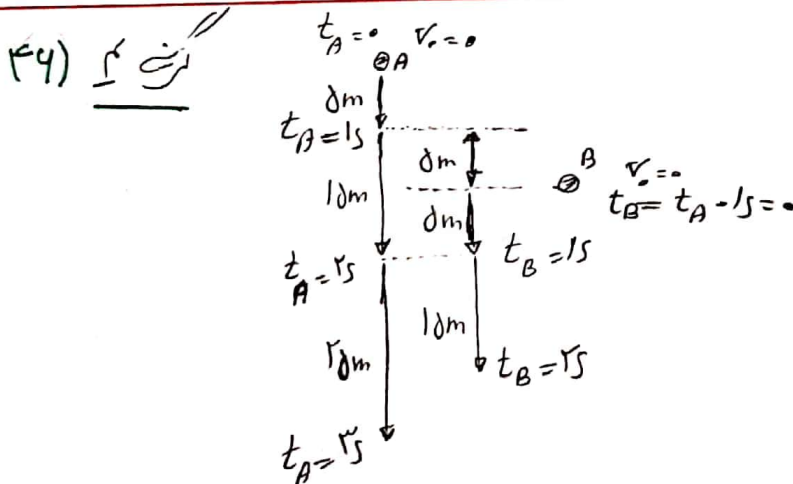


۴۲) $\left. \begin{aligned} * \Delta K &= -\Delta U \Rightarrow -\frac{1}{2}mv_0^2 = -mg(h_{\max} - 0) \\ * \Delta K' &= -\Delta U' \Rightarrow 0 - K_0 = -mg(h_{\max} - 0) \end{aligned} \right\} \Rightarrow v_0 = \frac{r_2}{h_{\max}}$
نرینه ۳
 $h_{\max} = 1.5 \text{ m}$

۴۳) $\Delta L = \alpha \cdot L_1 \cdot \Delta \theta$
 $q = 1.2 \times 10^{-5} \times 9 \times \Delta \theta \Rightarrow \Delta \theta = 10^\circ$ نرینه ۲

۴۴) $\left\{ \begin{aligned} W &> 0 \\ \Delta U &< 0 \end{aligned} \right\} \Rightarrow$ نرینه ۱

۴۵) $\left. \begin{aligned} x_A &= \frac{1}{2}at^2 + v_0 t + x_0 \\ x_B &= \frac{1}{2}(a + \frac{1}{r})(t - r)^2 + v_0(t - r) + x_0 \end{aligned} \right\} \xrightarrow{t=1.5} \begin{aligned} x_A &= x_B \\ 11a &= 11(a + \frac{1}{r}) \\ a &= 1.5 \text{ m/s}^2 \end{aligned}$
 $t = 1.5 \Rightarrow \begin{aligned} x_A &= 1.5 \text{ m} \\ x_B &= 1.1 \text{ m} \end{aligned} \Rightarrow x_B - x_A = 1.1 \text{ m}$ نرینه ۲



17) $t=0 \Rightarrow \begin{cases} v_A = 1 \text{ m/s}, v_B = 2 \text{ m/s} \\ a_A = -2 \text{ m/s}^2, a_B = 0 \end{cases} \quad t=1 \text{ s} \Rightarrow \begin{cases} x_A = \frac{1}{2}(-2)t^2 + 1t + 0 = 0.5 \text{ m} \\ v_A = -2 \times 1 + 1 = -1 \text{ m/s} \\ a_A = -2 \text{ m/s}^2 \end{cases}$

$t=1 \text{ s} \Rightarrow \begin{cases} x_B = v_B t + x_0 = 2 \times 1 + 0 = 2 \text{ m} \\ v_{0B} = 2 \text{ m/s} \\ a_B = -2 \text{ m/s}^2 \end{cases}$

$\frac{1}{2}(-2)t^2 + 4t + 0.5 = \frac{1}{2}(-2)t^2 + 2t + 2$
 $t^2 - 1t + 1.5 = 0 \Rightarrow t = 1.5 \text{ s}$ غ. ق. غ.

