Часть 1

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

Шифр: **21201440**

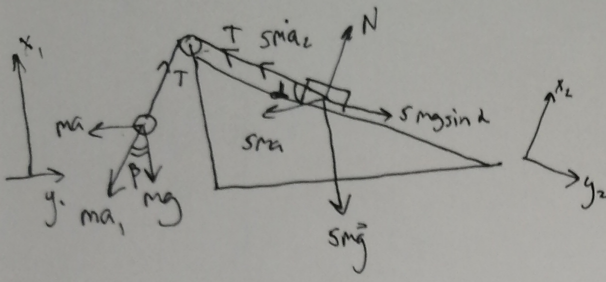
ID профиля: **336101**

Вариант 8

Чистовик

В 11-08

№1



$a_1 = \dot{V}_1 = (\ddot{\ell}+\ddot{\ell}_1) - \ddot{\ell}_1$

$a_2 = \dot{V}_2 = -(\ddot{\ell}-\ddot{\ell}_1) = \ddot{\ell}_1$

$\cos\beta = \frac{5}{13} \Rightarrow \sin\beta = \frac{12}{13}$

$\cos\alpha = \frac{3}{5} \Rightarrow \sin\alpha = \frac{4}{5}$

1) $m\vec{a}_1 = m\vec{a} + m\vec{g} + \vec{T}$

$5m\vec{a}_2 = 5m\vec{a} + 5m\vec{g} + \vec{T}$

2) На оси: $\begin{cases} ma_1 \sin\beta = ma - T\sin\beta \\ ma_1\cos\beta = mg - T\cos\beta \end{cases} \Rightarrow a = g\,tg\beta = \frac{12}{5}g$

$\begin{cases} 5ma_2 = T + 5ma\cos\alpha - 5mg\sin\alpha \\ N = 5ma\sin\alpha + 5mg\cos\alpha \end{cases}$

3) $T = \frac{mg\,tg\beta - ma_1\sin\beta}{\sin\beta} = 5ma_1 - 5mg\,tg\beta\cos\alpha + 5mg\sin\alpha$

$a_1 = \frac{g}{6\cos\beta} + \frac{5g\,tg\beta\cos\alpha}{6} - \frac{5}{6}g\sin\alpha = g\left(\frac{13}{6\cdot 5} + \frac{5\cdot 12\cdot 3}{6\cdot 5\cdot 5} - \frac{5\cdot 4}{6\cdot 5}\right) \approx 0{,}97g$

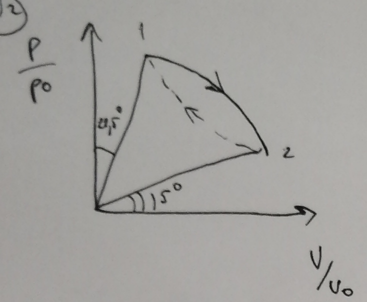
4) $H = \frac{a't^2}{2}$, $a' = a_1\cos\beta \Rightarrow t = \sqrt{\frac{2H}{a_1\cos\beta}} \approx \sqrt{\frac{2H}{0{,}97g\cdot\frac{5}{13}}} \approx \sqrt{5{,}38\frac{H}{g}}$

Ответ: $\frac{12}{5}g$; $0{,}97g$; $\sqrt{5{,}38\frac{H}{g}}$

Чистовик

В 11-08

№2



1) $p_1 = p_0 \cos 22{,}5^\circ$

$V_1 = V_0 \sin 22{,}5^\circ$

$p_2 = p_0 \cancel{\cos} \sin 15^\circ$

$V_2 = V_0 \cos 15^\circ$

$T_1 = \frac{p_1 V_1}{\nu R}$; $T_2 = \frac{p_2 V_1}{\nu R}$

$T_1 = \frac{p_0 V_0}{2\nu R} \sin 45^\circ = \frac{\sqrt{2}\, p_0 V_0}{4\nu R}$

$T_2 = \frac{p_0 V_0}{2\nu R} \sin 30^\circ = \frac{p_0 V_0}{4\nu R}$

$\frac{T_1 - T_2}{T_2} = \frac{\sqrt{2} - 1}{1} = \sqrt{2} - 1$

2) $C = \frac{dQ}{dT} = 0$; $Q_{12} = A_{12} + \Delta U_{12}$

$Q_{21} \approx 0 = A_{21} + \Delta U_{21}$

Q_{12} был больше нуля, пока $A_{12} > -\Delta U_{12} = \frac{5}{2}\nu R(T - T_1)$

