Часть 1

Олимпиада: **Физика, 11 класс (1 часть)**

Шифр: **21202528**

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Вариант 7

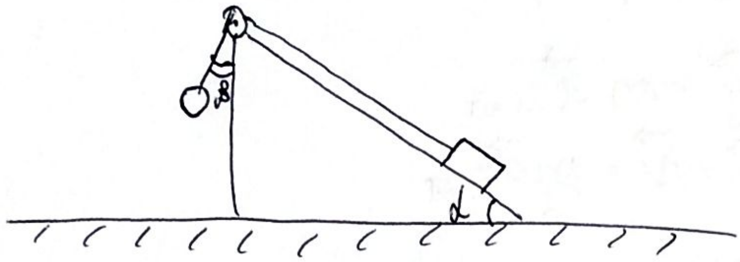
Чистовик
Вариант 7

№1

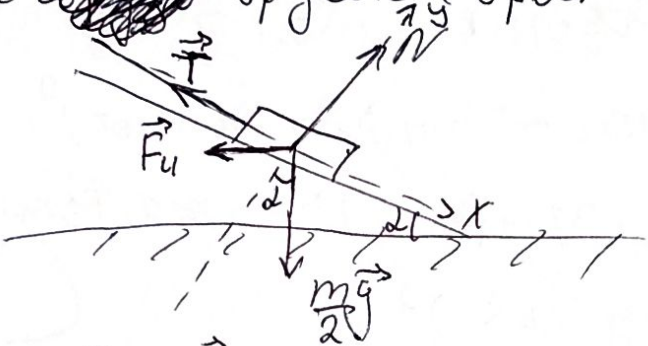
Дано:
α
$\cos\alpha = \frac{5}{13}$
m
$M = \frac{m}{2}$
β
$\cos\beta = \frac{3}{5}$
H

1) $a_к$ - ?
2) $a_{б\,от.}$ - ?
3) t - ?

Решение:



Рассмотрим силы, действующие на брусок (включая $\vec{F}_и$, т.е в НИСО)



$$\vec{N} + \frac{m}{2}\vec{g} + \vec{T} + \vec{F}_и = \frac{m}{2}\cdot \vec{a}_{б\,от}$$

$F_и = \frac{m}{2}\cdot a_к$

$y: N + mg\cos\alpha + F_и \sin\alpha = 0$

$\left.\begin{array}{l} \vec{F}_и \perp \frac{m\vec{g}}{2} \\ \vec{N} \parallel \vec{F}_и + \frac{m\vec{g}}{2} \end{array}\right\} \Rightarrow F_и = \frac{mg}{2}\cdot \operatorname{tg}\alpha$

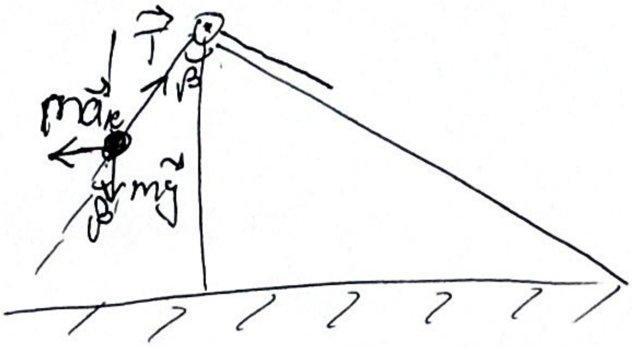
$\left.\begin{array}{l} \cos\alpha = \frac{5}{13} \\ \cos^2\alpha + \sin^2\alpha = 1 \end{array}\right\} \Rightarrow \sin\alpha = \sqrt{1-\cos^2\alpha} = \frac{12}{13}$

$\operatorname{tg}\alpha = \frac{\sin\alpha}{\cos\alpha} = \frac{12}{13}\cdot\frac{13}{5} = \frac{12}{5}$

$\frac{m}{2} a_к = \frac{m}{2} g \cdot \frac{12}{5}$

1) $a_к = g\cdot\frac{12}{5}$ $\quad a_к = 10\frac{м}{с^2}\cdot\frac{12}{5} = 24\frac{м}{с^2}$ (1)

т.к. нить нерастяжима, то $a_{б\,от} = a_{ш\,от.}$, где $a_{ш\,от.}$ – ускорение шарика относительно клина



$\vec{T} + m\vec{a}_к + m\vec{g} = m\vec{a}_{ш\,от.}$

$\vec{T} + \frac{m}{2}\vec{a}_к + \frac{m}{2}\vec{g} + \vec{N} = \frac{m}{2}\vec{a}_{б.от}$

