فیزیک تجربی ۱۵، ۴، ۱۴۰۲

دکتر علیرضا یاوری

سؤال ۴۶

$$^{A}_{Z}X \rightarrow {}^{4}_{2}\alpha + {}^{0}_{-1}\beta^{-} + {}^{0}_{+1}\beta^{+} + {}^{A-8}_{Z-2}Y$$

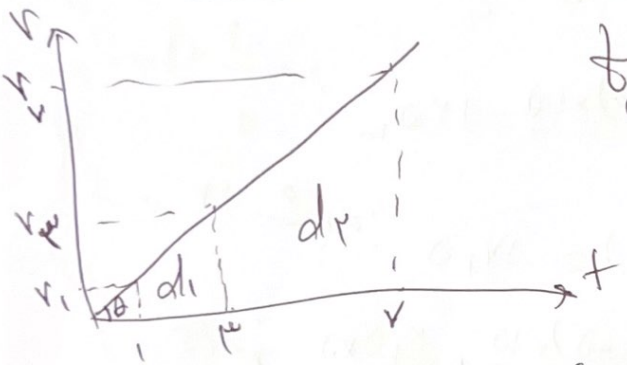
$$Z = N$$

سؤال ۴۷

$$W = -\Delta U = -q\Delta V \rightarrow 20\times10^{-7} = 5\times10^{-7}(V_B - 2)$$

$$\rightarrow 4 = V_B - 2 \rightarrow V_B = 10$$

سؤال ۴۸



$$\tan\theta = \frac{v_1}{1} = \frac{v_3}{3} = \frac{v_7}{7} \rightarrow \begin{cases} v_1 + 3v_1 = 20 \\ v_1 = 5 \\ v_3 = 15 \\ v_7 = 35 \end{cases}$$

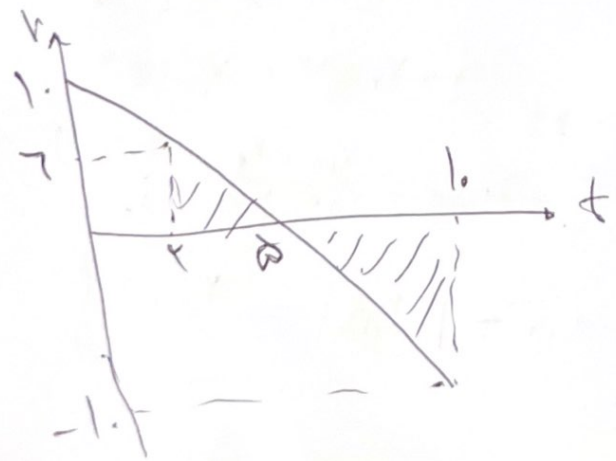
$$d_1 = \frac{(v_1 + v_3)\times 2}{2} = 20$$

