hc = 12420 eV Å]

[Dual Nature, Easy]

$$eV_s = \frac{hc}{\lambda} - \phi$$

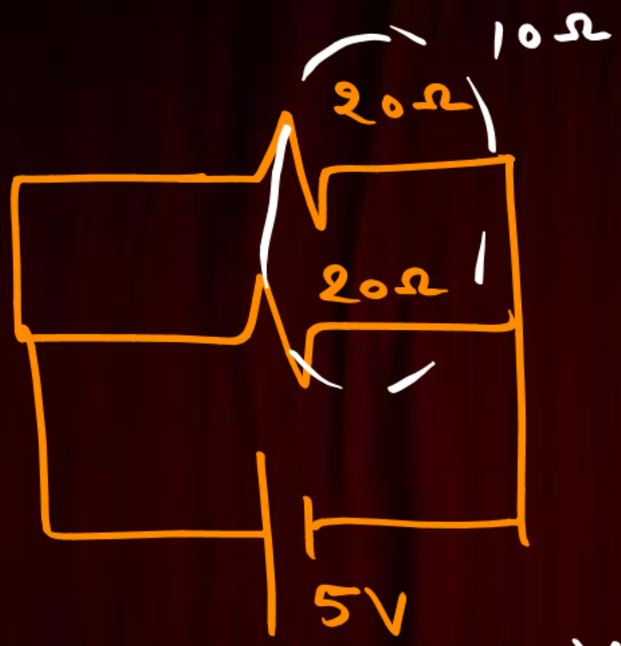
$$2eV = \frac{hc}{\lambda} - 1.4$$

$$\frac{hc}{\lambda} = 3.4\,eV$$

$$\frac{12420}{\lambda} = 3.4 \Rightarrow \lambda = \frac{12420}{3.4}$$

Two ideal diodes are connected in circuit as shown. find current through battery

[Semiconductor, Easy]



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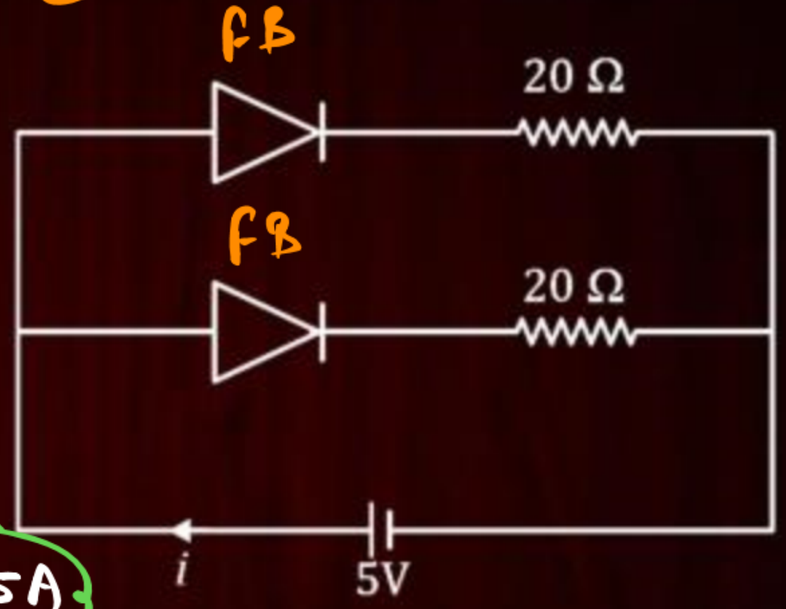

$$J = \frac{V}{R} = \frac{5}{10} = 0.5A$$

A 0.3 A

B 1 A

C 0.5 A ✓

D 0.25 A

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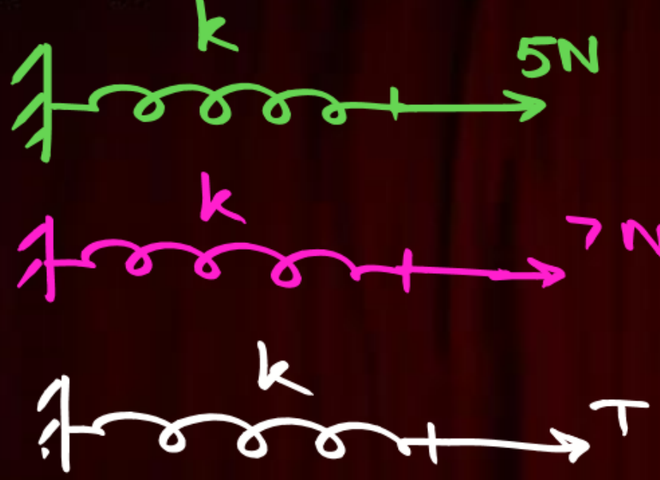
When a force of 5N is applied extension in the spring is found to be x_1, extension becomes x_2 when the force applied is 7N. Calculate the tension in spring when extension is $5x_1-2x_2$

[NLM, Easy]



$5 = kx_1 \Rightarrow x_1 = \frac{5}{k}$

$7 = kx_2 \Rightarrow x_2 = \frac{7}{k}$

$T = k(5x_1 - 2x_2)$

$= k\left[5\times\frac{5}{k} - 2\times\frac{7}{k}\right]$

$= 25 - 14 = 11$

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[Unit & dimensions
Moderate]

Match the following

List I	List II
A. Magnetic Field	P. $[L^2A]$
B. Magnetic Moment	Q. $[ML^2T^{-2}]$
C. Permittivity of free space	R. $[MT^{-2}A^{-1}]$
D. Torsional Constant	S. $[MLT^{-2}A^{-2}]$

B) $M = I \cdot A$

$[M] = [L^2 A]$

$\tau = c\theta$

$[c] = [\tau] = [ML^2T^{-2}]$

(A) A – R, B – P, C – S, D – Q

(B) A – S, B – Q, C – S, D – R

(C) A – P, B – R, C – Q, D – S

(D) A – Q, B – S, C – P, D - Q

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The energy in a system varies with position and time as $E(x, t) = x^3 e^{-\beta t}$, where $\beta = 0.3$ sec^{-1}. Given that the P% error in x = 1.2 % and that the % error in t = 1.6%. Find the maximum % error in E at t = 5 sec.

[Units & dimension, Head]

$$E = x^3 e^{-\beta t}$$

$$\frac{dE}{E} = \frac{(3x^2 dx)e^{-\beta t} + x^3\left[e^{-\beta t} \times (-\beta\, dt)\right]}{x^3 e^{-\beta t}}$$

$$\frac{dE}{E} = \frac{3x^2 e^{-\beta t}\, dx}{x^3 e^{-\beta t}} - \frac{\beta x^3 e^{-\beta t}\, dt}{x^3 e^{-\beta t}}$$

$$\Rightarrow \frac{dE}{E} = 3\frac{dx}{x} - \frac{\beta\, dt \times t}{t}$$

$$\Rightarrow \pm\frac{dE}{E} = 3\left[\pm\frac{dx}{x}\right] - \beta t\left[\pm\frac{dt}{t}\right]$$

$$\%E = 3 \times 1.x + \beta t \times 1.t$$

$$= 3 \times 1.2 + 0.3 \times 5 \times 1.6$$

$$= 3.6\% + 2.4\%$$

$$= 6\%$$ Ans