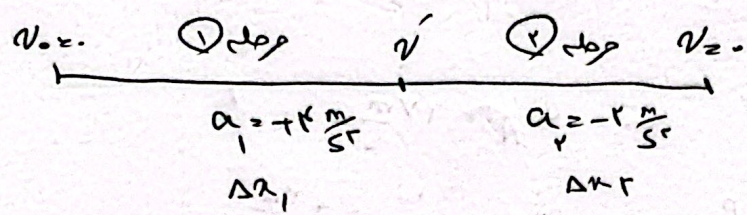


۴۴

$$\frac{1}{\lambda} = R_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$

$$\frac{1}{\lambda} = R \left(\frac{1}{r^2} - \frac{1}{\infty r^2} \right) \rightarrow \frac{1}{\lambda} = \frac{R}{r} \rightarrow \lambda = \frac{r}{R}$$



۱ ۴۷

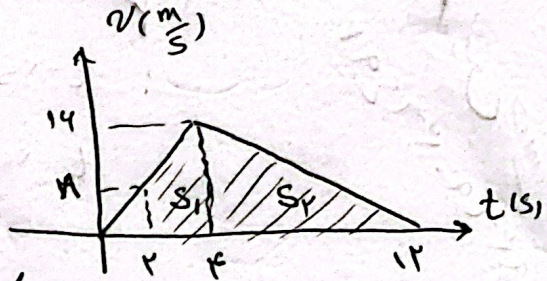
$$\Delta x_1 + \Delta x_2 = 94 \quad \text{و} \quad v_1 - v_2 = 2a \Delta x$$

$$\begin{aligned} (1) \quad v_1 - 0 &= 2a_1 \Delta x_1 \rightarrow v_1 - 0 = 8 \Delta x_1 \rightarrow \Delta x_2 = 2 \Delta x_1 \\ (2) \quad 0 - v_2 &= 2a_2 \Delta x_2 \rightarrow 0 - v_2 = -4 \Delta x_2 \end{aligned}$$

$$\Delta x_1 + \Delta x_2 = 94 \rightarrow 3 \Delta x_1 = 94 \rightarrow \Delta x_1 = 31.33 \text{ m}$$

$$\Delta x_2 = 2 \Delta x_1 = 62.66 \text{ m}$$

$$\begin{aligned} (1) \quad \Delta x_1 &= \frac{1}{2} a t^2 + v_1 t \\ 31.33 &= \frac{1}{2} \times 4 \times t^2 + 0 \rightarrow t = 3.96 \text{ s} \\ v_1 &= a t + v_1 \rightarrow v_1 = 15.73 \text{ m/s} \end{aligned}$$

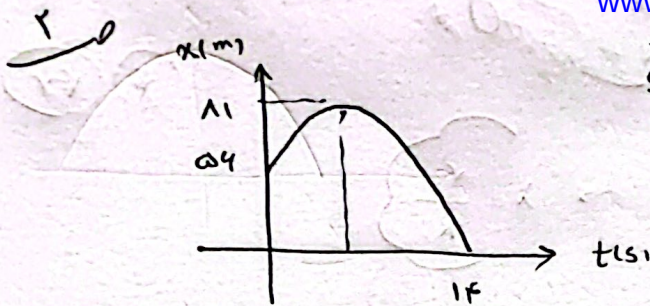


$$(2) \quad 0 = a t + v_2 \rightarrow 0 = -2 t + 14 \rightarrow t = 7 \text{ s}$$

$$\begin{aligned} \Delta x &= S_1 + S_2 \\ S_1 &= \left(\frac{15.73 + 0}{2} \right) \times 3.96 = 31.33 \text{ m} \\ S_2 &= \frac{15.73 \times 7}{2} = 55.06 \text{ m} \end{aligned}$$

$$\bar{v} = \frac{\text{Total Distance}}{\text{Total Time}} = \frac{31.33 + 55.06}{7 - 0} = \frac{86.39}{7} = 12.34 \text{ m/s}$$