$$\rightarrow d_2 = \frac{(3\times 5 + 15)\times 2}{2} = 100$$

سؤال ۴۹

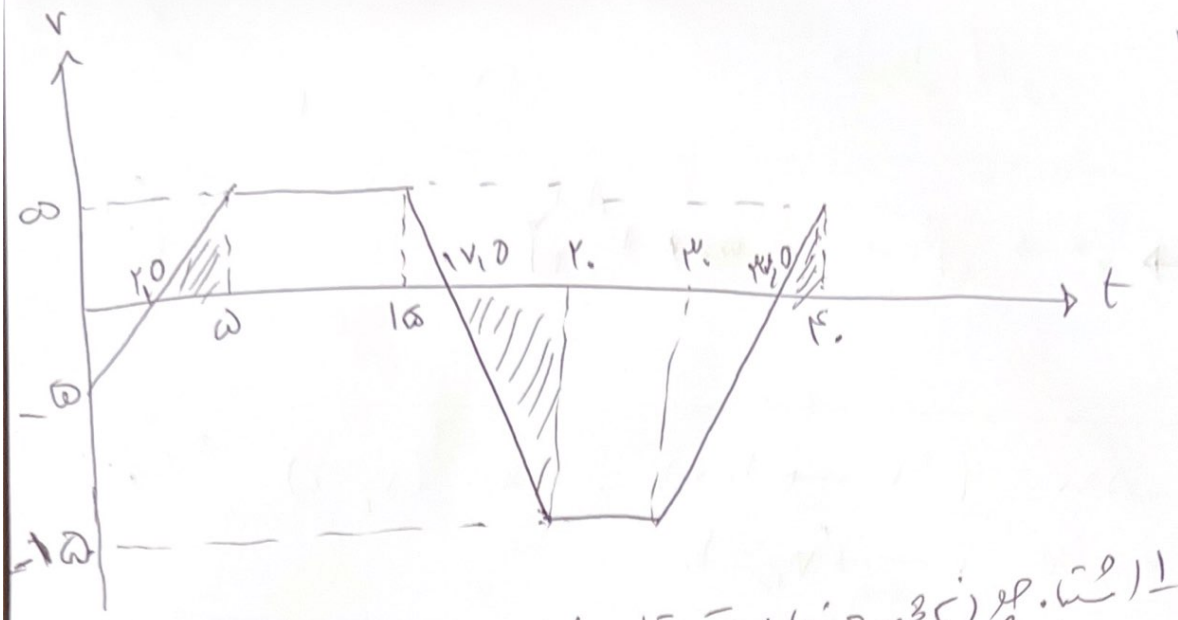
$$\begin{cases} x = \frac{1}{2}at^2 + v_0t + x_0 \rightarrow 0 = \frac{1}{2}a\times 12^2 + 12v_0 + 36 \\ v = at + v_0 \rightarrow \boxed{0 = 12a + v_0} \end{cases} \rightarrow \boxed{2a + v_0 + 3 = 0}$$

$$a = -2,\ v_0 = 10$$



$$d = \frac{2\times 3^2}{2} + \frac{5\times 10}{2} = 34$$

$$\overline{v} = \frac{d}{\Delta t} = \frac{34}{10-2} = \frac{17}{4}$$



گزینه ۱۱ پاسخ: جمع زمان حرکت‌ها

$۲۱٫۵ + ۱۷٫۵ + ۲۱٫۵ = ۱۲۰_s$

گزینه ۱۲ پاسخ:

$$\Delta x = ۵\times ۱۰ + \frac{۵\times ۵}{۲} - \frac{(۲۰+۵)\times ۱۵}{۲} = ۱۲۵_m$$

گزینه ۱۳ پاسخ:

$$۱۷٫۵ - ۲۱٫۵ + ۲۱٫۵ = ۱۷٫۵$$

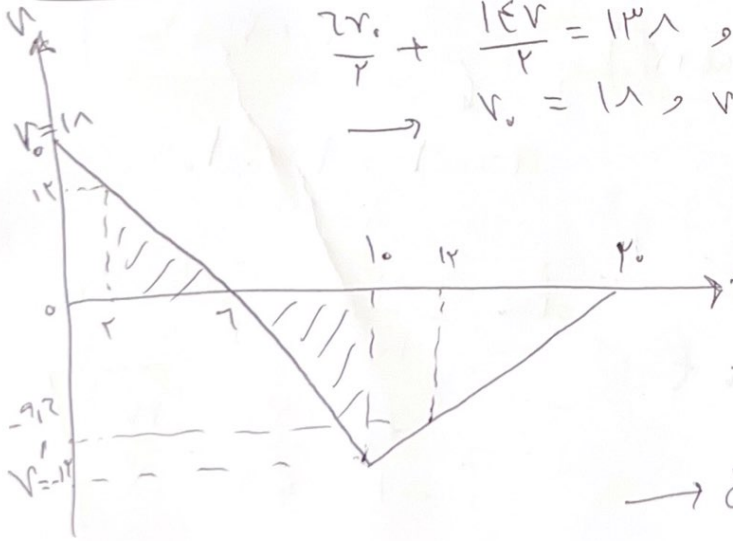
گزینه ۴ صحیح:

$$d = \frac{۵\times ۲۱٫۵}{۲} + \frac{(۱۵+۱۰)\times ۵}{۲} + \frac{(۲۰+۵)\times ۱۵}{۲} + \frac{۲۱٫۵\times ۵}{۲}$$

