

$$\frac{\text{Kg}}{\text{A} \cdot \text{sr}} \quad \left\{ \begin{array}{l} \nu = \text{Kg} \frac{\text{m}}{\text{sr}} \\ \frac{\text{kg}}{\text{sr}} = \frac{\nu}{\text{m}} \Rightarrow \frac{\text{kg}}{\text{A} \cdot \text{sr}} = \frac{1}{\text{A}} \cdot \frac{\nu}{\text{m}} \end{array} \right. \xrightarrow{B = \frac{F}{I \cdot l}} T = \frac{\nu}{\text{A} \cdot \text{m}}$$

۳-۱۸۲

۱-۱۸۱

۱-۱۸۳

$$\frac{E_r}{E_i} = \left(\frac{n_i}{n_r} \right)^2 = \left(\frac{1}{3} \right)^2 = \frac{1}{9}$$

۴-۱۸۴ دومین حالت برآیند $n=3$ است

۲-۱۸۵ طبق قاعده دست راست

۱-۱۸۶ چون متناوب است شکی متوسط میانگین سرعت در دو نقطه است

$$t_1 = 0 \rightarrow v_1 = 18 \quad t_2 = 4 \rightarrow v_2 = -6 \Rightarrow v_{av} = \frac{v_1 + v_2}{2} = \frac{18 - 6}{2} = 6 \left(\frac{m}{s} \right)$$

$$t_1 \xrightarrow{\Delta x_1} t_{1+1} \xrightarrow{\Delta x_1 - aT^r} t_{1+2} \xrightarrow{\Delta x_1 - 2aT^r} t_{1+3} \xrightarrow{\Delta x_1 - 3aT^r} t_{1+4}$$

$$r = 1 \text{ m/s}$$

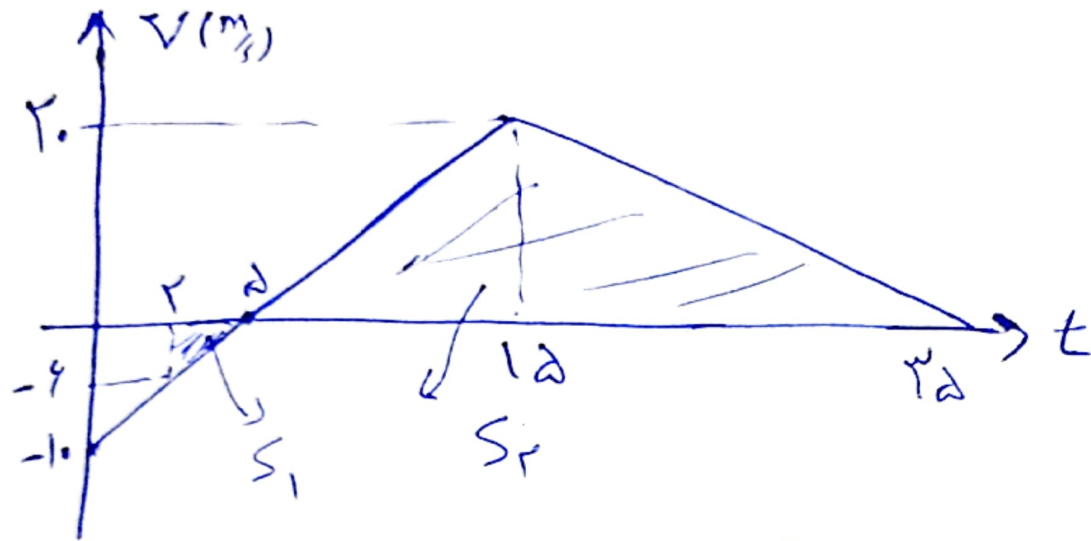
$$\Delta x_f = \Delta x_1 + \Delta x_1 - aT^r + \Delta x_1 - 2aT^r + \Delta x_1 - 3aT^r$$

$$r_{00} = r(r_{00}) - 3aT^r \rightarrow 3aT^r = r_{00} \rightarrow a = \frac{r_{00}}{3 \times r} = \frac{r_0}{3} \left(\frac{\text{m}}{\text{s}^2} \right)$$