~~$T + \frac{m}{2}a_к + \frac{mg}{2} + N$~~

$T + \frac{m}{2}a_к\cos\alpha + \frac{m}{2}g\sin\alpha = \frac{m}{2}a_{б\,от}$

~~$(mg - T\cos\beta)^2 + (ma_к - T\sin\beta)^2 = (m a_{б.от})^2$~~

~~$(mg)^2 - 2mgT\cos\beta + (T\cos\beta)^2 + (ma_к)^2 - 2ma_кT\sin\beta + (T\sin\beta)^2 =$~~

~~$= (2T + ma_к\cos\alpha + mg\sin\alpha)^2$~~

T^2

$\frac{mg}{\cos\beta} + \frac{ma_к}{\sin\beta} - T = T + \frac{m}{2}a_к\cos\alpha + \frac{m}{2}g\sin\alpha$

$2T = \frac{m\,10\cdot13}{5} + \frac{m\cdot24\cdot13}{12} - \frac{m}{2}\cdot24\cdot\frac{4}{5} + \frac{m}{2}\cdot10\cdot\frac{3}{5}$

$2T = m(26 + 26 - 9{,}6 + 3)$

$T = 22{,}7\ m$

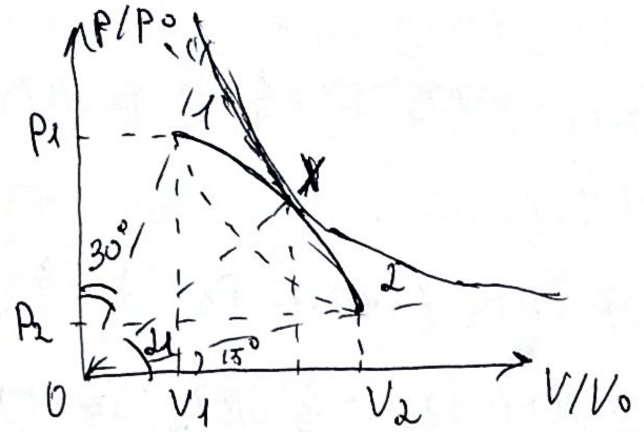
2) $T + \frac{m}{2}a_к\cos\alpha + \frac{m}{2}g\sin\alpha = \frac{m}{2}a_{б.от.}$

№2

Дано:
p_0
V_0
$\alpha = 30^\circ$
$\beta = 15^\circ$

1) $\frac{T_1 - T_2}{T_2}$ - ?
2) γ - ? при $C = 0$
3) η - ?

Решение:



Пусть окр пересекает горизонтальную ось в точке V_0, а верт. – в точке p_0

1: $p_1 = p_0 \cdot \sin 60^\circ$
$V_1 = V_0 \cdot \cos 60^\circ$

2: $p_2 = p_0 \cdot \sin 15^\circ$
$V_2 = p_0 \cdot \cos 15^\circ$

$$\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2} = const$$

$$\frac{p_0 V_0 \cdot \sin 60^\circ \cdot \cos 60^\circ}{T_1} = \frac{p_0 V_0 \cdot \sin 15^\circ \cdot \cos 15^\circ}{T_2}$$

$$\frac{p_0 V_0}{2 T_1} \cdot \sin 120^\circ = \frac{p_0 V_0}{2 T_2} \cdot \sin 30^\circ$$

$$\frac{\sqrt{3}}{2} \cdot \frac{1}{T_1} = \frac{1}{2} \cdot \frac{1}{T_2}$$

(3)

1) $\frac{T_1}{T_2} = \sqrt{3} \Rightarrow T_1 = \sqrt{3}\, T_2 \Rightarrow \frac{T_1 - T_2}{T_2} = \frac{\sqrt{3}\, T_2 - T_2}{T_2} = \sqrt{3} - 1$

$A_{1\text{-}2} = \frac{360^\circ}{(90^\circ - 35^\circ - 15^\circ)} \cdot \pi p_0 V_0 + p_2 V_2 - p_1 V_1 = 8\pi p_0 V_0 + p_0 V_0 \cdot \frac{1}{2} \sin 30^\circ -$
$- p_0 V_0 \cdot \frac{1}{2} \sin 120^\circ = p_0 V_0 (8\pi + \frac{1}{4} - \frac{\sqrt{3}}{4})$

