

$\Delta K = W_t$  (141)

$\frac{1}{2} m v^2 = W_f = f \cdot d = \mu_y \mu_k d$

$\rightarrow d = \frac{v^2}{2 \mu_y \mu_k}$

$\rightarrow \frac{d_A}{d_B} = \frac{\mu_{k_B}}{\mu_{k_A}} = \frac{1}{2} \rightarrow$  (2) گزینه

$x = \frac{1}{2} a_x t^2 = \frac{1}{2} (1) \times 4^2 = 2$  (107)

$x = \frac{1}{2} a_x t^2 = \frac{1}{2} (2) (2)^2 = 4$

$\rightarrow r = 2i + 4j \rightarrow$  گزینه (1)

~~...~~ گزینه (1) (142)

$\frac{14}{t} = \frac{24}{12} \rightarrow t = 14s$  (10V)

$\tan \alpha = \frac{v^2}{r y}$  (143)

$r = \frac{v^2}{g \tan \alpha} = \frac{10^2}{10 \times \frac{3}{4}} = 13.3m$

گزینه (1)

$a_B = \frac{-2 - (-2.1)}{12} = \frac{12}{12} = 1$

$\Delta x_B = \frac{1}{2} a t^2 + v_i t$

$= \frac{1}{2} (1) (12)^2 - 2 \cdot (12) = 192m$

گزینه (3)

$E_1 = E_2 \rightarrow W_y = mgh$  (144)

$mgh = \frac{1}{2} \mu \alpha^2 \rightarrow W_y = \frac{1}{2} \mu \alpha^2$

$\frac{1}{2} \mu \alpha^2 = \frac{1}{2} (20) \times (12 \alpha)^2 = 144j$

گزینه (3)

$y_A = y_B \rightarrow -\frac{1}{2} g t^2 + v_i t = -\frac{1}{2} g t^2 - v_i t + H$  (10A)

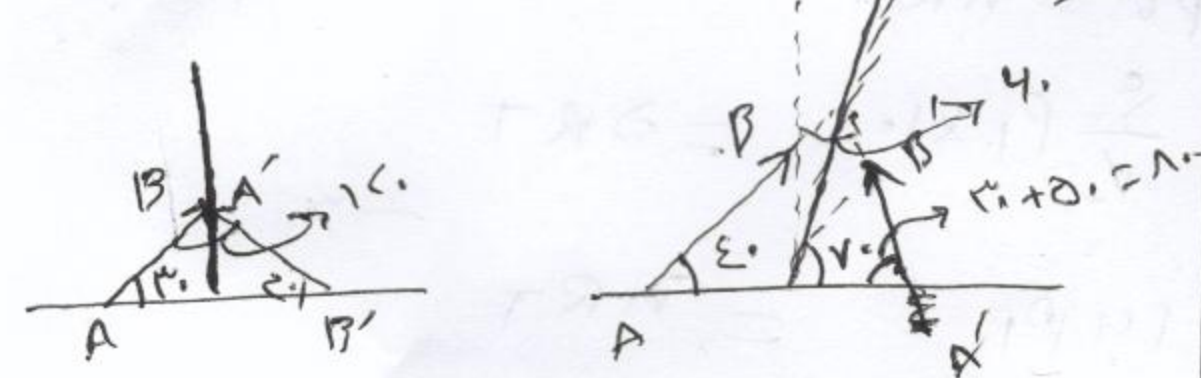
$\rightarrow t = 2s$

$\Delta y_A = -8 + 3 \cdot 2 = -8 + 6 = -2$

$\rightarrow \Delta y_B = 12 - 8 = 4$

$\frac{\Delta y_A}{\Delta y_B} = \frac{1}{2} \rightarrow$  گزینه (4)

$\alpha = 2(\alpha_1) + \alpha_2 = 2(20) + 10 = 50$  (145)



$\Delta \alpha = 12 - 4 = 8$

گزینه (3)

$a = |F - P| = 8 \rightarrow \begin{cases} P_1 = 10 \\ P_2 = 20 \end{cases}$  (149)

گزینه (5) (189)

$T = 2T'$  (140)

$a = \frac{m_r - m_l}{m_l + m_r} g = \frac{4 - 1}{4 + 1} \times 10 = 4 m/s^2$

$T' - m_l g = m_l a \rightarrow T' = m_l (g + a) = 14N$

گزینه (1)

$m_1 \epsilon \Delta \theta \leq m_2 L \Delta T$  147  
 $\rho_1 \alpha \epsilon \Delta T \leq \rho_2 \alpha \Delta T$   
 $\rightarrow m_1 = 10 \text{ kg} \rightarrow m_2 = 400 \text{ gr}$   
 گزینہ 1

$H = \frac{k A \Delta \theta}{L}$ ,  $L_A = L_B, \Delta \theta_A = \Delta \theta_B$  147