$t=1.5 \Rightarrow v_B = (-2)(1.5) + 2 = 1 \text{ m/s}$ 1 نر

18) $a_B = \frac{\Delta v}{\Delta t} = \frac{14}{1} = 14 \text{ m/s}^2$

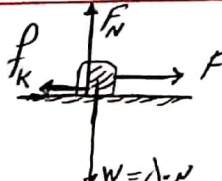
$t=2.5 \Rightarrow v_A = v_B \Rightarrow a_A \times 2 + (-12) = 2 \times 2 - 14 \Rightarrow a_A = 4 \text{ m/s}^2$

$v_A = 0 \Rightarrow 4t - 12 = 0 \Rightarrow t = 3 \text{ s} \Rightarrow v_B = 2 \times 3 - 14 = -10 \text{ m/s}$

$(3, 1) \text{ s} : \begin{cases} v_A > 0 \Rightarrow \Delta x_A = \frac{1}{2} \times 4 \times 3^2 + 0 = 18 \text{ m} \\ v_B < 0 \Rightarrow \Delta x_B = \frac{1}{2} \times 2 \times 3^2 - 1 \times 3 = -1.5 \text{ m} \end{cases} \Rightarrow \underline{3} \underline{\text{نر}}$

19) $T = 2\pi \times \frac{r^3}{G \cdot M_e}$ 2 نر

20) $\vec{p} = (3t - 4)\vec{i} \Rightarrow \Delta \vec{p} = (3\Delta t)\vec{i}$
 $(1, 2) \text{ s} : \Delta \vec{p} = 3 \times 1 \vec{i} = 3\vec{i}$
 $\vec{F}_{av} = \frac{\Delta \vec{p}}{\Delta t} = \frac{3\vec{i}}{1} = 3\vec{i}$ 1 نر

21)  $F = 24 \text{ N}$ $a = \frac{24 - 0}{2} = 12 \text{ m/s}^2$ 3 نر

$f_k = \mu_k N = 0.5 \times 20 = 10 \text{ N}$
 $f_R = F \sqrt{1 + \mu_k^2} = 20 \sqrt{1 + 0.14} = 20 \sqrt{1.14} = 20 \sqrt{1.14} = 20 \times 1.07 = 21.4 \text{ N}$
 $f_R' = 10 \sqrt{1.14} = 10 \times 1.07 = 10.7 \text{ N}$

22) $F_c = \frac{mv^2}{r} = \frac{2 \times 10^3 \times 2^2}{2} = 4000 \text{ N}$ 2 نر

$$\omega 3) \quad h = 3 \Rightarrow f_r = 300 \text{ Hz} \Rightarrow f_i = \frac{300}{3} = 100 \text{ Hz}$$

$$L = 90 \text{ cm}$$

$$f_i = \frac{v}{\lambda} \Rightarrow 100 = \frac{v}{3 \times 100} \Rightarrow v = 30000 \text{ m/s}$$

$$\omega 4) \quad I = \frac{P_{av}}{A} \Rightarrow \frac{I'}{I} = \frac{P'}{P} \times \frac{A}{A'} \Rightarrow \frac{I'}{I} = \frac{P'}{P} \times \left(\frac{r}{r'}\right)^2 \quad \left\{ \begin{array}{l} P' = 2P \\ r' = \frac{1}{2} r \end{array} \right.$$

$$\Rightarrow \frac{I'}{I} = 2 \times 2^2 = 8$$

$$\beta' - \beta = 10 \log \frac{I'}{I} \Rightarrow \beta' - \beta = 10 \log 8 = 30 \log 2 = 9 \text{ dB}$$

$$\omega 5) \quad T \propto \sqrt{L}, \quad g = \text{con.} \quad \frac{T'}{T} = \sqrt{\frac{L'}{L}} \times 1 \Rightarrow \frac{9}{8} = \sqrt{\frac{L'}{L}}$$