$A_{12} = \int p_0 \cos(\alpha + 22{,}5^\circ) V_0 d\sin(\alpha + 22{,}5^\circ) = p_0 V_0 \int \cos^2(\alpha + 22{,}5^\circ) d(\alpha + 22{,}5^\circ)$

Ответ: 1) $\sqrt{2} - 1$

2

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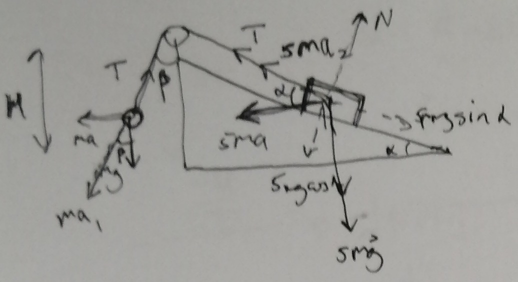
Черновик

№1



$$a_1 = \dot{V}_1 = \cancel{\ }(\ddot{l} + \ddot{l}_1) = \ddot{l}_1$$

$$a_2 = \dot{V}_2 = (\ddot{l} - \ddot{l}_1) = -\ddot{l}_1$$

$$m\vec{a}_1 = m\vec{a} + m\vec{g} + \vec{T}$$

$$5m\vec{a}_2 = 5m\vec{a} + 5m\vec{g} + \vec{T}$$

Оси: $\cancel{ma_1 = ma +}$

$$\begin{cases} ma_1 \sin\beta = ma - T\sin\beta \\ ma_1 \cos\beta = mg - T\cos\beta \end{cases}$$

$$\begin{cases} 5ma_2 = T + 5ma\cos\alpha - 5mg\sin\alpha \\ N = 5ma\sin\alpha + 5mg\cos\alpha \end{cases}$$

$$T = \frac{ma - ma_1\sin\beta}{\sin\beta} = \frac{mg - ma_1\cos\beta}{\cos\beta}; \quad (1)$$

$$T = 5ma_2 - 5ma\cos\alpha + 5mg\sin\alpha;$$

(1) $$\frac{a}{\sin\beta} - a_1 = \frac{g}{\cos\beta} - a_1 \Rightarrow \cancel{a = g\sin\beta} \Rightarrow \boxed{a = g\,tg\beta}$$

(2) $$\cancel{a_2} = T = \frac{mg\,tg\beta - ma_1\sin\beta}{\sin\beta} = 5ma_1 - 5mg\,tg\beta\cos\alpha + 5mg\sin\alpha$$

$$\frac{mg}{\cos\beta} - ma_1 = 5ma_1 - 5mg\,tg\beta\cos\alpha + 5mg\sin\alpha$$

$$6a_1 = \frac{g}{\cos\beta} + 5g\,tg\beta\cos\alpha - 5g\sin\alpha$$

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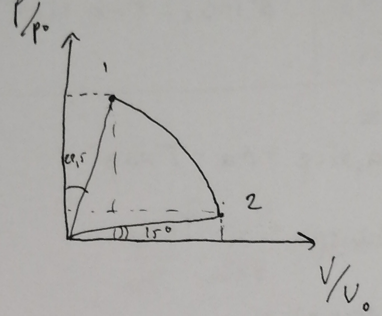
$a_1 \cos\beta = a'$

$H = \frac{a' t^2}{2} \Rightarrow t = \sqrt{\frac{2H}{a'}} = \sqrt{\frac{2H}{a_1 \cos\beta}}$

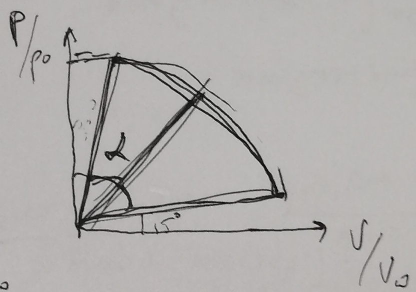
№2 $i = 5$

$C_V = \frac{5}{2} R$



$p_1 V_1 = \nu R T_1$

$p_2 V_2 = \nu R T_2$



$C = \frac{dQ}{dT} = 0$

1) $p_1 = p_0 \cos 22{,}5^\circ \qquad V_1 = V_0 \sin 22{,}5^\circ$

$p_2 = p_0 \sin 15^\circ \qquad V_2 = V_0 \cos 15^\circ$

$p_1 V_1 = \frac{p_0 V_0}{2} \sin 45^\circ = \frac{p_0 V_0}{2} \frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{4} p_0 V_0$