سرعت صفرا $t = \Delta$ $\rightarrow \begin{cases} V = at + V_0 \\ t = \Delta \quad V = 0 \end{cases} \rightarrow 0 = \Delta a + V_0 \rightarrow V_0 = -\Delta a \quad \approx -111$

$\begin{cases} t = 1 \rightarrow x = 44 \\ t = 12 \rightarrow x = 0 \end{cases} \rightarrow \begin{cases} 44 = \frac{1}{2}a(1)^2 + V_0 + x_0 \\ 0 = \frac{1}{2}a(12)^2 + 12V_0 + x_0 \end{cases} \rightarrow \begin{cases} 44 = \frac{1}{2}a - \Delta a + x_0 \\ 0 = 72a - 12a + x_0 \end{cases} \Rightarrow \begin{cases} 44 = -\frac{9}{2}a + x_0 \\ 0 = 60a + x_0 \end{cases}$

$\rightarrow 44 = -\frac{9}{2}\left(-\frac{x_0}{60}\right) + x_0 \rightarrow x_0 + \frac{3x_0}{4} = 44 \rightarrow x_0 = \frac{4 \times 44}{7} = 25.14$



$$S_1 = \frac{1}{2} \times 2 \times 4 = 4$$

1-119

$$S_2 = \frac{1}{2} \times 18 \times 20 = 180$$

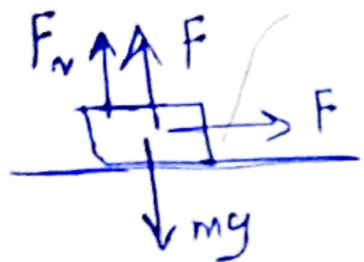
$$x_{20} - x_2 = -S_1 + S_2 = -4 + 180 = 176$$

$$x_{20} - (-4) = 176 \rightarrow x_{20} = 176 - 4 = 172$$

$$g = g_0 - \frac{99}{100} g_0 = \frac{1}{100} g_0$$

$$\frac{g}{g_0} = \left(\frac{R_e}{R}\right)^2 \Rightarrow \frac{1}{100} = \left(\frac{R_e}{R}\right)^2 \rightarrow R = 10 R_e$$

2-190

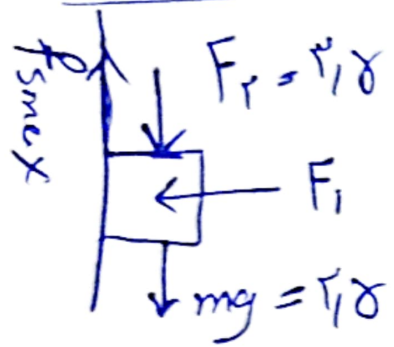


$$\begin{cases} F_N = mg - F \\ F = f_{smax} \end{cases} \Rightarrow$$

$$F = \mu_s (mg - F) \rightarrow F = \frac{1}{4} (30 - F) \rightarrow F = 10 \text{ (N)} \quad \text{۲-۱۹۱}$$

$$f'_{smax} = \mu_s (mg - F') = \frac{1}{4} (30 - 4) = 12 \quad \text{در حالت دوم } F' = 9 \text{ (N) است}$$

$$F' < f'_{smax} \rightarrow \text{نکند} \rightarrow f_s = F' = 9 \text{ (N)}$$



$$\text{قوتی سطح} = R = 10 \text{ (N)} \quad , F_N = F_1 \quad 1-192$$

$$\text{توازن} \Rightarrow f_{smx} = F_r + mg = 2,8 + 2,8 = 4 \text{ (N)}$$

$$R = \sqrt{f_{smx}^2 + F_1^2} \rightarrow 10^2 = 4^2 + F_1^2 \rightarrow F_1^2 = 92 \rightarrow F_1 = 10 \text{ (N)}$$

