Çözüm:

Fotun enerjisi $E = \hbar \cdot f$ ifadesi ile verilir. → X $E = h \cdot f$

De Broglie dalga boyu çizgisel momentum ile doğru orantılıdır → X

$\lambda = \frac{h}{p}$

Korunumlu kuvvetler tarafından yapılan iş, sistemin ilk ve son durumuna bağlıdır. İlk ve son durum arasında izlenen yol yapılan işi etkilemez. → ✓

Tamamen yalıtılmış bir sistemde bir nokta yükün r kadar uzağındaki bir noktadaki elektrik alan vektörü o noktadan geçen eş potansiyel yüzeye diktir → ✓

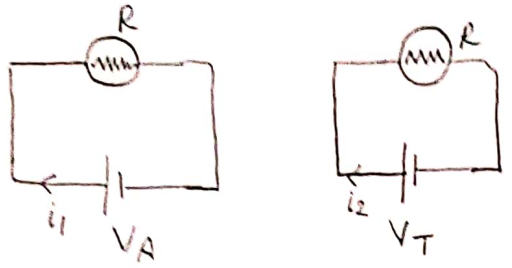
Dünyanın manyetik güney kutbu ile coğrafi güney kutbunun konumları günümüzde farklıdır → ✓

Bir cismin sıcaklığını 1 Celsius derece yükseltmek için gerekli ısı enerjisine o cismin özgül ısısı denir → X ısı sığası

Bir ışık ışını herhangi iki nokta arasında ilerlerken izlediği yol en az zamanı gerektiren yoldur → ✓ Fermat Prensibi

Cevap: B

Çözüm:



$$i_1 = \frac{V_A}{R} \qquad P = i_1^2 R = \frac{V_A^2}{R^2} R \qquad R = \frac{V_A^2}{P}$$

$$V_T = i_2 \cdot R \qquad i_2 = \frac{V_T}{R}$$

$$P_T = i_2^2 R = \left(\frac{V_T}{R}\right)^2 R = \frac{V_T^2}{R^2} R = \frac{V_T^2}{R} = \frac{V_T^2}{V_A^2/P} = \frac{V_T^2}{V_A^2} \cdot P$$

$$P_T = \left(\frac{V_T}{V_A}\right)^2 P = \left(\frac{240}{120}\right)^2 \cdot 90 = 360 \text{ W}$$

Cevap: E

Çözüm:

$$p = \frac{n \cdot R \cdot T}{V} = \frac{n \cdot R \cdot T}{h \cdot S} \qquad p = \frac{m_1 g}{S}$$

$$\frac{n \cdot R \cdot T}{h \cdot S} = \frac{m_1 g}{S} \qquad h = \frac{n \cdot R \cdot T}{m_1 g}$$

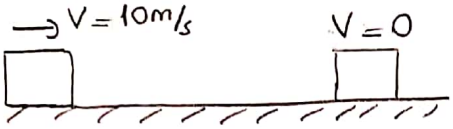
$$p' = \frac{n \cdot R \cdot T}{V'} = \frac{n \cdot R \cdot T}{h' \cdot S} \qquad p' = \frac{(m_1 + m_2)\, g}{S}$$

$$\frac{n \cdot R \cdot T}{h' \cdot S} = \frac{(m_1 + m_2)\, g}{S} \qquad \frac{m_1 \cdot g \cdot h}{h'} = (m_1 + m_2) \cdot g$$

$$h' = \frac{m_1}{m_1 + m_2} \cdot h = \frac{3}{3+9} \cdot 4 = 1\ m,,$$

Cevap: A

Çözüm:



$K_i = \frac{1}{2} m V^2$ $\qquad K_i = Q$

$Q = \frac{1}{2} m V^2 = \frac{1}{2} \cdot 4 \cdot 10^2 = 50 \cdot (4.2) j$ $\qquad 1 j = \frac{1}{4.2} cal$ $\qquad Q = \frac{50 \cdot (4.2)}{4.2} cal = 50 c$

$-20^\circ C$ buz $\longrightarrow 0^\circ$ buz $\longrightarrow 0^\circ$ su $\longrightarrow 10^\circ$ su

$Q_{gerekli} = m \cdot c_{buz} \cdot \Delta T + m \cdot L_b + m \cdot c_{su} \cdot \Delta T$

$Q_{gerekli} = m \cdot (0.5 \cdot 20 + 80 + 1 \cdot 10) = 100 \cdot m$

$100 \cdot m = 50$ $\qquad m = 0.5 gr$

Cevap: E

Çözüm:

$V_1 \rightarrow$ ilk durum

$\Delta V = \beta \cdot \Delta T \cdot V_{ilk}$

$\Delta V_{celik} = \beta_c \cdot V_1 \cdot \Delta T \qquad \Delta V_{etanol} = \beta_e V_1 \cdot \Delta T$

$\Delta V_{etanol} - \Delta V_{celik} = \beta_e \cdot V_1 \cdot \Delta T - \beta_c \cdot V_1 \cdot \Delta T = V_1 \cdot \Delta T \cdot (\beta_e - \beta_c)$

$V_1 = 100\ m^3 \quad \Delta T = 26 - 9 = 17^\circ C \quad \beta_e = 75 \cdot 10^{-5} \quad \beta_c = 3.6 \cdot 10^{-5}$

$\Delta V = 100 \cdot 17 \cdot 10^{-5} \cdot (71.4) = 1.2138\ m^3 \cong 1.2\ m^3 \qquad 1.2\ m^3$ taşır

Cevap: A

Çözüm:

$$P = k \cdot A \left| \frac{\Delta T}{L} \right|$$

$$\frac{J}{s} = [k] \cdot m^2 \cdot \frac{k}{m} \qquad [k] = \frac{J}{m \cdot k \cdot s}$$

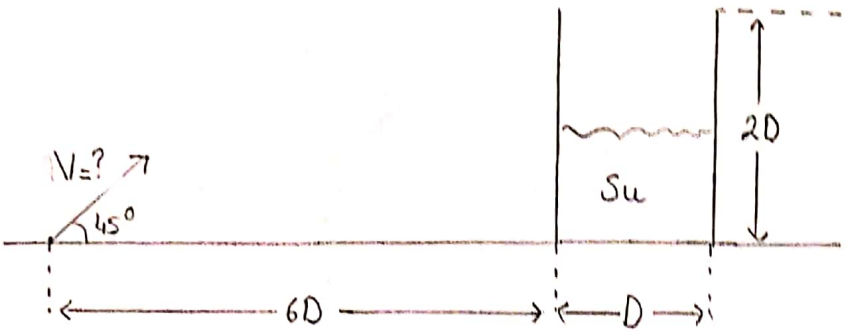
$$P = \sigma \cdot A \, e \cdot T^4$$

$$\frac{J}{s} = [\sigma] \cdot m^2 \cdot k^4 \qquad [\sigma] = \frac{J}{m^2 k^4 s}$$

$$\frac{[k]}{[\sigma]} = \frac{J}{m \cdot k \cdot s} \cdot \frac{m^2 \cdot k^4 \cdot s}{J} = m \cdot k^3$$

Cevap: E

Gözüm:



$V_{min} \cdot \cos 45 \cdot t = 6D$

$V_{min} \cdot \sin 45 \cdot t - \frac{1}{2} g t^2 = 2D$

$V_{min} \cdot \frac{1}{\sqrt{2}} \cdot \frac{6D}{V_{min} \cdot \frac{1}{\sqrt{2}}} - \frac{1}{2} g \cdot \frac{36D^2}{\frac{V_{min}^2}{2}} = 2D$