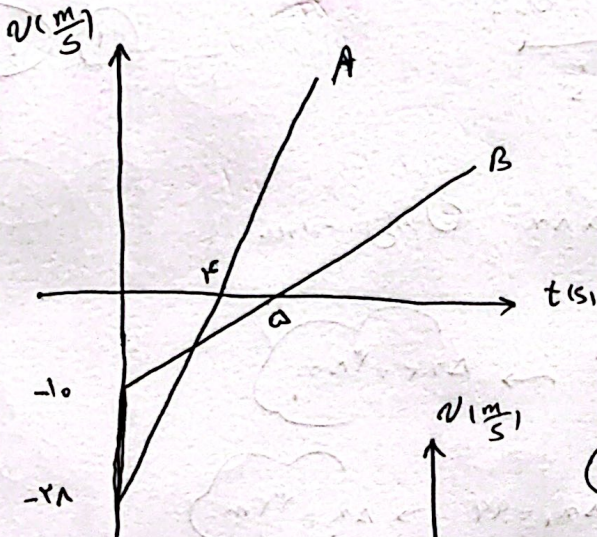
سازمان سنجش



$$\bar{S} = \frac{\Delta x}{\Delta t} = \frac{(11 - 0) + 11}{10} = \frac{22}{10} = 2.2 \text{ m/s}$$

$$= \frac{a \cdot t}{2} = \frac{0.4}{2} = 0.2 \text{ m/s}$$

(1) (2)

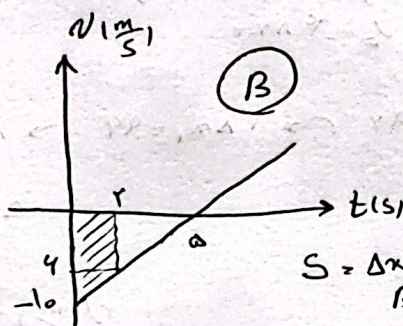


$$a_A = + \frac{v}{t}$$

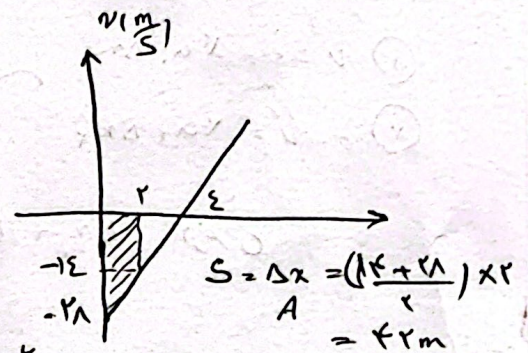
$$a_B = \frac{10}{4} = + \frac{2.5}{s}$$

$$x_{0B} = 0$$

$$x_{0A} = + 10 \text{ m}$$



$$S = \Delta x_B = \left(\frac{0 + (-10)}{2} \right) \times 4 = -20 \text{ m}$$

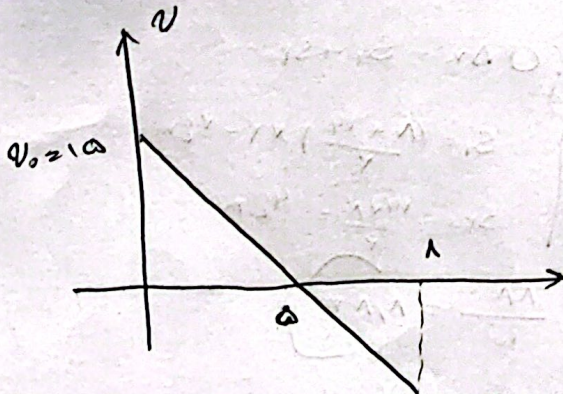


$$S = \Delta x_A = \left(\frac{0 + 10}{2} \right) \times 4 = 20 \text{ m}$$

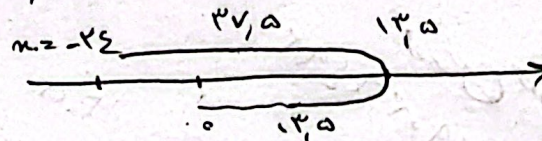
$$t = 4 \text{ s} \quad x_B = x_{0B} + \Delta x_B = 0 + 10 = 10 \text{ m}$$

$$t = 4 \text{ s} \quad x_A = x_{0A} + \Delta x_A = 0 + 10 = 10 \text{ m}$$

$$x_B - x_A = 0 \text{ m}$$



$$S = \Delta x = \left(\frac{10 + 0}{2} \right) \times 4 = 20 \text{ m}$$



$$v - v_0 = a \Delta t$$

$$0 - v_0 = + (2.5) \times 4$$

$$-v_0 = -10$$

$$v_0 = 10 \text{ m/s}$$

(1) (2)