$$f_s = \mu_s F_N = \mu_s F_1 \rightarrow \mu_s = \frac{f_s}{F_1} = \frac{4}{10} = 0,4$$

$$\lambda + \frac{\lambda}{2} = 20 \rightarrow \frac{3}{2}\lambda = 20 \rightarrow \lambda = 13.33 \text{ (cm)} \quad v = 10 \text{ (m/s)}$$

$$\lambda = vT \rightarrow T = \frac{\lambda}{v} = \frac{13.33}{10} = 1.33 \text{ (s)}$$

$$\Delta x_{\text{موج}} = v \Delta t \xrightarrow{\Delta t = 1 \text{ (s)}} \Delta x_{\text{موج}} = 10 \times 1 = 10 \text{ (m)}$$

الف - X

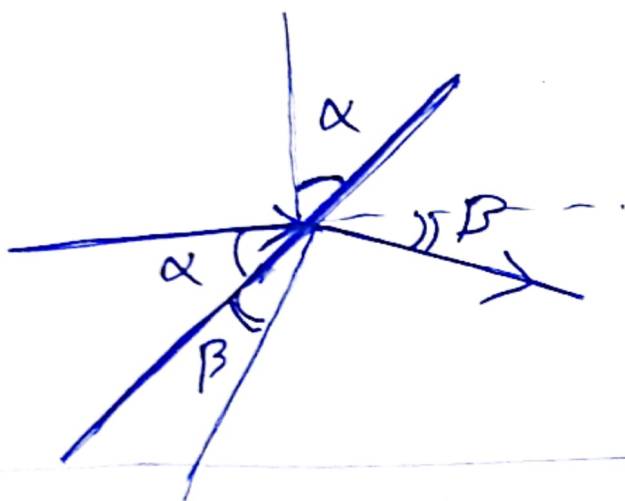
$$\Delta t = 1.33 \text{ (s)} = \frac{T}{2} \Rightarrow l_{\text{موج}} = 2A = 2 \times 7 \text{ cm} = 14 \text{ (cm)}$$

ب - ✓

ج - چون سرعت ذره ثابت نیست جواب بار مختلف درست نیست X

د - در یک دوره تناوب جابه جایی تمام ذرات همگام است ✓

۱۹۳



$$\frac{\sin \alpha}{v_1} = \frac{\sin \beta}{v_2} \rightarrow \frac{1/\lambda}{v_1} = \frac{1/\lambda'}{v_2} \rightarrow \frac{v_1}{v_2} = \frac{\lambda}{\lambda'}$$