$\Delta U_{2\text{-}1} = -A_{2\text{-}1}$, т.к. $Q = 0$

$\Delta U_{2\text{-}1} = \frac{3}{2} \nu R (T_1 - T_2) = \frac{3}{2} \nu R (\sqrt{3} - 1) T_2$

Пусть есть $p_x; p_y; V_x; V_y$ такие, что $T_x = T_y \Rightarrow$
$\Rightarrow \Delta U = 0 \Rightarrow C = 0$

$$p_x V_x = \frac{p_0 V_0}{2} \cdot \sin 2(90^\circ - \beta_1) = \frac{p_0 V_0}{2} \cdot \sin 2\beta_1$$

$$p_y V_y = \frac{p_0 V_0}{2} \cdot \sin 2\alpha_1 = \frac{p_0 V_0}{2} \cdot \sin 2\alpha_1$$

При этом $p_x \to p_y$, $V_x \to V_y$ $\Rightarrow$

$\Rightarrow \alpha_1 = \beta_1 = 45^\circ$

2) $\alpha_1 = 45^\circ$; $\sin \alpha_1 = \frac{\sqrt{2}}{2}$

$$\frac{p_0 V_0}{T_0} = \frac{p_x V_x}{T_x}$$

$$\frac{p_0 V_0}{T_0} = \frac{p_0 V_0}{2 T_x}, \text{ т.к. } \sin 2\alpha_1 = \sin 90^\circ = 1$$

$2T_x = T_0 \Rightarrow 2T$

$$A_{2\,1-x} = \frac{360^\circ}{(90^\circ - 30^\circ - 45^\circ)} \pi p_0 V_0 + \frac{p_0 V_0}{2} - p_1 V_1 = 24\pi p_0 V_0 + \frac{1}{2} p_0 V_0 -$$
$$- \frac{\sqrt{3}}{4} p_0 V_0 = p_0 V_0 \left(24\pi + \frac{1}{2} - \frac{\sqrt{3}}{4}\right)$$

$p_0 V_0 = \nu R T_0$ $\quad \Delta U_{2-1} = -A_{2\,2-1}$

$$\Delta U_{2-1} = \frac{3}{2} \nu R (T_1 - T_2) = \frac{3}{2} \nu R (\sqrt{3} - 1) T_2$$

$$\frac{p_0 V_0}{T_0} = \frac{p_2 V_2}{T_2} \Rightarrow \frac{p_0 V_0}{T_0} = \frac{p_0 V_0 \sin 30^\circ}{2 T_2} \Rightarrow T_0 = 4 T_2 \Rightarrow T_x = 2 T_2$$

$$p_0 V_0 = \nu R T_0 = \nu R 4 T_2 \Rightarrow A_{2\,1-x} = \nu R T_2 (96\pi + 2 - \sqrt{3})$$

$$\Delta U_{1-x} = \frac{3}{2} \nu R T_2 (2 - 1) = \frac{3}{2} \nu R T_2$$

$$A_2 = A_{2\,1-2} + A_{2\,2-1} = \nu R T_2 (32\pi + 1 - \sqrt{3}) - \frac{3}{2} \nu R T_2 (\sqrt{3} - 1)$$

$$\eta = \frac{A_2}{Q_H} = \frac{A_2}{A_{2\,1-x} + \Delta U_{1-x}} = \frac{\nu R T_2 (32\pi + 1 - \sqrt{3} - \frac{3\sqrt{3}}{2} + \frac{3}{2})}{\nu R T_2 (96\pi + 2 - \sqrt{3} + \frac{3}{2})}$$

(4)

3

Черновик

$p_2^2 + V_2^2 = V_0^2$

$V_2 = V_0 \cdot \cos 15^\circ$

$p_2 = p_0 \cdot \sin 15^\circ$

$V_1 = V_0 \cdot \cos 60^\circ$

$p_1 = p_0 \cdot \sin 60^\circ$

~~$pV = \nu RT$~~

$p\frac{V}{T} = const$

$\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$

$\frac{p_0 \sin 60^\circ \cdot V_0 \cos 60^\circ}{T_1} = \frac{p_0 \sin 15^\circ \cdot V_0 \cos 15^\circ}{T_2}$

$\frac{p_0 V_0 \cdot \sin 120^\circ}{2 T_1} = \frac{p_0 V_0 \cdot \sin 30^\circ}{2 T_2}$

$\frac{p_0 V_0}{T_0} = \frac{p_0 \sin 15^\circ \cdot V_0 \cos 15^\circ}{T_2} = \frac{p_0 V_0 \sin 30^\circ}{2 T_2}$

