

JEE-Main-31-01-2024 (Memory Based) [MORNING SHIFT]

Physics

Question: Find the energy released in kilowatt-hour if 4 gram of mass converts to energy.

Given speed of light is

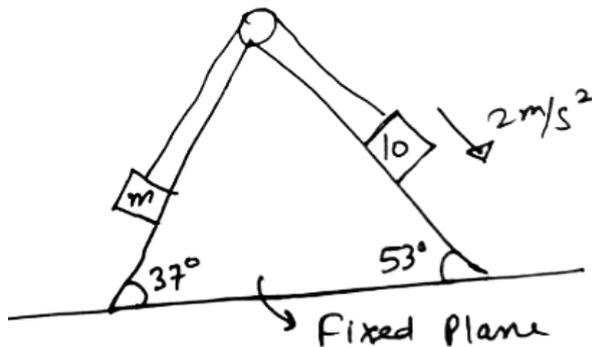
$$C = 3 \times 10^8 \text{ m/s}$$

Options:

- (a) 10^6 Kwh
- (b) 10^7 Kwh
- (c) 10^8 Kwh
- (d) 10^9 Kwh

Answer: (c)

Question: Find the value of m if the 10 kg block accelerates at 2 m/s^2 down the plane when coefficient of friction is $\frac{1}{4}$ at all the surfaces

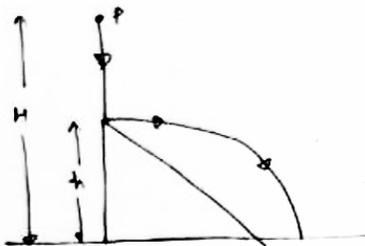


Options:

- (a) 4.5 kg
- (b) 3.5 kg
- (c) 2.5 kg
- (d) 1.5 kg

Answer: (a)

Question: A particle 'P' is released from a fixed height 'H' from the ground if falls on an incline at its top point. After striking the plane its velocity becomes horizontal. Find the ratio H/h so that total time of flight becomes maximum



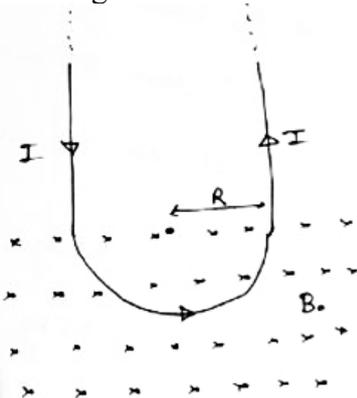
Options:



- (a) 4
- (b) 6
- (c) 2
- (d) 8

Answer: (c)

Question: A uniform magnetic field B_0 exists going inside the screen as shown. The two infinite parallel wires are joined to the semicircular wire of radius R as shown, and carry current I . Find the force on the wire if only the semicircular wire is present in the magnetic field region.



Options:

- (a) $2 IRB_0$
- (b) $I RB_0$
- (c) $4 I RB_0$
- (d) 0

Answer: (a)

Question: A capacitor connected with a battery has a charge Q . The charge increases to $2.5Q$ if a dielectric material with dielectric constant ' k ' is inserted. The value of ' k ' is

Options:

- (a) 0.4
- (b) 2.5
- (c) 1
- (d) 5

Answer: (b)

Question: In a region of space, the peak electric field due to electromagnetic wave is 50 N/C . Find the average energy density in this region.

Options:

- (a) $1.1 \times 10^{-8} \text{ J/m}^3$
- (b) $2.1 \times 10^{-8} \text{ J/m}^3$
- (c) $5.5 \times 10^{-9} \text{ J/m}^3$
- (d) $2.2 \times 10^{-8} \text{ J/m}^3$

Answer: (a)

Question: Two charges ' q ' and $3q$ are separated by a distance ' r ' if ' x ' is the distance from ' q ' where the electric field is zero, find x

Options:

- (a) $0.37r$



- (b) $0.73r$
(c) $1.7r$ 30-01-2024
(d) $1.4r$

Answer: (a)

Question: Light from two sources of intensities in ratio 1:9 and phase difference 60 degrees meet on the screen. Find the ratio of net intensity when they are coherent versus when they are not

Options:

- (a) $8/5$
(b) $5/8$
(c) $13/10$
(d) $10/13$

Answer: (c)

Question: Bulk modulus of rubber is $9 \times 10^8 \text{ N/m}^2$. To what depth a rubber ball is taken so that its volume decreases by 0.02 %. Density of water 10^3 kg/m^3 , $g = 10 \text{ m/s}^2$

Options:

- (a) 5 m
(b) 18 m
(c) 180 m
(d) 100

Answer: (b)