Ex-19E

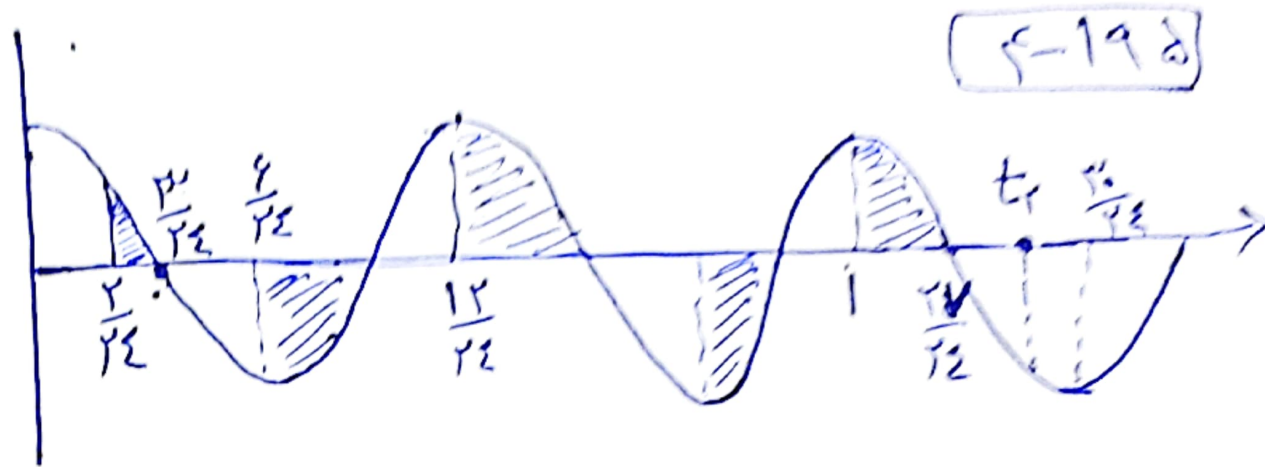
$$x = y \cos \pi t$$

$$y_K = \frac{y_K}{T} \rightarrow T = \frac{1}{f} = \frac{12}{f_2} \text{ (s)}$$

$$t_1 = \frac{1}{12} = \frac{1}{f_2}$$

$$t_2 = \frac{1}{f} = \frac{y_A}{f_2}$$

$$\Delta t = \frac{1}{f_2} + 5\left(\frac{1}{f_2}\right) = \frac{14}{f_2}$$



$$\frac{\varphi}{c} = R \left(\frac{1}{n^{\cdot r}} - \frac{1}{n^r} \right) \Rightarrow \frac{r_{\text{Kd}} \times 10^{12}}{r_{\text{Kd}} \times 10^9} = \frac{1}{100 \times 10^9} \left(\frac{1}{n^{\cdot r}} - \frac{1}{n^r} \right)$$

1-192

$$\Rightarrow \frac{r_{\text{Kd}}}{r} = \frac{r_{\text{Kd}}}{r_{100}} = \frac{r}{\Sigma} = 1 - \frac{1}{\Sigma} = \left(\frac{1}{n^{\cdot r}} - \frac{1}{n^r} \right) \Rightarrow \begin{cases} n' = 1 \\ n = r \end{cases}$$

(n=4) دوسری خط برائے $\rightarrow \frac{1}{\lambda} = R \left(\frac{1}{f_r} - \frac{1}{f_r} \right) = R \left(\frac{f_o}{14 \times 36} \right) \rightarrow \lambda = \frac{14 \times 36}{f_o R}$

(n=4) سولہویں خط بالمر $\rightarrow \frac{1}{\lambda'} = R \left(\frac{1}{f_r} - \frac{1}{f_r} \right) = \frac{f_r}{5 \times 36} \rightarrow \lambda' = \frac{5 \times 36}{f_r R}$

$$\frac{\lambda}{\lambda'} = \frac{\frac{14 \times 36}{f_o R}}{\frac{5 \times 36}{f_r R}} = \frac{14 \times 36 \times f_r R}{5 \times 36 \times f_o R} = \frac{f_r}{f_o}$$

$$\boxed{3-19V}$$

$$E_r = \frac{V}{dr} = \frac{V_0}{\omega r_0^2} = 5 \times 10^3 \left(\frac{V}{m} \right)$$

$$E_t = \frac{V}{dr} = \frac{V_0}{10 \times 10^{-2}} = 1 \times 10^3$$

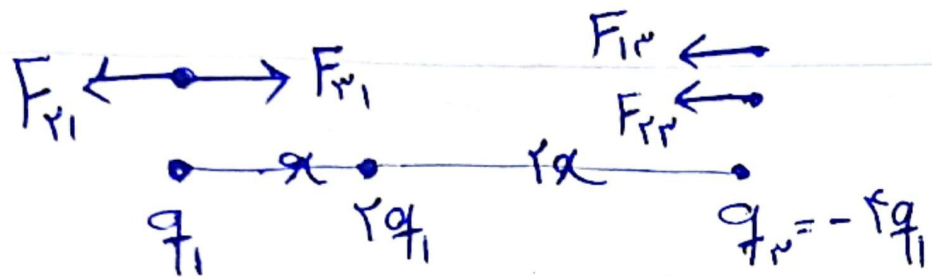
[-19.1]

$$V_t - V_p = E_r dr \rightarrow V_p = V_t - E_r dr = V_0 - 5 \times 10^3 \times 10 \times 10^{-2} = V_0 - 15 = 1 \text{ V}$$

$$V_p = V_t - E_t dr = V_0 - 1 \times 10^3 \times 10 \times 10^{-2} = V_0 - 10 = 5 \text{ V} \rightarrow \text{کوتاه کامی}$$