$\frac{H_A}{H_B} = \frac{k_A A_A}{k_B A_B} = \frac{9 \times 1}{1 \times 1} = 9$   
 گزینہ 1

$\rho h = \rho' h'$   
 $h = \frac{\rho' h'}{\rho} = \frac{1 \times 10}{1} = 10 \text{ cm}$   
 $\rightarrow \Delta H = 10 - 10 = 0 \text{ cm}$   
 گزینہ 1

$\rho = \frac{\rho_1 v_1 + \rho_2 v_2}{v_1 + v_2} = \frac{1 \times 1 + 2 \times 1}{1 + 1} = 1.5$  148  
 $\rho = 1.5 \text{ kg/m}^3$

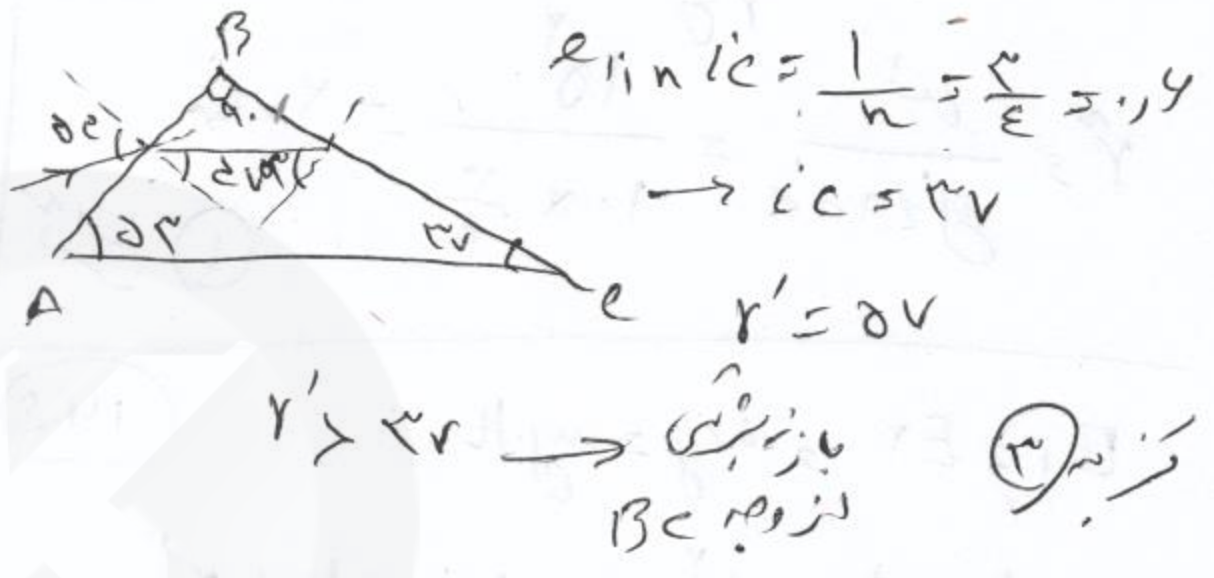
$\rho = \rho_1 y h = 1 \times 1 \times 1 = 1$   
 گزینہ 1

$\mu m \leq 5 \times 10^{-3} - 200 = 2 \times 10^{-3} \text{ gr}$  149  
 $\rho' \leq \frac{m'}{V} = \frac{2 \times 10^{-3}}{1 \times 10^{-3}} = 2 \text{ g/cm}^3$

$m_1 = 54 - 40 = 14 \text{ gr}$   
 $\rho' \leq \frac{m'}{V} = \frac{14}{1} = 14 \text{ g/cm}^3$   
 $\rightarrow \rho' \leq 14 \text{ kg/m}^3$   
 گزینہ 1

$\rho - \rho' = 2$  149  
 $\frac{\rho}{\rho'} = \frac{1}{2} \rightarrow \rho = 2\rho'$   
 $\frac{1}{2} - \frac{1}{2} = \frac{1}{2} \rightarrow F = -10 \text{ cm}$   
 $\frac{1}{4} - \frac{1}{4} = -\frac{1}{2} \rightarrow \rho' = 2 \times 2 = 4$   
 $\rightarrow m' = \frac{\rho'}{\rho} = \frac{4}{1} = 4 \text{ gr}$   
 گزینہ 2

$n = \frac{\sin i}{\sin r} \Rightarrow \frac{\epsilon}{\mu} = \frac{\sin i}{\sin r} \rightarrow r = 37^\circ$  149



$\rho = 1 - \frac{T_c}{T_H} \rightarrow \frac{T_c}{T_H} = 0.7$  149  
 $273 + \theta_c = 0.7 (273 + \theta_c) \rightarrow \theta_c = 2010$   
 گزینہ 3