Question: Two equal resistances with temperature coefficients of resistances α_1 and α_2 respectively are first joined in series and then joined in parallel. The equivalent temperature coefficients in the two cases will be

Options:

- (a) $\alpha_1 + \alpha_2, \frac{\alpha_1 + \alpha_2}{2}$
(b) $\frac{\alpha_1 + \alpha_2}{2}, \frac{\alpha_1 + \alpha_2}{2}$
(c) $\frac{\alpha_1 + \alpha_2}{2}, \alpha_1 + \alpha_2$
(d) $\alpha_1 + \alpha_2, \alpha_1 + \alpha_2$

Answer: (b)

Question: If $t = \alpha x^2 + \beta x$ & v sphere velocity. Find Acceleration of particle

Options:

Answer: $(2\alpha v^3)$

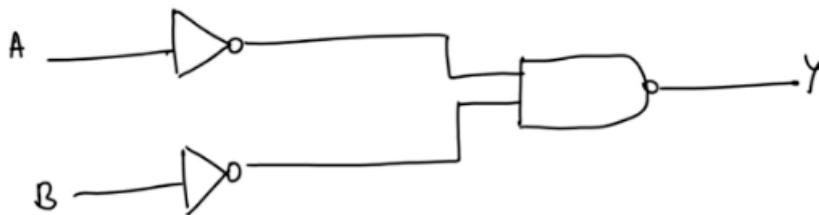
Question: If the error in the length and cross sectional diameter of a wire is both 1%, then the error in the resistance will be:

Options:

- (a) 2%
(b) 3%
(c) 4%
(d) 5%

Answer: (b)

Question: What is the below logic gate circuit equivalent to



Options:

- (a) AND gate
- (b) OR gate
- (c) NAND gate
- (d) NOR gate

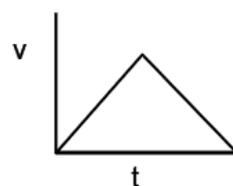
Answer: (b)

Question: A spherical ball is released from rest in a long cylinder filled with glycerine. The graph of its velocity vs time is

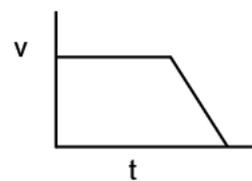
Options:



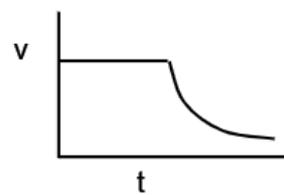
(a)



(b)



(c)



(d)

Answer: (a)

Question: A Prism has a refractive index of $\mu = \cot \frac{A}{2}$. Find the minimum deviation if it is kept in air. A is angle of Prism

Prism

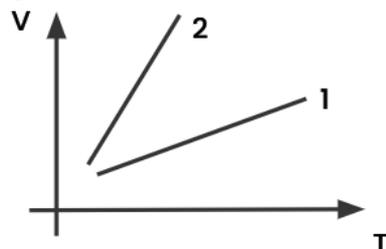
Options:

- (a) $\frac{\pi}{2} - \frac{A}{2}$

- (b) $\pi - 2A$
- (c) $\pi - A$
- (d) $\frac{\pi}{2} - A$

Answer: (b)

Question: Given two isobaric process compare the pressures ?



Options:

- (a) $P_1 < P_2$
- (b) $P_1 > P_2$
- (c) $P_1 = P_2$
- (d) None of the above

Answer: (b)

Question: Four particles each of mass 'm' are placed at the four vertices of a square of side 'a'. Find the net force on any one of the particle ?

Options:

Answer: $\frac{G.m^2}{2a^2}(2\sqrt{2} + 1)$

Question: If the stopping potential for light of wavelength λ is 8 Volts then find the threshold wavelength if the stopping potential becomes 2 Volts for a wavelength of 3λ ?

Options:

- (a) λ
- (b) 2λ
- (c) 3λ
- (d) 9λ

Answer: (d)

Question: An artillery of mass M_1 carries a shell of M_2 mass. Initially both are at rest. If artillery fires the shell on smooth ground in the horizontal direction then the ratio of KE of artillery & shell will be

Options:

- (a) M_1/M_2
- (b) M_2/M_1
- (c) M_1+M_2/M_2
- (d) M_1+M_2/M_1

Answer: (b)

Question: A block is performing SHM of amplitude A. When it is at $2A/3$ from mean position, its velocity is tripled. Find the new amplitude of motion. $A' = \frac{A}{3}$

Options:

- (a) 7
- (b) 6
- (c) 5
- (d) 3

Answer: (a)