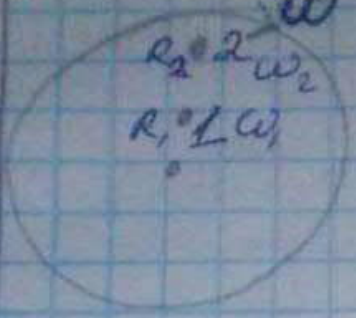
1-masala



Bir oqqa iga bolgani uchun $\omega_1 = \omega_2$ ya'ni burchak tezliklari bir xil.

$v = \omega R$

$v_1 = \omega R_1$

$v_2 = \omega R_2$

$\frac{v_2}{v_1} = 2{,}5$

$\frac{\omega R_2}{\omega R_1} = 2{,}5$

$\frac{a_2}{a_1} = ?$

$a = \omega^2 R$

$\frac{a_2}{a_1} = \frac{\omega_2^2}{\omega_1^2} \cdot \frac{R_2}{R_1}$

$\frac{a_2}{a_1} = 2{,}5$

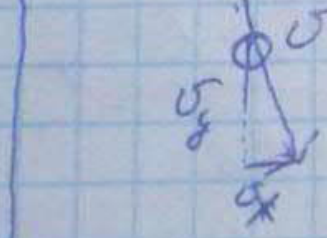
Javob: B

2-masala, Bu ham xuddi 1-masaladagidek.

$\frac{v_2}{v_1} = 7$ $\frac{a_2}{a_1} = ?$ $\frac{a_2}{a_1} = \frac{\omega^2 R_2}{\omega^2 R_1} = 7$

$\frac{v_2}{v_1} = \frac{\omega R_2}{\omega R_1} = 7$ Javob: B

3-masala



$v_x = const$

$v_y = gt$

$v = \sqrt{v_y^2 + v_x^2}$

$v = \sqrt{(gt)^2 + (v_x)^2}$

$v_x = 4$

$t = 0{,}3$ s

$v = \sqrt{(10 \cdot 0{,}3)^2 + (4)^2} = 5$ m/s Javob: D

Toh gorizontal otil
ganda ma'lum vaqtd
kegin v_y → tashkil
etuvchi tezlikka eg
shadi. $v_x = const$

4-masala. Tosh gorizontal otilgandan keyin, uni v_y → pastka tushuvchi tezlik paydo bo'ladi. Bunda $v_N = \sqrt{v_x^2 + v_y^2}$

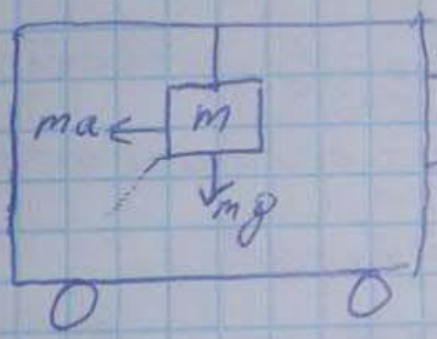
$v_N = 50\ m/s^2$ $\quad v_N = \sqrt{v_x^2 + v_y^2}$ $\quad \sqrt{v_N^2 - v_x^2} = v_y$

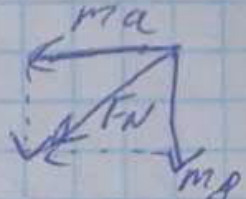
$v_x = 40\ m/s$ $\quad v_y = gt$ $\quad v_y = \sqrt{50^2 - 40^2} = 30\ m/s$

$t = ?$ $\quad t = \frac{v_y}{g} = \frac{30}{10} = 3\ sek$

$g = 10\ m/s$ $\quad$ Javob: (A)

5-masala

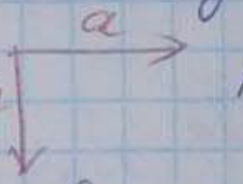




$F_N = \sqrt{(ma)^2 + (mg)^2}$

$m = 1\ kg$

$a = 1,2\ m/s^2$ $g = 10\ m/s^2$



$F_N = \sqrt{m^2(a^2 + g^2)}$

Poyezd gorizontal harakatlangani uchun $a \perp g$

$F_N = \sqrt{1^2(1,2^2 + 10^2)} \approx 10,7\ N$ $\quad$ Javob: (A)

7-masala: 6-masalani o'zi.

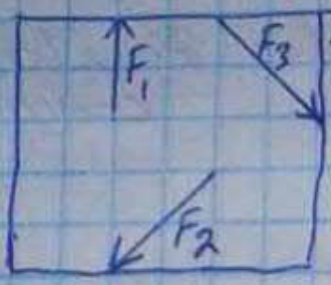
$F_N = ?$ $\quad F_N = \sqrt{(ma)^2 + (mg)^2}$

$m = 7\ kg$ $\quad F_N = \sqrt{(7 \cdot 1,2)^2 + (7 \cdot 10)^2} = 70,5\ N$

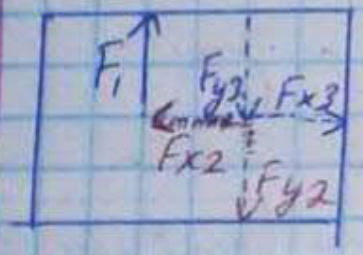
$a \perp g$ $\quad$ Javob: (B)

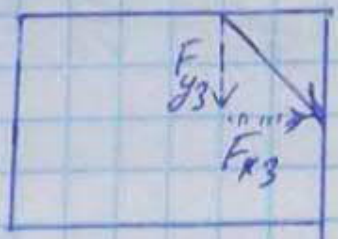
$a = 1,2\ m/s^2$ $\quad g = 10\ m/s^2$

7 - masala,



→ Bu chizmada ta'sir etayotgan kuchlar yonalishi berilgan. Keling bizga muammo bo'layotgan F_3 va F_2 kuchlarni proektsiyalaymiz;





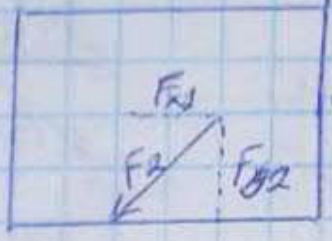
1) $F_{x3} = F_{y3}$ ekanligi chizmada ko'rinib turibdi.

Chizmada F_{x2} qarama qarshi F_{x3}

$F_N = 0$

F_{y2} bir yonalishda F_{y3} $F_N = F_{y2} + F_{y3}$

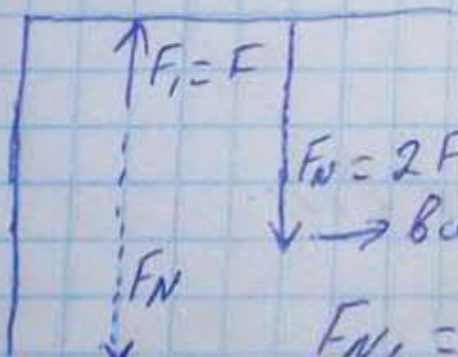
$F_N = 2F$



2) $F_{x2} = F_{y2}$ → chunki F_2 - kvadratni diagonali

1- va 2- tenglikladan shuni bilamiz $F_{y3} = F_{x3} = F_{y2} = F_{x2}$ → lekin yonalishlari har xil.

Endi umumiy natija,



→ Bu kuchni parallel ko'chirsak

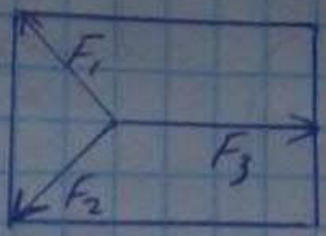
$F_{N_1} = F_N - F_1 = 2F - F = F$ Javob: (C)

Natijaviy vektor pastga yonalgan

8-masala

$m = 1\,kg$

$\vec{a} = ?$



Kõrinib turibdiki

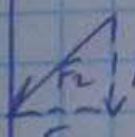
$F_3 = 4N$

Endi F_1 va F_2 ni proektsialaymiz.

$F_{x_1} = 2N$

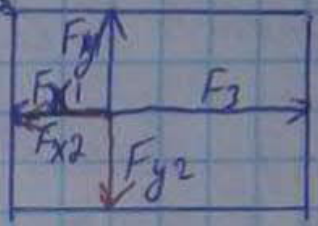
$F_{y_1} = 2N$

birlashtiramiz chizmani



$F_{x_2} = 2N$

$F_{y_2} = 2N$



$F_{y_1} - F_{y_2} = 0$

F_{x_1} va F_{x_2} vektorlar ustma ust tushgani uchun qo'shilib

$\vec{F}_N = \vec{F}_{x1} + \vec{F}_{x2}$

$\vec{F}_N = 2 + 2 = 4N$

Endi $\vec{F}_N$ → vektor bilan $\vec{F}_3$ → vektor yonalishi qarama qarshi va teng miqdorda bolgani uchun

$F_{Nun} = F_3 - F_N = 4 - 4 = 0\,N$

Natijaviy kuch nol demak tezlanish hamyog'

Javob: (3)

9-masala.

