Часть 1

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

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ID профиля: **808752**

Вариант 4

чистовик №1

№1. $C(T) = \frac{9}{5} R \frac{T}{T_0}$; $\frac{3}{4} T_0$

$Q_1 - ?$

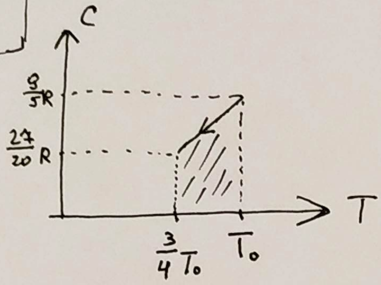
$T_1 - ?$

$A_{min} - ?$

Решение:

1. Для графика $C(T)$ $Q = \pm S \cdot \nu$

Построим его в координатах C, T



$C(T_0) = \frac{9}{5} R$ $C(\frac{3}{4} T_0) = \frac{27}{20} R$

По условию $Q_1 < 0$ → (убрали – т.к ищем ~~отданное~~ отданное тепло)

$$Q_1 = +S\nu = \nu\left(T_0 - \frac{3}{4}T_0\right) \cdot \frac{1}{2} R \left(\frac{9}{5} + \frac{27}{20}\right) =$$

$$\frac{1}{4} T_0 \cdot \frac{1}{2} R \left(\frac{36 + 27}{20}\right) = \frac{63}{5} \cdot \frac{1}{2} R T_0 \nu =$$

$$\Rightarrow Q_1 = \frac{63}{10} \nu R T_0$$

2. Общая формула Q: $Q = -\nu(T_0 - T_1) \cdot \frac{1}{2}(C(T_0) + C(T_1))$

Также $Q = A + \Delta U$ но тут Q – подводимо, значит имеем

$$\Delta U = \frac{3}{2} \nu R (T_1 - T_0)$$

$$A = Q - \Delta U \quad \Big| \quad Q = +\frac{1}{2}\nu(T_1 - T_0)\left(\frac{9}{5}R + \frac{9}{5} R \frac{T_1}{T_0}\right) = \frac{9}{10} \nu R (T_1 - T_0)\left(1 + \frac{T_1}{T_0}\right)$$

$$A = \frac{9}{10} \nu R (T_1 - T_0)\left(\frac{T_0 + T_1}{T_0}\right) - \frac{3}{2} \nu R (T_1 - T_0) =$$

$$\frac{3}{2} \nu R (T_1 - T_0)\left(\frac{3}{5}\left(\frac{T_0 + T_1}{T_0}\right) - 1\right) = \frac{3}{2} \nu R (T_1 - T_0)\left(\frac{3T_0 + 3T_1}{5T_0} - \frac{5T_0}{5T_0}\right) =$$

$$\frac{3}{2} \nu R (T_1 - T_0)\left(\frac{3T_1 - 2T_0}{5T_0}\right) =$$

$$\frac{3 \nu R}{10 T_0} (T_1 - T_0)(3T_1 - 2T_0)$$

Получили $A(T_1)$ найдем точку минимума работы:

$$A'(T_1) = 0 \rightarrow 6T_1 - 5T_0 = 0 \quad T_1 = \frac{5}{6} T_0$$

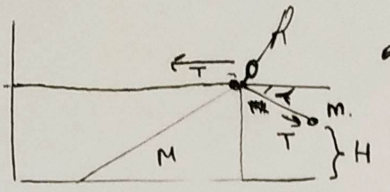
3. Посчитаем A_{min}:

$$A_{min} = A(T_1) = \frac{3 \nu R}{10 T_0}\left(\frac{5}{6} T_0 - T_0\right)\left(\frac{15}{6} T_0 - \frac{12}{6} T_0\right) =$$

$$-\frac{\cancel{3} \nu R}{10 \cancel{T_0}} \cdot \frac{1}{\cancel{6}\,2} \cancel{T_0} \cdot \frac{1}{2} T_0 = \frac{-\nu R T_0}{40}$$