$$L' = L + 14 \text{ cm}$$

$$T' = T + 1/10 \text{ s} \Rightarrow T = 1/10 \text{ s} \Rightarrow T = \frac{9}{8} T$$

$$T = ? \text{ s}$$

$$\frac{L'}{L} = \frac{81}{64} \quad \left\{ \begin{array}{l} L' = L + 14 \text{ cm} \\ L = 96 \text{ cm} \end{array} \right.$$

$$T = 2\pi \sqrt{\frac{L}{g}} = 2\pi \sqrt{\frac{96}{9.8}} = 2 \times 1.45 = 2.9 \text{ s}$$

$$\omega 6) \quad T = \frac{2\pi}{\omega} = \frac{2\pi}{20\pi} = 0.1 \text{ s}$$

$$(0.1 \text{ s}) = \left(0.1 \frac{T}{r}\right) \Rightarrow | \Delta x | = L = 2A$$

$$S_{av} = \frac{L}{\Delta t} \Rightarrow 10 = \frac{2A}{0.1} \Rightarrow A = 1.0 \times 10^{-1} \text{ m} = 1.0 \text{ cm}$$

صفی ۴

۵۷)

$$h=1 \quad f_1 = \frac{v}{\lambda} = \frac{250}{2 \times 10^{-8}} = 250 \text{ Hz} \Rightarrow T_1 = \frac{1}{f_1} = \frac{1}{250} \text{ s} = \frac{1000}{250} \text{ ms} = 4 \text{ ms}$$

نیز

$$۵۸) \quad 13.4 - 15.18 = -1.78 \text{ eV} \Rightarrow \begin{cases} n'=1 \Rightarrow E_1 = -13.4 \text{ eV} \\ n=2 \Rightarrow E_2 = -15.18 \text{ eV} \end{cases}$$

$$E_2 - E_1 = 1.78 \text{ eV} \quad \underline{\text{نیز}}$$

$$۵۹) \quad W_0 = 4 \text{ eV}$$

$$\lambda' = \frac{\lambda}{4} \Rightarrow k'_{\text{max}} = 4 k_{\text{max}} \Rightarrow hf' - W_0 = 4(hf - W_0)$$

$$\lambda = ? \text{ nm}$$

$$h \times 4f - W_0 = 4hf - 4W_0$$

$$\Delta W_0 = 4hf$$

$$\Delta x \text{ eV} = 4 \times 4 \times 10^{-19} \text{ eV} \times f$$

$$f = \frac{4}{e} \times 10^{-19} \text{ Hz}$$

$$\lambda = \frac{c}{f} = \frac{3 \times 10^8 \text{ m/s}}{\frac{4}{e} \times 10^{-19} \frac{1}{s}} = \frac{15}{4} \times 10^{-7} \text{ m} = 3.75 \text{ nm}$$

نیز

$$۶۰) \quad \underline{\text{نیز}}$$

$$۶۱) \quad C = \text{con.}$$

$$U = \frac{1}{r} CV \Rightarrow \frac{U'}{U} = \left(\frac{V'}{V} \right)^2 \Rightarrow \frac{U'}{U} = \frac{9}{16}$$