$6D - \frac{36gD^2}{V_{min}^2} = 2D \qquad 4D = \frac{36gD^2}{V_{min}^2}$

$V_{min}^2 = 9gD \qquad V_{min} = \sqrt{9gD} = 3\sqrt{gD}$

$V_{max} \cdot \cos 45 \cdot t = 7D$

$V_{max} \cdot \sin 45 \cdot t - \frac{1}{2} g t^2 = 2D$

$V_{max} \cdot \frac{1}{\sqrt{2}} \cdot \frac{7D}{V_{max} \cdot \frac{1}{\sqrt{2}}} - \frac{1}{2} g \cdot \frac{49D^2}{\frac{V_{max}^2}{2}} = 2D$

$7D - \frac{49gD^2}{V_{max}^2} = 2D \qquad 5D = \frac{49gD^2}{V_{max}^2}$

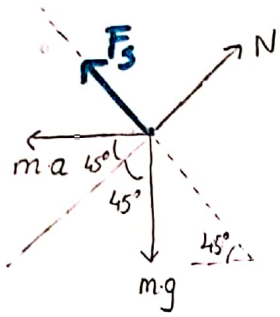
$V_{max}^2 = \frac{49}{5} gD \qquad V_{max} = \frac{7}{\sqrt{5}} \sqrt{gD}$

$3\sqrt{gD} < V < \frac{7}{\sqrt{5}} \sqrt{gD}$

Cevap: A

Çözüm:

Araba referans sisteminde:



$0 < \beta < 1$ için;

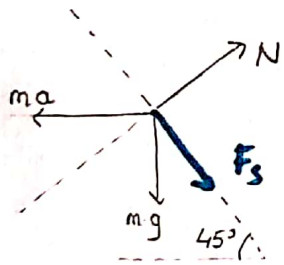
$m \cdot g \cdot \cos 45 > m \cdot a \cdot \cos 45$ } F_s yönü

$$N = m \cdot a \cdot \cos 45 + m \cdot g \cdot \cos 45 = \frac{m}{\sqrt{2}}(a+g)$$

$$\mu \cdot \frac{m}{\sqrt{2}}(a+g) + m \cdot a \cdot \cos 45 = m \cdot g \cdot \cos 45$$

$$\mu \cdot \frac{m}{\sqrt{2}}(a+g) = m \cdot \frac{1}{\sqrt{2}} \cdot (g-a) \qquad \mu = \frac{g-a}{g+a} = \frac{g-\beta g}{g+\beta g}$$

$$\mu = \frac{1-\beta}{1+\beta}$$



$\beta > 1$ için;

$m \cdot g \cos 45 < m \cdot a \cdot \cos 45$ } F_s yönü

$$N = m \cdot a \cdot \cos 45 + m \cdot g \cdot \cos 45 = \frac{m}{\sqrt{2}}(a+g)$$

$$\mu \cdot \frac{m}{\sqrt{2}}(a+g) + m \cdot g \cdot \cos 45 = m \cdot a \cdot \cos 45$$

$$\mu \cdot \frac{m}{\sqrt{2}}(a+g) = m \cdot \frac{1}{\sqrt{2}}(a-g) \qquad \mu = \frac{a-g}{a+g} = \frac{\beta \cdot g - g}{\beta \cdot g + g}$$

$$\mu = \frac{\beta - 1}{\beta + 1}$$

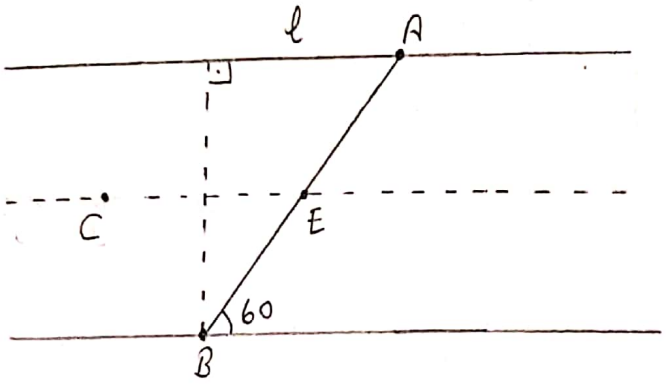
$0 < \beta < 1$ için $\mu = \frac{1-\beta}{1+\beta}$

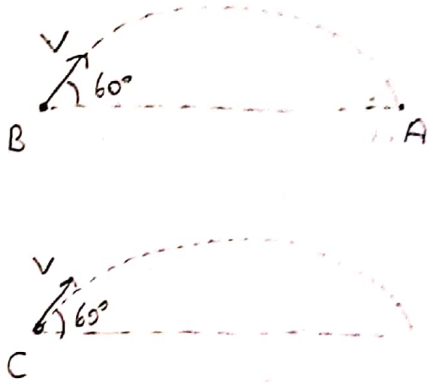
$\beta > 1$ için $\mu = \frac{\beta - 1}{\beta + 1}$

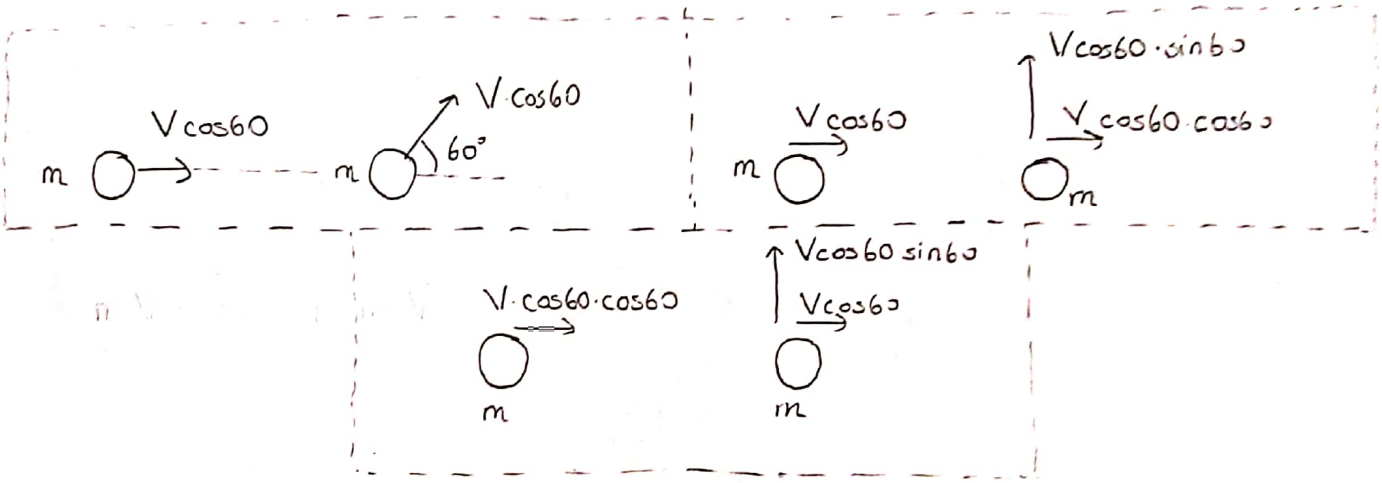
Cevap: D

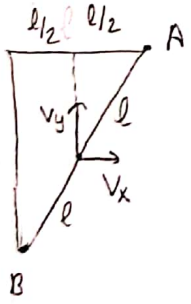
Gözüm:

Kuşbakışı Görünüm





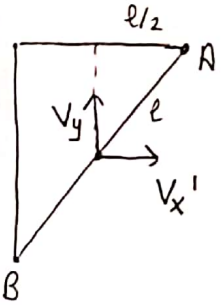




Vy · t = ℓ√3 / 2

Vx · t = ℓ / 2

Gorpışma olmasaydı



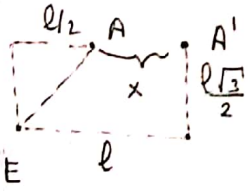
Vy · t = ℓ√3 / 2

Vx' t = ℓ'

Gorpışma olunca

$V_x = V \cdot \cos60 \cdot \cos60 = V \cdot \frac{1}{4}$ $\quad V_x' = V \cdot \cos60 = V \cdot \frac{1}{2}$