$$\rightarrow d = ۲۲۲٫۵\ m$$

دکتر علیرضا یاور

سؤال ۱۲



$$\frac{۲۷۰}{۲} + \frac{۱۴۷'}{۲} = ۱۳۸ \quad , \quad \frac{v'}{۷} = \frac{v_0}{۶}$$

$$\rightarrow v_0 = ۱۸ \quad , \quad v' = ۱۲$$

$$a_1 = -۳, \quad a_2 = ۱٫۶$$

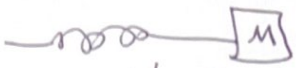
$$\rightarrow v_{۲} = ۱۲ \quad , \quad v_{۱۲} = -۹٫۶$$

$$\rightarrow \bar{a} = \frac{v_{۱۲} - v_{۲}}{۱۲-۲} = \frac{-۹٫۶ - ۱۲}{۱۰}$$

$$\rightarrow \bar{a} = |-۲٫۱۶| = ۲٫۱۶$$

$k\Delta l = mg$

$\Delta l = 1\cdot cm$



$\Delta L' = 2cm$ $\quad \mu_k = 0.2$

$k\Delta L' = \mu_k mg$

$$k=k \longrightarrow \frac{mg}{\Delta L} = \frac{\mu_k Mg}{\Delta L'} \longrightarrow \frac{M}{m} = \frac{\Delta L'}{\Delta L \cdot \mu_k} = \frac{2}{1\cdot \times 0.2} = 1$$

$p = at^2 + bt + c \longrightarrow \begin{cases} 0 = 4a + 2b + 12 \\ 0 = 12a + 4b + 12 \end{cases} \Rightarrow p = 2t^2 - 12t + 12$

$$\longrightarrow \begin{cases} p_2 = 18 - 36 + 12 = -2 \\ p_5 = 50 - 60 + 12 = 2 \end{cases} \longrightarrow \Sigma F = \frac{\Delta p}{\Delta t} = \frac{2-(-2)}{5-2} = 4$$

$$a = \frac{2+20}{2} = \frac{12}{2} = 6$$

$F_1 - f_k = ma \longrightarrow 25 - f_k = 5 \times 6 \longrightarrow f_k = 25$

$N - mg - F_2 = 0 \longrightarrow N = 50 + 20 = 70$

$$R = \sqrt{f_k^2 + N^2} = \sqrt{25^2 + 70^2} = 35\sqrt{5}$$

$T = \frac{\Delta t}{n} = \frac{36}{20} = 1.8 = 2\pi\sqrt{\frac{l}{g}} \xrightarrow{g=\pi^2} l = 81\,cm$

$l' = 81 - 17 = 64\,cm \longrightarrow T' = 2 \times 0.8 = 1.6 \longrightarrow n' = \frac{\Delta t'}{T'} = \frac{40}{1.6}$

$\longrightarrow n' = 25$

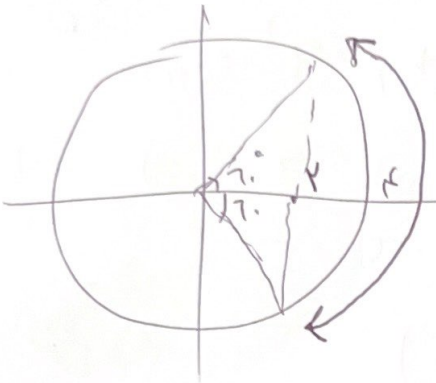
تست ۳۶

$\lambda = \frac{v}{f}$ ، $A = \pi \frac{d^2}{4}$ ، $\pi = 3$ ، $f = 200$

$v = \sqrt{\frac{R}{\rho A}} = \sqrt{\frac{2 \times 10^4}{9000 \times 3 \times \frac{4 \times 10^{-6}}{4}}} = 100$ ← $\lambda = \frac{v}{f} = \frac{100}{200} = \frac{1}{2}$

$\frac{\lambda}{2} = \frac{1}{4} m = 25\,cm$

تست ۱۷



$\Delta\varphi = \frac{2\pi}{3} = \omega \Delta t = \frac{2\pi}{3} \times \Delta t$