$$V' = \frac{3}{4} V$$

$$\frac{U'-U}{U} = ?$$

$$\frac{U'-U}{U} = \frac{-7}{16} \quad \underline{\text{نیز}}$$

صفحه ۵

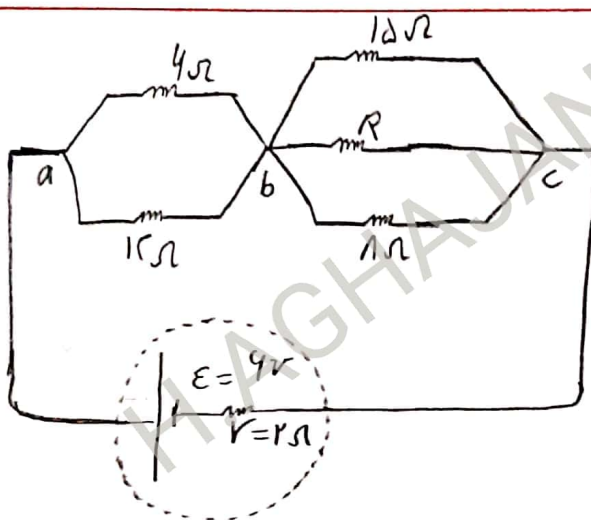
۹۲) $\phi = -2.0 \text{ nC}$
 $\Delta U = (2mJ) \Rightarrow \Delta V = \frac{\Delta U}{q} = \frac{2 \times 10^{-3}}{-2 \times 10^{-8}} = -10^5 \text{ V}$
 $V_B - V_A = -10^5 \text{ V} < 0$ نیز

۹۳) در حالت اول:

در حالت دوم:

$$\begin{aligned} \vec{E}_1 & \Rightarrow E = E_1 \sqrt{2} \\ \vec{E}_1 & \Rightarrow E' = E_1 \sqrt{1} \end{aligned} \left\} \frac{E'}{E} = \sqrt{2} \right. \text{ نیز$$

۹۴)



$$V_{ab} = V_{bc} \Rightarrow I \cdot R_{ab} = I \cdot R_{bc} \Rightarrow R_{ab} = R_{bc} \Rightarrow r = R_{bc} \Rightarrow R_{eq} = r + \epsilon = 1\Omega$$

$$I = \frac{\epsilon}{R_{eq} + r} = \frac{4}{10} \Rightarrow \boxed{I = 0.4 \text{ A}}$$

$$V_{bc} = \begin{cases} I \times R_{bc} = 0.4 \times 1 \\ I \times 1\Omega = \frac{I}{1} \times 1 \end{cases}$$

$I = 0.4 \text{ A}$ نیز

$$(45) (R_1 + R_2) + \Delta V = (R_1 + R_2) + \Delta V$$

$$(I R_1) + \Delta V = \frac{1}{2} \Delta x R_1 \Rightarrow \frac{1}{2} \Delta x R_1 > \Delta V$$

گزینه ۲ → با توجه به گزینه ها

$$(44) \text{ با } k: R_{eq} = \frac{1}{2} R \quad I = \frac{\mathcal{E}}{\frac{1}{2} R + R_{int}} = \frac{\frac{1}{2} \mathcal{E}}{R}$$

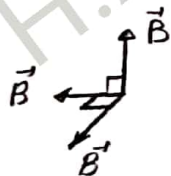
$$V = \mathcal{E} - IR = \mathcal{E} - \frac{1}{2} \frac{\mathcal{E}}{R} \times \frac{R}{1} = \frac{1}{2} \mathcal{E}$$

$$\text{با } k: R'_{eq} = \frac{1}{4} R \quad I' = \frac{\mathcal{E}}{\frac{1}{4} R + R_{int}} = \frac{\frac{1}{4} \mathcal{E}}{R}$$

$$V' = \mathcal{E} - I'R = \mathcal{E} - \frac{1}{4} \frac{\mathcal{E}}{R} \times \frac{R}{1} = \frac{3}{4} \mathcal{E}$$

$$\frac{V'}{V} = \frac{\frac{3}{4} \mathcal{E}}{\frac{1}{2} \mathcal{E}} = \frac{3}{2} \quad \text{گزینه ۳}$$

(47)



$$B_T = B\sqrt{3}$$

$$B = \frac{\mu_0 N I}{2r} = \frac{12 \times 10^{-6} \times 1 \times 10}{2 \times 10 \times 10^{-2}} = \frac{1}{10} \times 10^{-5} = 1 \times 10^{-6} \text{ T}$$

$$B_T = 2\sqrt{3} \times 10^{-6} \text{ T}$$

گزینه ۱

(48) گزینه ۲

$$(49) L = \mu_0 \times \frac{N^2}{l} \times A = \frac{12 \times 10^{-6} \times 10^4 \times 1 \times 10^{-4}}{1 \times 10^{-1}} = 12 \times 10^{-6} \text{ H} = 12 \text{ mH}$$