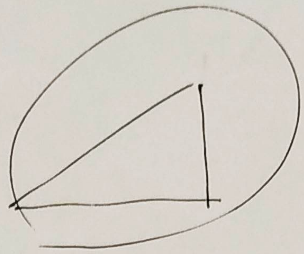
Ответ: $\frac{63}{10} \nu R T_0$; $\frac{5}{6} T_0$; $\frac{-\nu R T_0}{40}$

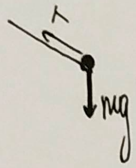
черновик 1



$\arccos\alpha = \frac{8}{17}$

$Ma =$





$\frac{36}{27} = \frac{9 \cdot 4}{9 \cdot 3} =$

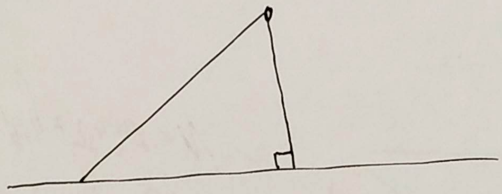
63

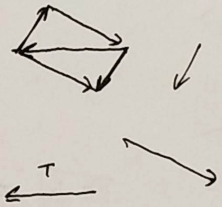
3JR

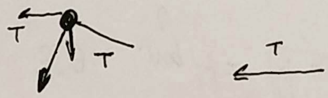
$\frac{3JR}{10}\left(-\frac{1}{6}\right)\left(\frac{1}{2T_0}\right) =$

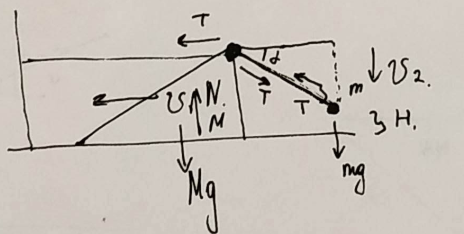
$-\frac{3JRT_0}{120} = -\frac{JRT_0}{40}$

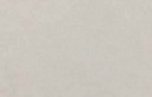
$\frac{3}{6} = \frac{1}{2}$







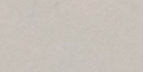


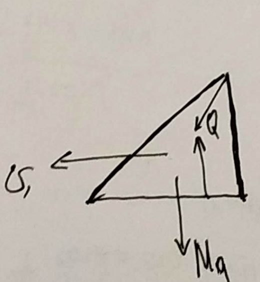


$Q^2 = T^2 + T'^2 - 2T'T\cos\alpha$

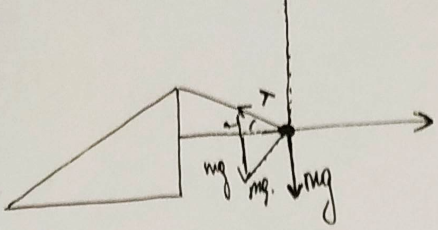
ung ч.т.н. .....

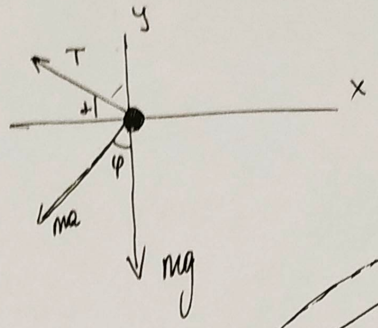
aui.

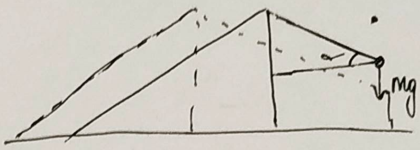




чертовски 2.