$\Delta t = 0.1\,s$

دکتر علیرضا باهر

تست ۲۱

$x = vt$

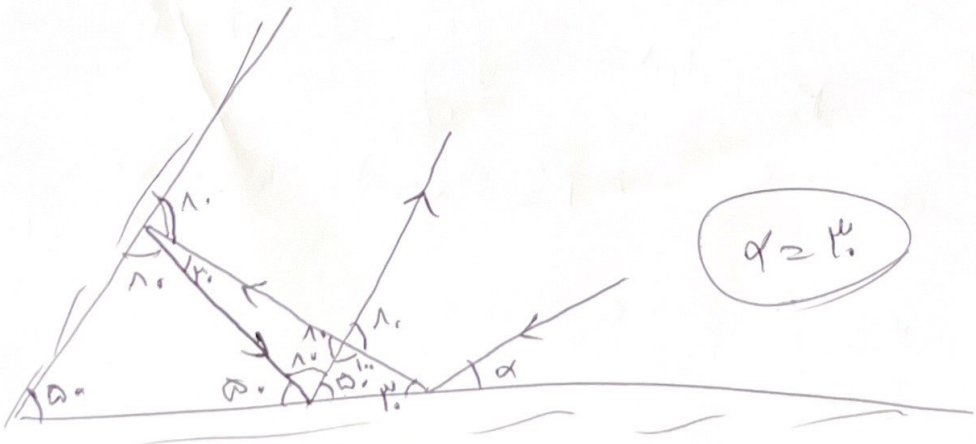
$t_2 = 2s$ ، $t_1 = 1s$ ، $x_2 = 2d$ ، $x_1 = d$

$t_2 = 2t_1 \rightarrow x_2 = 2x_1$

$\rightarrow x_1 + x_2 = d + 2d = 3d = 120$

$\rightarrow d_2 = 40 = x_1$

تست ۳۹



تست ۱

$$\Delta E = -E_R\left(\frac{1}{n_2^2}-\frac{1}{n_1^2}\right)=\frac{hc}{\lambda}$$

$$5\to 4 \Rightarrow 13.6\left(\frac{1}{16}-\frac{1}{25}\right)=\frac{1240}{\lambda} \to \lambda = 4052$$

$$2\to 1 \to 13.6\left(\frac{1}{1}-\frac{1}{4}\right)=\frac{1240}{\lambda'} \Rightarrow \lambda' = 122$$

$$\Rightarrow \lambda - \lambda' = 3931$$

تست ۲

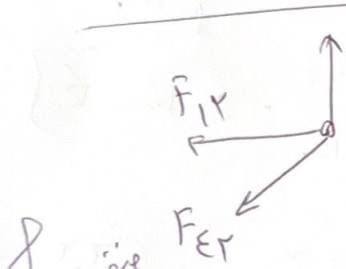
$$U'-U=25 \to \frac{1}{2C}\left(q'^2-q^2\right)=25$$

$$q'=\frac{3}{4}q \to \frac{1}{2\times 40}\left(\frac{9}{16}-1\right)q^2=25 \to q=40$$

تست ۳

چون نیروها در راستای x-ها است

پس مولفه‌های y را کاری با هم ندارند

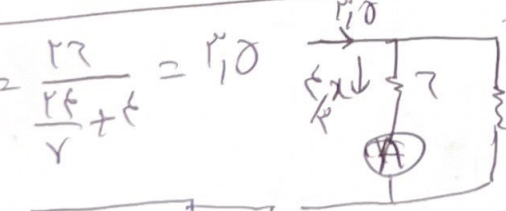


$$F_{32} = F_{42}\sin 45 \to \frac{20}{10^2} = \frac{q_4}{(10\sqrt{2})^2}\times\frac{\sqrt{2}}{2}$$

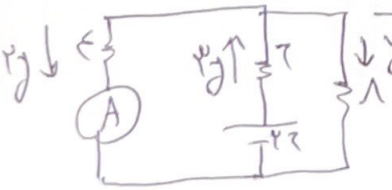
$$\to q_4 = 10\sqrt{2} \to \text{گزینه ۴}$$

تست ۴

$$I = \frac{12}{\frac{12}{2}+4} = 1.5$$



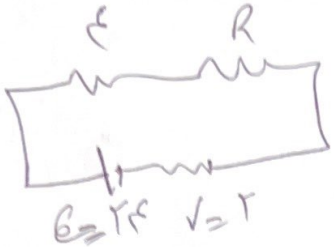
$$\Rightarrow x+\frac{2}{3}x = 1.5 \to x = 0.9$$