$\frac{1}{T_0} = \frac{1}{4 T_2} \Rightarrow T_0 = 4 T_2 \Rightarrow$

$\Rightarrow T_1 = \sqrt{3} T_2 = \frac{\sqrt{3}}{4} T_0$

$\frac{\sin 60^\circ}{T_1} = \frac{\sin 30^\circ}{T_2}$

$\frac{T_1}{T_2} = \frac{\sin 60^\circ}{\sin 30^\circ} = \frac{\sqrt{3} \cdot 2}{2 \cdot 1} = \sqrt{3}$

$\frac{(\sqrt{3} T_2 - T_2)}{T_2} = \sqrt{3} - 1$

$\frac{A_2}{Q_н} = \frac{Q_н - Q_х}{Q_н}$

$\vec{a}_{абс} = \vec{a}_{от} + \vec{a}_п$

$Q = c m \Delta t \Rightarrow c = \frac{Q}{m \cdot \Delta T}$

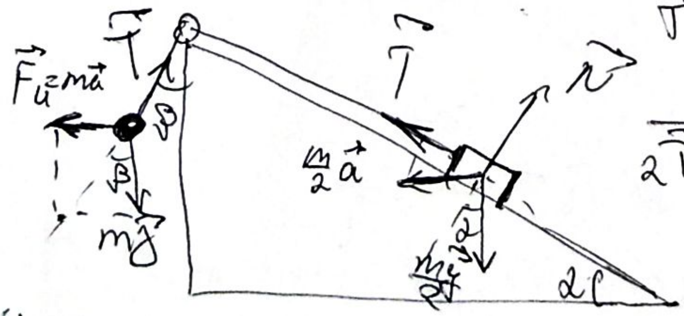
$c = \frac{Q}{\nu}$

$pV = \nu RT$

$\Delta U = \frac{3}{2} \nu R \Delta T = \frac{3}{2} \nu R T_2 (1 - \sqrt{3})$

$Q = A_2 + \Delta U$

$A_2 =$



$\vec{T} + m\vec{a} + m\vec{g} = m\vec{a}_x$

$\vec{T} + \vec{N} + \frac{m\vec{g}}{2} + \frac{m\vec{a}}{2} = \frac{m\vec{a}_x}{2}$

$2\vec{T} + \vec{N} + m\vec{g} + m\vec{a} = m\vec{a}_x$

$\frac{5}{13}$ $\frac{12}{13}$

~~$mg \sin \beta$~~

$mg \, tg \beta = ma$ $a = 24 \frac{м}{с^2}$ $\cos \beta = \frac{3}{5} \Rightarrow \sin \beta = \frac{4}{5}$ $\frac{12}{5}$

$tg \beta = \frac{4}{3}$

$\frac{4}{3} g = a$

$T + F_u \cos\alpha - \frac{m}{2} g \sin\alpha = m a_{\text{от}}$

$(mg - T\cos\beta)^2 + (ma_x + T\sin\beta)^2 = m a_{\text{от}}$

$(mg)^2 - 2mgT\cos\beta + T^2\cos^2\beta + (ma_x)^2 - 2ma_x T\sin\beta + T\sin^2\beta^2 =$
$= (T + F_u\cos\alpha - \frac{m}{2} g\sin\alpha)^2$

$T^2 + (mg)^2 + (ma_x)^2 - 2mT(g\cos\beta + a_x\sin\beta) = (T + F_u\cos\alpha - \frac{m}{2}g\sin\alpha)^2$

~~$T^2 + (mg)^2 + (ma_x)^2$~~

$T^2 + (10m)^2 + (24m)^2 - 2mT(10\cdot\frac{3}{5} + 24\cdot\frac{4}{5}) = T^2 + F_u^2\cos^2\alpha - (\frac{m}{2}10\cdot\frac{12}{13})^2$

$\frac{Q}{m} = 0 \to Q = 0$

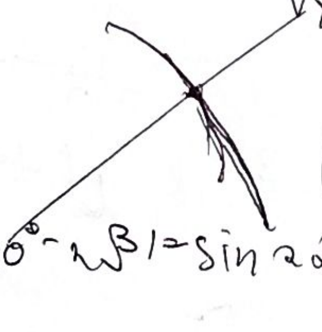
$Q = A_r \quad \Delta U = 0 \quad \frac{3}{2}\nu R\Delta T$