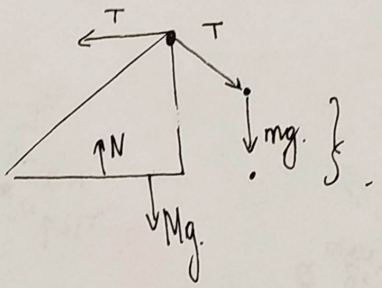


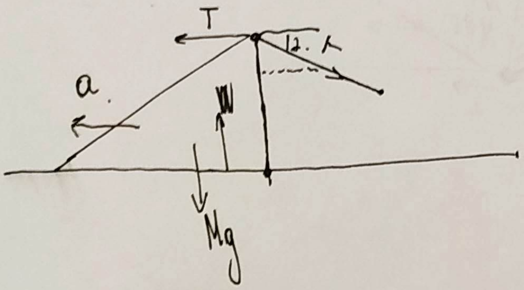
$Ox: \; T \cdot \cos\alpha = ma \sin\varphi$

$Oy: \; T\sin\alpha - mg = ma\cos\varphi$

$mg = T$

$$\frac{T\cdot\cos\alpha}{T\sin\alpha - mg} = tg\varphi.$$





ЗСЭ: $mgH = \frac{MV_1^2}{2}.$

$3T_1^2 - 2T_1T_0 - 3T_1T_0 + 2T_0^2$

$(2T_0^2 - 5T_1T_0)' = 4T_0' - 5T_0$

$4T_1 = 5T_0$

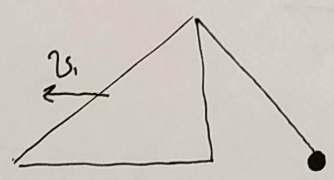
$T_1 = \frac{5}{4}T_0.$

$(3T_1^2 - 5T_1T_0 + 2T_0)'$

$Ox: \; T - T\cos\alpha = Ma_{кл.}$

$Oy: \; Mg - N + T\sin\alpha = 0.$

$Mg + T\sin\alpha = N.$



$6T_1 = 5T_0$

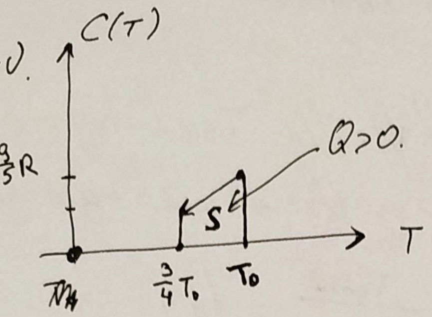
$T_1 = \frac{5}{6}T_0.$

$2T_0^2 - 5T_0T_1 + 3T_1$

3

$C(T) = \frac{9}{5}R\frac{T}{T_0}$. Эмаль $Q<0$. T_0 R $\frac{9}{5}R$ $\frac{3T_0}{4T_0}$ $\frac{27}{20}R$. черновик 3

$Q = C\Delta T \cdot \nu$.



$\delta A = Q \pm S \cdot \nu$

$Q = -S \cdot \nu =$

Ответим столько чти.

$Q = A + \Delta U$.

$\delta Q = \delta T \delta C$. $\Delta T < 0$ $\Delta C < 0$.

$\delta Q = \delta A + dU$. $C\nu dT$

$\delta Q = \nu C(T) \cdot dT$.

$Q = A + \Delta U$.

$\delta A + dU = \nu C(T) \cdot dT$.

$A = Q - \Delta U$

$\delta A = \nu C(T) dT - \frac{3}{2}\nu R dT$.

$\nu dT(C(T) - \frac{3}{2}R)$

$A_{мин} = ?$

T_1 T_0

$S = (T_0 - T_1) \cdot \frac{1}{2}(C(T_0) + C(T_1))\nu$.

$Q = (T_1 - T_0)(C(T_0) + C(T_1))\frac{1}{2}$

Десть $\Delta U = \frac{3}{2}\nu R(T_1 - T_0)$.

$Q = A + \Delta U$

$A = Q - \Delta U = (T_1 - T_0)\left(\frac{9}{5}R + \frac{9}{5}R\frac{T_1}{T_0}\right) \cdot \frac{1}{2}\nu - \frac{3}{2}\nu R(T_1 - T_0)$.