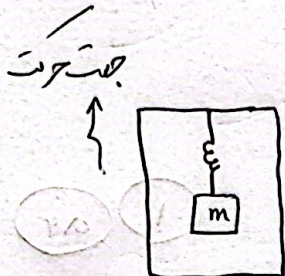
$$0 - f_k = ma \rightarrow 0 - \mu_k mg = ma \rightarrow a = -0.2 \times 10$$

$$a = -2 \frac{m}{s^2}$$

$$v^2 - v_0^2 = 2a\Delta x$$

$$\Delta x = -\frac{1}{2}at^2 + v_0 t \rightarrow 4.25 = -\frac{1}{2} \times (-2) t^2 \rightarrow t^2 = 4.25$$

$$t = 2.05$$



$$m = 15 \text{ kg}$$

$$k = 2500 \frac{N}{m}$$

$$k\Delta x - mg = ma$$

$$k\Delta x = m(g+a)$$

$$2500 \Delta x = 15(9.8 + 1.5)$$

$$2500 \Delta x = 15 \times 11.3 = 169.5$$

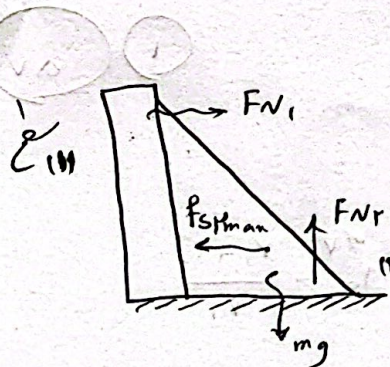
$$\Delta x = 0.0678 \text{ m} = 6.78 \text{ mm}$$

افزایش طول داریم

$$\Delta x = \frac{1}{2}at^2 + v_0 t$$

$$19 = \frac{1}{2}a \times 4.25$$

$$a = 8.92 \frac{m}{s^2}$$



سریع به بالا می رود
به پایین می آید

$$F_{N1} = f_{s \max}$$

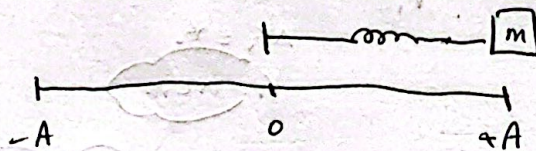
$$F_{N1} = \mu_s F_{N2}$$

$$F_{N1} = \mu_s mg$$

$$F_{N1} = mg$$

$$F_{N2} = mg$$

$$F_{Ry} = F_{N1} \sqrt{1 + \mu_s^2} > mg$$



$$\frac{T}{4} = 0.15 \text{ s} \rightarrow T = 0.6 \text{ s}$$

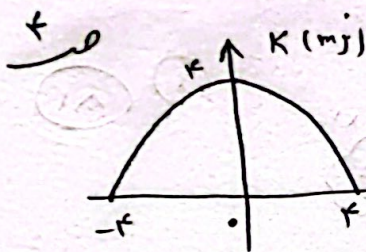
$$\omega = \frac{2\pi}{T} = \frac{2\pi}{0.6} = \frac{10\pi}{3}$$

$$v_{\max} = A\omega = 0.15 \frac{m}{s} = 0.05 \frac{m}{s}$$

$$A \times \frac{10\pi}{3} = 0.05$$

$$A \times \frac{10}{3} = 0.05 \rightarrow A = 0.015 \text{ m}$$

(۳) (۵۵)



$$A = 0.04 \text{ m}$$

$$m = 0.1 \text{ kg}$$

$$K_{\max} = E = \frac{1}{2} m \omega^2 A^2 = \frac{1}{2} m v_{\max}^2 = \frac{1}{2} k A^2$$

$$4 \times 10^{-3} = \frac{1}{2} \times 0.1 \times \omega^2 \times 14 \times 10^{-4}$$

$$4 \times 10^{-3} = 7 \times 10^{-5} \omega^2 \Rightarrow \omega^2 = 57.14 \Rightarrow \omega = 7.56 \text{ rad/s}$$