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

$\frac{T_1 - T_2}{T_2} = \frac{\frac{p_1 V_1}{\nu R} - \frac{p_2 V_2}{\nu R}}{\frac{p_2 V_2}{\nu R}} = \frac{p_0 V_0 \frac{\sqrt{2}}{4} - \frac{p_0 V_0}{4}}{\frac{p_0 V_0}{4}} = \boxed{\sqrt{2} - 1}$

2)

Черновик

2) $C_V = \frac{5}{2}R$

$C = \frac{dQ}{dT} = 0$

$\quad = \frac{dU}{dT} = 0 \quad \frac{d\frac{5}{2}\nu RT}{dT}$

$Q = A + \Delta U$

$\quad = \int p\,dV + \frac{5}{2}\nu R \Delta T$

$T = \frac{pV}{\nu R} = \frac{p_0 \cos(\alpha + 22{,}5^\circ) V_0 \cos(15^\circ + 52{,}5^\circ - \alpha)}{\nu R} =$

$\cancel{90 - 22{,}5^\circ - 15^\circ = 52{,}5^\circ}$

$= \frac{p_0 V_0}{\nu R} \cos(\alpha + 22{,}5^\circ) \cos(90 - (22{,}5^\circ + \alpha)) =$

$= \frac{p_0 V_0}{\nu R} \cos(\alpha + 22{,}5^\circ) \sin(22{,}5^\circ + \alpha) =$

$= \frac{p_0 V_0}{2\nu R} \sin(2\alpha + 45^\circ)$

$Q(\alpha) = ?$

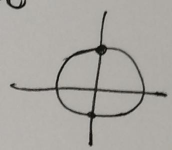
$\frac{dT}{d\alpha} = \frac{p_0 V_0}{2\nu R} \cdot 2\cos(2\alpha + 45^\circ) = 0$

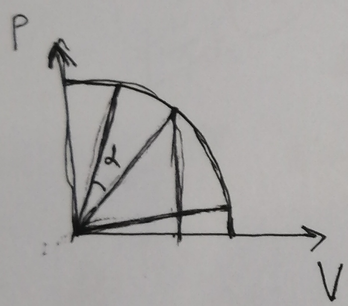
$\cos(2\alpha + 45^\circ) = 0$

$2\alpha + 45^\circ = 90^\circ$

$2\alpha + 45^\circ = 270^\circ$

$2\alpha =$





$p(\alpha) = p_0 \cos(\alpha + 22{,}5^\circ)$

$V(\alpha) = V_0 \sin(22{,}5^\circ + \alpha)$

$p(V) = ?$

$\frac{p(\alpha)}{V(\alpha)} = \frac{p_0}{V_0 \,\mathrm{tg}(\alpha + 22{,}5^\circ)}$

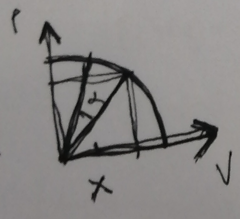
$p(\alpha) = V(\alpha) \frac{p_0}{V_0 \,\mathrm{tg}(\alpha + 22{,}5^\circ)}$

$\cancel{p^2 + V^2 = p_0^2 \cos^2\alpha + V_0^2 \sin^2\alpha}$

$\sin(22{,}5^\circ + \alpha) = \frac{V}{V_0}$

$\cos(22{,}5^\circ + \alpha) = \frac{P}{P_0}$

$\boxed{\frac{y}{x} = t \quad y = tx}$



$x = x(t)$

$y = y(t)$

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$t = 28{,}5^\circ + \alpha$ Черновик

$\text{розв.} \int \cos t \, d \sin t = \int \cos t \, d \cos(90 - t) = \cancel{\cos} \int \sin(90 - t) \, d \sin t =$