$A(T_1) = ?$ .. $(T_1 - T_0) \cdot \frac{9}{10}\nu R\left(1 + \frac{T_1}{T_0}\right) - \frac{3}{2}\nu R(T_1 - T_0) =$

$\frac{3}{5} + \frac{3T_1}{5T_0} - \frac{5T_0}{5T_0} =$

$\frac{3}{2}\nu R(T_1 - T_0)\left(\frac{3}{5}\left(1 + \frac{T_1}{T_0}\right) - 1\right) = A$..

$3T_0 + \frac{3T_1 - 5T_0}{5T_0} +$

$\frac{3}{2}\nu R(T_1 - T_0)\left(\frac{3T_0 - 2T_1}{5T_0}\right) =$

$(3T_1 - 2T_0)(T_1 - T_0) =$ $\frac{3}{5} + \frac{3}{5}\frac{T_1}{T_0} - \frac{5T_0}{5T_0}$ $= 3T_1 - 2T_0$.

$\frac{3\nu R}{10T_0}\left((T_1 - T_0)(3T_0 - 2T_1)\right)$. $3T_1^2 - 5T_0T_1 + 2T_0 =$

$6T_1 = 5T_0$. $\frac{3T_0}{T_0 5} - \frac{2T_0}{5T_0}$

$3T_0T_1 + 2T_1^2 - 3T_0^2 + 2T_0T_1$ $T_1 = \frac{6}{5}T_0$ $\frac{3T_0 - 2T_1}{5T_0}$.

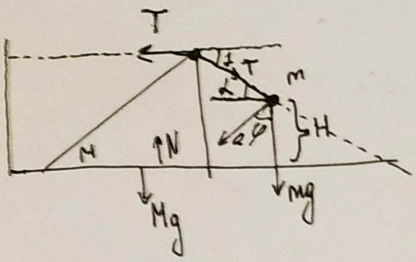
$\frac{3\nu R}{10T_0}\left(-3T_0^2 + 5T_0T_1 + 2T_1^2\right)$ $2T$ $2T_1^2 + 5T_0T_1 - 3T_0^2$

$2T_1 + 5T_0 = 0$ $T_1 = -\frac{5}{2}T_0$.

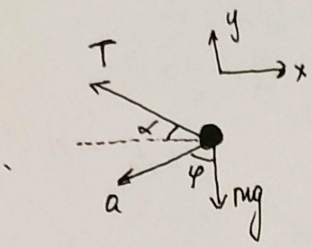
нельзя $-\frac{5}{2}T_0$.

$\cos\alpha = \frac{8}{17}$

черновик №4.



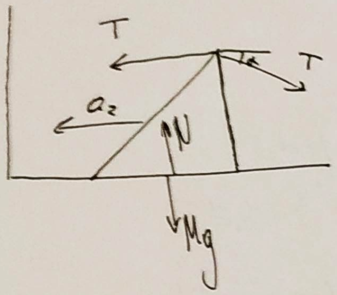
1. Рассмотрим шар отдельно:



2зН: $O_y: T\sin\alpha - mg = a_1 m\cdot\cos\varphi$

$O_x: +T\cos\alpha = +a_1 m \sin\varphi$

$$\frac{T\cos\alpha}{T\sin\alpha - mg} = tg\varphi.$$

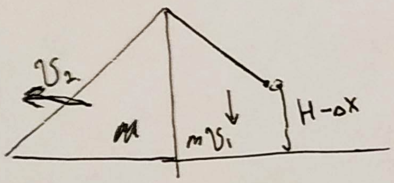


$Ma_2 = T - T\cos\alpha.$

$Ma_2 = T(1-\cos\alpha).$

$$a_2 = \frac{T(1-\cos\alpha)}{M}.$$

a_1 − ?



