

JEE-Main-24-01-2025 (Memory Based)
[MORNING SHIFT]

Physics

Question: A force given by $F = \alpha + \beta x^2$ when $\alpha = 1$ acts on a particle from $x = 0$ to $x = 1$. If the work done is 5 joule then find β .

Options:

- (a) 12
- (b) 1/12
- (c) 1/3
- (d) 3/4

Answer: (a)

Question: If $I = I_A \sin \omega t + I_B \cos \omega t$, then find rms value of current

Options:

(a) $I_{rms} = I_A + I_B$

(b) $I_{rms} = \sqrt{I_A^2 + I_B^2}$

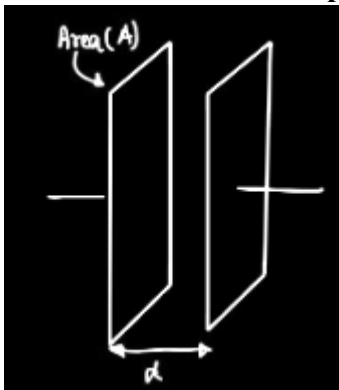
(c) $I_{rms} = \sqrt{\frac{I_A^2 + I_B^2}{2}}$

(d) $I_{rms} = \frac{1}{2} \sqrt{I_A^2 + I_B^2}$

Answer: (c)

Question: For a parallel plate capacitor having plate area A and separation between plate is d.

If electric field between plates is E, find energy density of capacitor.



Options:

- (a) $\frac{1}{4}\epsilon_0 E^2$
- (b) $\frac{1}{2}\epsilon_0 E^2$
- (c) $\frac{E^2}{2\epsilon_0}$
- (d) $2\epsilon_0^2$

Answer: (b)

Question: What is the relative shift of focal length of a lens when optical power is increased from 0.1 D to 2.5 D?

Options:

- (a) 24/25
- (b) 13/10
- (c) 21/25
- (d) 11/10

Answer: (a)

Question: A particle of mass m is projected with a velocity V_0 making an angle of 45° with the horizontal. The magnitude of the angular momentum of the projectile about the horizontal point of projection when the particle is at maximum height h is :

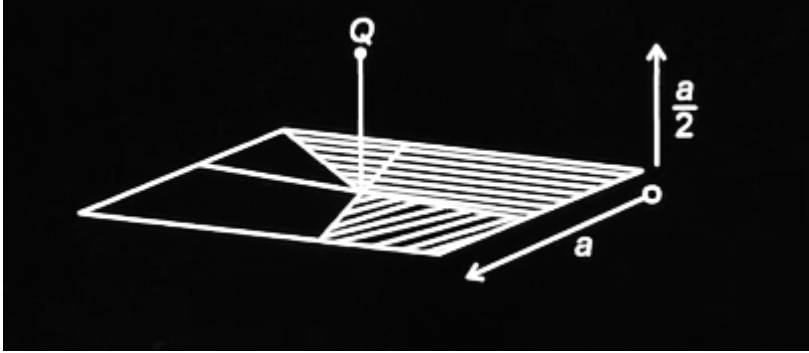
Options:

- (a) zero
- (b) $\frac{mV_0^3}{(4\sqrt{2}g)}$
- (c) $\frac{mV_0^3}{(\sqrt{2}g)}$
- (d) $m\sqrt{3gh^3}$

Answer: (b)

Question: The electric flux through the shaded area of square plate of side a due to

point charge placed at distance of $a/2$ from it as shown in figure, is $\frac{NQ}{48\epsilon_0}$.
Then N is



Options:

- (a) $N = 10$
- (b) $N = 5$
- (c) $N = 15$
- (d) $N = 20$

Answer: (b)

Question: In a square loop of side length $\frac{1}{\sqrt{2}}$ m, a current of 5 A is flowing. Find magnetic field at its centre in μT .

Options:

- (a) 80
- (b) 18
- (c) 9
- (d) 8

Answer: (d)

Question: The radius of circular motion of a satellite orbiting earth is changed from r to $1.03 r$. The percentage change in time period is

Options:

- (a) 4.5 %
- (b) 9 %
- (c) 3 %
- (d) 1 %

Answer: (a)

Question: A plano convex lens of refractive index 1.5 and radius of curvature 2 cm is kept in air and another plano convex lens of same refractive index and radius liquid whose refractive index is 1 : 2. Find f_1/f_2

Options:

- (a) $1/3$
- (b) $2/3$
- (c) $3/2$
- (d) $3/1$

Answer: (a)

Question: A car is negotiating a curved road of radius R with maximum velocity v . The road is banked at an angle θ . The coefficient of friction between the tyres of the car and the road is μ_s . Find μ_s

Options:

- (a) $\mu_s = \frac{V_0^2 - Rg \tan \theta}{Rg + V_0^2 \tan \theta}$
- (b) $\mu_s = \frac{V_0^2 - Rg \tan \theta}{Rg + V_0^2 \tan \theta}$
- (c) $\frac{V_0^2}{Rg}$
- (d) $\frac{V_0^2}{Rg \cos \theta}$

Answer: (a)

Question: Which statements are correct

S-1 : Zener diode works in inverse biased in heavily doped biasing

S-2 : LED work in forward bias and are heavily doped

S-3 : Photo diode work in forward bias and are lightly doped

S-4 : Solar cells are forward biased and are lightly doped

S-5 : An ideal P-N junction offers high resistance in reverse biasing and low resistance in forward biasing.