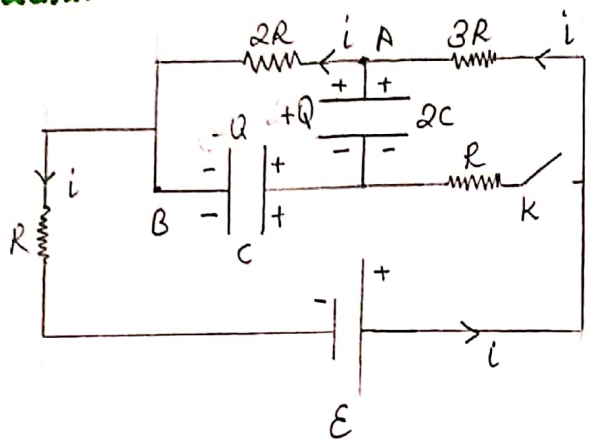
$t = \frac{\ell}{2V_x}$ $\quad \ell' = V_x' \frac{\ell}{2V_x} = \frac{\ell}{2} \cdot \frac{\frac{V}{2}}{\frac{V}{4}} = \ell$



$x = \ell - \frac{\ell}{2} = \frac{\ell}{2}$ //

Cevap: C

Gözüm:



kirchhoff Yasasından;

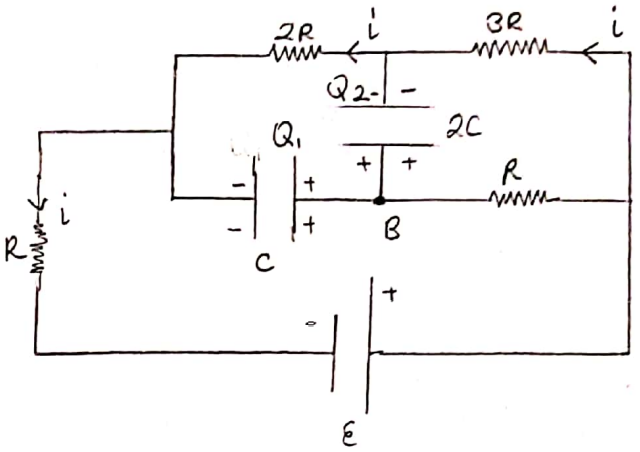
$$\varepsilon - i\cdot 3R - i\cdot 2R - i\cdot R = 0$$

$$V_A - 2i\cdot R + \frac{Q}{C} + \frac{Q}{2C} = V_A$$

$$\varepsilon = 6\,i\,R \qquad i = \frac{\varepsilon}{6R}$$

$$\frac{3Q}{2C} = 2\cdot\frac{\varepsilon}{6R}\cdot R = \frac{\varepsilon}{3}$$

$$Q_{ilk} = \frac{2}{9}C\varepsilon$$



kirchhoff Yasasından;

$$\varepsilon - 6\cdot i\cdot R = 0 \qquad i = \frac{\varepsilon}{6\cdot R}$$

$$V_B - \frac{Q_2}{2C} - i\cdot 2R + \frac{Q_1}{C} = V_B$$

$$\frac{\varepsilon}{6R}\cdot 2R = \frac{\varepsilon}{3} = \frac{2Q_1 - Q_2}{2C}$$

$$\varepsilon - \frac{Q_2}{2C} - i\cdot 2R - i\,R = 0$$

$$\frac{Q_2}{2C} = \varepsilon - 3i\,R = \varepsilon - 3\cdot\frac{\varepsilon}{6R}\cdot R = \frac{\varepsilon}{2}$$

$$Q_2 = \varepsilon\cdot C \qquad Q_1 = \left(\frac{2\varepsilon C}{3} + Q_2\right)\cdot\frac{1}{2}$$

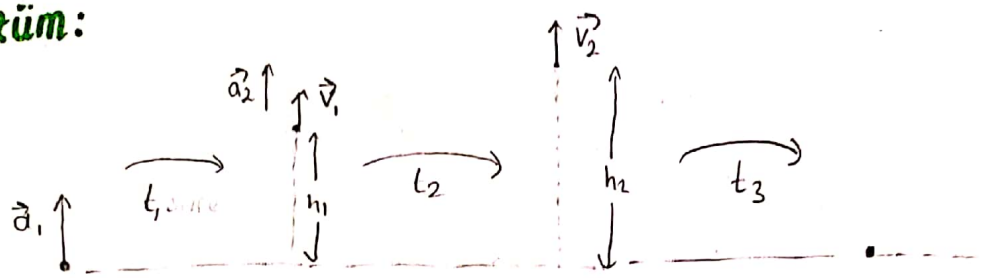
$$Q_1 = \frac{5}{3}\,\varepsilon\cdot C\cdot\frac{1}{2} = \frac{5}{6}\varepsilon C$$

$$Q_{son} = Q_1 + Q_2 = \frac{5}{6}\varepsilon C + \varepsilon C = \frac{11\varepsilon C}{6}$$

$$\Delta Q = Q_{son} - Q_{ilk} = \underset{(6)}{\frac{11}{6}}\varepsilon C - \underset{(4)}{\frac{2}{9}}\varepsilon C = \frac{66-8}{36}\varepsilon\cdot C = \frac{58}{36}\varepsilon\cdot C = \frac{29}{18}\varepsilon C$$

Cevap: B

Çözüm:



$$\frac{1}{2}a_1 t_1^2 = h_1 \qquad a_1 t_1 = V_1$$

$$V_1 + a_2 t_2 = V_2 \qquad a_2 = \frac{V_2 - V_1}{t_2}$$

$$V_1 t_2 + \frac{1}{2}a_2 t_2^2 = h_2 - h_1$$

$$a_1 t_1 t_2 + \frac{1}{2}\frac{V_2 - a_1 t_1}{t_2} t_2^2 = h_2 - \frac{1}{2}a_1 t_1^2$$

$$a_1 t_1 t_2 + \frac{1}{2}V_2 t_2 - \frac{1}{2}a_1 t_1 t_2 + \frac{1}{2}a_1 t_1^2 = h_2$$

$$h_2 = \frac{a_1 t_1 (t_1 + t_2) + V_2 t_2}{2}$$

$$h_2 + V_2 t_3 - \frac{1}{2}g t_3^2 = 0$$

$$t_{top.} = t_1 + t_2 + t_3$$

h_2, t_3 ?

$$\frac{g t_3^2}{2} - V_2 t_3 - \frac{a_1 t_1 (t_1 + t_2) + V_2 t_2}{2} = 0$$

$$t_3^2 - \frac{2V_2}{g} t_3 - \frac{a_1 t_1 (t_1 + t_2) + V_2 t_2}{g} = 0$$

$$t_3 = \frac{\frac{2V_2}{g} \pm \sqrt{\left(\frac{2V_2}{g}\right)^2 + 4\,\frac{a_1 t_1 (t_1 + t_2) + V_2 t_2}{g}}}{2} = \frac{V_2}{g} + \sqrt{\frac{V_2^2}{g^2} + \frac{a_1 t_1 (t_1 + t_2) + V_2 t_2}{g}}$$

$V_2 = 132.5\ m/s \quad g = 9.81\ m/s^2 \quad a_1 = 3.5\ m/s^2 \quad t_1 = 25s \quad t_2 = 10s$

$t_3 \cong 38.5\ s$

$t_{top.} = t_1 + t_2 + t_3 = 25 + 10 + 38.5 = 73.5\ s$

Cevap: B

Çözüm:

$$q = (0.1)\cdot 10^{-3}\cdot (5.6)\cdot 10^{11}\cdot (1.6)\cdot 10^{-19} \cong 8.96\cdot 10^{-12} C$$

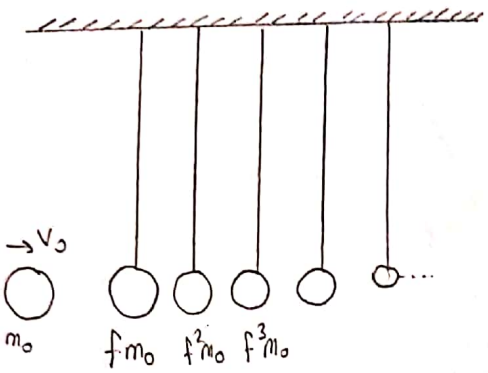
$$E = k\frac{q}{r^2}$$

$$10^{-6} = 9\cdot 10^{9}\cdot \frac{8.96\cdot 10^{-12}}{r^2} \qquad r^2 = 9\cdot (8.96)\cdot 10^{3} \qquad r \cong 283.97$$

283.97 metre ve altındaki uzaklıkları hissedebilirler.