$$\frac{Mv_2^2}{2} + \frac{mv_1^2}{2} + mg(H-\Delta x).$$

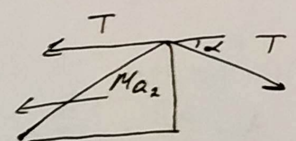
1

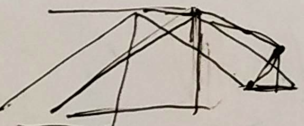
$mv_2^2 + mv_1^2 + 2mgH - 2mgX$

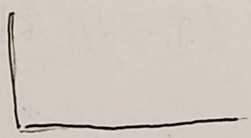
$2mv_2\cdot a_2 + 2mv_1 a_1 + 0 = -2mgv_1$

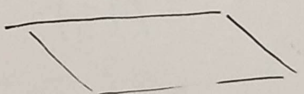
$2Mv_2 a_2 + 2mv_1(a_1 - 1) = 0.$

$H\,tg\alpha = \frac{a_2 t^2}{2}$



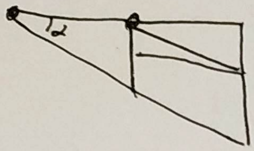


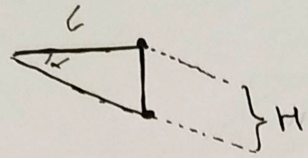




черновик 5:

Клин пройдет $H \cdot tg\alpha$ м.



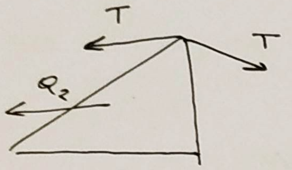


$L =$

$\frac{H}{L} = tg\alpha.$

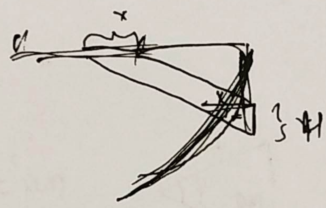
$L = tg\alpha \cdot H.$

$L = tg\alpha \cdot H$ дальше ускорения нет у стола иначе и т.д.

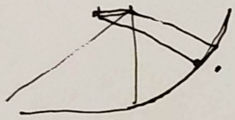


Находим отношение гор. проекций ускорений.