$\frac{p_x V_x}{T} = \frac{p_y V_y}{T}$

$p = \frac{1}{V}$

$p_x = k p_y$

$V_x = \frac{1}{k} V_y$



$(\frac{1}{a})' =$

$T_1 = T_2 \Rightarrow \sin(180° - 2\beta) = \sin 2\alpha$

~~$T + \frac{m}{2}\cdot 24\cdot\cos$~~

$T + \frac{m}{2}\cdot 24\cdot\frac{5}{13} - \frac{m}{2}\cdot 10\cdot\frac{12}{13} = \frac{m}{2} a_{\text{от}}$

$(10m - T\cdot\frac{4}{5})^2 + (24m - T\cdot\frac{3}{5})^2 = (m a_{\text{от}})^2$

$100m^2 - 16Tm + T^2 + (24m)^2 - \frac{3}{5}\cdot 24\cdot 2Tm = T^2 + \frac{240}{26}mT + (\frac{240}{26}m)^2$

$100m - 16T + 24^2 m - \frac{3\cdot 24\cdot 2}{5}\cdot T = \frac{240}{26}T + (\frac{240}{26})^2 m$

$100 + 576 - (\frac{240}{26})^2 = \frac{240}{26}T + \frac{3\cdot 24\cdot 2}{5}T + 16T$

Часть 2

Олимпиада: **Физика, 11 класс (2 часть)**

Шифр: **21202528**

ID профиля: **302398**

Вариант 7

Чистовик

Вариант-7

Дано:

$d_0 = 0{,}25$ м

$\frac{D_1}{D_2} = 3$

$d_1 = 0{,}5$ м

1) x - ?

D_1 - ?

2) D_{50} - ?

Решение:

Т.к. человек близорукий, то ему требуются очки с рассеивающими линзами.

$\frac{1}{d} + \frac{1}{f} = D_2 - D_1$

$d \to \infty \Rightarrow \frac{1}{d} \to 0$

$\frac{1}{f} = D_2 - D_1$ (1)

$\frac{1}{d_0} + \frac{1}{f} = D_2 - D_2$

$\frac{1}{d_0} + \frac{1}{f} = D_2 - \frac{1}{3} D_1$ (2)

(2)-(1): $\frac{1}{d_0} = D_2 - \frac{1}{3} D_1 - D_2 + D_1 = \frac{2}{3} D_1$

$\frac{1}{d_0} = \frac{2}{3} D_1 \Rightarrow D_1 = \frac{3}{2 \cdot 0{,}25 м} = 6$ дптр

$\begin{cases} 0 + \frac{1}{f} = D_2 - D_1 \\ \frac{1}{x} + \frac{1}{f} = D_2 \end{cases} \Rightarrow \frac{1}{x} + D_2 - D_1 = D_2$

$\frac{1}{x} = D_1$

(1)

$\frac{1}{x} = 6$ дптр $\Rightarrow x = \frac{1}{6}$ м

$$\begin{cases} \frac{1}{d_1} + \frac{1}{f} = D_2 - D_{50} \\ 0 + \frac{1}{f} = D_2 - D_1 \end{cases}$$

$$\frac{1}{d_1} = -D_{50} + D_1$$

$$D_{50} = D_1 - \frac{1}{d_1}$$

$$D_{50} = 6 \text{ дптр} - \frac{1}{0{,}5 м} = 4 \text{ дптр}$$

Ответ: 1) $X = \frac{1}{6} м \approx 0{,}167 м$; $D_1 = 6$ дптр

2) $D_{50} = 4$ дптр

(2)

№1

Дано:

$C_1 = C$

$C_2 = 4C$

L

R

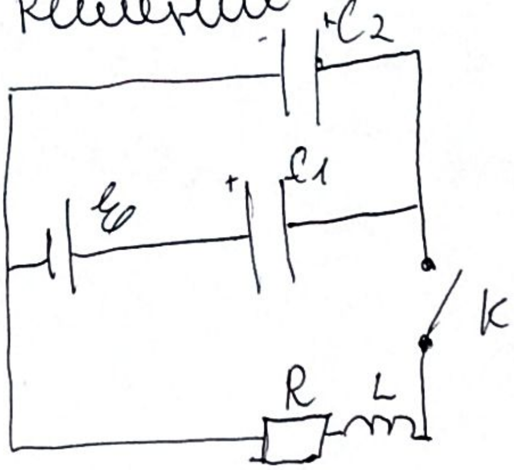
$\mathcal{E}$

1) $I'(0)$ — ?

2) Q — ?