گزینه ۱

صفحه ۷

$$V_0) A = \pi r^2 = \pi \times 10^{-4} \text{ m}^2 \quad N=1$$

$$\theta = 4.0^\circ \Rightarrow \cos \theta = \frac{1}{r}$$

$$\Delta t = 10 \mu\text{s} \times 10^{-6} \Rightarrow \Delta B = -4.0 \dots G = -4 \times 10^{-4} \text{ T}$$

$$\bar{E} = -N \frac{\Delta \Phi}{\Delta t} = -N \cdot A \cdot \cos \theta \cdot \frac{\Delta B}{\Delta t} = -1 \times \pi \times 10^{-4} \times \frac{1}{r} \times \frac{-4 \times 10^{-4}}{10 \times 10^{-6}}$$

$$\bar{E} = 0.4 \text{ V} \quad \underline{\text{نیز}}$$

$$VI) \left. \begin{array}{l} P_C = P_D = P_0 \\ P_A = P_B + f_r \cdot g \cdot h_{BA} \Rightarrow P_A > P_B \end{array} \right\} \Rightarrow \underline{\text{نیز}}$$

$$VII) A = 0.001 \text{ m}^2 = 1 \times 10^{-4} \text{ m}^2$$

$$\rho_g = 1.0 \rho_a$$

$$\rho_g = \frac{W}{A} = \frac{m \cdot g}{A} \quad m = ? \text{ gr}$$

$$1.0 = \frac{m \times 10}{1 \times 10^{-4}} \Rightarrow m = 1 \times 10^{-4} \text{ kg}$$

$$m = 0.1 \text{ gr} \quad \underline{\text{نیز}}$$

$$VIII) \Delta k = ? \text{ J}$$

$$W_T = W_F + W_{f_k} + W_{mg} + W_{F_n}$$

$$\Delta k = W_T =$$

$$= F \times dx \cos 30^\circ + f_k \times dx (-1) + 0 + 0$$

$$= (4.0 \times 10^{-4} \times 1 - 0.001 \times 1) \times 1 = 0.001 \text{ J}$$

$$\Delta k = 0.001 \text{ J} \quad \underline{\text{نیز}}$$

$$IX) \theta_c = \frac{m_1 c_1 \theta_1 + m_2 c_2 \theta_2 + m_3 c_3 \theta_3}{m_1 c_1 + m_2 c_2 + m_3 c_3}$$

$$\theta_c = \frac{1.0 \times 100 \times 10 + 2.0 \times 100 \times 10 + 3.0 \times 100 \times 10}{1.0 \times 100 + 2.0 \times 100 + 3.0 \times 100} = 10^\circ \quad \underline{\text{نیز}}$$

صفحه 1

۷۵) $T = \text{con.}$
 $n = \text{con.}$

$$\begin{cases} P_1 = P_0 + \frac{W}{A} \\ V_1 = A \times 10 \text{ cm} \end{cases}$$

$$\begin{cases} P_2 = P_0 + \frac{10W}{A} \\ V_2 = A \times 20 \text{ cm} \end{cases}$$

$$\frac{W}{A} = \frac{14/8}{2 \times 10^{-3}} = 7 \times 10^5 \text{ Pa}$$

$$P_1 \cdot V_1 = P_2 \cdot V_2$$

$$\left(P_0 + \frac{W}{A}\right) \times 10 A = \left(P_0 + \frac{10W}{A}\right) \times 20 A$$

$$P_0 = \frac{24W}{A}$$

$$P_0 = 24 \times 7 \times 10^5 = 1.68 \times 10^7 \text{ Pa}$$

۱۶۸۰۰۰۰۰