Cevap: D

Çözüm:



Momentum korunumu;

$$m_0 \cdot V_0 = m_0 \cdot V_0' + f \cdot m_0 \cdot V_1$$

Enerji korunumu;

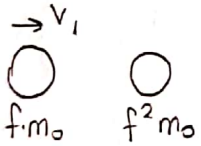
$$\frac{1}{2} m_0 V_0^2 = \frac{1}{2} m_0 V_0'^2 + \frac{1}{2} f \cdot m_0 \cdot V_1^2$$

$$V_0' = V_0 - V_1 \cdot f$$

$$V_0^2 = V_0'^2 + f \cdot V_1^2$$

$$V_0^2 = V_0^2 - 2 f V_0 V_1 + V_1^2 f^2 + f V_1^2$$

$$2 f V_0 V_1 = V_1^2 f (f+1) \qquad V_1 = \frac{2V_0}{f+1}$$



$$f m_0 \cdot V_1 = f m_0 V_1' + f^2 m_0 V_2$$

$$\frac{1}{2} f m_0 V_1^2 = \frac{1}{2} f m_0 V_1'^2 + \frac{1}{2} f^2 m_0 V_2^2$$

$$V_1' = V_1 - V_2 \cdot f$$

$$V_1^2 = V_1'^2 + f V_2^2$$

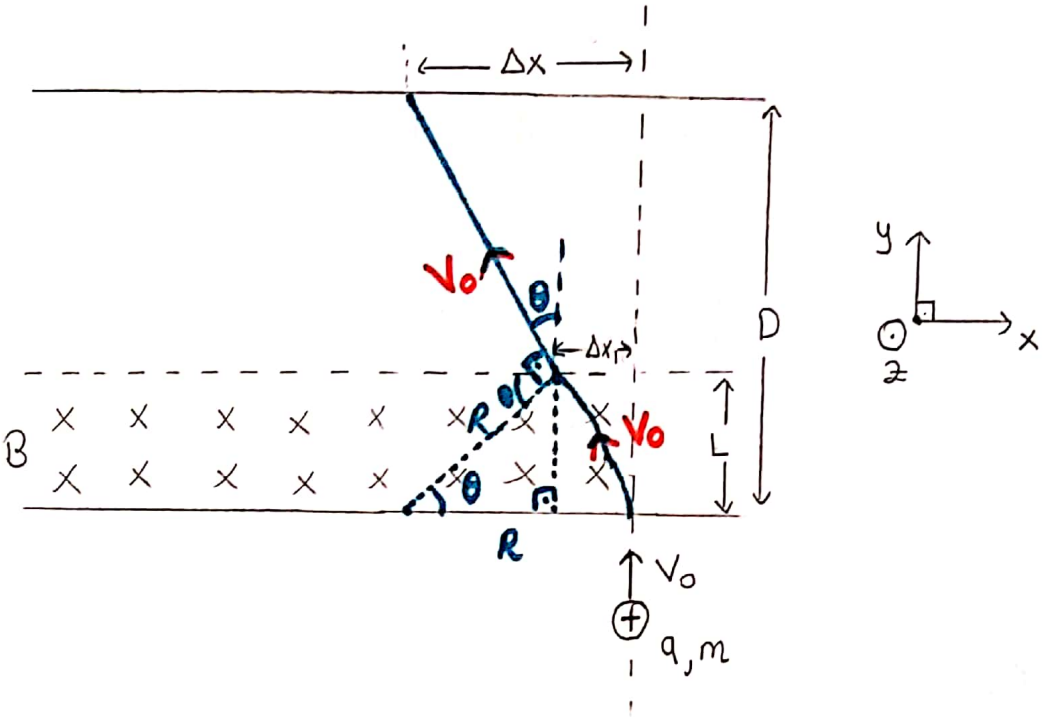
$$V_1^2 = V_1^2 - 2 V_1 V_2 f + V_2^2 f^2 + f V_2^2$$

$$2 V_1 V_2 f = V_2^2 f (1+f) \qquad V_2 = \frac{2}{f+1} V_1 = \frac{2}{f+1} \cdot \frac{2}{f+1} \cdot V_0 = \left(\frac{2}{f+1}\right)^2 V_0$$

$$V_1 = \left(\frac{2}{f+1}\right)^1 V_0 \qquad V_2 = \left(\frac{2}{f+1}\right)^2 V_0 \qquad V_n = \left(\frac{2}{f+1}\right)^n V_0$$

Cevap: A

Çözüm:



$$m \cdot V_0 = B \cdot q \cdot R \qquad R = \frac{m \cdot V_0}{B \cdot q} \qquad \sin\theta = \frac{L}{R} \qquad \cos\theta = \frac{\sqrt{R^2 - L^2}}{R} \qquad \tan\theta = \frac{L}{\sqrt{R^2 - L^2}}$$

$$\Delta x_1 = R - R \cdot \cos\theta = R \cdot (1 - \cos\theta)$$

$$\Delta x = \Delta x_1 + V_0 \cdot \sin\theta \cdot t \qquad V_0 \cdot \cos\theta \cdot t = D - L \qquad t = \frac{D - L}{V_0 \cdot \cos\theta}$$

$$\frac{\Delta x}{\Delta x_1} = \frac{\Delta x_1 + V_0 \cdot \sin\theta \cdot t}{\Delta x_1} = 1 + \frac{V_0 \cdot \sin\theta \cdot \frac{D - L}{V_0 \cdot \cos\theta}}{R \cdot (1 - \cos\theta)} = 1 + \frac{(D - L) \cdot \tan\theta}{R \cdot (1 - \cos\theta)}$$

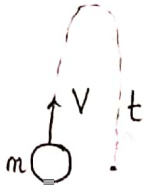
$$\frac{\Delta x}{\Delta x_1} = 1 + \frac{D - L}{R} \cdot \frac{L}{\sqrt{R^2 - L^2}} \cdot \frac{1}{1 - \frac{\sqrt{R^2 - L^2}}{R}} = 1 + \frac{L \cdot (D - L)}{\sqrt{R^2 - L^2} \cdot (R - \sqrt{R^2 - L^2})}$$

$$m = 3 \cdot 10^{-11}\ kg \qquad V_0 = 2 \cdot 10^5\ m/s \qquad B = 0.5\ T \qquad q = 2\mu C \qquad D = 3\sqrt{11}\ m \qquad L = \sqrt{11}\ m$$

$$R = \frac{3 \cdot 10^{-11} \cdot 2 \cdot 10^5}{(0.5) \cdot (2 \cdot 10^{-6})} = 6\ m \qquad \frac{\Delta x}{\Delta x_1} = 1 + \frac{(3\sqrt{11} - \sqrt{11}) \cdot \sqrt{11}}{\sqrt{6^2 - 11} \cdot (6 - \sqrt{6^2 - 11})} = 1 + \frac{2 \cdot 11}{5 \cdot (6 - 5)} = 5.4$$