$$a = -\omega^2 x$$

$$a = -57.14 \times 0.04 = -2.2856 \text{ m/s}^2$$

$$|a| = 2.2856 \text{ m/s}^2$$

$$f = 1 \text{ Hz}$$

$$\omega = 2\pi f = 14\pi$$

$$A = 10 \text{ cm} = 0.1 \text{ m}$$

$$\lambda = \frac{v}{f}$$

$$v = A\omega$$

$$\frac{\lambda}{f} = 10 \text{ cm} \rightarrow \lambda = 10 \text{ cm} = 0.1 \text{ m}$$

$$v_m = A\omega = 0.1 \times 14\pi = 1.4\pi = \frac{14\pi}{10} = \frac{14\pi}{5}$$

$$\beta_2 - \beta_1 = 20^\circ \text{ by } \frac{r_1}{r_2}$$

$$\beta_1 - \beta_2 = 20^\circ \text{ by } \frac{r_2}{r_1} \Rightarrow 14 = 20 \text{ by } \frac{r_1 + r_2}{r_1}$$

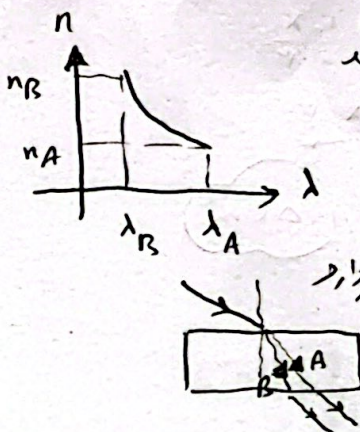
$$0.7 = \frac{r_1 + r_2}{r_1} \Rightarrow 0.7 = \frac{r_1 + r_2}{r_1}$$

$$0.7 = 1 + \frac{r_2}{r_1} \Rightarrow \frac{r_2}{r_1} = -0.3$$

$$\frac{10}{2} = \frac{r_1 + r_2}{r_1} \Rightarrow 10r_1 = 2r_1 + 2r_2$$

$$8r_1 = 2r_2$$

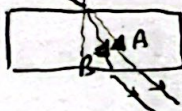
$$r_2 = 4r_1$$



برای خروج از سطح عمودی الطوع باید در امتداد محور ورودی باشد

$$\lambda_A > \lambda_B \Rightarrow n_A < n_B \Rightarrow \text{انحراف A} > \text{انحراف B}$$

نور آبی در درجه انحراف بیشتری از نور قرمز دارد



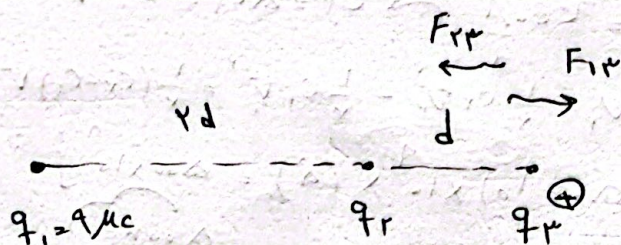
(۲) (۵۸)

بنا $N = \frac{N_0}{r^n}$, $n = \frac{t}{T}$ و $n' = \frac{t}{rT} = \frac{n}{r}$

$\frac{N}{N_0} = \frac{1}{r^n} = \frac{1}{r}$ $\rightarrow r^n = r$

$\rightarrow r^{n'} = r^{\frac{n}{r}} = \sqrt[r]{r^n} = \sqrt[r]{r}$

$\rightarrow \frac{N}{N_0} = \frac{1}{\sqrt[r]{r}} = \frac{1}{r^{\frac{1}{r}}}$



۳ ۴۰ $q_r > q_3$ - دفعه q_r به سمت چپ

$F_{1r} = \frac{k q_1 q_r}{(2d)^2} = \frac{k q_1 q_r}{4d^2} = \frac{k q_r}{4d}$

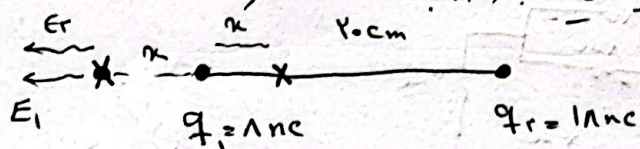
$F_{13} = \frac{k q_1 q_3}{d^2}$ q_3 به سمت چپ $F = \left| \frac{k q_r}{d} - \frac{k q_1 q_3}{d^2} \right| = F_{13}$