$m_1 = 2kg$

$m_2 = 3kg$

$T = ?$

$$a = \frac{F_N}{m_{um}} = \frac{m_2 g - m_1 g}{m_2 + m_1}$$

$$a = \frac{3 \cdot 10 - 2 \cdot 10}{3+2} = 2\ m/s^2$$

Javob: (B)

$T = m_1(g+a) = 2(10+2) = 24$

$T = m_2(g-a) = 3(10-2) = 24$

10-masala. 9-masala bilan bir xil. $m_2 = 9kg$

$m_1 = 2kg$

$g = 10\ m/s^2$

$T = ?$

$$\boxed{T = \frac{2 m_1 m_2}{m_1 + m_2} \cdot g} \quad T = \frac{2 \cdot 2 \cdot 9}{2+9} \cdot 10 = 32,7N$$

Javob: (A)

11-masala;

F_g Og'irlik kuchi pastga yonalgan, unga

m

mg xavoni qarshilik kuchi teskari ta'sir qilgani uchun harakat tezlanishini kamaytiradi.

$m = 3kg$

$a = 6\ m/s^2$ $g = 10\ m/s^2$

$F_N = mg - F_q$

$ma = mg - F_g$

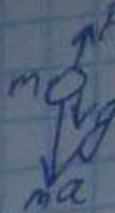
$F_g = mg - ma$

$F_g = 3 \cdot 10 - 3 \cdot 6$

$F_g = 12N$

Javob: (B)

12-masala. Xuddi 11-masaladek ishlaymiz.



$ma = mg - F_g$

$a = \frac{mg - F_g}{m}$

$a = \frac{3 \cdot 10 - 24}{3} = 2\ m/s^2$

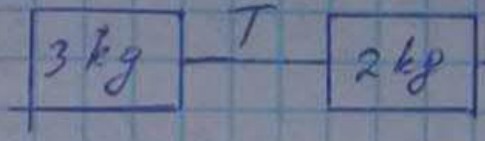
$g = 10\ m/s^2$

$F_g = 24N$

$m = 3kg$

Javob: (B)

13-masala.



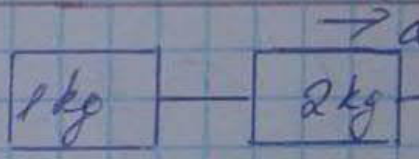
$F = (m_1 + m_2)a + \mu(m_1 + m_2)g$

$7 = (2+3)a + 0{,}3(2+3) \cdot 10$

Bu ifodadan $a = (-)$ chiqqani uchun sistema harakatga kelmaydi. $T = F - \mu m_1 g$

Javob: (B) $T = 7 - 0{,}3 \cdot 2 \cdot 10 = 1N$

14-masala:



$F = 13N$

$m_1 = 2kg$

$m_2 = 1kg$

$g = 10\ m/s^2$

$T = ?$

$\mu = 0{,}3$

$F = (m_1 + m_2)a + \mu g(m_1 + m_2)$

$13 = 3a + 3 \cdot 3$

$4 = 3a$

$a = \frac{4}{3}\ m/s^2$

Taranglik kuchini 2-jism vujudga keltiradi

$T = m_2 a + \mu m_2 g$

$T = 1 \cdot \frac{4}{3} + 0{,}3 \cdot 1 \cdot 10 = 4{,}33$

Javob: (A)

15-masala:

$m_1 = 2kg$

$m_2 = 3kg$

$F = 72N$

$T = \frac{F}{2}$ $T = \frac{72}{2} = 36N$

$a_2 = a - a_0$

$a_1 = a + a_0$

$T_1 = T_2$

$\begin{cases} T_1 = m_1(g + a_1) \\ T_2 = m_2(g - a_2) \end{cases}$

$T = m_1(g + a_1)$

$T_2 = m_2(g - a_2)$

$\begin{cases} 36 = 2 \cdot (10 + a_1) \\ 36 = 3 \cdot (10 - a_2) \end{cases}$

$\begin{cases} a_1 = 8 m/s^2 \uparrow \\ a_2 = -2 m/s^2 \\ a - a_0 = -2 m/s^2 \uparrow \end{cases}$

Demak $a < a_0$. 2-jism ham yuqoriga harakat qiladi.

16-masala.

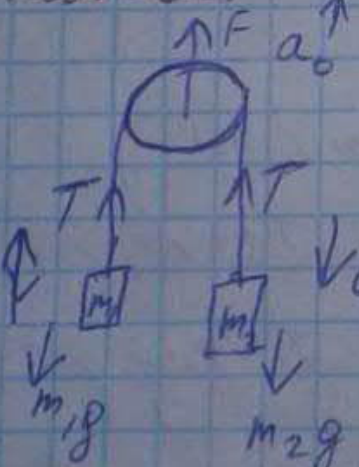
$m_1 = 3kg$

$m_2 = 4kg$

$F = 96N$

$a = ?$

$a_1 = ?$



$T = \frac{F}{2}$ $T = \frac{96}{2} = 48N$

$\begin{cases} T_1 = m_1(g + a_1) \\ T_2 = m_2(g - a_2) \end{cases}$

$a_1 = a_0 + a$

$a_2 = a - a_0$

$48 = 3 \cdot (10 + a_1)$

$a_1 = 6 m/s^2 \uparrow$

17-masala

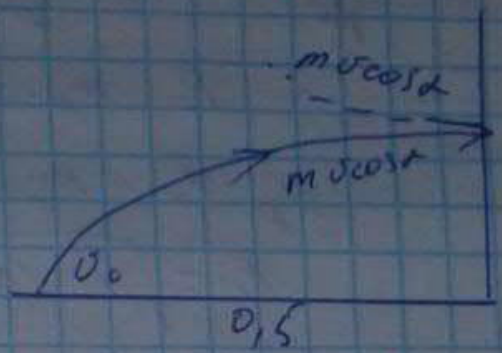
$m = 0,4\ kg$

$\alpha = \frac{\pi}{8}$

$S = 0,5\ m$

$\Delta P = 5,2\ kg \cdot \frac{m}{s}$

$v_0 = ?$



$\Delta P = 2mv_0\cos\alpha$

$v_0\cos\alpha = const$

$5,2 = 2 \cdot 0,4 \cdot v_0 \cdot 0,92$

$v_0 \approx 7,1\ m/s$

Javob: (A)

18-masala.

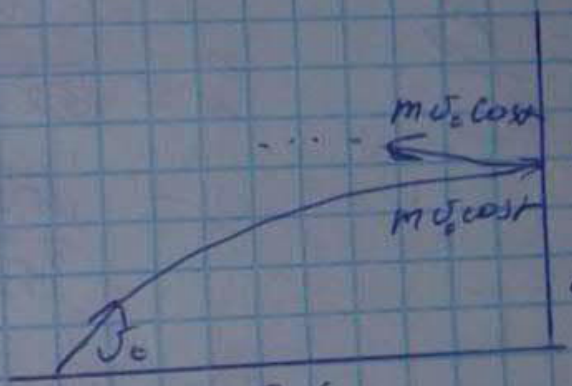
$m = 0,42\ kg$

$\alpha = \frac{\pi}{11}$

$S = 0,5$

$\Delta P = 7,3\ kg \cdot \frac{m}{s}$

$v_0 - ?$



$\Delta P = 2mv_0\cos\alpha$

$\Delta P = 7,3 = 2 \cdot 0,42 \cdot \cos\frac{\pi}{11} \cdot v_0$

$v_0 = \frac{7,3}{2 \cdot 0,42 \cdot 0,96} = 9\ m/s$

Javob: (B)

19-masala.