$= \int \sin(90 - t)$

$d \sin(90 - t) =$

$= \cos(90 - t) \, d \sin(90 - t)$

$\int \cos^2 t \, dt$

$\int$

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Черновик

$Q_{(d)} = A_{(d)} + \Delta U_{(d)}$

$A(d) =$

$Q_{12} = \underset{>0}{A_{12}} + \underset{<0}{\Delta U_{12}}$

$Q_{21} = 0 = \underset{<0}{A_{21}} + \underset{>0}{\Delta U_{21}}$

$A_{21} = -\Delta U_{21} = \Delta U_{12}$

$\eta = \frac{A}{Q} = \frac{A_{12}+A_{21}}{A_{12}+\Delta U_{12}} = A_{12} -$

Тепло будет подводиться, пока $A > -\Delta U$

$A = -\Delta U = \frac{5}{2}\nu R(T_1 - T)$

$A = \int p dV = \int p_0 \cos(\alpha+22{,}5^\circ) V_0 d\sin(\alpha+22{,}5^\circ) = p_0 V_0 \int \cos^2(\alpha+22{,}5^\circ) d(\alpha+22{,}5^\circ) =$

$= p_0 V_0 \int \cos^2 t\, dt$

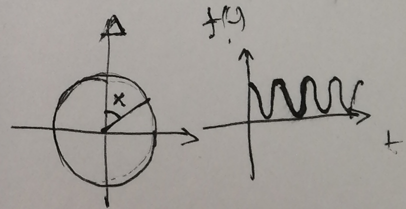
$d\sin(\alpha+22{,}5^\circ) = dt$

$\left(\frac{\sin x}{\cos x}\right)' = \frac{\cos^2 x + \sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x}$

$\int \sin(90-x) d\sin x = -\int \sin(90-x) d(\sin 90-x) = -\int t\, dt = -\frac{t^2}{2} =$

$= \frac{\sin^2(90-x)}{2}$

$\int \sin(90-x) d\sin x =$



$d\sin x = \cos x\, dx$

$d(\sin(-x)) = -\cos(-x)\, dx = -\cos x\, dx = -d\sin x$

$d(\sin(90-x)) = \cos(90-x)\, d(90-x) = -\cos(90-x)\, dx$

$= -\int \sin(90-x)\, d(-x) = +\int \frac{\sin(90-x)}{\cos(90-x)}\, d(90-x) = \int \operatorname{tg} t\, dt$

$C_p = \frac{[illegible] + C_p}{2}$

Часть 2

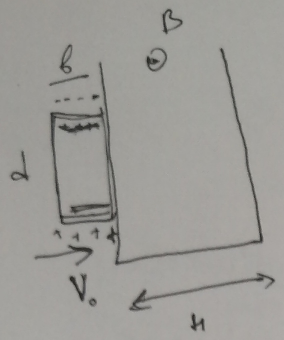
Олимпиада: **Физика, 11 класс (2 часть)**

Шифр: **21201440**

ID профиля: **336101**

Вариант 8

(4)



$$\frac{kq^2}{\ell^2} = qBV$$

$$\frac{kq}{\ell}\cdot\frac{\xi}{\ell} = BV$$

$$\frac{\xi}{\ell} = BV \Rightarrow \boxed{U = BV\ell}$$

$$I = \frac{U}{\rho d}$$

$$R = \rho\cdot(2d+2b)$$

$$\xi = \frac{-d\varphi}{dt} = Bd\frac{\Delta b}{\Delta t}$$

$$F_A = BId$$

$$a_0 = \frac{F_A}{m} = \frac{BUd}{\rho d} = \frac{BU}{\rho} = \frac{B^2V_0\cancel{b}d}{\rho}$$

$$\underline{F = BId}, \quad a < b$$

$$I = \frac{\xi}{\rho L}, \quad a < b$$

$$a = \frac{F}{m}$$

$$\xi = Bd\,\cancel{\frac{\partial a}{\partial t}}\,\frac{\partial a}{\partial t}$$

$$\cancel{a} = \quad a = V_0t + \frac{at^2}{2}$$

$$\xi_0 = Bd\frac{\partial b}{\partial t} = BdV_0$$

$$I_0 = \frac{\cancel{\xi_0}}{\cancel{\rho d}R}$$

$$F_{A_0} = BI_0d = \frac{B^2dV_0}{\rho d}d = \frac{B^2V_0d}{\rho} \oplus$$

$$V = V_0 + at$$

$$a = \frac{F}{m}; \quad F = BId = \frac{Bd\xi}{\rho L} = \frac{Bd}{R}BdV = \frac{B^2d^2}{R}V$$

$$a = \frac{B^2d^2V}{Rm}; \quad \frac{dV}{dt} = \frac{B^2d^2V}{Rm}$$

$$\frac{dV}{V} = \frac{B^2d^2}{Rm}dt$$

$$a = \frac{B^2d^2}{Rm}\frac{\partial l}{\partial t}$$

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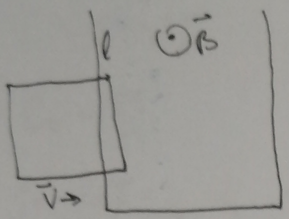
Чистовик