$F_{1r} = F' \rightarrow F_{1r} = |F_{13} - F_{1r}|$

$\frac{k q_r}{4d} = \frac{k q_1 q_3}{d^2} = \frac{k q_r}{d}$ $\rightarrow \frac{k q_r}{4d} = \frac{k q_r}{d}$ $\rightarrow \frac{1}{4} = 1$ $\rightarrow \frac{1}{4} = \frac{1}{1}$ $\rightarrow \frac{1}{4} = \frac{1}{1}$ $\rightarrow \frac{1}{4} = \frac{1}{1}$

$q_r = -2 \mu c$

۲ ۹۱ $E_1 = 4 E_r$ چون $E_1 = 4 E_r$ پس فقط مورد نظر باید نزدیک بار q_1 باشد



$E_1 = 4 E_r$ $\frac{k q_1}{x^2} = 4 \frac{k q_r}{(10+x)^2}$

$\frac{1}{x^2} = \frac{4}{(10+x)^2}$ $\rightarrow \frac{1}{x} = \frac{2}{10+x}$

$\frac{1}{x} = \frac{2}{10+x}$ $\rightarrow \frac{1}{x} = \frac{2}{10+x}$

$\frac{1}{x} = \frac{2}{10+x}$ $\rightarrow \frac{1}{x} = \frac{2}{10+x}$

$10+x = 2x$ $\rightarrow x = 10 \text{ cm}$

$x = 10 \text{ cm}$

$10 + 10 = 20 \text{ cm}$

$E_1 = 4 E_r$

$\frac{1}{x^2} = \frac{4}{(10-x)^2}$

$\frac{1}{x^2} = \frac{4}{(10-x)^2}$ $\rightarrow \frac{1}{x} = \frac{2}{10-x}$

$10-x = 2x$ $\rightarrow x = 10 \text{ cm}$

$x = 10 \text{ cm}$

۱

$$C = 10 \text{ nF}$$