Options:

(a) S - 1, S - 2 and S - 5 are correct

(b) S - 1, S - 3 and S - 4 are correct

(c) S - 1, S - 2 and S - 4 are correct

(d) S - 1, S - 3 and S - 5 are correct

Answer: (a)

Question: An electron jumps from principal quantum state A to C by releasing photon of wavelength 2000 Å and from state B to C by releasing of photon of wavelength 6000 Å, then final the wavelength of photon for transistor from A to B.

Options:

(a) 3000 Å

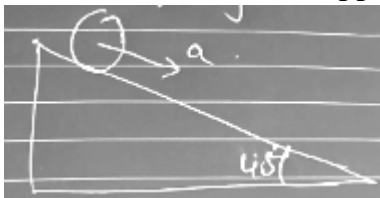
(b) 4000 Å

(c) 8000 Å

(d) 2000 Å

Answer: (a)

Question: The acceleration of a solid cylinder mass 'm' Radius 'R' rolling down an incline of 45° without slipping .



Options:

(a) 9

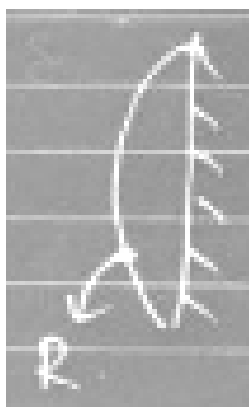
(b) 9/2

(c) $9\sqrt{2/3}$

(d) $9\sqrt{3/2}$

Answer: (3)

Question: For a given plano convex silvered as shown if equivalent focal length is F . Find radius of curvature of convex surface Refractive index(μ) surrounding as



Options:

(a) $\frac{(1 - \mu)}{2F}$

(b) $2(\mu - 1)F$

(c) $\frac{(\mu - 1)F}{2}$

(d) $(\mu - 1)F$

Answer: (b)

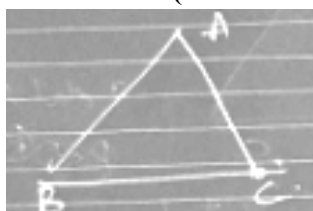
Question: A liquid drop is divided into 27 droplets and in that process work done is 10 J. If the same droplet is divided into 64 small droplets then find the work done.

Options:

- (a) 30 J
- (b) 15 J
- (c) 10 J
- (d) 60 J

Answer: (b)

Question: In the given figure total resistance of the wire ABC is R . Find resistance across AB. ($AB = BC = CA$)



Options:

- (a) $R/3$
- (b) $2R/5$
- (c) $3R/7$
- (d) $2R/9$

Answer: (d)

Question: A particle starts performing simple harmonic motion from its mean position with time period 2s and amplitude of 1cm. The average speed of the particle after 12.5 sec from the start of its motion is nearly.

Options:

- (a) 2 m/s
- (b) 200 m/s
- (c) 0.02 cm/s
- (d) 2 cm/s

Answer: (d)

Question: In an ideal gas pressure is varying with temperature according to the given equation $P = 2T$. Find which of the following at elements are correct (2 is a constant).

Statement 1 - process can be considered isochoric

Statement 2 - change in internal energy is 0

Statement 3 - Work done on the gas is 0

Statement 4 - No transfer of that energy

Options:

- (a) Statement 1,2,3
- (b) Statement 4
- (c) Statement 1 & 3
- (d) None of these

Answer: (c)

Question: In a parallel plate capacitor length and width are 3 cm and 1 cm respectively. Separation between plates is $3 \mu\text{m}$. By which of the following values capacitance increases by a factor of 10.

- (a) $l=6 \text{ cm}$, $b = 5 \text{ cm}$, $d = 3 \mu\text{m}$
- (b) $l=5 \text{ cm}$, $b=2 \text{ cm}$, $d= 1 \mu\text{m}$
- (c) $l =5 \text{ cm}$, $b= 1 \text{ cm}$, $d= 30 \mu\text{m}$
- (d) $l=1 \text{ cm}$, $b=1 \text{ cm}$, $d =30 \mu\text{m}$

Options:

- (a) A, B
- (b) A, C
- (c) B, C
- (d) B, C, D

Answer: (a)