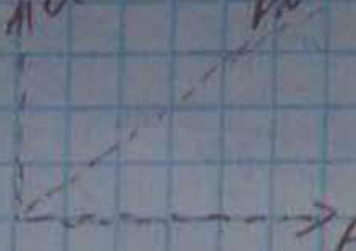
$\upsilon_p = \upsilon \cdot 1{,}2$

$\upsilon_\alpha = \upsilon$

$m_p = m$

$m_\alpha = 4m$

$P_N = ?$



$P_N = \sqrt{P_\alpha^2 + P_p^2}$

$P_p = m_p \cdot \upsilon_p$

$P_\alpha = m_\alpha \cdot \upsilon_\alpha$

$P_N = \sqrt{(m \cdot 1{,}2\upsilon)^2 + (4m\upsilon)^2}$

Javob: (3) $P_N = 4{,}2\, m\upsilon$

20-masala. $P_N = \sqrt{P_\alpha^2 + P_p^2}$

$\upsilon_p = 6\upsilon$

$\upsilon_\alpha = \upsilon$

$\upsilon_\alpha \perp \upsilon_p$

$m_\alpha = 4m$

$m_p = m$

$\upsilon_m = ?$

$\upsilon_m = \dfrac{P_N}{m_{um}}$

$P_N = \sqrt{(4m\upsilon)^2 + (6m\upsilon)^2}$

$P_N = \sqrt{52}\, m\upsilon$

$\upsilon_m = \dfrac{\sqrt{52}\, m\upsilon}{5m} = 1{,}44\upsilon$

Javob: (4)

21-masala:

$v_1 = 3$ m/s

$v_2 = 4$ m/s

$v_3 = 3$ m/s

$v_{um} = ?$

3ala dvigatel ulansa quvvatlari qoshiladi. $N_{um} = N_1 + N_2 + N_3$

$N_{um} = \frac{m \cdot v_{um}^2}{2 \cdot t}$

$N_1 = \frac{m v_1^2}{2t}$

$N_2 = \frac{m v_2^2}{2t}$

$N_3 = \frac{m v_3^2}{2t}$

$\frac{m v_{um}^2}{2t} = \frac{m v_1^2}{2t} + \frac{m v_2^2}{2t} + \frac{m v_3^2}{2t}$

$v_{um}^2 = v_1^2 + v_2^2 + v_3^2$

$v_{um} = \sqrt{3^2 + 4^2 + 3^2} = \sqrt{34}$ m/s

$v_{um} = \sqrt{v_1^2 + v_2^2 + v_3^2}$

Javob: (B)

22-masala Xuddi 21-masaladek ishlanadi.

23-masala.

1) p O ---- d ---- α O → v

2) v_2 ← O p ---- d ---- O α → v_1

ikki zarra bir birini turtib impuls beradi

$P_1 = P_2$ $\quad 4m v_1 = m v_2$

$v_2 = 4 v_1$

$\frac{4m \cdot v^2}{2} = \frac{4m v_1^2}{2} + \frac{m v_2^2}{2}$

$4v^2 = 4v_1^2 + \dots$

1-holatdagi energiya: $E = \frac{m_\alpha \cdot v^2}{2}$

$v_1 = \frac{v}{\sqrt{5}}$

2-holatda 2 ga bo'lindi: $E = E_p + E_\alpha$

$v_2 = \frac{4v}{\sqrt{5}}$

Javob: (C)

(69) $\nu = 4 \cdot 10^{14}$ Hz

24-masala. 1) $^{\alpha}O \leftarrow \alpha \dashrightarrow S \rightarrow \upsilon_{p1}$

$m_p = m$

$m_\alpha = 4m$

2) $\upsilon_{\alpha 2} \leftarrow O \overset{\alpha}{\leftarrow} \dashrightarrow O \overset{p}{\rightarrow} \upsilon_{p2}$

$\upsilon_{p1} = 800 \cdot 10^3$ m/s

$\upsilon_{\alpha 2} = ?$

impulslari teng.

$P_1 = P_2$ $\quad 4m\upsilon_{\alpha 2} = m\upsilon_{p2}$ $\quad \upsilon_{p2} = 4\upsilon_{\alpha 2}$

1-holdagi energiya ikkinchi holda

Sharo taqsimlanadi: 1) $E_1 = \frac{m_p \upsilon_{p1}^2}{2}$

$\frac{m_p \upsilon_{p1}^2}{2} = \frac{m_p \upsilon_{p2}^2}{2} + \frac{m_\alpha \cdot \upsilon_{\alpha 2}^2}{2}$ 2) $E_2 = \frac{m_p \upsilon_{p2}^2}{2} + \frac{m_\alpha \cdot \upsilon_{\alpha 2}^2}{2}$

$\frac{m\upsilon^2}{2} = \frac{m\upsilon_{p2}^2}{2} + \frac{4m\upsilon_{\alpha 2}^2}{2}$ $\quad E_1 = E_2$

$\upsilon^2 = (4\upsilon_{\alpha 2})^2 + 4\upsilon_{\alpha 2}^2$

$\upsilon_{\alpha 2} = \frac{\upsilon}{\sqrt{20}}$ $\quad \upsilon_{\alpha 2} = \frac{800 \cdot 10^3}{\sqrt{20}} \approx 179 \cdot 10^3$

Javob: (C)

25-masala.

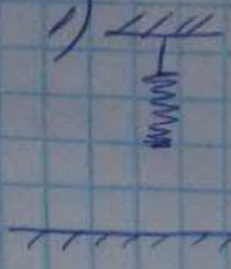
$m = 131\,g = 131 \cdot 10^{-3}$

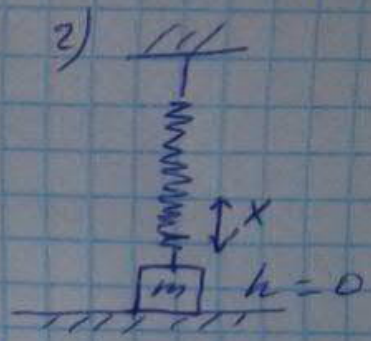
$k = 131\ N/m$

$a = ?$

$E_k = min.$

$g = 9,8$





Prujinaga yuk osilsa yuk tebranma harakatga keladi. Kinetik energiya minal bolgan moment

Bu joyda tezlanish max. boladi.

$$a_{max} = \omega^2 x$$

$$\omega = \sqrt{\frac{k}{m}} \quad x = \frac{F}{k}$$

Javob: (C)

$$a_{max} = \frac{k}{m} \cdot \frac{F}{k} = \frac{k}{m} \cdot \frac{mg}{k} = g$$

$$a = g = 9,8\ m/s^2$$

26-masala ham xuddi 25 ga oxshaydi.

27-masala. Tabiatda energiya bir turdan 2-turga aylanib turadi. $E_p \to$ potensial E_k ga va nolga. $E_p \to max$ bolsa $E_k = 0$ bolatti. Bu ham 25-masalaga oxshaydi.

29-masala.

$\lambda = 8\pi$

$X = 8,28\ m$

$A = 50\ mm = 50 \cdot 10^{-3}\ m$

$a_m = 125\ m/s^2$

$\upsilon = ?$

$\upsilon = \lambda \cdot \nu$

$\nu = \frac{\omega}{2\pi}$

$a_m = \omega^2 A$

$\omega = \sqrt{\frac{a_m}{A}}$ $\omega = \sqrt{\frac{125}{50 \cdot 10^{-3}}} = 50$

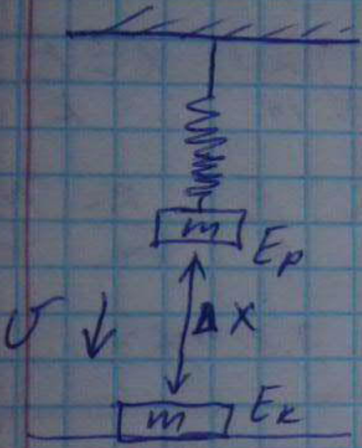
$\nu = \frac{50}{2\pi}$

$\upsilon = \lambda \cdot \nu = 8\pi \cdot \frac{50}{2\pi} = 200\ m/s$

$X \Rightarrow$ koordinata kerak emas

$\dots = 8\pi \cdot \frac{50}{2\pi} = 200$ m/s

32-masala:



$$E_p = E_{k_1} + E_{p_1} \qquad mg = \Delta x \cdot k$$

$$\Delta x = \frac{mg}{k}$$

$$E_{k_1} = \frac{m\upsilon^2}{2} = \frac{m\,2g\Delta x}{2}$$

$$\upsilon = \sqrt{2g\Delta x}$$

$$E_{k_1} = \frac{(mg)^2}{k}$$

$$E_{p_1} = \frac{k\Delta x^2}{2} = \frac{k\cdot\left(\frac{mg}{k}\right)^2}{2} = \frac{mg^2}{2k}$$

$$E_p = E_{k_1} + E_{p_1} = \frac{(mg)^2}{k} + \frac{(mg)^2}{2k} = \frac{3}{2}\frac{(mg)^2}{k}$$

$$E_p = \frac{3}{2}\frac{(72\cdot 10^{-3}\cdot 10)^2}{72} = 0,0108\ J$$

$E_p = 10,8$ mJ

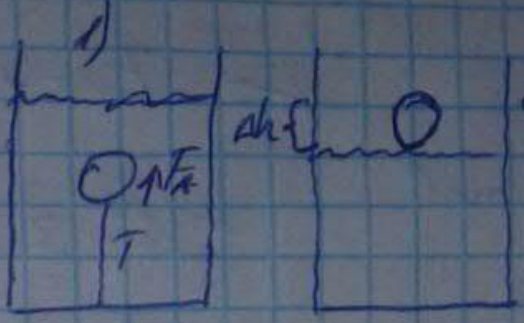
Javob: (C)

33-masala.