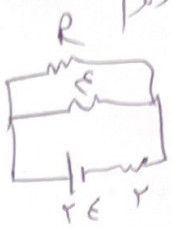


$$KVL: 12 - 2y\times 2 - 8y = 0 \to y = 1$$

$$\Rightarrow x - y = 0.9 - 1 = -0.1$$

سوال ۳۵ کنکور





$$I_1 = \frac{2\varepsilon}{2+R}$$

$$P_1 = I_1(\varepsilon - IV) = \frac{2\varepsilon^2}{(2+R)^2}(\varepsilon+R)$$

$$\Sigma_2 = \frac{2\varepsilon}{2+\frac{\varepsilon R}{\varepsilon+R}} = \frac{2\varepsilon(\varepsilon+R)}{8+2R}$$

$$\rightarrow P_2 = \frac{2\varepsilon^2}{(8+2R)^2}(\varepsilon+R)(\varepsilon R)$$

$$P_1 = \frac{2\varepsilon}{10} P_2 \rightarrow \frac{1}{(2+R)^2} = \frac{\varepsilon R}{(8+2R)^2} \times \frac{2\varepsilon}{10} \rightarrow R = \varepsilon$$

طبق گفته

سوال ۳۶ کنکور

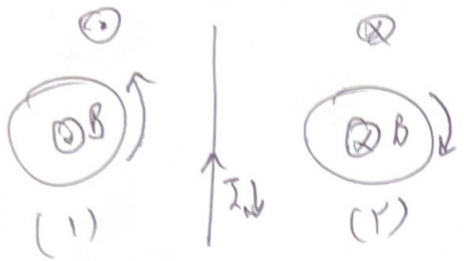
اول $I = \frac{\varepsilon}{2R} = \frac{12}{2} = 2$ حالت دوم $R_V = \infty$ ← جریان عبور نمی‌کند $\rightarrow I' = 0$

$V = R I = 5 \times 2 = 10$ $\quad V = \varepsilon = 12$

اختلاف پتانسیل دو سر

سوال ۳۷ کنکور

$$\bar{\varepsilon} = \frac{NBA}{\Delta t} = \frac{100 \times 50 \times 10^{-4} \times 200 \times 10^{-4}}{0.1} = 0.1$$



$B_1 = \frac{\mu_0 I}{2\pi r}$ ↓

میدان B_1 در محل B ↓

$\rho = \frac{m}{Ah} \rightarrow h = \frac{m}{\rho A}$

$\rightarrow h = \frac{2.2}{1 \times 20} = 1\,cm$

$h = \frac{0.44}{1 \times 20} = 2.2$ → $\rho_1 h_1 = \rho_2 h_2$

$\rightarrow 2.2 \times 1 = 1 \times h_2 \rightarrow h_2 = 2\,cm$

$h = 20 - 1 = 19\,cm \rightarrow P = \rho g h = 1000 \times 10 \times \frac{19}{100}$

$\rightarrow P = 1900\,Pa$

$E_1 = E_2 + R \rightarrow mgh_1 + \frac{1}{2}mv_1^2 = \frac{1}{2}mv_2^2 + R$

$\rightarrow 0.2 \times 10 \times 15 + \frac{1}{2} \times \frac{2}{10} \times 100 = \frac{1}{2} \times \frac{2}{10} \times 18^2 + R$

$\rightarrow R = -7.2$

$Q = 0 \rightarrow 0.2 \times 4200 (20 - 15) + 100 \times 400 (20 - 0) + A(20 - 0) = 0 \rightarrow A = 4200$

$$K_2 = \frac{1}{2} m r^2 = \frac{1}{2}(2..)(25..)^2 \times 1.^{-7} = 3,125 \times 1.^{2}$$

$$F = \frac{9}{5}\theta + 32 \longrightarrow 5\theta = \frac{9}{5}\theta + 32 \rightarrow K_2 = 125$$

$$F = 9 \times 2 B \sin\theta \Rightarrow$$

$$f \times 1.^{-4} = B \times 5 \times 1.^{5} \times 12 \times 1.^{-2.} \longrightarrow B = ;5$$