

۱۱

۴۱) ۴

$$۴۲) \rho = \frac{W}{\Delta t} \Rightarrow \rho = \frac{m \cdot g \cdot h}{\Delta t} \Rightarrow \rho_{\text{و}} = \frac{40 \times 10 \times (h \times \frac{1}{\rho})}{40} \Rightarrow \eta = 120 \quad (۳)$$

$$۴۳) ۴d \times \frac{\pi}{r} = \frac{r \pi}{r} v \omega / 5 \quad (۱)$$

۴۴) ۵

$$۴۵) \frac{k_f}{k_i} = \frac{m_f}{m_i} \times \left(\frac{v_f}{v_i} \right)^2 \Rightarrow \frac{2}{5} = \frac{m_f}{10} \times \left(\frac{2}{5} \right)^2 \Rightarrow m_f = 1 \text{ kg} \quad (۳)$$

$$m_f - m_i = 1 - 10 = -9 \text{ kg}$$

$$۴۶) v = \frac{r}{t} - 10$$

$$\begin{aligned} (0, 0) \text{ s: } v_{av} &= \frac{r}{t} \left(\frac{0+0}{r} \right) - 10 = \frac{-10}{r} = \frac{-10}{r} \text{ m/s} \\ (10, 10) \text{ s: } v'_{av} &= \frac{r}{t} \left(\frac{10+10}{r} \right) - 10 = \frac{10}{r} \text{ m/s} \end{aligned} \quad \left. \vphantom{\begin{aligned} (0, 0) \text{ s: } v_{av} &= \frac{r}{t} \left(\frac{0+0}{r} \right) - 10 = \frac{-10}{r} = \frac{-10}{r} \text{ m/s} \\ (10, 10) \text{ s: } v'_{av} &= \frac{r}{t} \left(\frac{10+10}{r} \right) - 10 = \frac{10}{r} \text{ m/s} \end{aligned}} \right\} \frac{v_{av}}{v'_{av}} = -1 \quad (۱)$$

$$۴۷) x = \frac{1}{2} a t^2 + v_0 t + r_0$$

$$\begin{cases} t=2 \text{ s} \Rightarrow 0 = 2a + 2v_0 + r_0 \\ t=5 \text{ s} \Rightarrow 0 = 12.5a + 5v_0 + r_0 \end{cases} \Rightarrow \begin{cases} a = 4 \text{ m/s}^2 \\ v_0 = -12 \text{ m/s} \end{cases}$$

$$v = at + v_0 = 4 \times 5 - 12 = 8 \text{ m/s} \quad (۴)$$

$$۴۸) \Delta y = -\frac{1}{2} g t^2$$

$$-12.1 = -\frac{1}{2} g t^2 \Rightarrow t = 1.5 \text{ s} \quad t=1.5 \Rightarrow \Delta y = -5 \text{ m}$$

$$12.1 - 5 = 7.1 \text{ m} \quad (۱)$$

[2]

(9)

$$x_A = x_B = 0$$

$$v_A = 1 \text{ m/s}, a_A = -1 \text{ m/s}^2$$

$$v_B = -1 \text{ m/s}, a_B = 1 \text{ m/s}^2$$

$$x_A = -t^2 + 1.0t$$

$$x_B = \frac{1}{2} t^2 - 1.0t$$

$$\text{B, Answer: } L = x_A - x_B = -\frac{1}{2} t^2 + 1.0t$$

$$1.0 = -\frac{1}{2} t^2 + 1.0t \Rightarrow 1.0 = -\frac{1}{2} t^2 + 1.0t \Rightarrow t = 1.0 \text{ s}$$

$$L = x_B - x_A = \frac{1}{2} t^2 - 1.0t$$

$$1.0 = \frac{1}{2} t^2 - 1.0t \Rightarrow 1.0 = \frac{1}{2} t^2 - 1.0t \Rightarrow t = 1.0(\sqrt{2} + 1) \text{ s} \checkmark$$

$$1.0 = \frac{1}{2} t^2 - 1.0t \Rightarrow 1.0 = \frac{1}{2} t^2 - 1.0t \Rightarrow t = 1.0(\sqrt{2} - 1) \text{ s} \checkmark$$