۱-۱۹۹ | تمام خطوط نشان دهنده شدت میدان است

۳-۲۰۰



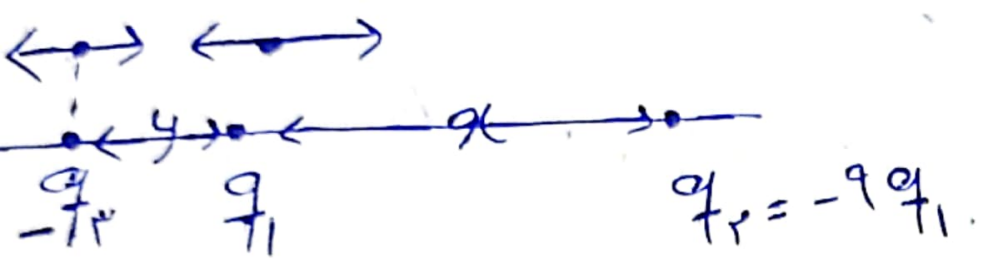
$$|F_1| = |F_{12} - F_{21}| = \left| \frac{kq_1^2}{r^2} - \frac{kq_1^2}{r^2} \right| = \left| \frac{14kq_1^2}{9r^2} \right|$$

$$|F_2| = |F_{12} + F_{21}| = \left| \frac{kq_1^2}{9r^2} + \frac{14kq_1^2}{9r^2} \right| = \frac{15}{9} \frac{kq_1^2}{r^2}$$

$$\left| \frac{F_1}{F_2} \right| = \frac{1}{11}$$

۴۲۰۱

بارهای کناری باید هم‌نقطه باشند بار وسط
مخالف بار آن باشد

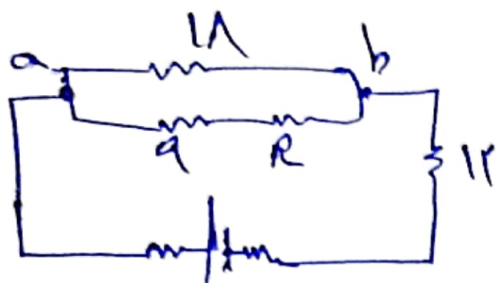


q_1 دخی: $F_{31} = F_{21} \Rightarrow \frac{kq_1 q_3}{y^2} = \frac{kq_1 q_2}{x^2} \rightarrow \boxed{\frac{q_2}{q_1} = \frac{x^2}{y^2}} \quad (1)$

q_2 دخی: $F_{12} = F_{32} \Rightarrow \frac{kq_1 q_2}{y^2} = \frac{kq_1 q_2}{(x+y)^2} \rightarrow \frac{1}{y} = \frac{1}{x+y}$

$\frac{1}{y} = \frac{1}{x+y} \rightarrow \frac{1}{y} = \frac{1}{x} \rightarrow x = y \rightarrow \boxed{y = \frac{x}{2}} \quad (2)$