В 11-08

№4



1) $\mathcal{E} = \cancel{B} -\frac{d\Phi}{dt} = -B\frac{dS}{dt} = -Bd\frac{\partial l}{\partial t}$

2) $I = \frac{|\mathcal{E}|}{R} = \frac{Bd}{R}\frac{\partial l}{\partial t}$

3) $F_A = BId = \frac{B^2d^2}{R}\frac{\partial l}{\partial t}$

$\frac{F_A}{m} = a = \frac{B^2d^2}{Rm}\frac{\partial l}{\partial t} = \chi V$; где $\chi = \frac{B^2d^2}{Rm}$

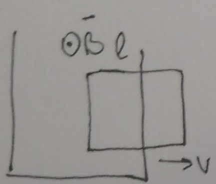
Тогда $a_0 = \chi V_0 = \frac{B^2d^2}{Rm}V_0$; $a = \frac{\partial V}{\partial t} = \chi V \Rightarrow V = V_0 e^{\chi t}$

$$b = \int_0^\tau V dt = V_0\int_0^\tau e^{\chi t}dt = \frac{V_0}{\chi}e^{\chi t}\Big|_0^\tau = \frac{V_0}{\chi}\left[e^{\chi\tau}-1\right] = b$$

$$V_k = V_0 e^{\chi\tau} = b\chi + V_0 = V_1 = \frac{2}{3}\frac{d^3B^2}{mR} + V_0$$

Когда рамка находится внутри поля, то $\frac{d\Phi}{dt}=0$, поэтому она едет со скоростью V_1

Выезд:



$\mathcal{E} = -\frac{d\Phi}{dt} = -Bd\frac{\partial l}{\partial t}$

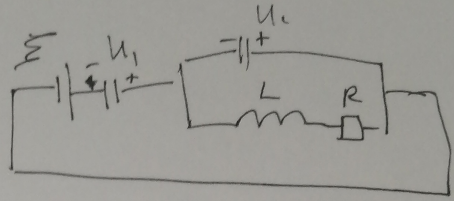
Аналогично получаем: $V_2 = \cancel{B}\,\frac{2}{3}d\chi + V_1 =$

$= \frac{4}{3}\frac{B^2d^3}{mR} + V_0$

Ответ: $\frac{B^2d^2V_0}{Rm}$; $\frac{2}{3}\frac{d^3B^2}{mR} + V_0$; $\frac{4}{3}\frac{B^2d^3}{mR} + V_0$

Чистовик

В 11-08



№3 1) $U_{10}+U_{20}=\mathcal{E}$

$C_0=\frac{5C}{6}$

$q_0=C_0\mathcal{E}=q_1=q_2=CU_{10}=5CU_{20}$

$U_{10}=\frac{5}{6}\mathcal{E}$

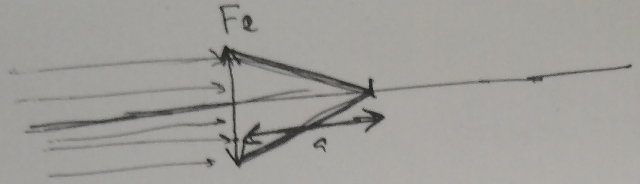
$U_{20}=\frac{\mathcal{E}}{6}$

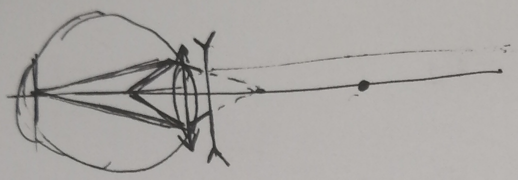
2) Ток через катушку сразу после замыкания $=0=I_{L_0}=I_{R_0}$