$$q = 50 \text{ nC}$$

$$\rightarrow C = \frac{q}{V} \rightarrow V = 5 \text{ V}$$

$$k = 1$$

خازن به هم وصل

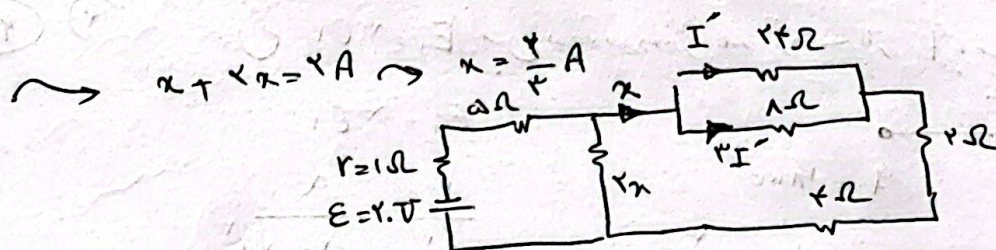
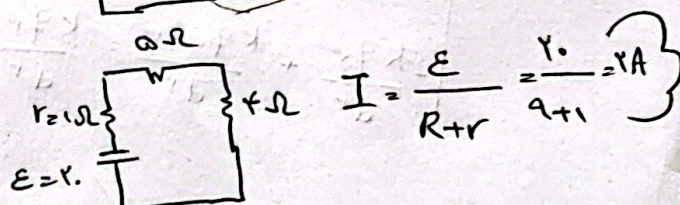
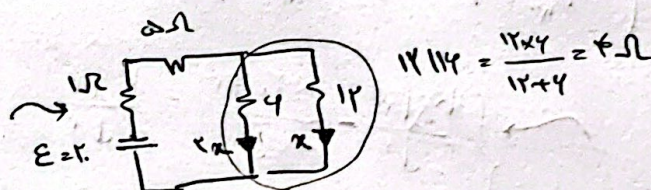
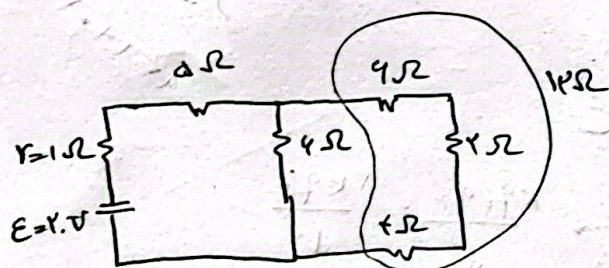
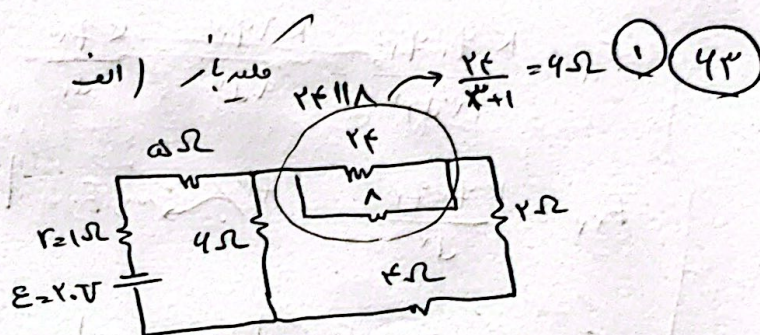
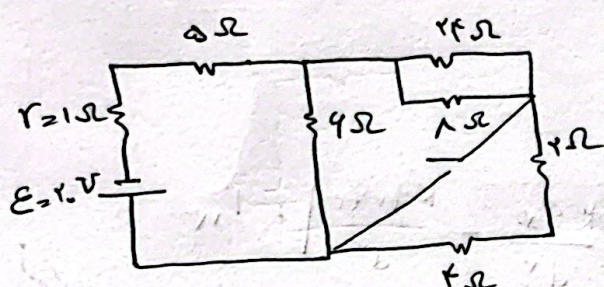
بفرار دایره ای الکترون $k = 5$ ظرفیت خازن ۵ برابر شود

$$\rightarrow C_1 = 10 \text{ nF}$$

$$C = K \epsilon_0 \frac{A}{d} \rightarrow C_2 = 5 C_1 = 50 \text{ nF}$$

$$V_2 - V_1 = \frac{1}{2} C_2 V_2^2 - \frac{1}{2} C_1 V_1^2 = \frac{1}{2} (C_2 - C_1) V^2$$

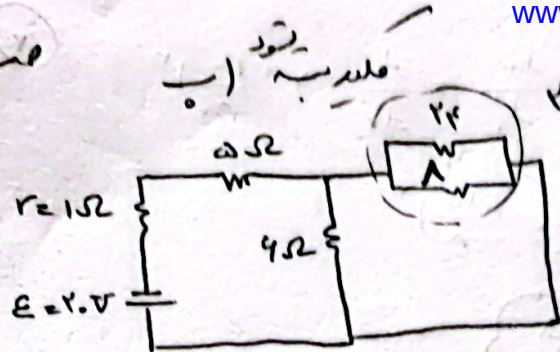
$$\Delta U = \frac{1}{2} (50 - 10) \times 10^{-9} \times (5)^2 = 500 \times 10^{-9} \text{ J} = 500 \text{ nJ}$$



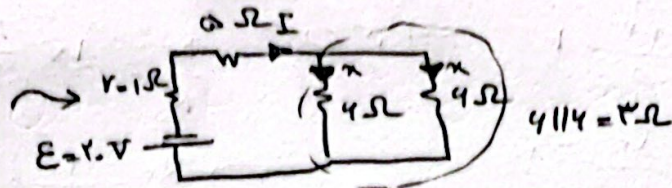
$$I = \frac{E}{R + r} = \frac{2}{5 + 1 + \frac{4}{3}} = \frac{2}{\frac{14}{3}} = \frac{3}{7} \text{ A}$$

$$I' = I \times \frac{2}{4} = \frac{3}{7} \times \frac{2}{4} = \frac{3}{14} \text{ A}$$

ادامہ ۴۳ (۱)