$T - T\cos\alpha = Ma_2.$



$x = tg\alpha H$



$2S$ ~~...~~

$S = \frac{at_1^2}{2}$ ⟷

$a_2 = tg\alpha \cdot a_{1x}$

$\cos\alpha = \frac{8}{17}$

$tg\alpha H = \frac{a_2 t^2}{2}$

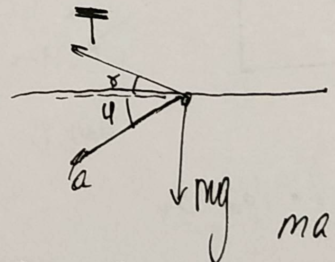
$H = \frac{a_1 t^2}{2}$

$tg\alpha = \frac{a_2}{a_1}$

289

$\frac{289-64}{17^2} = \frac{15}{17}.$

$T(1-\cos\alpha) = M \cdot tg\alpha \cdot a_{1x}.$



$T(1-\cos\alpha) = M \cdot \sin\alpha \cdot \frac{T}{m}$

$\sin\alpha = \frac{15}{17}.$

$ma\sin\varphi = T\cos\alpha.$

$a_1x = T$

$a_{1x} = Ma\sin\varphi =$

$a\sin\varphi = \frac{T\cos\alpha}{m}.$

$1-\cos\alpha = \frac{M}{m}\sin\alpha.$

$1 - \frac{8}{17} = \frac{M}{m} \cdot \frac{15}{17}.$

$15M = 9m.$

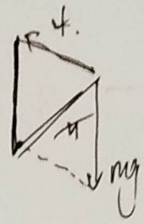
$17 - 8 = 15\frac{M}{m}$

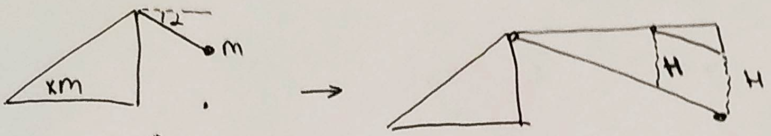
$\frac{9}{15} = \frac{9m}{15m}$

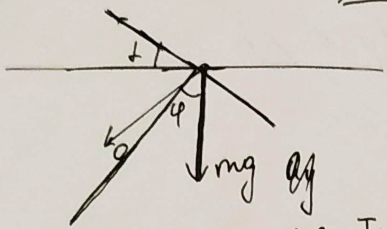
Ответ $\frac{9}{15}$

$15M =$

черновик 6.







$H = \frac{a_{1y} t^2}{2}$

$H \operatorname{tg}\alpha = \frac{a_2 t^2}{2}.$

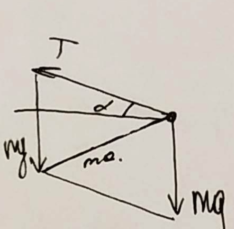
$mg - T\sin\alpha = m a_y.$ $\qquad \operatorname{tg}\alpha = \frac{a_2}{a_{1y}}$

$T(\cancel{\sin}\,1-\cos\alpha) = M a_2.$

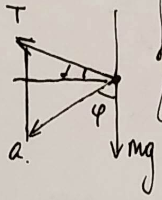
$a_2 = \operatorname{tg} a_{1y}.$

$T(1-\cos\alpha) = xm \operatorname{tg}\alpha\, a_{1y}.$

y



$mg^2 = T^2 + (ma)^2$



$$\begin{cases} \frac{a_y t^2}{2} = H \\ \frac{a_2 t^2}{2} = H \operatorname{tg}\alpha. \end{cases}$$

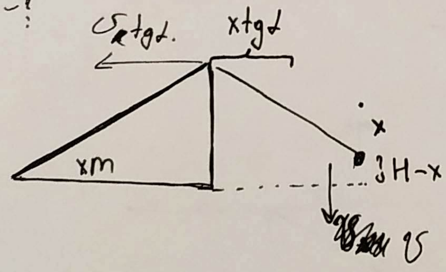
$\frac{a_2}{a_y} = \operatorname{tg}\alpha$

$a_2 = \operatorname{tg}\alpha \cdot a_y.$

$a_y = a \cdot \sin\varphi.$

$a_2 =$

a_y –?



m.

$v_1 = t \cdot \operatorname{tg}\alpha \cdot a_y$

$v_2 = t \cdot a_y.$

$a_y.$

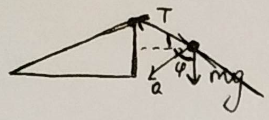
$x \frac{(v\operatorname{tg}\alpha)^2}{2} + \frac{v^2}{2} + 2g(H - l)' = 0.$

$x v^2 \operatorname{tg}\alpha^2 + v^2 + 2gH - 2gl' = 0 \qquad 2a_y($

$x\operatorname{tg}\alpha \cdot 2a_y + 2a_y + 0 - 2g = 0$

$x\operatorname{tg}\alpha\, 2a_y + 2a_y - 2g = 0.$

черновик.

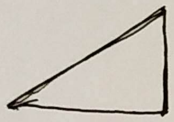


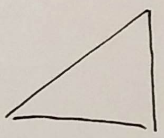
$$mg - T\sin\alpha = ma\cos\varphi$$

$$T\cos\alpha = ma\sin\varphi$$

$$\cancel{tg\varphi =}\ tg\varphi = \frac{T\cos\alpha}{mg - T\sin\alpha} = \frac{T\cos\alpha}{mg} - ctg\alpha = tg\,\cancel{\varphi}$$

T от mg - ?





Часть 2

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

Шифр: **21200186**

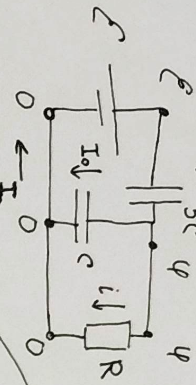
ID профиля: **808752**

Вариант 4

ЧЕРНОВИК 2.