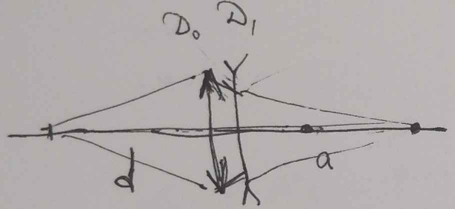
$$-U_{20}=\mathcal{E}_{си}-\cancel{I_0 R}^{\to 0} \Rightarrow \frac{\mathcal{E}}{6}=+L\frac{dI}{dt}\Rightarrow\frac{dI}{dt}=\boxed{+\frac{\mathcal{E}}{6L}}$$

3) $W_0=\frac{C_0\mathcal{E}^2}{2}=\frac{5}{12}C\mathcal{E}^2$

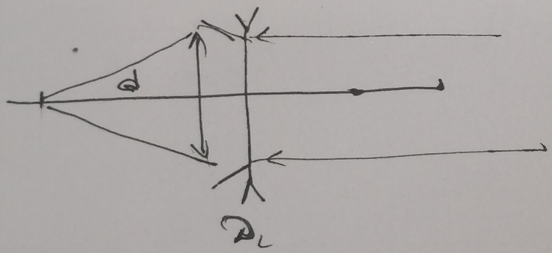
№5 $\varepsilon = 5$ $a = 25$ см







$\frac{1}{d} + \frac{1}{a} = D_0 + D_1$



$\frac{1}{d} + \cancel{\frac{1}{\infty}} = D_0 + D_2$

$\frac{1}{d} = D_0 + D_2$

$D_1, D_2 < 0$

$\frac{1}{D} = -F$

$\frac{1}{d} + \frac{1}{0{,}25} = D_0 + D_1$

$\frac{1}{d} + 4 = D_0 + 5D_2$

$\frac{D_1}{D_2} = 5 \Rightarrow D_1 = 5D_2$

$\frac{1}{d} = D_0 + D_2$

$\frac{1}{d} = D_0 + 5 - 4 = D_0 + 1$

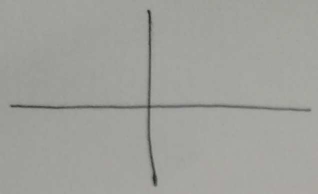
$\frac{1}{d} - D_0 = 5D_2 - 4 = D_2$

$4D_2 = 4$

$\boxed{\frac{1}{d} = D_0 + 1}$

$\boxed{D_2 = 1}$

$\boxed{D_1 = 5}$



$$\frac{1}{d}+\frac{1}{x}=D_0$$

$$\frac{1}{d}-\frac{4}{1}=D_0+D_1$$

$D_1=5D_2$

$$\frac{1}{d}-\frac{1}{\infty}=D_0+D_2$$

$$\frac{1}{d}+D_0=-D_2$$

$$\frac{1}{d}+D_0=-D_1+4$$

$\cancel{D_2}$

$D_2=5D_2-4$

$-4D_2=-4$

$D_2=1$

$$\frac{1}{d}-4=D_0+D_1$$

$$\frac{1}{d}=D_0+D_2$$

$$\frac{1}{d}-D_0=D_1+4=5D_2+4=D_2$$

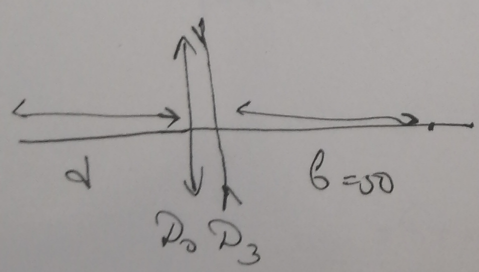
$$\frac{1}{d}-D_0=D_2$$

$D_2=-1$

$D_1=5$

$$\frac{1}{d_0}-D_0=-1$$

$$\frac{1}{d_0}+\frac{1}{1}=\frac{1}{D_0}\Rightarrow\boxed{x=1}$$



$$\frac{1}{d}-\cancel{\frac{1}{b}}\,2=D_0+D_3$$

$$\frac{1}{d}-D_0=D_3+2=-1$$

$$\boxed{D_3=-3}$$

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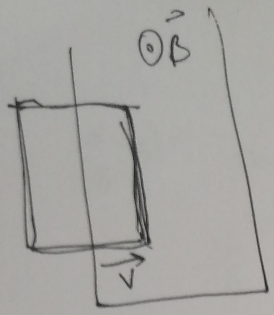