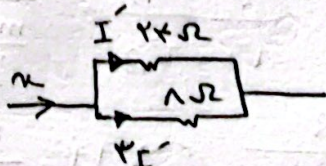


$$2 \parallel 1 \parallel 1 = \frac{2 \times 1}{2+1} = \frac{2}{3} \Omega$$



$$I = \frac{E}{R_T + r} = \frac{2}{9} A$$

$$I = x + x \rightarrow x = \frac{I}{2} = \frac{1}{9} A$$

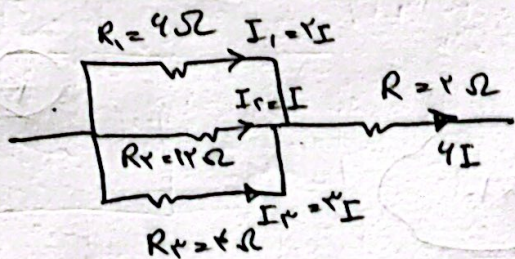


$$x = I' + 3I'$$

$$I' = \frac{x}{4} = \frac{1/9}{4} = \frac{1}{36} = \frac{1}{4} \times \frac{1}{9} = \frac{1}{36}$$

$$\frac{I_{8\Omega}}{I_{2\Omega}} = \frac{1/36}{1/9} = \frac{1}{4} = \frac{1}{4}$$

۴۴ (۲)



$$R I^2 = R_1 I_1^2 + R_2 I_2^2 + R_3 I_3^2$$

$$R_1 = 4 \Omega$$

$$R_2 = 12 \Omega$$

$$P_{R_1} = 4 I_1^2 = 4 (2I)^2 = 16 I^2$$

$$P_{R_2} = 12 I_2^2 = 12 I^2$$

$$P_{R_3} = 6 I_3^2 = 6 (2I)^2 = 24 I^2$$

$$P_{R_1} + P_{R_2} + P_{R_3} = 52 I^2$$

$$P_R = R I^2 = 2 (4I)^2 = 32 I^2$$

$$R = \rho \frac{l}{A} \rightarrow \frac{R_r}{R_i} = \frac{\rho_r}{\rho_i} \times \frac{l_r}{l_i} \times \left(\frac{A_i}{A_r} \right) \rightarrow \left(\frac{\rho_i}{\rho_r} \right)^2$$

$$\frac{\rho_r}{\rho_i} = 1$$

فرض کنیم

$$\frac{R_r}{R_i} = 1 \times \frac{1}{10} \times \left(\frac{10}{1} \right)^2$$

$$\frac{l_r}{l_i} = \frac{1}{10}$$

$$\frac{R_r}{R_i} = \frac{10}{1} = \frac{10}{1}$$

$$\frac{\rho_r}{\rho_i} = \frac{1}{10}$$

$$\rho_A = 1,2$$

$$\rho_B = 1,8$$

$$\rho = 1,4$$

$$\rho = \frac{m}{V} = \frac{m_A + m_B}{V_A + V_B} = \frac{m_A + m_B}{\frac{m_A}{\rho_A} + \frac{m_B}{\rho_B}}$$

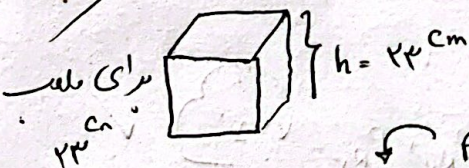
$$\rho = 1,4 = \frac{m_A + m_B}{\frac{m_A}{1,2} + \frac{m_B}{1,8}} \rightarrow 1,4 = \frac{m_A + m_B}{\frac{2m_A + 3m_B}{6}}$$

$$\rho = 1,4 = \frac{2m_A + 3m_B}{6} \rightarrow 8,4m_A + 12,6m_B = 2m_A + 3m_B$$

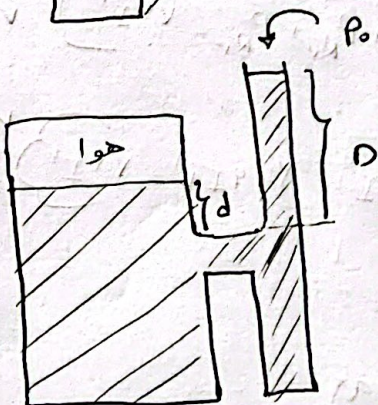
$$6,4m_A = 9,6m_B \rightarrow \frac{m_A}{m_B} = \frac{3}{4}$$