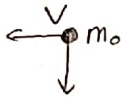
Cevap: D

Çözüm:



$$V \cdot t - \frac{1}{2} a \cdot t^2 = 0 \qquad a = \frac{2V}{t}$$

$$G \frac{M \cdot m}{R^2} = m \cdot a \qquad a = \frac{G \cdot M}{R^2}$$



$$G \frac{M \cdot m_0}{(R+h)^2} = \frac{m_0 V^2}{(R+h)} \qquad V = \sqrt{G \frac{M}{R+h}}$$

$$V \cdot T = 2\pi \cdot (R+h) \qquad \sqrt{G \frac{M}{R+h}} \cdot T = 2\pi (R+h)$$

$$T = \frac{2\pi \cdot (R+h)}{\sqrt{\frac{a \cdot R^2}{M} \cdot \frac{M}{R+h}}} = 2\pi (R+h) \sqrt{\frac{R+h}{a \cdot R^2}} = 2\pi \sqrt{\frac{(R+h)^3 \cdot t}{2V R^2}}$$

Cevap: A

Çözüm:

$$\frac{1}{f} = \left(\frac{n_m}{n_o} - 1\right)\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$$

$$\frac{1}{f_1} = \left(\frac{3}{1} - 1\right)\left(\underset{(2)}{\frac{1}{6}} + \underset{(3)}{\frac{1}{4}}\right) = 2 \cdot \frac{5}{12} \qquad \frac{1}{f_1} = \frac{5}{6}$$

$$\frac{1}{f_2} = \left(\frac{3}{4/3} - 1\right)\left(\frac{1}{6} + \frac{1}{4}\right) = \frac{5}{4} \cdot \frac{5}{12} \qquad \frac{1}{f_2} = \frac{25}{48}$$

$$\frac{1}{f} = \frac{1}{d_c} + \frac{1}{d_g} \qquad \frac{d_c}{d_g} = \frac{h_c}{h_g}$$

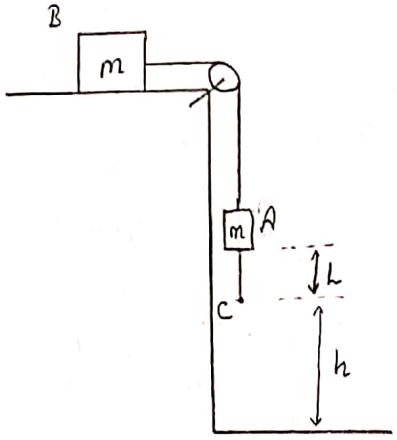
$$\frac{5}{6} = \frac{1}{12} + \frac{1}{d_g} \qquad \frac{1}{d_g} = \frac{9}{12} \qquad d_g = \frac{4}{3} \qquad \frac{h}{h_g} = \frac{12}{4/3} = 9 \qquad h_g = \frac{h}{9}$$

$$\frac{25}{48} = \frac{1}{d_c} + \frac{1}{d_g} \qquad \frac{d_c}{d_g} = \frac{h_c}{h_g} \qquad h_g = \frac{d_g}{d_c} h_c \qquad \frac{d_g}{d_c} \cdot h = \frac{h}{9} \qquad d_c = 9 \cdot d_g$$

$$\frac{25}{48} = \frac{1}{d_c} + \frac{9}{d_c} = \frac{10}{d_c} \qquad d_c = \frac{48 \cdot 10}{25} = \frac{96}{5} = 19.2\ cm$$

Cevap : E

Çözüm:



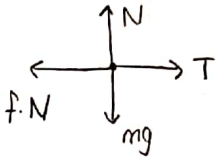
Serbest Cisim Diyagramları;

A;

$$mg - F_s = m \cdot a_A$$

$$F_s = T$$

B;



$$T - f \cdot N = m \cdot a_B$$

$$N = m \cdot g$$

$$\left.\begin{aligned} \frac{1}{2} a_A \cdot t^2 &= L+h \\ \frac{1}{2} a_B \cdot t^2 &= h \end{aligned}\right\} \quad t^2 = \frac{2(L+h)}{a_A} = \frac{2h}{a_B} \qquad a_B = a_A \cdot \frac{h}{L+h}$$

$$\left.\begin{aligned} m \cdot g - T &= m \cdot a_A \\ T - f \cdot m \cdot g &= m \cdot a_B \end{aligned}\right\} \quad m \cdot g \cdot (1-f) = m \cdot (a_A + a_B) \qquad g(1-f) = a_A + a_A \cdot \frac{h}{L+h}$$

$$g(1-f) = a_A \cdot \left(1 + \frac{h}{L+h}\right) = a_A \cdot \left(\frac{L+2h}{L+h}\right) \qquad a_A = \frac{g \cdot (h+L)(1-f)}{2h+L}$$

Cevap: E

Çözüm:

$$V = k\frac{q}{r} \rightarrow E = k\frac{q}{r^2} = \frac{V}{r} \rightarrow r = \frac{V}{E}$$

Sınır durum için elde edilebilen gerilim 3MV, maksimum elde edilebilen gerilim olsun.

$$r = \frac{3\,MV}{3\cdot 10^6 \frac{V}{m}} = \frac{3\cdot 10^6\,V}{3\cdot 10^6\,\frac{V}{m}} = 1m$$

$r = 1m$ için max. $\rightarrow$ 3MV

$r > 1m$ için max. $>$ 3MV

$r = 0.5m$ için $\rightarrow$ $(0.5)\cdot 3\cdot 10^6 = 1.5\,MV$ ✗

$r = 0.75m$ için $\rightarrow$ $(0.75)\cdot 3\cdot 10^6 = 2.25\,MV$ ✗

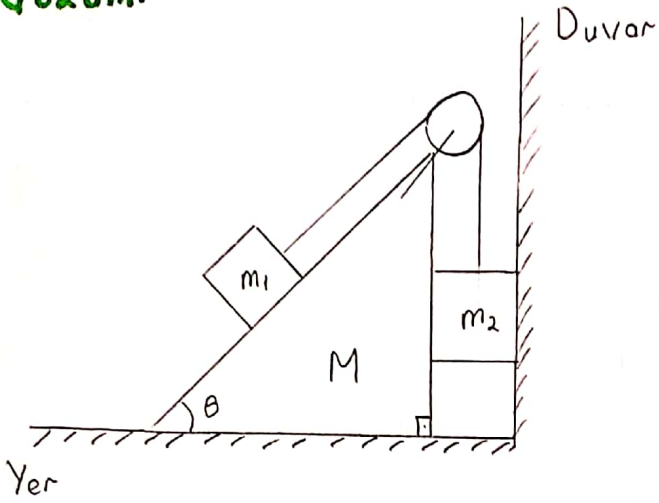
$r = 1m$ için $\rightarrow$ $(1)\cdot 3\cdot 10^6 = 3\,MV$ ✓

$r = 1.25m$ için $\rightarrow$ $(1.25)\cdot 3\cdot 10^6 = 3.75\,MV$ ✓

$r = 1.5m$ için $\rightarrow$ $(1.5)\cdot 3\cdot 10^6 = 4.5\,MV$ ✓

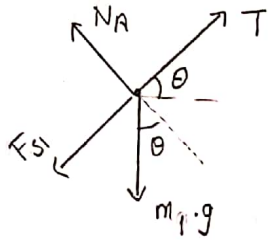
Cevap: D

Çözüm:

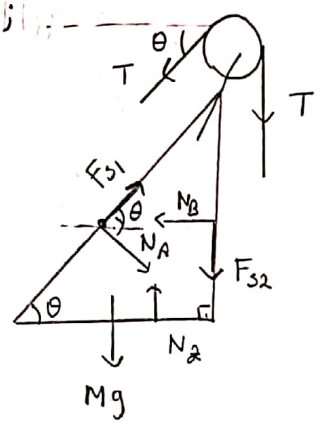


Serbest Cisim Diyagramları;

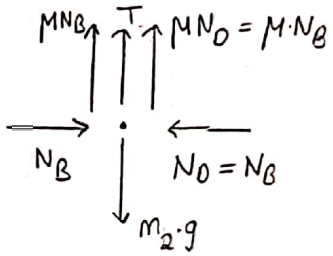
m_1 ;