$PV = nRT$  150  
 $\frac{\epsilon}{V} P_1 \times 1 = 2RT$   
 $14 P_1 = nRT$   
 $\rightarrow \frac{\epsilon}{V} P_1 \times 1 = \frac{2}{1} \rightarrow n = 2 \text{ mol}$

$W = -P \Delta V = -2 \times 10^5 (-1 \times 10^{-3}) = 200 \text{ J}$  151  
 $\Delta U = Q + W = -200 + 200 = 0 \text{ J}$   
 گزینہ 3

$$\frac{\Delta \phi}{2\pi} = \frac{\Delta x}{\lambda} \Rightarrow \frac{\Delta \phi}{2\pi} = \frac{r}{\lambda} \rightarrow \Delta \phi = 2\pi$$

دایره ای ← گزینش ①

$$f = f_s \frac{v}{v+vs}$$

گزینه ①

$$\frac{DF^0}{DF^1} = \frac{\frac{v}{v+vs} - 1}{1 - \frac{v}{v+vs}} = \frac{v+vs}{v-vs}$$

$$= \frac{v+vs}{v-\frac{v}{k}} = \frac{k+1}{k-1} \rightarrow \text{گزینه ③}$$

گزینه ① ۱۹۵

$$k=110 \rightarrow v = \frac{v}{k} = \frac{30}{110} = 0.27 \text{ m/s} \quad 190$$

$$v = \frac{v}{\rho} \sqrt{\frac{f}{\rho a}} \rightarrow \epsilon_u = \frac{\epsilon}{(12 \times 10^{-11})^2} \times \frac{f}{11000 \times 2}$$

$$\rightarrow F = \frac{\epsilon_u \times 4\pi \times 10^{-7} \times 10^9}{\epsilon} = 9.17 \text{ N}$$

گزینه ③

گزینه ② ۱۹۱

$$\frac{\alpha}{D} = \frac{n\lambda}{a} \quad 197$$

$$\frac{x'}{D} = \frac{(2m-1)\lambda}{2a} \rightarrow \frac{100}{D} = \frac{\delta \lambda}{2a}$$

$$\rightarrow \frac{100}{a} = 4m$$

$$\frac{\alpha}{D} = \frac{n\lambda}{a} \rightarrow \alpha = n \frac{100}{a} = 2 \times 4m = 8m$$

گزینه ③

گزینه ⑤ ۱۹۷

$$\frac{I_r}{I_1} = \left(\frac{A_r r}{A_1}\right)^2 = 14 \quad 192$$

$$\beta_r = 1.5 \beta_1$$

$$\beta_c - \beta_1 = 10 \log \frac{I_r}{I_1}$$

$$1.5 \beta_1 = 10 \log 14 = 10 \log 2^2$$

$$1.5 \beta_1 = 2 \log 2 \times 5 = 2 \log 2^5 = 10 \log 2^5$$

$$\rightarrow \beta_1 = 2 \rightarrow \beta_c = 1.5 \times 2 = 3$$

$$\rightarrow \beta_c = 5 \text{ dB}$$

گزینه ④

$$\omega = \frac{hc}{\lambda_0} = \frac{\epsilon \times 10^{-18} \times 3 \times 10^8}{4 \times 10^{-9}} = 7.5 \times 10^{10} \quad 198$$

$$v = \frac{hc}{h} = \omega \rightarrow \frac{hc}{\lambda} = \epsilon$$

$$\rightarrow \lambda = \frac{hc}{\epsilon} = \frac{12 \times 10^{-17}}{\epsilon} = 3 \times 10^{-17} \text{ m}$$

$$\rightarrow \lambda = 3 \times 10^{-17} \text{ m} \rightarrow \text{گزینه ①}$$

$$n = \frac{c}{v} = \frac{3 \times 10^8}{\epsilon} = 2 \quad 199$$

$$m = \frac{m_0}{\gamma n} = \frac{m_0}{14} \rightarrow m' = \frac{10}{14} m_0$$

$$\rightarrow \frac{m'}{m_0} = 0.714 \text{ در صد} \rightarrow \text{گزینه ⑤}$$

$$L_1 = \frac{r}{\epsilon} \lambda_1 \rightarrow \lambda_1 = \frac{\epsilon}{r} L \quad 192$$

$$\epsilon L = \frac{1}{\epsilon} \lambda_2 = \frac{r}{\epsilon} \lambda_2 = \frac{4}{\epsilon} \lambda_2$$

$$\lambda_2 = \frac{\epsilon}{4} \lambda_2 = \frac{r}{4} \lambda_2 = \frac{1}{4} \lambda_2$$

$$\frac{\lambda_2}{\lambda_1} = \frac{\frac{1}{4} \lambda_2}{\frac{r}{\epsilon} \lambda_2} = \frac{\epsilon}{4r} \rightarrow \text{گزینه ③}$$

$$e \frac{d\theta}{dt} = \frac{1}{r} m v^2 = \frac{1}{r} \times 1.4 \times 10^{-19} \times 1.9 \times 10^8 = 1.14 \times 10^{-11} \text{ N}$$