$S = 50 sm^2 = 50 \cdot 10^{-4} m^2$

$\Delta h = 4 \cdot 10^{-2}$

$T - ?$



Ipni tarangligi faqat Arximed kuchiga teng bo'ladi chunki po'kak bo'lgani uchun $mg \approx 0$

$T = F_A \quad T = \rho_s V_j g$

$T = 10^3 \cdot 2 \cdot 10^{-4} \cdot 10$

$T = 2 N$

$V_j = S \cdot \Delta h$

$V_j = 50 \cdot 10^{-4} \cdot 4 \cdot 10^{-2} = 2 \cdot 10^{-4} m^3$

Javob: (C)

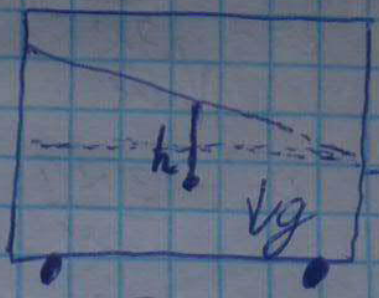
35 - masala:

$a = 4\ m/s^2$

$g = 10\ m/s^2$

$h = 10\ sm = 0{,}1\ m$

$\rho = ?$



$P = \frac{F_N}{S}$; $F_N = \sqrt{(mg)^2 + (ma)^2}$

$F_N = m\sqrt{g^2 + a^2}$ $\quad m = \rho \cdot S \cdot h$

$P = \frac{m\sqrt{g^2+a^2}}{S} = \frac{\rho \cdot S \cdot h\sqrt{g^2+a^2}}{S}$

$P = \rho \cdot h \cdot \sqrt{g^2+a^2}$

$P = 10^3 \cdot 0{,}1 \cdot \sqrt{10^2+4^2} \Rightarrow$

$\Rightarrow 1077\ Pa$

Javob: (C)

37-masala:

H_2

$\mu = 2 \cdot 10^{-3}$ kg/mol

$R = 8,31$

$\upsilon = 120$ m/s

$T = ?$

$\upsilon = \sqrt{\frac{3RT}{\mu}}$

$\upsilon^2 = \frac{3RT}{\mu}$

$T = \frac{\upsilon^2 \cdot \mu}{3R} = \frac{(120)^2 \cdot 2 \cdot 10^{-3}}{3 \cdot 8,31} = 1,15$ K

Javob: (A)

39 - masala:

He

$R = 8,31$

$\mu = 4 \cdot 10^{-3}$ kg/mol

$\upsilon = 140$ m/s

$T = ?$

$\upsilon = \sqrt{\frac{3RT}{\mu}}$

$T = \frac{\upsilon^2 \mu}{3R}$

$T = \frac{(140)^2 \cdot 4 \cdot 10^{-3}}{3 \cdot 8,31} = 3,14$ K

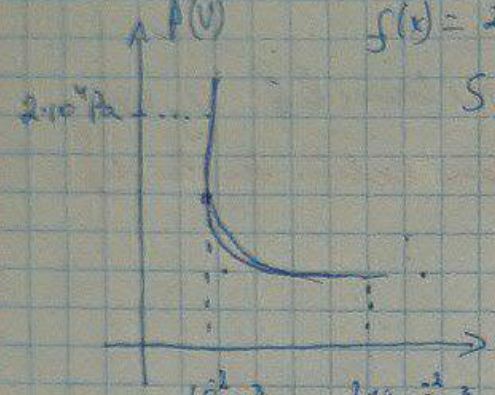
Javob: B

41.

$P_0 \cdot V_0 = P_x \cdot V_x \Rightarrow T_1 = T_2$

Bu yerda $P(V) = \frac{1}{V}$

$V_0 = 10^{-2} \cdot m^3$ $\quad V_x = 2{,}72 \cdot 10^{-2} \cdot m^3$



$S(x) = 2 \cdot 10^4 P(V)$

S → yuza → PV → bajarilgan ish.

$$S = 2 \cdot 10^4 \int_{V_0}^{V_x} P(V)\,dx = 2 \cdot 10^4 \int_{V_0}^{V_x} \frac{1}{V}\,dx = 2 \cdot 10^4 \ln V \Big|_{10^{-2}}^{2{,}72 \cdot 10^{-2}}$$

$= 2 \cdot 10^4 (\ln 2{,}72 \cdot 10^{-2} - \ln 1) \cdot 10^{-2} = \ln 2{,}72 \cdot 10^{-2} \cdot 2 \cdot 10^4 =$

$= 1 \cdot 2 \cdot 10^4 \cdot 10^{-2} = 2 \cdot 10^2 = 200$ J

42.

Bu yechim ham 41 kabi.

$$A = 8 \cdot 10^4 \int_{V_0}^{V_x} P(V)\,dx = 8 \cdot 10^4 \ln V \Big|_{10^{-2}}^{2{,}72 \cdot 10^{-2}} = 8 \cdot 10^4 \cdot 1 \cdot 10^{-2} = 800$$ J

43.

$A_{tashqi\ kuch} = -A_{gaz}$.

$$A_{gaz} = 30 \cdot 10^3 \int_{V_0}^{V_x} P(V) = 30 \cdot 10^3 \cdot 10^{-2} \ln V \Big|_{1}^{2{,}72} = 300$$ J.

$A_{tashqi\ kuch} = -A_{gaz} = -300$ J.

---

44) Bu masala yechimi 43 kabi.

$A_{gaz} = 6 \cdot 10^4 \int_{V_0}^{V_x} P(V) = 600$ $\quad A_{t.k} = -600$ J.

---

45) To'g'ri tasdiqlar: 2) Faqat Amaliy jismlar izotrop dir.

3) bosim ortsa nurlash harorati ham ortadi.

$PV = \nu RT$ → bu tenglamada bosim va temperatura to'g'ri proporsional.

Javob: (B) [2, 3]

48.

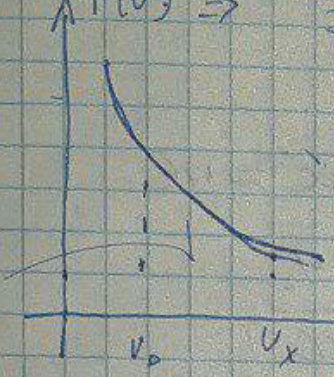
$T = 300\,K = const.$ $N = 2 \cdot 10^{23}$ $V_0 = 0{,}1\ m^3$ $V_k = 0{,}272\ m^3$

$A = ?$ $N_A = 6 \cdot 10^{23}$

$\vartheta = \frac{N}{N_A} = \frac{1}{3}$ mol.

$P_0 V_0 = \vartheta RT \Rightarrow P_0 = \frac{\vartheta RT}{V_0} = \frac{\frac{1}{3} \cdot 8{,}31 \cdot 300}{0{,}1} = 8310.$

$P(V) \Rightarrow f(x) = 8310\,(P(V))$



$A = 8310 \int_{V_0}^{V_x} P(V) = 8310 \ln V \cdot 10^{-1} \Big|_1^{2{,}72} \approx 8{,}3 \cdot 10^3$

---

51. $V = 30\ litr = 3 \cdot 10^{-2}\ m^3$ $U = 450\ J$. $P = ?$

$U = \frac{3}{2} P \cdot V \Rightarrow P = \frac{2U}{3V} = \frac{2 \cdot 450}{3 \cdot 3 \cdot 10^{-2}} = 10\ kPa.$

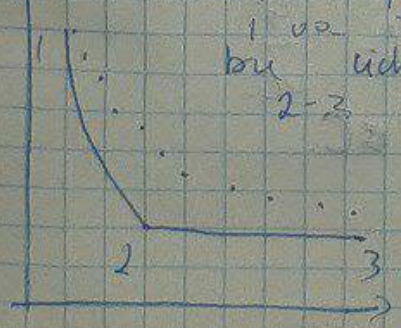
---

52. $\rho = 18\ kg/m^3 = \frac{U}{V}$ $P = ?$

$P = \frac{2}{3} \cdot \frac{U}{V} = \frac{2}{3} \cdot \rho = \frac{2}{3} \cdot 18 \cdot 10^3 = 12 \cdot 10^3 = 12\ kPa.$

---

52. P



1-2 oraliq adiabatik. 2-3 → izobarik.
1 va 3 nuqtada $T = const$. yani bir xil.
Bu uchun 1-2 da yo'qotilgan issiqlik.
2-3 da qaytarib olinadi.