$U = BVl$

$U = BdV$

$I = \frac{U}{R} = \frac{BdV}{R}$

$F = BId = \frac{Bd^2V}{R}$

$\frac{F}{m} = a$

$a = \frac{B^2d^2V}{Rm} = XV$

$X = \frac{B^2d^2}{Rm}$

$\cancel{V = V_0 t + at}$ $\cancel{V = V_0 + at = V_0 + \frac{B^2d^2}{mR}V}$

$$b = \int_0^\tau V dt = \int_0^\tau V_0 e^{X\tau} dt = V_0 \int_0^\tau e^{Xt} dt = \frac{V_0}{X} e^{Xt}\Big|_0^\tau =$$

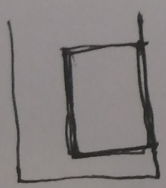
$$= \frac{V_0}{X}\left[e^{X\tau} - e^{X\cdot 0}\right] = \frac{V_0}{X}e^{X\tau} - \frac{V_0}{X} = b$$

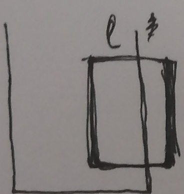
$$\frac{V_0}{X}e^{X\tau} = b + \frac{V_0}{X} \Rightarrow V_0 e^{X\tau} = bX + V_0$$

$$\cancel{e^{X\tau} = \left(b + \frac{V_0}{X}\right)\frac{X}{V_0} =}$$

$$V_k = V_0 e^{X\tau} = ? = bX + V_0 = V_1$$

Дальше – процесс выхода.

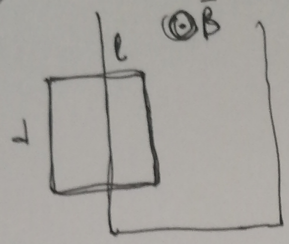




$\mathcal{E} = \frac{BdS}{dt} = -Bd\frac{\partial l}{\partial t}$

$I = \frac{Bd}{R}\frac{\partial l}{\partial t}$

$a = \frac{B^2d^2}{Rm}\frac{\partial l}{\partial t} \Rightarrow V_2 = bX + V_1$



$$\mathcal{E} = -\frac{d\Phi}{dt} = B\frac{dS}{dt} = Bd\frac{\partial l}{\partial t}$$

$$I = \frac{\mathcal{E}}{R} = \frac{Bd}{R}\frac{\partial l}{\partial t}$$

$$F_A = BId = \frac{B^2d^2}{R}\frac{\partial l}{\partial t}$$

$$\boxed{a = \frac{B^2d^2}{Rm}\frac{\partial l}{\partial t}}$$

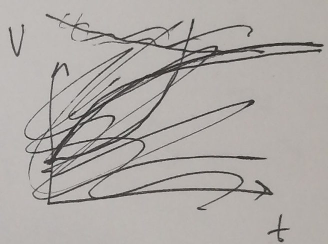
$$\frac{\partial V}{\partial t} = \frac{B^2d^2}{Rm}V$$

$$\frac{\partial V}{V} = \frac{B^2d^2}{mR}\partial t$$

$$V = at + \frac{\partial t^2}{2};$$

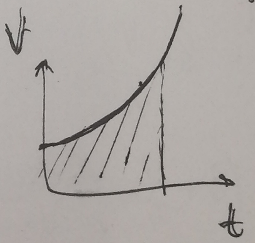
$$\ln\frac{V}{V_0} = \frac{B^2d^2}{mR}\tau$$

$$\boxed{V = V_0 e^{\frac{B^2d^2}{mR}\tau}}$$



$$\cancel{b = V_0 t + a_0 t}$$

$$t = \frac{b}{\langle V\rangle}$$



$$V = V_0 e^{x\tau}$$

$$a = xV_0 e^{x\tau}$$

$$J = x^2 V_0 e^{x\tau}$$

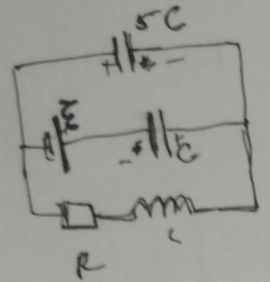
....