گزینه ۳ درست است

$$L = \frac{N^2 \mu_0 I^2 A}{l} = \frac{2^2 \times 10^{-7} \times 10 \times \pi \times 10^{-4}}{10} \times 1.2 \times 10^{-2} = 1.5 \times 10^{-10} \text{ H}$$

$$\rightarrow L = 0.1 \text{ H}$$

گزینه ۳

$$e_L = L \frac{dI}{dt} \rightarrow 4 = 2 \times 10^{-2} \frac{dI}{dt}$$

$$\rightarrow \frac{dI}{dt} = 200 \text{ A/s}$$

گزینه ۳

$$\omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{200}{10}} = 4.47 \text{ rad/s}$$

$$v_{max} = A \omega = 5 \times 4.47 = 22.35 \text{ m/s}$$

$$x = 5 \sin \omega t \rightarrow \dot{x} = 5 \omega \cos \omega t = 22.35 \cos \omega t$$

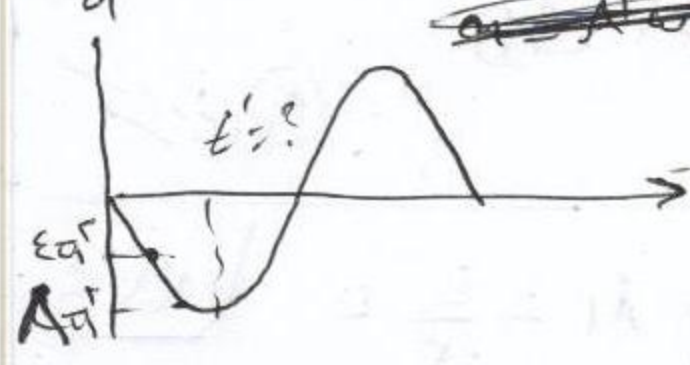
$$\rightarrow \cos \omega t = 1$$

$$v = v_{max} \cos \omega t = 22.35 \text{ m/s}$$

گزینه ۱

$$v = -\frac{v_{max}}{r} \rightarrow \cos \omega t = -1/r$$

$$\rightarrow \omega t = \frac{\pi}{2} \rightarrow T = 1 \text{ s}$$



$$a = \omega^2 r_{max} = 2 \times 10^{-2} \times 5 = 10^{-1} \text{ m/s}^2$$

$$a = \frac{1}{r} a_{max} \rightarrow \sin \omega t = 1/r$$

$$\rightarrow \omega t = \frac{\pi}{2} \rightarrow T = \frac{1}{r} \text{ s}$$

گزینه ۴

گزینه ۴ درست است

$$T_1 x = T_2 x \quad | 178$$

$$T_1 \cos 60 = T_2 \cos 30 \rightarrow \frac{T_1}{T_2} = \frac{\cos 30}{\cos 60} = \frac{\sqrt{3}/2}{1/2} = \sqrt{3}$$

گزینه ۳ درست است

$$E = \frac{v}{d} = \frac{200}{2 \times 10^{-2}} = 10^4 \text{ V/m}$$

| 179

$$F = (qE) = 2 \times 10^{-19} \times 10^4 = 2 \times 10^{-15} \text{ N}$$

گزینه ۵ درست است



$$I_1 = \frac{V}{1+2} = \frac{10}{3} = 3.33 \text{ A}$$

$$I_2 = \frac{10}{10} = 1 \text{ A}$$

$$V_C + 2(1) - 1(1) = 0 \rightarrow V_C = 4 \text{ V}$$

$$W = \frac{1}{2} C V^2 = \frac{1}{2} \times 20 \times 4^2 = 80 \mu \text{ J}$$

گزینه ۴ درست است

گزینه ۱ درست است | 181

$$R_T \uparrow \rightarrow I_D \downarrow \rightarrow V_{R_T} \uparrow \quad | 182$$

گزینه ۲ درست است

$$f = \frac{N \cdot I \cdot I_T}{2 \pi a R} = \frac{2 \times 10^{-19} \times 10 \times 10^{-4}}{2 \pi \times 10^{-2}} = 10^{-15} \text{ Hz}$$

| 183

گزینه ۳ درست است



در این قضیه و انتقال یک نوترون به پروتون تبدیل شده  
و یک انرژی آزاد می شود.

$$E = mc^2 = \frac{-2}{m} \times \frac{-27}{m} \times (3 \times 10^8)^2$$

$$\rightarrow u = 15 \times 10^{14} = 1.5 \times 10^{15} \text{ eV}$$

گزینه (ب) درست است