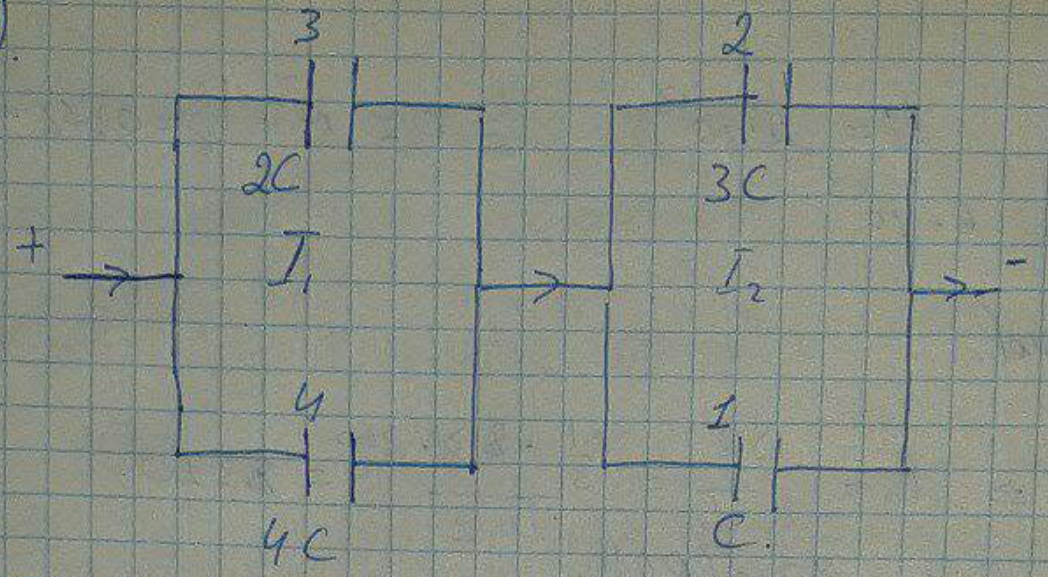
1-3 oraliqda ϑRT yo'qolsa.

$A = \Delta U = \frac{3}{2} \vartheta RT$ ish bajariladi.

2-3 da ϑRT olinsa. $A' = \vartheta RT$ ish bajariladi.

Demak $A_{um} = \frac{3}{2} \vartheta RT + \vartheta RT = \frac{5}{2} \vartheta RT = 2600$ $A = \vartheta RT = \frac{2600}{2{,}5} = 1040\ J.$

57).



$I_1 = I_2 \Rightarrow q_1 = q_2$

$C_{4,3} = 2C + 4C = 6C.$ $\quad C_{1,2} = 3C + C = 4C.$

$U_3 = U_4 = \frac{q_1}{C_{4,3}} = \frac{q}{6C}$ $\quad U_1 = U_2 = \frac{q_2}{4C}$

$\frac{U_3}{U_2} = \frac{\frac{q}{6C}}{\frac{q}{4C}} = \frac{2}{3}.$ $\quad$ J/b. $\frac{U_3}{U_2} = \frac{2}{3}.$

58) $\frac{E_2}{E_1} = ?$ $\quad E_2 = \frac{C_2 U_2^2}{2}$ $\quad E_1 = \frac{C_1 \cdot U_1^2}{2}$

$U_1 = U_2$

$\frac{E_2}{E_1} = \frac{3C \cdot U^2}{\frac{C \cdot U^2}{2}} = 3.$ $\quad$ J/b: $\frac{E_2}{E_1} = 3.$

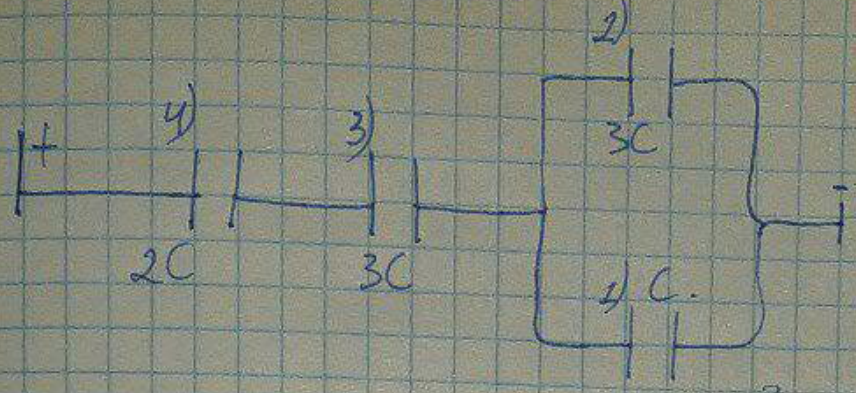
59) $\frac{q_4}{q_1} = ?$ $\quad q_4 = U_4 \cdot C_4$ $\quad U_4 = U_3 = \frac{q}{11C}$ $\quad C_4 = 6C$

$q_1 = U_1 \cdot C_1$ $\quad U_1 = U_2 = \frac{q}{4C}$ $\quad C_1 = C.$

$\frac{q_4}{q_1} = \frac{\frac{q}{11C} \cdot 6C}{\frac{q}{4C} \cdot C} = \frac{24}{11}$

D javob

60)



$q_4 = q_3 = q_{2,1}$ $\quad E = \frac{q^2}{2C}$.

$E_1 = \frac{C U^2}{2}$ $\quad U = \frac{q}{4C}$ $\quad C \cdot \frac{q^2}{16C^2} = \frac{q^2 \cdot C}{32C^2} = \frac{q^2}{32C}$.

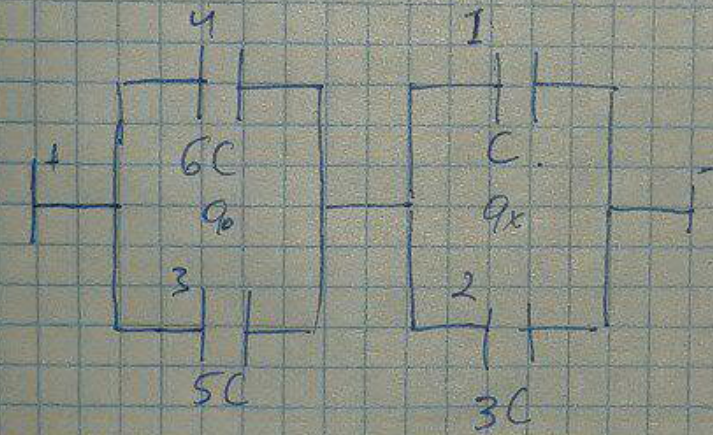
$E_2 = \frac{3C \cdot U^2}{2} = 3C \cdot \frac{\frac{q^2}{16C^2}}{2} = \frac{3q^2}{32C}$ $\quad E_2 = 3E_1$

$E_3 = \frac{q^2}{2 \cdot 3C} = \frac{q^2}{6C}$ $\quad E_3 > E_2$.

$E_4 = \frac{q^2}{2 \cdot 2C} = \frac{q^2}{4C}$ $\quad E_4 > E_3 > E_2 > E_1$

J/b (C) E_4 eng katta.

61.



$q_{min} = ?$.

$q_0 = q_x$

$q_0 = U_0 \cdot C_{um} = U \cdot 11C$. $\quad U_0 = \frac{q_0}{11C}$. $\quad q_x = U_x \cdot C_{um} = U_x \cdot 4C$.

$\frac{U_0}{U_x} = \frac{11}{4}$. $\quad U_x = \frac{4U_0}{11}$ $\quad U_x = \frac{q_x}{4C}$.

$q_1 = U_x \cdot C = \frac{4U_0}{11} \cdot C$ $\quad q_2 = \frac{4U_0}{11} \cdot 3C$ $\quad q_3 = U_0 \cdot 5C$ $\quad q_4 = U_0 \cdot 6C$.

