

**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

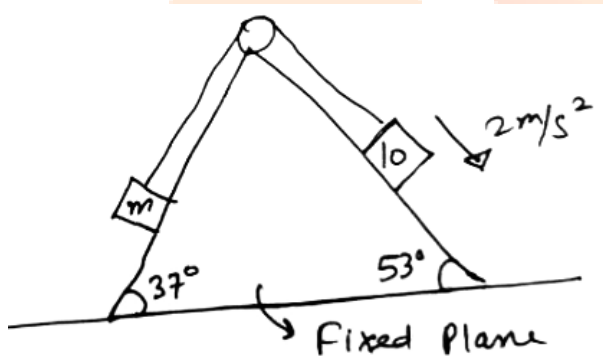
$$C = 3 \times 10^8 \text{ m/s}$$

**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  $2 \text{ m/s}^2$  down the plane when coefficient of friction is  $\frac{1}{4}$  at all the surfaces

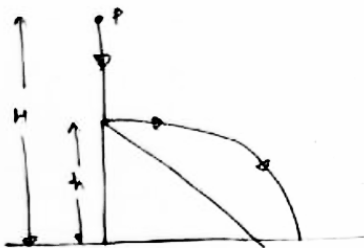


**Options:**

- (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

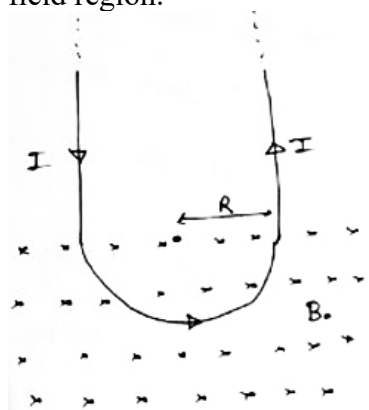


**Options:**

- (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  $50 \text{ N/C}$ . 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)  $1.7r$   
 (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  $10^3 \text{ kg/m}^3$ ,  $g = 10 \text{ m/s}^2$

**Options:**

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

**Answer: (b)**

**Question:** Two equal resistances with temperature coefficients of resistances  $\alpha_1$  and  $\alpha_2$  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:  $(2\alpha v^3)$**

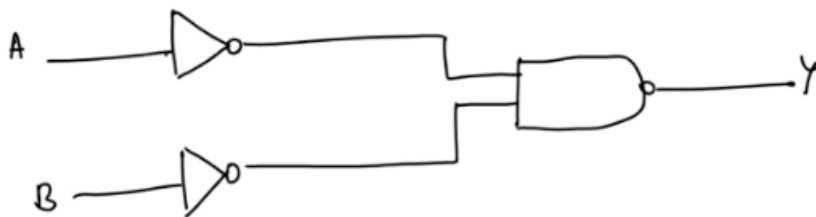
**Question:** If the error in the length and cross sectional diameter of a wire is both 1%, then the error in the resistance will be:

**Options:**

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

**Answer: (b)**

**Question:** What is the below logic gate circuit equivalent to



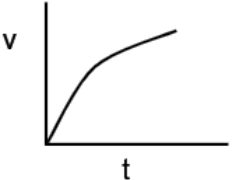
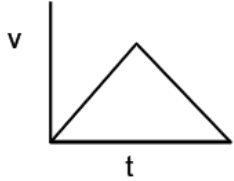
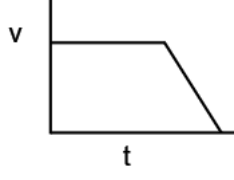
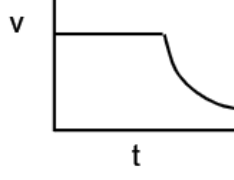
**Options:**

- (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

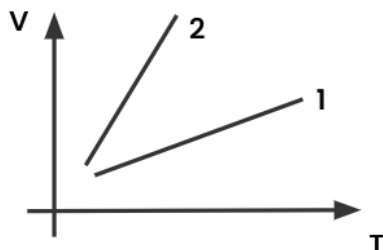
**Options:**

- (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:**  $\frac{G \cdot m^2}{2a^2} (2\sqrt{2} + 1)$

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

**Options:**

- (a)  $\lambda$
- (b)  $2\lambda$
- (c)  $3\lambda$
- (d)  $9\lambda$

**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)**