3) I_r — ? когда ток через $C_1 = I_0$

Решение



$U_L = L \cdot I'$

В $t = 0$ $I = 0 \Rightarrow I'$ — max

[illegible]

$U_{C2} = U_{R+L} \} \Rightarrow U_{C2} = U_L = L \cdot I'$

$U_R = R \cdot I = 0$

$\mathcal{E} + U_{C1} = U_{C2} = U_L = L \cdot I'$

$\frac{U_{C2}}{U_{C1}} = \frac{C_2}{C_1} = \frac{4}{1}$ т.к. в этот момент нижняя ветка не активна

$\mathcal{E} + U_{C1} = 4U_{C1} \Rightarrow U_{C1} = \frac{\mathcal{E}}{3} \Rightarrow U_{C2} = \frac{4}{3}\mathcal{E}$

$\frac{4}{3}\mathcal{E} = L \cdot I' \Rightarrow I' = \frac{4\mathcal{E}}{3L}$ 1)

~~$\mathcal{E} + U_{C1} = U_{C2}$~~

$\mathcal{E} = U_{C1} + U_{C2}$

$\frac{U_{C1}}{U_{C2}} = \frac{C_1}{C_2} = \frac{1}{4}$

$\mathcal{E} = U_{C1} + 4U_{C1} = 5U_{C1}$

$U_{C1} = \frac{1}{5}\mathcal{E}$

$U_{C2} = U_L$

$\frac{1}{5}\mathcal{E} = L \cdot I' \Rightarrow$

$\Rightarrow I' = \frac{\mathcal{E}}{5L}$

(3)

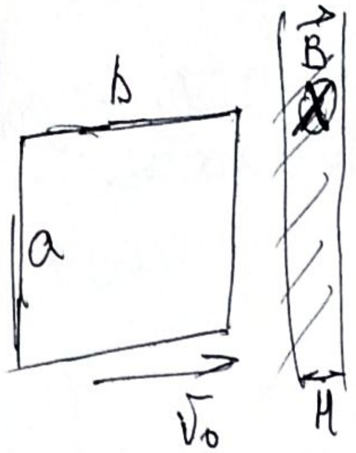
№2

Дано:
m
d
v_0
R
B

$b = 3d$
$H = \frac{d}{3}$

1) $a(0)$?
2) v_1 - ?
3) v_2 - ?

Решение:



$\mathcal{E} = B v_0 l \sin\alpha$, $l = d$ $\Rightarrow$

$\Rightarrow \mathcal{E} = B v_0 d \sin\alpha$

$I = \frac{\mathcal{E}}{R} = \frac{B v_0 d \sin\alpha}{R}$

$F_A = B I l \sin\alpha$ $\Rightarrow$

$\Rightarrow F_A = B \cdot \frac{B v_0 d \sin\alpha}{R} \cdot d \sin\alpha = \frac{B^2 v_0 d^2}{R}$ ($\sin\alpha = 1$)

$\vec{F}_A = m\vec{a}_0 \Rightarrow a_0 = \frac{F_A}{m} = \frac{B^2 v_0 d^2}{Rm}$