$q_{min} = \frac{4}{11} \cdot U_0 C = q_1$ $\quad$ J/b (C) I

kuchini quyidagi ifodadan hisoblaymiz: $F = \frac{q^2}{2 \cdot \varepsilon_0 \cdot S}$.

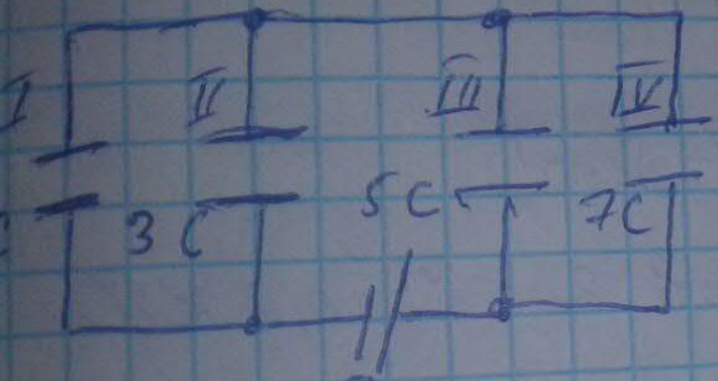
Zaryadlangan kondensator qoplamalarining o`zaro elektrostatik ta`sirlashish kuchi bo`yicha quyidag xulosalarni chiqaramiz:

a) Zaryadlanib tok manbaidan uzilgan kondensatorda qoplamalar orasidagi masofa o`zgartirilsin yok qoplamalar orasiga dielektrik kiritilsin. Bu holatda kondensator zaryadi o`zgarmasligini inobatga olgan hold $F = \frac{q^2}{2 \cdot \varepsilon_0 \cdot S}$ ifodaga ko`ra qoplamalar orasidagi elektrostatik ta`sirlashish kuchi o`zgarmaydi. Bu shartda kelib chiqadiki, dielektrik modda qoplamalar orasiga qanday qalinlikda kiritilsa ham qoplamalar ta`sirlashis kuchi o`zgarmaydi. Agar qoplamalar dielektrik muhitga to`liq tushirilsagina $F = \frac{q^2}{2 \cdot \varepsilon_0 \cdot \varepsilon \cdot S}$ ifodaga ko`r ta`sirlashish kuchi o`zgaradi.

b) Tok manbaiga ulangan kondensatorda qoplamalar orasidagi masofa o`zgartirilsin yoki qoplamalar orasig dielektrik kiritilsin. Bu holatda kondensator kuchlanishi o`zgarmasligini va faqat sig`im o`zgarishini inobatg olish kerak: $F = \frac{q^2}{2 \cdot \varepsilon_0 \cdot S} = \frac{C^2 \cdot U^2}{2 \cdot \varepsilon_0 \cdot S} = \frac{\varepsilon^2 \cdot \varepsilon_0^2 \cdot S^2 \cdot U^2}{2 \cdot \varepsilon_0 \cdot S \cdot d^2} = \frac{\varepsilon^2 \cdot \varepsilon_0 \cdot S \cdot U^2}{2 \cdot d^2}$. Demak tok manbaiga ulangan kondensato qoplamalarining o`zaro elektrostatik ta`sir kuchi quyidagicha: $F = \frac{\varepsilon_0 \cdot S \cdot U^2}{2} \cdot \frac{\varepsilon^2}{d^2}$ yoki $F \sim \frac{\varepsilon^2}{d^2}$.

Agar qoplamalar dielektrik muhitga to`liq tushirilsa $F = \frac{q^2}{2 \cdot \varepsilon_0 \cdot \varepsilon \cdot S} = \frac{C^2 \cdot U^2}{2 \cdot \varepsilon_0 \cdot \varepsilon \cdot S} = \frac{\varepsilon^2 \cdot \varepsilon_0^2 \cdot S^2 \cdot U^2}{2 \cdot \varepsilon_0 \cdot \varepsilon \cdot S \cdot d^2} = \frac{\varepsilon \cdot \varepsilon_0 \cdot S \cdot U^2}{2 \cdot d^2}$

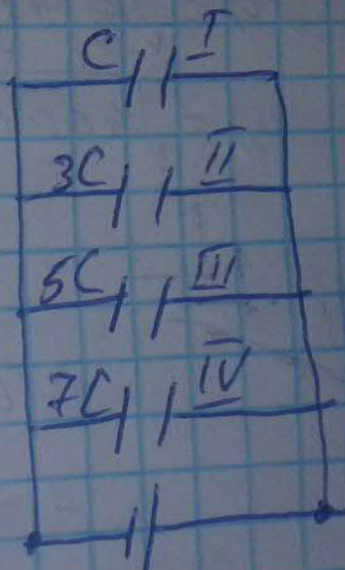
7 62-masala:



$U_1 = U_2 = U_3 = U_4 = \mathcal{E}$

Javob: (B)

Ekvivalent sxema



$q_{min} = ?$

$q = CU$

$q_1 = C_1 U_1$

$q_1 = C \cdot \mathcal{E} = C\mathcal{E}$

Eng kichigi q_1 dan

63- masala:

$$\frac{\uparrow q}{U} = \frac{\uparrow \varepsilon \varepsilon_0 S}{d}$$

$U = const$

$\varepsilon_1 = 1$

$\varepsilon_2 = 6$

$q_2 = 6q_1$

$$F_1 = \frac{k \cdot q^2}{r^2}$$

$$F_2 = \frac{k(6q_1)^2}{r^2} = \frac{36kq^2}{r^2}$$

$F_2 = 36F_1$

65-masala:

$\rho = 1{,}1 \cdot 10^{-6}\ \Omega \cdot m$

$j = 5\ A/m^2$

$E = ?$

$E = \frac{U}{d}$ $U = I \cdot R$

$I = j \cdot S$

$R = \frac{\rho \cdot d}{S}$

$E = \frac{j \cdot S \cdot \frac{\rho d}{S}}{d}$; $E = j\rho = 1{,}1 \cdot 10^{-6} \cdot 5 = 5{,}5 \cdot 10$

Javob: (C)

67-masala.

$E = 2\ V/m$

$\frac{W}{V \cdot t} = 0{,}8 \cdot 10^{-6} \frac{W}{m^3}$ → bu son 1 sekundda o'tkazgichdan chiqqan issiqlik miqdorini $1 m^3$ ga to'gri kelgan qismi.

$j = ?$

Yechish: $W = I^2 R t$ $t = 1$ deb olamiz.

$V = S \cdot d$ $I = j \cdot S$ $R = \frac{\rho \cdot d}{S}$

$$\frac{W}{V} = \frac{I^2 R}{S \cdot d} = \frac{j^2 S^2 \cdot \frac{\rho d}{S}}{S \cdot d} = j^2 \cdot \rho$$

$\frac{W}{V} = j^2 \cdot \rho$ $E = j \cdot \rho = 2 V/m$

$\frac{W}{V} = j \cdot E$ $0{,}8 \cdot 10^{-6} = j \cdot 2$ Javob: (C)

$j = \frac{W}{V \cdot E}$ $j = 0{,}4 \cdot 10^{-6} \frac{A}{m^2}$

... Javob: 1 kJ

#62-masala.

69-masala.

$S = 10 \cdot 2\,sm^2 = 20 \cdot 10^{-4}\,m^2$

$l = 4\,m = 4 \cdot 10^{2}\,m$

$\rho = 1{,}68 \cdot 10^{-8}\,\Omega \cdot m$

$R = ?$

$R = \frac{\rho \cdot l}{S}$

$R = 1{,}68 \cdot 10^{-8} \cdot \frac{4 \cdot 10^{2}}{20 \cdot 10^{-4}} = 3{,}36 \cdot 10^{-2}$

Javob: (D)

71-masala.

(C).

Dastlab yuza $a \cdot b$ uzunlik esa c edi.

Keyin esa yuzani $a \cdot c$ hosil giladi

b uzunlik boladi.

$S =$

$S =$

Ber-n:

$\upsilon =$

$\rho_1 = \rho_2 = \rho$

$S_1 = a \cdot b$

$l_1 = c$

$S_2 = a \cdot c$

$l_2 = b$

$\frac{R_2}{R_1} = ?$

$R = \rho \frac{l}{S}$

$\frac{R_2}{R_1} = \frac{\rho \frac{b}{a \cdot c}}{\rho \cdot \frac{c}{a \cdot b}} = \frac{b^2}{c^2}$

Javob: (A)

R

I

t

72-masala.