(10)

$$d.) \Delta p = \sum_{(F-t)} = (8 \times 1) + (1 \times 1) + (4 \times 1) = 13 \text{ kg m/s}$$

$$\Rightarrow \Delta p = m \times \Delta v \Rightarrow 13 = 1 \times \Delta v \Rightarrow \Delta v = 13 \text{ m/s}$$

$$a_v = \frac{\Delta v}{\Delta t} = \frac{13}{1} = 13 \text{ m/s}^2 \quad (11)$$

d.) (12)

$$d.) v = -gt + v_0 \Rightarrow v = -1.0t \quad m = 1 \text{ kg}$$

$$p = mv = 1 \times (-1.0t) = -1t \quad (13)$$

$$d.) T = \frac{1}{f} = \frac{1}{1} = 1 \text{ s}$$

$$t = \frac{1}{1} \text{ s} = \frac{\Delta T}{f} = T + \frac{T}{2} \Rightarrow x = 0 \Rightarrow k = k_{\max} = \frac{1}{2} m \omega^2 A^2$$

$$\Rightarrow k = \frac{1}{2} \times 1 \times 100 \times \pi^2 \times 1 \times 1 = 50 \pi^2 \text{ J} = 50 \pi^2 \text{ mJ} \quad (14)$$

۱۳

$$\left. \begin{aligned} \text{د۴)} \quad |a| = a_{\max} &\Rightarrow x = \pm A \\ \text{حرکت نوسانی} \\ \{a\}_0 &\Rightarrow x_0 \\ v &\leq 0 \end{aligned} \right\} \textcircled{1}$$

$$\text{د۵)} \quad \frac{v\lambda}{r} = v_m \Rightarrow \lambda = r_m \quad \lambda = \frac{c}{f} \Rightarrow r = \frac{v\lambda}{f} \Rightarrow f = 1.8 \times 10^8 \text{ Hz} \\ \Rightarrow f = 180 \text{ MHz} \quad \textcircled{2}$$

$$\text{د۶)} \quad \lambda_A > \lambda_B \Rightarrow \hat{D}_A < \hat{D}_B \quad \hat{D} = \text{زویه انحراف} \\ \text{از عمیق به رفیق} \quad \Rightarrow \textcircled{3}$$

د۷) ۱۳

$$\text{د۸)} \quad n' = 4 \quad \left| \begin{aligned} n' = 4 \\ n = 1 \end{aligned} \right. \Rightarrow \frac{1}{\lambda_{\max}} = R \left(\frac{1}{n'^2} - \frac{1}{n^2} \right) = R \times \frac{9}{16 \times r_D} \\ \lambda_{\max} = \frac{16 \times r_D}{9R} \quad \left. \begin{aligned} n' = 4 \\ n = \infty \end{aligned} \right\} \frac{\lambda_{\max}}{\lambda_{\min}} = \frac{r_D}{9} \quad \textcircled{1}$$

$$\text{د۹)} \quad 1 + r_D = 1 + r + 1 + (N \times 1) \Rightarrow N = r \quad \left. \begin{aligned} m_1, m_r \end{aligned} \right\} \textcircled{2}$$

$$\text{۱۰)} \quad f = \frac{v}{\lambda} = \frac{1.8 \times 10^8 \text{ V}}{\frac{r}{4} \times 3 \times (1.8 \times 10^8)^2} = \frac{1.8 \times 10^8 \text{ V}}{r \times 1.8 \times 10^8 \times 1.8} = \frac{1}{r} \times 1.8 \times 10^8 \text{ V} \\ f = \frac{1.8 \times 10^8 \text{ V}}{r} \quad \textcircled{3}$$

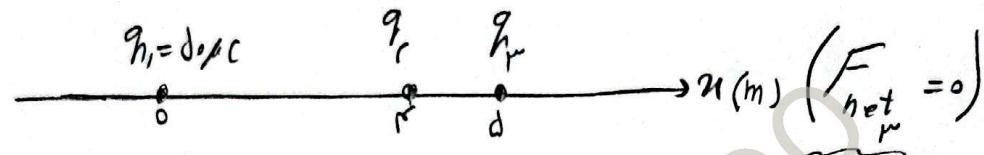
16

91) (14)

92) $V = \text{con.}$

$$\left. \begin{aligned} d' &= \frac{1}{r} d \\ c &= k \epsilon_0 \frac{A}{d} \end{aligned} \right\} \Rightarrow c' = r c$$

$$\left. \begin{aligned} Q &= C \times V \\ Q' &= r Q \end{aligned} \right\} \quad (14)$$