1) $a(0) = \frac{B^2 v_0 d^2}{Rm}$

$F_A(t) = B I(t) d$

$I(t) = \frac{\mathcal{E}(t)}{R}$

$\mathcal{E}(t) = B v(t) d \sin\alpha = B v(t) d$

$\Rightarrow F_A(t) = \frac{B^2 \cdot v(t) d^2}{R}$

$m a(t) = \frac{B^2 v(t) d^2}{R}$

$a(t) = \frac{B^2 v(t) d^2}{Rm}$

$v'(t) = a(t) \Rightarrow v'(t) = \frac{B^2 v(t) d^2}{Rm}$

$\frac{\Delta v}{\Delta t} = \frac{B^2 \cdot \Delta S d^2}{Rm \Delta t}$

$\Delta v = \frac{B^2 \cdot \Delta S d^2}{Rm}$

$\Delta S = \frac{1}{3} d$

~~$\Rightarrow v_1 = \frac{B^2 d^2 \cdot d}{3Rm}$~~

4

$$\Delta V = \frac{B^2 d^3}{5Rm}$$

2) $V_1 = V_0 + \Delta V = V_0 + \frac{B^2 \cdot d^3}{5Rm}$

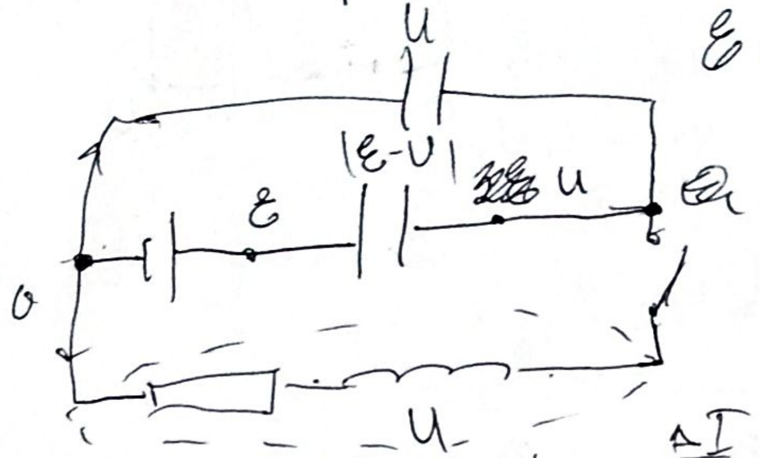
~~3) Т.к. поток начнёт уменьшаться, когда к щели подойдёт левая граница => => найдёт~~

$$\Delta V = \frac{B^2 d^3}{5Rm}$$

3) $V_2 = V_1 + \Delta V = V_0 + \frac{2B^2 d^3}{5Rm}$

3

Черновик



$\mathcal{E}q=\frac{Uqi}{2}$ $\frac{CU^2}{2}=\frac{q^2}{2C}$

$U=\frac{q}{C}$

$E=\frac{Q}{2\varepsilon_0 S}$

$k\frac{q}{r^2}$

U_L

$U_L=L\cdot I'$ $I=C\cdot U_C'$ $\frac{\Delta I}{\Delta t}\cdot L=U_C$

$U_C'=C\cdot I$ $\frac{CU^2}{2}+$

$U_L-?$

$U_L=U_C \Rightarrow U_L'=U_C'$

$F_A=BIl\cdot\sin\alpha$

$B\frac{\mathcal{E}_i}{R}\cdot l\sin\alpha$

$\mathcal{E}_i=BVl\sin\alpha$

$\Delta\Phi=\Delta S\cdot B$ $B\frac{\mathcal{E}_i}{R}l$

$\Delta S=d\cdot V\cdot\Delta t$

$\mathcal{E}_i=\left|\frac{\Delta\Phi}{\Delta t}\right|=\frac{\Delta S\cdot B}{\Delta t}$

$I=\frac{\mathcal{E}_i}{R}$

$\frac{d\cdot V\cdot\Delta t\cdot B}{\Delta t}=d\cdot V\cdot B$

$\frac{4CU^2}{2}+\frac{C(\mathcal{E}-U)^2}{2}$

$F_A=\frac{B\cdot B\cdot V\cdot d\cdot d}{R}=\frac{B^2\cdot V\cdot d^2}{R}$ $q=C\cdot U$

$\mathcal{E}(C(\mathcal{E}-U)+4CU)=$

$ma_A=\frac{B^2\cdot V\cdot d^2}{R}$ $=2CU^2+C(\mathcal{E}-U)^2$

$V'=a_A$ $C\mathcal{E}^2-C\mathcal{E}U+4CU\mathcal{E}=$

$a_A=\frac{B^2\cdot V^2\cdot d^2}{R}$ $=2CU^2+\frac{C(\mathcal{E}-U)^2}{2}$

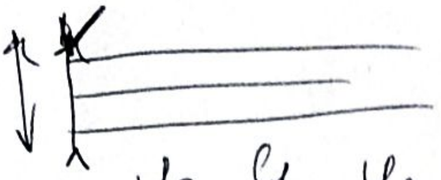
$\frac{\Delta V}{\Delta t}=a_A$

$V^2=\frac{a_A\cdot R}{B^2\cdot d^2}$ $C\mathcal{E}^2-C\mathcal{E}U+4C\mathcal{E}U=$

$=\frac{2CU^2+C\mathcal{E}^2+2C\mathcal{E}U+CU}{2}$

$V=\frac{\sqrt{a_A\cdot R}}{Bd}$ $V'=\frac{\sqrt{R}}{Bd}\cdot\frac{1}{2}\cdot\frac{1}{\sqrt{a_A}}$

$0{,}5C\mathcal{E}^2$



U_2 $\frac{C_1}{C_2} = \frac{U_1}{U_2}$ $q_1 = C_1 U_1$

$q_2 = C_2 U_2$

$D_1 + D_2$

$\frac{1}{50} + \frac{1}{f} = (D_2 + D_1)$

$0 + \frac{1}{f} = (D_1 + D_2)$

$\frac{1}{d_0} + \frac{1}{f} = (D_2 + D_2) = 3D_1 + D_2$

$\frac{1}{d_0} = 2D_1$

$0 + \frac{1}{f} = D_1 + D_2$

$\frac{1}{d} + \frac{1}{f} = D_2$

$\frac{1}{0{,}25 м} = 2 \cdot D_1$

$D_1 = 2$ дптр

$\mathcal{E}(U_{c1} \cdot q_1 + (\mathcal{E} + U_{c1}) q_2) = \frac{CU_{c1}^2}{2} + \frac{C(\mathcal{E} + U_{c1})^2}{2}$