$$\boxed{b = \frac{2}{3}d}$$

$$\cancel{S = V_0 t + a}$$

$$b = V_0 t + \frac{a_0 t^2}{2} + \frac{J_0 t^3}{6}$$

№3



$U_1 + U_2 = \xi$

$\frac{5C \cdot C}{6C} = \frac{5C}{6} = C_0$

$q_0 = \xi C_0$

$\cancel{q_1 + q_2 = q_0 = CU_1 + 5CU_2 = \frac{5C}{6}\xi}$

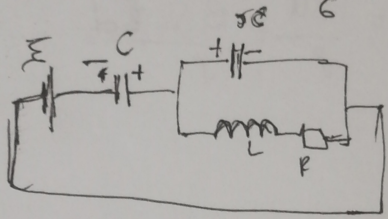
$q_1 = q_2 = q_0 = \xi \frac{5}{6} C = $ $\cancel{U_1 + 5U_2 = \frac{5}{6}\xi}$

$U_1 + U_2 = \xi$

$= U_1 C \Rightarrow U_{1_0} = \frac{5}{6}\xi$

$\frac{5}{6}\xi = 5U_2 \Rightarrow U_{2_0} = \frac{\xi}{6}$

0



1 $\xi + U_1 + \xi_{си} - IR = 0$

$\cancel{U_2 = \xi_{си} - IR}$ $\quad U_2 + \cancel{IR}^{\to 0} - \xi_{си} = 0 \quad U_2 = -L\frac{dI}{dt}$

Ток через катушку $I_L = I_R \Rightarrow I_{L0} = 0 = I_R \Rightarrow IR = 0 \Rightarrow$

$\xi_{си0} = -L\frac{dI}{dt} \Rightarrow \frac{dI}{dt} = \frac{\xi}{6} = L\frac{dI}{dt} \Rightarrow \frac{dI}{dt} = \frac{\xi}{6L}$

2 $W_0 = \frac{C_0\xi^2}{2} = \frac{5}{6}\frac{C\xi^2}{2} = \frac{5}{12}C\xi^2$

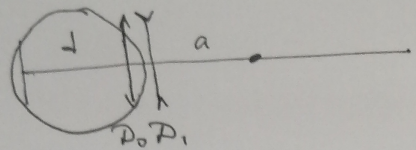
L – провод ; $\quad U_R = IR$; $\quad \xi - U_1 = IR$

$I = \frac{\xi - U_1}{R}$

№5

Чистовик

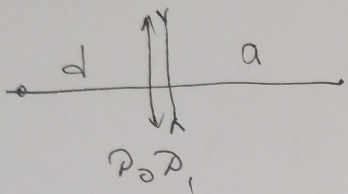
В 11-08

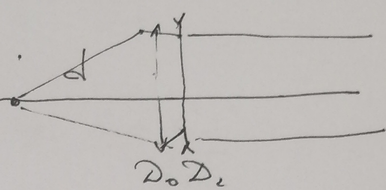


$a = 25\text{ см} = \frac{1}{4}$ м

Человек - близорукий $\Rightarrow D_1 < 0$; $D_2 < 0$

1)





$$\frac{1}{d} - \frac{1}{a} = D_0 + D_1 \qquad \frac{1}{d} - \frac{1}{\infty} = D_0 + D_2$$

$$\frac{1}{d} - D_0 = D_1 + 4 \qquad \frac{1}{d} - D_0 = D_2$$

V $\boxed{D_1 = 5D_2} \Rightarrow \frac{1}{d} - D_0 = 5D_2 + 4 = D_2$

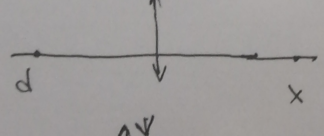
$4D_2 = -4$

$D_2 = -1$ дптр

$D_1 = -5$ дптр

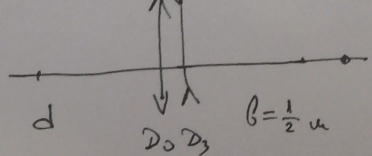
$\frac{1}{d} - D_0 = D_1 = -1$ дптр

Человек без очков:



$\frac{1}{d} + \frac{1}{x} = D_0 \Rightarrow \frac{1}{x} = \frac{1}{d} - D_0 = -1 \Rightarrow x = 1$ метр

2)



$\frac{1}{d} - \frac{2}{1} = D_0 + D_3 \Rightarrow D_3 + 2 = -1 \Rightarrow D_3 = -3$ дптр

Ответ: $x = 1$ метр; $D_2 = -5$ дптр ; $D_3 = -3$ дптр

1