۱۹۲ $\rightarrow q_2 = q_1 \left(\frac{1}{4}\right)$



$$V_{ab} = V_{1V} \rightarrow R_{ab} = 1V$$

$$\frac{1A(q+R)}{1A+(q+R)} = 1V \rightarrow R = 2V$$

$$2 - 2.07$$

$$R = \frac{V}{I} = 1\Omega$$

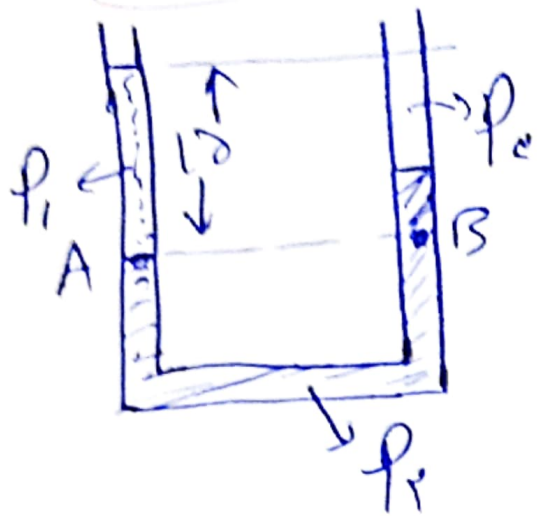
$$I = \frac{\mathcal{E}}{R_T} \Rightarrow \frac{1A}{1\Omega} = \frac{\mathcal{E}}{1\Omega + 9 + 2 + \mathcal{E}} \Rightarrow \mathcal{E} = 2\mathcal{E}$$

$$2 - 2.2$$

$$V^{\mathcal{L}} = \mathcal{E} - IR = 1V - 2\left(\frac{V}{R}\right) = 9 \text{ mV} \rightarrow I_q = 1A \rightarrow I_R = 10A$$

$$\rightarrow R = 2 \times 9 = 18\Omega \rightarrow P_R = RI_R^2 = 18 \times \frac{1}{2} = 9W$$

$$1 - 2.2$$



$$P_A = P_B \rightarrow \rho_1 h_1 = \rho_2 h_r + \rho_2 h_c$$

$$\boxed{r = 2.4}$$

$$\Delta h = 1/r h_r + h_c$$

$$h_r + h_c = \Delta h$$

$$\Rightarrow \Delta h = h_c + 1/r (\Delta h - h_c)$$

$$\Delta h = h_c + \frac{r}{r-1} h_c$$

$$\Delta h - \frac{r}{r-1} h_c = -h_c \rightarrow -\frac{r}{r-1} h_c = -h_c \rightarrow h_c = 9 \text{ cm} \rightarrow V_{r=9} = 9 \text{ cm}^3$$

$$W_{mg} = -\Delta U_g = -mg\Delta h = \frac{1}{r} \times 10 \times \frac{1}{10} = 1 \text{ (J)}$$

1-2. ✓

$$W_t = \Delta K \rightarrow W_{mg} + W_f = \frac{1}{r} \times \frac{1}{r} \times (r)^2 \rightarrow W_f = \frac{9}{2} - 1 = -\frac{1}{2} = -1/2 \text{ (J)}$$

$$W_f = E_f - E_i = (K_f + U_f) - K_i \rightarrow -\frac{K_o}{\lambda} + K_o = K_f + U_f$$

$$\boxed{f = 7.0 \text{ \AA}}$$

$$K_f = \frac{V}{\lambda} K_o - U_f \Rightarrow \frac{1}{f} m v^2 = \frac{V}{\lambda} \times \frac{1}{f} \times m \times \lambda^2 - m \times 1.0 \times 1 \rightarrow v = 4 \text{ (m/s)}$$

$$\Delta L_{Cu} - \Delta L_{Fe} = 1.7 \times 10^{-3} \text{ (m)} \rightarrow L \Delta T (\alpha_{Cu} - \alpha_{Fe}) = 1.7 \times 10^{-3}$$

$$\boxed{7 - 7.9}$$

$$10 \times \Delta T \times (1/11 - 1/12) \times 10^{-2} = 1.7 \times 10^{-3} \rightarrow \Delta T = 100$$

$$m c \Delta T + m L_f + m c \Delta T + m' c \Delta T' = 0$$

$$1 \times 7100 \times 10 + 1 \times 336000 + 1 \times 2700 \times 8 - m' \times 7100 \times (18) = 0$$

$$m = \frac{571000}{7100} = 8 \text{ (kg)}$$

$$\boxed{8 - 710}$$

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