$\frac{1}{d_2} + \frac{1}{f} = D_2$

2 см

$2\mathcal{E} U_{c1} \cdot q_1 + 2\mathcal{E}^2 q_2 + 2\mathcal{E} U_{c1} q_2 = CU_{c1}^2$

$\frac{1}{d} + \frac{1}{f} = D_2 - 3D_1$ $\mathcal{E} q_1 + \mathcal{E} q_2 = \frac{CU_{c1}^2}{2} + \frac{C(\mathcal{E} + U_1)^2}{2}$

$2\mathcal{E}(q_1 + q_2) = CU_{c1}^2 + C\mathcal{E}^2 + 2C\mathcal{E}U_1 + C$

$\frac{1}{d_0} + \frac{1}{f} = D_2 - 3D_1$ $2\mathcal{E}(q_1 + q_2) = 2U_{c1}^2 + C\mathcal{E}^2 + 2C$

$\frac{1}{d_0} = D_2 - D_1 + 3D_1 = 2D_1$ $v' = a$ $a = \frac{B^2 b^2}{R} \cdot v$

$\mathcal{E} q_1 + \mathcal{E} q_2 = \frac{q_1^2}{2C_1} + \frac{q_2^2}{8C_1}$ $v = at$ $v = at$

$\frac{1}{x} + \frac{1}{f}$

$\mathcal{E} 2q = \frac{q^2}{2C_1} + \frac{q^2}{8C_1}$ $a = v \cdot t$

$v = a \cdot t$

$2\mathcal{E} = \frac{q}{2C_1} + \frac{q}{8C_1}$ $v' = a$

$2\mathcal{E} = \frac{5q}{8C_1}$

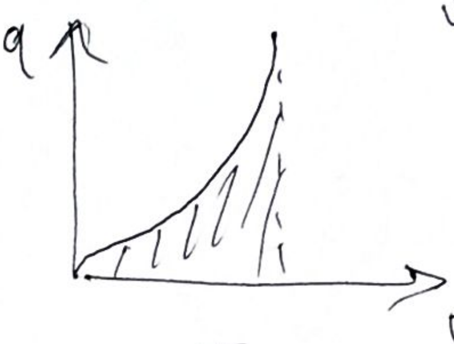
$\frac{\Delta v}{\Delta t} = a$

$a = \frac{B^2 \cdot v \cdot d^2}{Rm}$ $v' = a$ $v' = \frac{B^2 v d^2}{Rm}$

$\frac{\Delta v}{\Delta t} = \frac{B^2 \cdot v \cdot d^2}{Rm}$ $a = \frac{B^2 \cdot \Delta s \cdot d^2}{Rm \Delta t}$ $\frac{\Delta v}{\Delta t} = \frac{B^2 v d^2}{Rm}$

$\Delta v = \frac{B^2 \cdot v \cdot d^2}{Rm} \cdot \Delta t$ $\frac{v_2 - v_1}{\Delta t} = \frac{B^2 v_2 d^2}{Rm}$

v_0 v_1



$v = \frac{\Delta v \, Rm}{\Delta t \, B^2 d^2}$

$\frac{\Delta v}{\Delta t} = \frac{B^2 v d^2}{Rm}$

$\frac{\Delta s}{\Delta t} = v$

$\frac{\Delta v}{\Delta t} = \frac{B^2 \cdot \Delta s \, d^2}{Rm \Delta t}$

0,01e

$\Delta v = \frac{B^2 \cdot \Delta s \cdot d^2}{Rm}$

$\frac{B^2 v_0 d^2}{Rm}$

$v_1 = \frac{B^2 v_0 d^2}{Rm} \cdot \Delta t_1$ $s = \frac{(1 + \frac{B^2 d^2}{Rm} \Delta t) v_0}{2} \cdot \Delta t$

$v_2 = \frac{B^2 \cdot \frac{B^2 v_0 d^2}{Rm} \cdot \Delta t_1 \Delta t}{Rm}$

$\frac{\mu}{l} \cdot \frac{1}{l}$