Ber-n:

$S_1 = 1,2\,sm^2 = 2\cdot10^{-4}\,m^2$

$S_2 = 1,4\,sm^2 = 4\cdot10^{-4}\,m^2$

Demak

$l_1 = 4\cdot10^{-2}\,m$

$l_2 = 2\cdot10^{-2}\,m$

$\frac{R_2}{R_1} = ?$

$$\frac{R_2}{R_1} = \frac{\rho\frac{l_2}{S_2}}{\rho\frac{l_1}{S_1}} = \frac{l_2}{S_2}\cdot\frac{S_1}{l_1} \Rightarrow$$

$$\Rightarrow \frac{2\cdot10^{-2}}{4\cdot10^{-2}}\cdot\frac{2\cdot10^{-4}}{4\cdot10^{-4}} = \frac{1}{4}$$

4 marta kamayadi.

Javob: ②

73-masala;

$R = 10\,\Omega$

$I = 5t$

$t = 2$

$I \Rightarrow$ tok kuchi o'zgarmaganligi uchun uni o'rta arifmetigidan foydalanib bolmaydi. O'tkazgan issiqlik miqdorini vaqt bo'yicha integrallab topamiz.

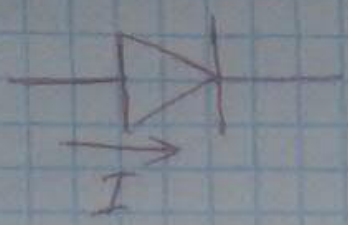
$$q = \int I^2 R\,dt$$

$$q = \int (5t)^2\cdot10\,dt = 250\int t^2\,dt$$

$$q = 250\cdot\frac{t^3}{3} = \frac{250\cdot2^3}{3} = 667\,J.$$

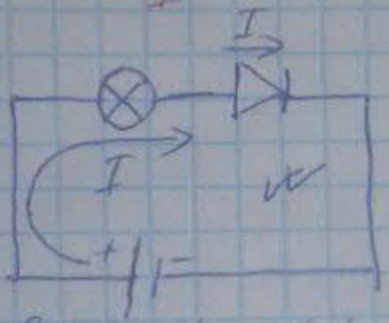
Javob: ④

79-masala

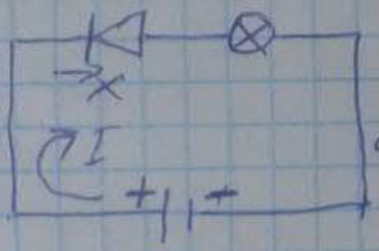


Diod dan faqat bir yonalishda tok oqadi.

→ Bu yonalishda o'tmaydi.

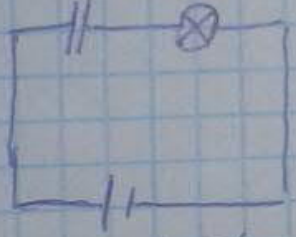
1) 

1-chiroqdan tok o'tadi.

2) 

tokni o'tqazmaydi diod

2-yonmaydi.

3) 

3-dan tok o'tmaydi sababi orada kondensator bor. Kondensatordan tok o'tmaydi.

4) 

tok lampadan o'tad

4-lampa yonadi.

21-masala:

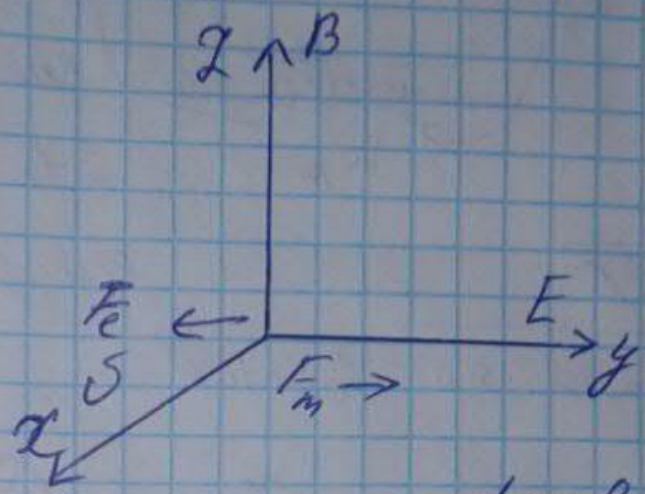
$E = 120\ V/m$

$B = 10\ T$

$\upsilon = 12\ m/s$

e

x, y, z o'qlarining musbat yo'nalishlari:



Demak elektron uchib kiryapti:

Agar: $\upsilon = \frac{E}{B}$ shart

bajarilsa yani $F_m = F_E$

tenglik x o'q bo'yl

$E \Rightarrow y$ o'q bo'ylab

$B \Rightarrow z$ o'q bo'ylab yo

$e \cdot E = e \upsilon B$ bo'lsa

zarra tekis to'g'ri chiziqli harakat qila

$\upsilon = \frac{E}{B} = \frac{120}{10} = 12\ m/s$ bajardi demak

trayektoriya to'g'ri chiziq.

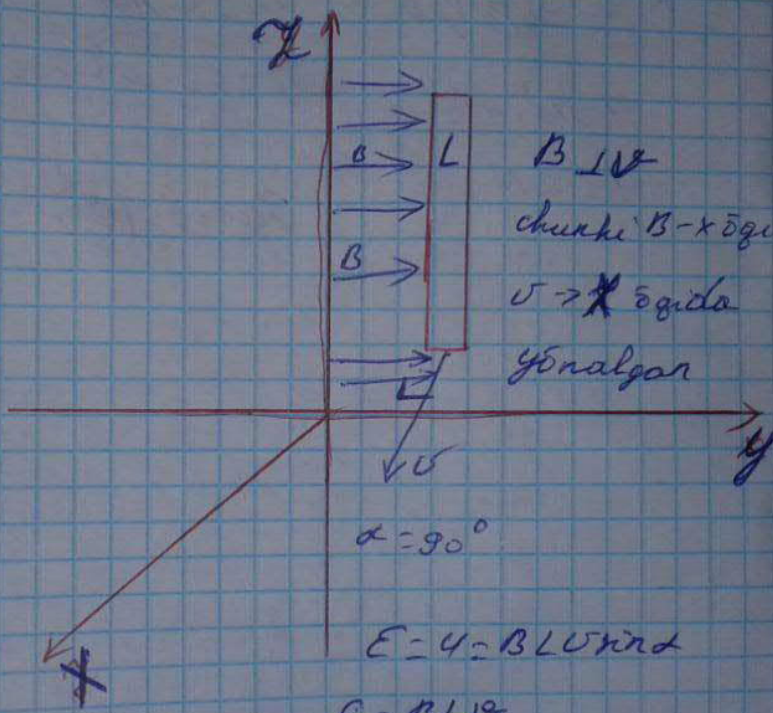
T = 1

84 - masala

B = 2,5 T

L = 2 m

υ = 10 m/s



$B \perp \upsilon$

chunki B - x o'qi

υ -> x o'qida

yo'nalgan

$\alpha = 90^\circ$

$\mathcal{E} = \Phi = BL\upsilon \sin\alpha$

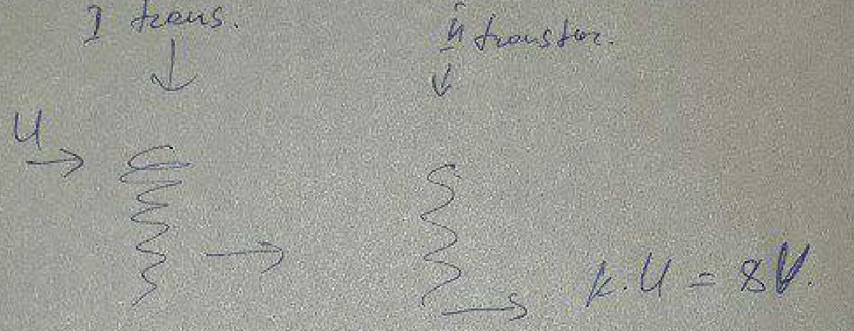
$\mathcal{E} = BL\upsilon$

$\mathcal{E} = 2,5 \cdot 2 \cdot 10 = 50 V$

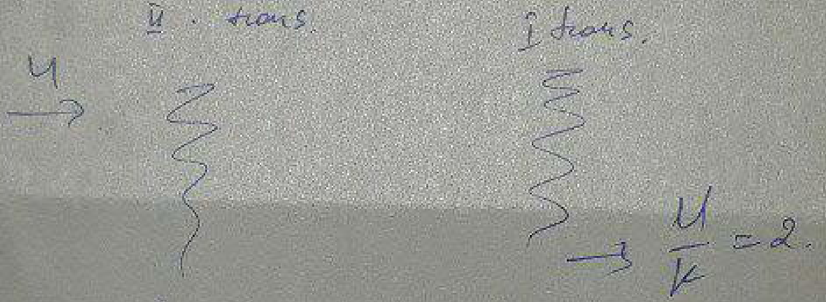
Javob: C

I transformatorga U kuchlanish kelsa II transformator uni k martta özgartiradi.