M;



m_2;



$$m_1 \begin{cases} N_A = m_1 \cdot g \cos\theta \quad F_{S1} = \mu N_A \\ T - \mu m_1 \cdot g \cos\theta - m_1 g \sin\theta = 0 \end{cases}$$

$$M \left\{ F_{S1} \cdot \cos\theta + N_A \cdot \sin\theta = N_B + T\cos\theta \right.$$

$$m_2 \left\{ m_2 \cdot g - T - 2\mu N_B = 0 \right.$$

$$T = m_1 \cdot g \cdot (\sin\theta + \mu \cdot \cos\theta)$$

$$N_B = F_{S1} \cdot \cos\theta + N_A \sin\theta - T\cos\theta$$

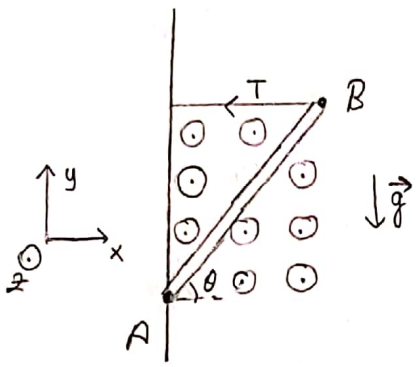
$$m_2 = \frac{T + 2\mu \cdot N_B}{g}$$

$$N_B = \mu m_1 g \cos\theta \cdot \cos\theta + m_1 \cdot g \cos\theta \sin\theta - (m_1 g \sin\theta \cdot \cos\theta - m_1 \cdot g \cos\theta \cdot \mu \cdot \cos\theta) = 0$$

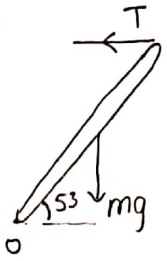
$$m_2 = \frac{T}{g} = \frac{m_1 \cdot g (\sin\theta + \mu \cdot \cos\theta)}{g} = m_1 \cdot (\sin\theta + \mu \cdot \cos\theta)$$

Cevap: A

Çözüm:

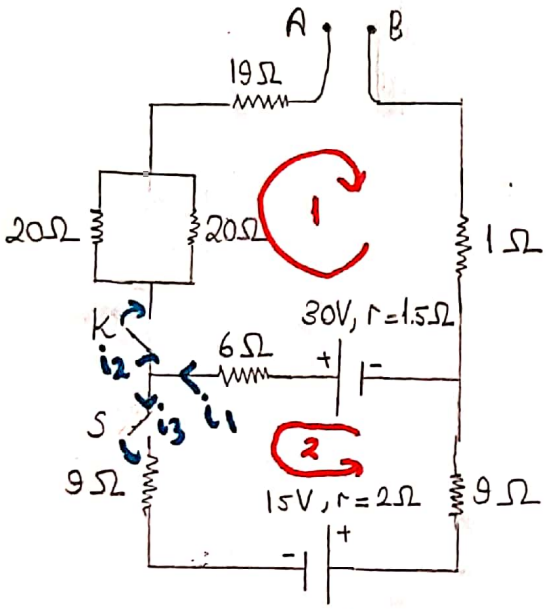


Anahtarlar kapatılmadan önce;

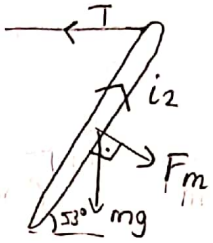


τ_o/ $mg \cdot \frac{\ell}{2} \cdot \cos 53 = T \cdot \ell \cos 37$

$T = \frac{mg}{2} \frac{\cos 53}{\cos 37} = \frac{mg}{2} \cdot \frac{0.6}{0.8} = \frac{3mg}{8}$



Anahtarlar kapatıldıktan sonra;



τ_o/ $mg \cdot \frac{\ell}{2} \cos 53 + i_2 \ell B \cdot \frac{\ell}{2} = T' \ell \cos 37$

$T' = \frac{mg}{2} \frac{\cos 53}{\cos 37} + \frac{i_2 B \ell}{2 \cos 37}$

$T' = \frac{3mg}{8} + \frac{i_2 B \cdot \ell}{2 \cos 37} = T + \frac{i_2 B \cdot \ell}{2 \cos 37}$

1. ve 2. ilmek için Kirchhoff Yasaları;

$i_2 + i_3 = i_1 \rightarrow i_3 = i_1 - i_2$

$30 - (6+1.5)\, i_1 - (10+19+1)\, i_2 = 0$

$30 - (6+1.5) \cdot i_1 - (9+2+9) \cdot (i_1 - i_2) + 15$

$30 - 7.5 i_1 - 30 i_2 = 0$

$30 - 7.5 i_1 - 20 i_1 + 20 i_2 + 15 = 0$

$i_1 + 4 i_2 = 4$

$27.5 i_1 + 20 i_2 = 45$

$5 i_1 + 20 i_2 = 20$

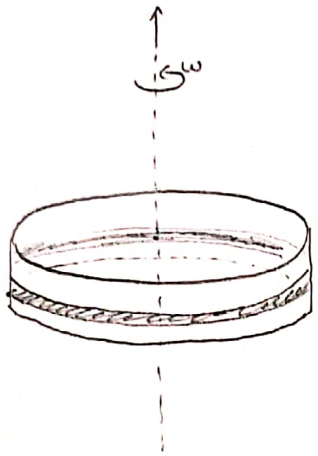
$27.5 i_1 - 20 i_2 = 45$

$32.5 i_1 = 65 \quad i_1 = 2A \quad i_2 = \frac{4 - i_1}{4} = 0.5A \quad B = 8T \quad \ell = 1m$

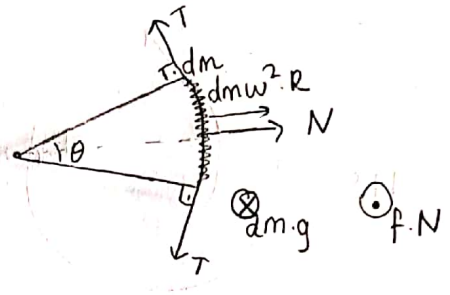
$\frac{i_2 \cdot B \cdot \ell}{2 \cdot \cos 37} = \frac{(0.5) \cdot 8 \cdot 1}{2 \cdot (0.8)} = 25 \qquad T' = T + 2.5\ N$

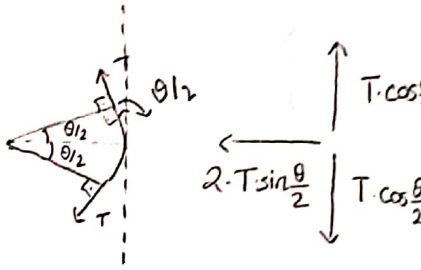
Cevap: C

Çözüm:



kuşbakışı bakış;





$$N + dm \cdot \omega^2 \cdot R = 2T \cdot \sin\frac{\theta}{2} \qquad \sin\frac{\theta}{2} \approx \frac{\theta}{2}$$

$$N = T \cdot \theta - dm \cdot \omega^2 \cdot R \qquad dm = \frac{m}{2\pi R} R \cdot \theta$$

$$N = T \cdot \theta - \frac{m}{2\pi} \cdot \theta \cdot \omega^2 \cdot R$$

Harekete geçme koşulu;