$$\Delta P = P_r - P_i = \rho g \Delta h$$

$$4 \times 10^3 = \rho g \times 0,2 \rightarrow \rho g = 2 \times 10^4$$



$$\Delta P = \rho g \Delta h = 2 \times 10^4 \times 0,23 = 4600 \text{ Pa} = 4,6 \text{ kPa}$$



$$\rho = 1$$

$$\rho = 13,4$$

$$P = P_0 + \rho g h$$

$$P - d = 13,4 - 4,8 = 8,6 \text{ cm}$$

$$h_{\text{cm}} - 4,8 = \frac{\rho g h}{\rho g} = \frac{1 \times 4,8}{13,4} = 0,36 \text{ cm}$$

$$P_{\text{atm}} = P_0 + P_0 = 0,36 \text{ cm}$$

9

$$Q_{\text{mix}} = R_a \% = \left(\frac{\text{مقدار انجماد}}{\text{مقدار انجماد}} \times 100 \right) \times 100$$

$$\left(\frac{1.5}{100} \times \frac{40}{100} \right) \times 100 = 15\%$$

(4) (49)

$$\begin{cases} m_A = 0.1 \text{ kg} \\ Q_A = 50 \text{ kJ} \end{cases}$$

$$Q = mL_f \rightarrow L_f = \frac{Q}{m}$$

(2) (70)

$$\begin{cases} m_B = 0.3 \text{ kg} \\ Q_B = 150 \text{ kJ} \end{cases}$$

$$\frac{L_{fA}}{L_{fB}} = \frac{Q_A}{Q_B} \times \frac{m_B}{m_A} = \frac{50}{150} \times \frac{0.3}{0.1} = \frac{1}{1} = 1$$

$$\begin{cases} 300 \text{ gr} \\ 10^\circ \text{C} \end{cases}$$

$$c = 1 \text{ cal/g}^\circ \text{C}$$

$$m_c = 300 \times 1 \text{ cal/g}^\circ \text{C}$$

(3) (71)

$$\begin{cases} 120 \text{ gr} \\ 10^\circ \text{C} \end{cases}$$

$$c_{Al} = 0.9$$

$$Al m_c = 120 \times 0.9 = 108$$

$$\theta_e = \frac{1 \text{ cal/g}^\circ \text{C} \times 300 + 108 \times 10}{1 \text{ cal/g}^\circ \text{C} + 108} = 40.4^\circ \text{C} \approx 40^\circ \text{C}$$

(4) (72)

$$I = I_m \sin \omega t \rightarrow I = 2 \sin 100\pi t$$

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{0.02} = 100\pi$$

$$I = 2 \sin \left(100\pi \times \frac{0.02}{100} \right)$$

$$I = 2 \sin \left(\frac{2\pi}{100} \right) = 2$$

$$R = 1 \Omega$$

$$E = 2 \times 1 = 2 \text{ V}$$



ص ۱۵

$$B = \mu_0 \frac{NI}{l}$$

$$l = 0.5 \text{ m}$$

$$I = 1.5 \text{ A}$$

$$B = 1.8 \text{ G} = 1.8 \times 10^{-4} = 1.8 \times 10^{-5}$$

$$N = ?$$

$$\mu_0 = 1.2 \times 10^{-6}$$

$$N = \frac{Bl}{\mu_0 I} = \frac{1.8 \times 10^{-5} \times 0.5}{1.2 \times 10^{-6} \times 1.5}$$

$$N = \frac{1}{4} \times 10^2 = 25$$

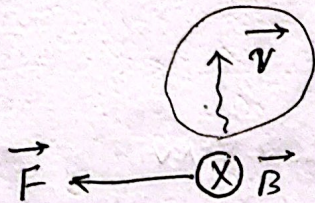
تعداد دور سیم لوله

(۱) (۷۳)

ص ۱۶ طبق مدل آتس رادرفورد (مدل هات) بارهای مثبت آتون به دور هسته آتون می‌چرخند

ص ۱۶

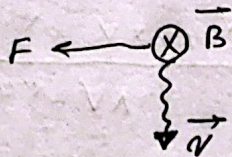
(۲) (۷۴)



طبق قاعده دست راست

(۲) (۷۵)

چون بار منفی است جهت لا و نه می‌شود



موسسه تخصصی زبان