1)



2)



$$\frac{k \cdot U}{\frac{U}{k}} = \frac{8}{2} = 4 = k^2 \Rightarrow k = 2$$

$2 \cdot U = 8V \Rightarrow U = 4V$. Javob.

by Supreme @OliyFizika

88-masala:

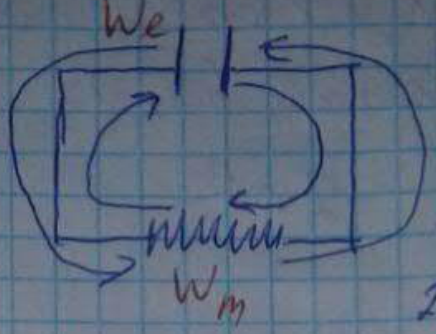
$C = 200 \cdot 10^{-6}$

$L = 50\,H$

$T - ?\ ms$

$\pi = 3$

Tebranish konturi:



1-davrda 3 ta elektr maydon energiyasiga 2 ta magnit maydon energiyasiga aylanadi

$T = 2\pi\sqrt{LC}$

$T = 2 \cdot 3\sqrt{2 \cdot 10^{-4} \cdot 50} = 0{,}6\ sek$

$0{,}6\ sek = 600\ ms$ Javob: (A)

89-masala:

$C = 120 \cdot 10^{-6}\,F$

$L = 30\,H$

$\pi = 3$

T_M ? magnit maydon energiyani o'zgarish davri

y: $T_M = \frac{T}{2}$

$T_M = \frac{2\pi\sqrt{LC}}{2} = \pi\sqrt{LC}$

$T_M = 3 \cdot \sqrt{30 \cdot 120 \cdot 10^{-6}} = 0{,}18\ s$

$0{,}18\ sek = 180\ ms$

Javob: (A)

92-masala:

$R = 10\ \Omega$

$C = 8 \cdot 10^{-3}$

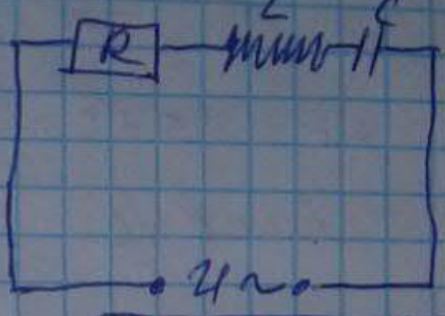
$L = 80\ H$

$\omega = 1{,}25\ rad/s$

$\cos\varphi = ?$

$\cos\varphi = \frac{R}{Z}$

$Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$



$Z = \sqrt{100 + \left(1{,}25 \cdot 80 - \frac{1}{8 \cdot 10^{-3} \cdot 1{,}25}\right)^2} = 10$

$\cos\varphi = \frac{R}{Z} = \frac{10\ \Omega}{10\ \Omega} = 1$

Javob: (C)

93-masala:

$\rho_0 = 3500\ kg/m^3$

$v = 0{,}6c$

$\rho = ?$

$\rho = \frac{\rho_0}{1 - \frac{v^2}{c^2}} = \frac{3500}{1 - \left(\frac{0{,}6c}{c}\right)^2} = 5470\ \frac{kg}{m^3}$

Javob: (A)

95-masala:

$v_1 = 0,9c$

$v_2 = 0,6c$

$$v_N = \frac{v_1 + v_2}{1 + \frac{v_1 v_2}{c^2}} = \frac{0,9c + 0,6c}{1 + \frac{0,9 \cdot 0,6c^2}{c^2}} = 0,97c$$

$v_N = 0,97c$

Javob: C

96-masala:

$v_1 = v_2 = 0,5c$

$m_0 = 1kg$

$$v_N = \frac{v_1 - v_2}{1 - \frac{v_1 v_2}{c^2}} = 0$$

Natijaviy tezlik nolga teng
Agar massani 2-kemadan turib hisoblansa

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{m_0}{\sqrt{1 - \frac{0^2}{c^2}}}$$

$m = m_0$

2-kemadan turib qarasa ham massa 1kg

Javob: B

97-m

$L = 1$

$n = 1$

$t = 0$

$S = ?$

98-m

$L = 2$

$n = 1$

$t = 0$

$N = ?$

$t_1 = \frac{2}{c}$

$t_1 = \frac{2}{}$

$N = \frac{t}{t_1}$

$2,5 \cdot 10^5$

Jav

97-masala:

$L = 12$ km $\quad S = vt$

$n = 1,5$ $\quad v = \frac{c}{n}$

$t = 0,01$

$S = ?$ $\quad S = \frac{c}{n} \cdot t = \frac{3 \cdot 10^8}{1,5} \cdot 0,01 = 2 \cdot 10^6$ m

$S = 2 \cdot 10^3$ km

Javob: ②

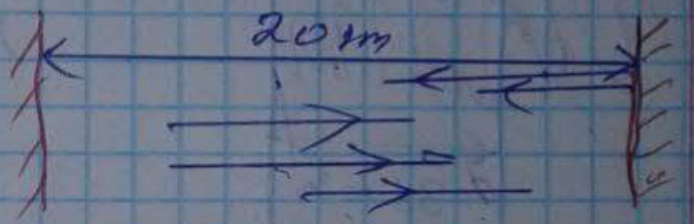
98-masala.

$L = 20$ sm

$n = 1,5$

$t = 0,5 \cdot 10^{-3}$ sekund

$N = ?$



Nur dasta boylab borib keladi. Bizdan so'ralyapti, narsa 0,5 ms da necha marta borib kelishi.

$t_1 = \frac{2L}{c} \cdot n =$

$t_1 = \frac{2 \cdot 20 \cdot 10^{-2} \cdot 1,5}{3 \cdot 10^8} = 2 \cdot 10^{-9}$ | 1 marta borib kelish u-n ketgan vaqt: $S = 2 \cdot L$ → chunki borib kelganda 2 marta yo'l stadi.

$N = \frac{t}{t_1} = \frac{0,5 \cdot 10^{-3}}{2 \cdot 10^{-9}} = 2,5 \cdot 10^5$ | $t_1 = \frac{S}{v}$ $\quad v = \frac{c}{n}$ $\quad S = 2L$

$2,5 \cdot 10^5$ marta borib keladi

Javob: ③

99-masala

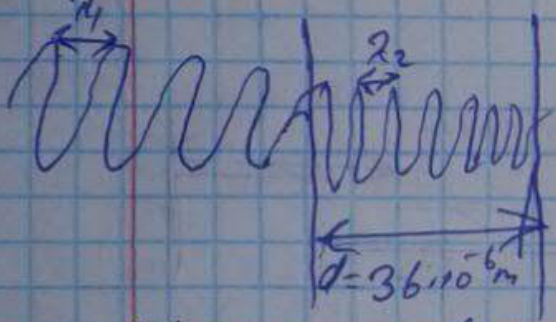
$\lambda_1 = 480 nm = 480 \cdot 10^{-9}$

$d = 36 \cdot 10^{-6} m$

$n = 1,6$

$N = ?$

Yorug'lik optik zichligi kichik muhitdan kattasiga o'tyapti. Bunda to'lqin uzunligi kamayadi ν-chastota o'zgarmaydi.



Savolda λ_2 -> nechta

$\upsilon = \lambda \nu$

$\nu = \frac{\upsilon}{\lambda}$

$\frac{c}{\lambda_1} = \frac{\upsilon}{\lambda_2}$

$\upsilon = \frac{c}{n}$

$\lambda_2 = \frac{\upsilon}{c} \cdot \lambda_1$

$\lambda_2 = \frac{c}{c \cdot n} \cdot n \cdot \lambda_1$

$\lambda_2 = \frac{\lambda_1}{n} = \frac{480 \cdot 10^{-9}}{1,6}$

$\lambda_2 = 3 \cdot 10^{-7} m$

Plyonkadagi to'lqin uzunligi

$N = \frac{d}{\lambda_2} = \frac{36 \cdot 10^{-6}}{3 \cdot 10^{-7}} = 12 \cdot 10 = 120$

$N = 120$ ta

Javob: (B)