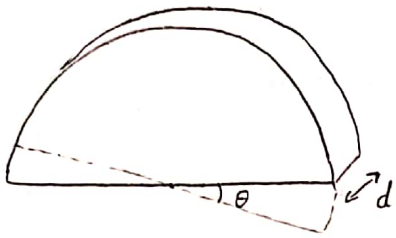
$$dm \cdot g \geq f \cdot N \qquad \frac{m \cdot \theta}{2\pi} \cdot g \geq f \cdot \left(T - \frac{m}{2\pi} \omega^2 R\right) \cdot \theta$$

$$\frac{m \cdot g}{2\pi} = f \cdot T - \frac{m \cdot f \cdot R}{2\pi} \omega^2 \qquad \frac{m \cdot f \cdot R}{2\pi} \cdot \omega^2 = f \cdot T - \frac{m \cdot g}{2\pi}$$

$$\omega^2 = \frac{2\pi}{m \cdot f \cdot R} \cdot \frac{2\pi f T - m \cdot g}{2\pi} = \frac{f \cdot 2\pi T - m \cdot g}{f \cdot m \cdot R} \qquad \omega = \sqrt{\frac{f \cdot 2\pi T - m \cdot g}{f \cdot m \cdot R}}$$

Cevap: A

Çözüm:



$$C = k\,\varepsilon_0 \cdot \frac{A}{d} \qquad C_0 = \varepsilon \cdot \varepsilon_0 \; \frac{\pi R^2/2}{d} = \frac{\varepsilon \cdot \varepsilon_0 \pi R^2}{2d}$$

$$C_1 = \varepsilon \cdot \varepsilon_0 \; \frac{\pi R^2 \left(\frac{\pi - \theta}{2\pi}\right)}{d} + \varepsilon_0 \; \frac{\pi R^2 \cdot \frac{\theta}{2\pi}}{d} = \frac{\varepsilon_0 \pi R^2}{2d}\left(\varepsilon\left(1 - \frac{\theta}{\pi}\right) + \frac{\theta}{\pi}\right)$$

$$E = \frac{1}{2} C V^2$$

$$E_{son.} = \frac{1}{2} C_1 \cdot U^2 = \frac{1}{2} \; \frac{\varepsilon_0 \pi R^2}{2d} \cdot \left(\varepsilon - \frac{\theta}{\pi}(\varepsilon - 1)\right) U^2$$

$$E_{ilk} = \frac{1}{2} C \cdot U^2 = \frac{1}{2} \; \frac{\varepsilon \cdot \varepsilon_0 \pi R^2}{2d} \cdot U^2$$

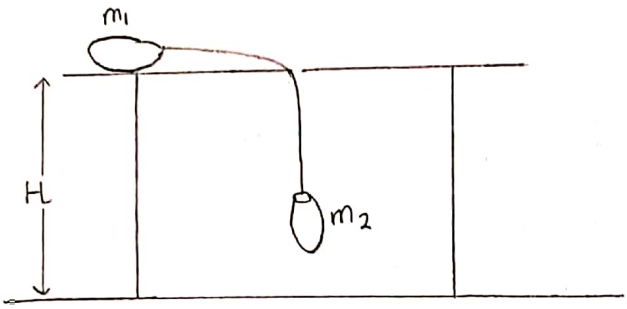
$$E_{son} - E_{ilk} = \frac{1}{2} \; \frac{\varepsilon_0 \pi R^2 \cdot U^2}{2d}\left(\varepsilon - \frac{\theta}{\pi}(\varepsilon - 1) - \varepsilon\right) = -\frac{\varepsilon_0 \pi R^2 \cdot U^2}{4d} \cdot \frac{\theta}{\pi}(\varepsilon - 1)$$

$$\Delta U = -\frac{\varepsilon_0 \cdot (\varepsilon - 1) \cdot \theta \cdot R^2}{4d} U^2 \qquad W = -\Delta U = \tau \cdot \theta$$

$$\tau = \frac{\varepsilon_0 \cdot (\varepsilon - 1) \cdot R^2 \cdot U^2}{4d}$$

Cevap: A

Çözüm:

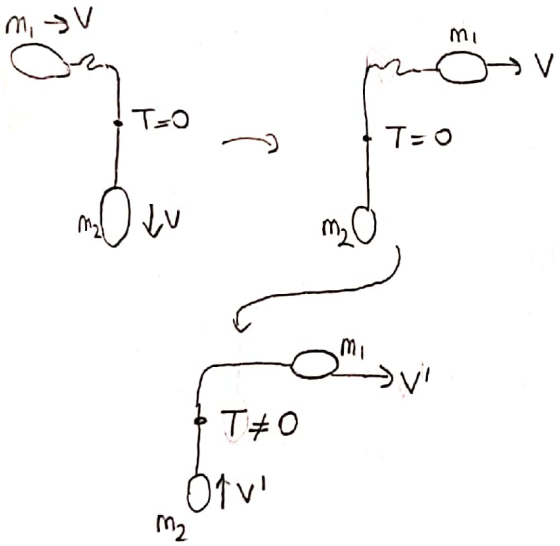


$U_0 = m_2 \cdot g\,H + m_1 \cdot g\,H \qquad K_0 = 0$

$U_S = m_1 \cdot g\,H \qquad K_S = \frac{1}{2}(m_1+m_2)V^2$

$$m_2 g H = \frac{1}{2}(m_1+m_2)V^2$$

$$V^2 = \frac{2 m_2 g H}{(m_1+m_2)}$$



Momentum korunumu:

$$m_1 \cdot V = (m_1+m_2)\cdot V' \qquad V' = \frac{m_1}{m_1+m_2} V$$

Mekanik enerji korunumu:

$$E_{ilk.} = U_i + K_i = m_1 \cdot g\,H + \frac{1}{2}(m_1+m_2)\cdot V'^2$$

$$E_{son.} = U_S + K_S = m_2 g\,h + m_1 g\,H$$

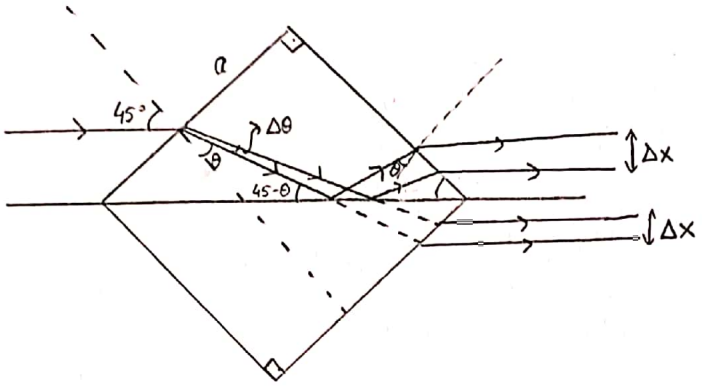
$$m_2 g h + m_1 g H = m_1 g H + \frac{1}{2}(m_1+m_2)\cdot V'^2 \qquad h = \frac{m_1+m_2}{2 m_2 g} V'^2$$

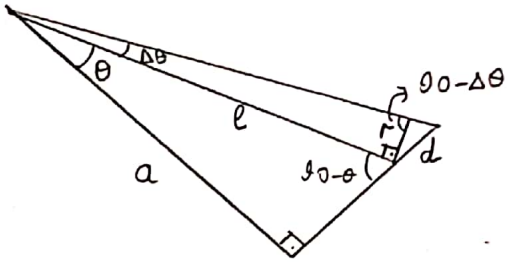
$$h = \frac{1}{2}\,\frac{m_1+m_2}{m_2 \cdot g}\cdot\frac{m_1^2}{(m_1+m_2)^2}\cdot V^2 = \frac{m_1^2}{2 m_2 g (m_1+m_2)}\cdot\frac{2 m_2 g H}{(m_1+m_2)} = \left(\frac{m_1}{m_1+m_2}\right)^2 H$$

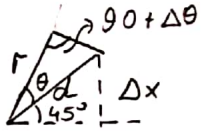
$$h = \left(\frac{m_1}{m_1+m_2}\right)^2 \cdot H$$

Cevap: B

Gözüm:







$\ell \cdot \cos\theta = a \qquad \tan\Delta\theta \approx \Delta\theta = \frac{r}{\ell}$