93) 

$$F_{lr} = F_{rr} \Rightarrow \frac{d_0}{dr} = \frac{|q_r|}{r^2} \Rightarrow q_r = 1 \mu C$$

(14)

94) $V = \mathcal{E} - IR$

$$P = V \times I = 9 \times 1.1 = 9.9 \text{ W}$$

95) $D' = 99 D$

$V = \text{con.}$

$I = \text{con.}$

$$R = \rho \frac{L}{A} = \frac{\rho L}{\pi r^2} \Rightarrow \frac{R'}{R} = \left(\frac{D}{D'} \right)^2$$

$$P = \frac{V^2}{R} \Rightarrow \frac{P'}{P} = \frac{R}{R'} = \left(\frac{D'}{D} \right)^2 = \left(\frac{99}{1} \right)^2$$

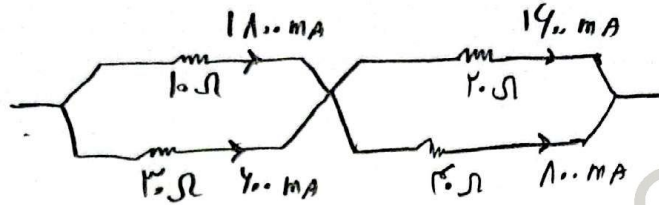
$$\frac{P'}{P} \approx \frac{9801}{1} \Rightarrow \frac{P' - P}{P} = \frac{9801 - 1}{1} = 9800\% \quad (1)$$

8

$$44) R_{eq} = \frac{3}{4} \Omega + \frac{4}{3} \Omega = \frac{25}{12} \Omega$$

$$I_T = \frac{\varepsilon}{R_{eq} + r} = \frac{d_0}{\frac{25}{12}} = \frac{12}{25} = 24 \mu A = 24 \cdot 10^{-6} A$$

$$I_{X1} = 24 \cdot 10^{-6} A \Rightarrow X = 4 \cdot 10^{-6} A, \quad I_{X2} = 24 \cdot 10^{-6} A \Rightarrow X' = 1 \cdot 10^{-6} A$$



$$(ب) \text{ ظرفیت } = 2 \cdot 10^{-6} A = 2 \cdot 10^{-6} A \quad (3)$$

46) (4)

$$47) F = B \cdot L \cdot I \cdot \sin \alpha = 6 \times 10^{-3} \times 1 \times 2 \times 10^{-2} \times 10^{-2} \times 5/18 = 1.0 \sqrt{3} N \quad (1)$$

49) (3)

$$50) |E| = B \cdot L \cdot v \Rightarrow |E_x| = |E_y| \Rightarrow |E_x| = |E_y| \quad (2)$$

$$51) D' = \frac{1}{4} D \Rightarrow A' = \frac{1}{4} A \quad D: \text{ قطر مثبت نشاء } D': \text{ قطر مثبت نشاء}$$

$$A' \times V' = A \times V \Rightarrow \frac{V'}{V} = \frac{A}{A'} = \frac{4}{1} \Rightarrow \frac{V - V'}{V} = -\frac{3}{4} \quad (1)$$

$$52) P_{gas} + f \cdot g \cdot h = P_0$$

$$P_{gas} + 10 \times 10^{-3} \times 10 \times 10^{-2} = 101325$$

$$P_{gas} = 101325 Pa \quad (2)$$

(4)

$$\begin{aligned}
 V^{(3)} \quad C_A &= \frac{Q}{m \cdot \Delta \theta} = \frac{1100}{1 \times 1} = 1100 \\
 C_B &= \frac{100}{1 \times 1} = 100 \text{ J/kg} \cdot ^\circ\text{C} \\
 C_C &= \frac{100}{1/10 \times 1} = 1000
 \end{aligned}
 \left. \begin{array}{l} \\ \\ \end{array} \right\} C_B < C_C < C_A \quad (3)$$

V⁽⁴⁾ (4)

$$\begin{aligned}
 V^{(4)} \quad T &= 100^\circ\text{C} \\
 h &= 100^\circ\text{C} \Rightarrow \frac{P_r}{T_r} = \frac{P_i}{T_i} \Rightarrow \frac{10 + V_d}{T_r} = \frac{V_d}{100}
 \end{aligned}$$

$$T_r = \frac{100 \times 10}{V_d} = 1000 \text{ K}$$

$$Q_c = 1000 - 100 = 900^\circ\text{C} \quad (4)$$