$r = \ell \cdot \Delta\theta = \frac{a}{\cos\theta} \cdot \Delta\theta$

$d \cdot \cos\theta = r \qquad d \cdot \sin 45 = \Delta x$

$\frac{r}{\cos\theta} \cdot \frac{1}{\sqrt{2}} = \Delta x$

$$\Delta x = \frac{a \cdot \Delta\theta}{\cos\theta} \cdot \frac{1}{\cos\theta \cdot \sqrt{2}} = \frac{a \cdot \Delta\theta}{\sqrt{2}\cos^2\theta}$$

Snell Yasaları;

$1 \cdot \sin 45 = (n + \Delta n) \cdot \sin\theta$

$$1 \cdot \sin 45 = n \cdot \sin(\theta + \Delta\theta) = n \cdot (\sin\theta \cdot \overbrace{\cos\Delta\theta}^{1} + \cos\theta \cdot \overbrace{\sin\Delta\theta}^{\Delta\theta}) \cong n\sin\theta + n \cdot \Delta\theta \cos\theta$$

$$\sin\theta = \frac{1}{(n+\Delta n)\cdot\sqrt{2}} \qquad \cos\theta = \sqrt{1 - \frac{1}{2(n+\Delta n)^2}} = \frac{\sqrt{2\cdot(n^2 + 2n\Delta n + (\Delta n)^2) - 1}}{\sqrt{2}\cdot(n+\Delta n)}$$

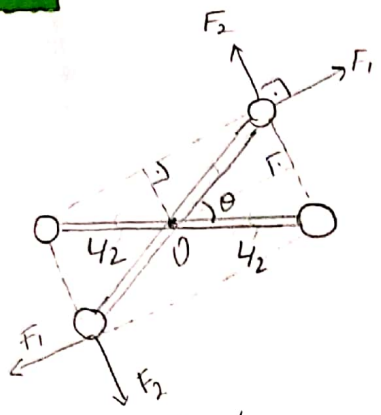
$$\cos\theta \cong \frac{\sqrt{2n^2 - 1}}{\sqrt{2}\,(n+\Delta n)} \qquad \frac{1}{\sqrt{2}} = n \cdot \frac{1}{\sqrt{2}\cdot(n+\Delta n)} + n\,\frac{\sqrt{2n^2-1}}{\sqrt{2}\,(n+\Delta n)} \cdot \Delta\theta$$

$$n + \Delta n = n + n\sqrt{2n^2 - 1} \cdot \Delta\theta \qquad \Delta\theta = \frac{\Delta n}{n\sqrt{2n^2-1}}$$

$$\Delta x = \frac{a}{\sqrt{2}} \cdot \frac{\Delta n}{n\cdot\sqrt{2n^2-1}} \cdot \frac{2\cdot(n+\Delta n)^2}{2n^2-1} = \frac{2a\cdot\Delta n\cdot(n^2 + \cancel{2n\cdot\Delta n}^{\,0} + \cancel{\Delta n^2}^{\,0})}{\sqrt{2}\,n\cdot(2n^2-1)^{3/2}} \cong \frac{\sqrt{2}\,a\,n\cdot\Delta n}{(2n^2-1)^{3/2}}$$

Cevap: A

Çözüm :



$$F_2 = \frac{1}{4\pi\varepsilon_0}\frac{Q^2}{\left(2\frac{L}{2}\sin\frac{\theta}{2}\right)^2} = \frac{Q^2}{4\pi\varepsilon_0 L^2\sin^2\frac{\theta}{2}}$$

$$F_1 = \frac{1}{4\pi\varepsilon_0}\frac{Q^2}{\left(2\frac{L}{2}\cos\frac{\theta}{2}\right)^2} = \frac{Q^2}{4\pi\varepsilon_0 L^2\cos^2\frac{\theta}{2}}$$

$$\tau = F_2\cdot\frac{L}{2}\cos\frac{\theta}{2} - F_1\cdot\frac{L}{2}\sin\frac{\theta}{2} = \frac{Q^2}{4\pi\varepsilon_0 L^2}\cdot\frac{L}{2}\left(\frac{\cos\frac{\theta}{2}}{\sin^2\frac{\theta}{2}} - \frac{\sin\frac{\theta}{2}}{\cos^2\frac{\theta}{2}}\right)$$

$$\tau = \frac{Q^2}{8\pi\varepsilon_0 L}\cdot\frac{\cos^3\frac{\theta}{2} - \sin^3\frac{\theta}{2}}{\sin^2\frac{\theta}{2}\cdot\cos^2\frac{\theta}{2}} \qquad \theta = \frac{\pi}{2} - \varepsilon$$

$$\tau = \frac{Q^2}{8\pi\varepsilon_0 L}\frac{\left(\cos\frac{\theta}{2} - \sin\frac{\theta}{2}\right)\left(\cos^2\frac{\theta}{2} + \frac{\sin\theta}{2} + \sin^2\frac{\theta}{2}\right)}{\frac{\sin^2\theta}{4}} = \frac{Q^2}{4\pi\varepsilon_0 L}\cdot\frac{(2+\sin\theta)\left(\cos\frac{\theta}{2} - \sin\frac{\theta}{2}\right)}{\sin^2\theta}$$

$$\sin\left(\frac{\pi}{2} - \varepsilon\right) = \cos\varepsilon \qquad \sin\left(\frac{1}{2}\left(\frac{\pi}{2} - \varepsilon\right)\right) = \sin\frac{\pi}{4}\cdot\cos\frac{\varepsilon}{2} - \cos\frac{\pi}{4}\sin\frac{\varepsilon}{2} = \frac{1}{\sqrt{2}}\left(\cos\frac{\varepsilon}{2} - \sin\frac{\varepsilon}{2}\right)$$

$$\cos\left(\frac{1}{2}\left(\frac{\pi}{2} - \varepsilon\right)\right) = \cos\frac{\pi}{4}\cdot\cos\frac{\varepsilon}{2} + \sin\frac{\pi}{4}\cdot\sin\frac{\varepsilon}{2} = \frac{1}{\sqrt{2}}\left(\cos\frac{\varepsilon}{2} + \sin\frac{\varepsilon}{2}\right)$$

$\cos\varepsilon \cong \cos\frac{\varepsilon}{2} \cong 1$

$\sin\varepsilon \cong \varepsilon$

$\sin\frac{\varepsilon}{2} \cong \frac{\varepsilon}{2}$

$$\tau_0 = 2\cdot\frac{Q^2}{4\pi\varepsilon_0 L}\cdot\frac{(2+\cos\varepsilon)\frac{1}{\sqrt{2}}\left(\cos\frac{\varepsilon}{2} + \sin\frac{\varepsilon}{2} - \cos\frac{\varepsilon}{2} + \sin\frac{\varepsilon}{2}\right)}{\cos^2\varepsilon} = \frac{Q^2\cdot 3\,\varepsilon\cdot 2}{4\sqrt{2}\,\pi\varepsilon_0 L}$$

$$I = 2\cdot M\left(\frac{L}{2}\right)^2 = \frac{M\cdot L^2}{2} \qquad \tau = I\cdot\alpha$$

$$-\frac{Q^2\cdot 6^3\,\varepsilon}{2\cdot 4\sqrt{2}\,\pi\varepsilon_0 L} = M\cdot\frac{L^2}{2}\cdot\ddot{\varepsilon} \qquad \ddot{\varepsilon} + \frac{3Q^2}{\sqrt{2}\,\pi\varepsilon_0 ML^3}\varepsilon = 0 \qquad \omega = \sqrt{\frac{3Q^2}{\sqrt{2}\,\pi\varepsilon_0 ML^3}}$$

$$f = \frac{\omega}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{3Q^2}{\sqrt{2}\,\pi\varepsilon_0 ML^3}} \qquad T = 2\pi\cdot\frac{1}{\omega} = 2\pi\sqrt{\frac{\sqrt{2}\,\pi\varepsilon_0 ML^3}{3Q^2}} \qquad \frac{1}{4\pi\varepsilon_0} = k$$

$$T = 2\pi\sqrt{\frac{\sqrt{2}\,ML^3}{12kQ^2}}$$

Cevap: A