$\downarrow i$ $\uparrow i$

$\mathcal{E}_{si} = B\upsilon L$ $B\upsilon L$

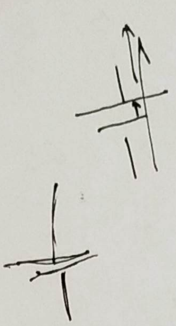


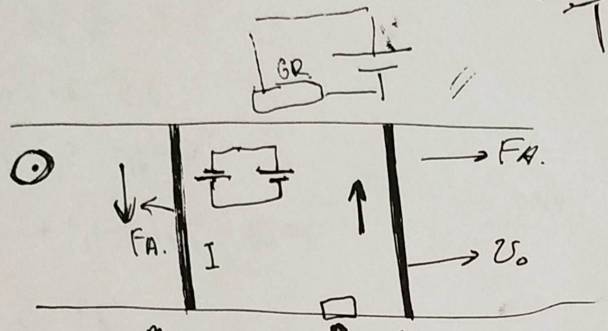
$I_0 = C(\varphi)'$ $i = \frac{\varphi}{R}$

$I = I_0 + i$

$I = C(\varphi)' + \frac{\varphi}{R}$

$I_0 = C\varphi'$ $C = U'$





опер. чтд.

t - пр. прил. времени.

было так сказано.

$BL = \frac{B}{M}$

B. $\frac{m}{2}$ 5R. R 2m R

6R.

$F_A \longrightarrow = BIL \sin\alpha$. $B\upsilon L = \mathcal{E}$.

$F_A = BIL$ $\mathcal{E}_{si} = B\upsilon L$.

$B\upsilon L$

$E = B$

$\mathcal{E} = B\upsilon L$.

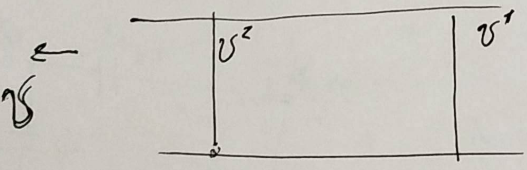
$\upsilon_0 + \frac{at^2}{2}$.

υ υ $\upsilon_0 + at =$ $BL = \frac{B}{M}$

$\frac{B}{M}$

В чём момент их скорости уравнения?

$B\upsilon' = B\upsilon^2$ $\upsilon_1 = \upsilon_2$. равны.



$\upsilon_1 = a_1 t + \upsilon_0 = a_2 t$

$\upsilon_2 = a_2 t$

Гл. И.

$\frac{\text{кг} \cdot \text{м}^2 \cdot \text{Ом}}{\text{Вт}}$

$\frac{R}{\upsilon} = \frac{1}{I}$

$t(a_2 - a_1) = \upsilon_0$. $IR = \upsilon$

$\frac{R}{\upsilon} = \frac{1}{I}$.

$\frac{B\upsilon_0 L}{6R} = I$ $\frac{B^2L^2\upsilon_0}{6R} = \frac{m}{2} a_2 = 2ma_1$

$t \; \frac{3B^2L^2\upsilon_0}{3 \cdot 4Rm} = \upsilon_0 1$. кг.м

mgh

$a_2 = \frac{4B^2L^2\upsilon_0}{12Rm}$ $a_1 = \frac{B^2L^2\upsilon_0}{12Rm}$

$t = \frac{4Rm}{B^2L^2}$ $\frac{\text{Ом} \cdot \text{кг}}{\text{м} \cdot \text{м} \cdot \text{Т} \cdot \text{Т}}$

$\frac{mgh}{p} = t$.

$S =$

$S = \frac{a_2 t^2}{2} = \frac{4B^2L^2\upsilon_0}{12R} \cdot \frac{4^2R^2 \cdot m^2}{B^2L^2B^2L^2}$

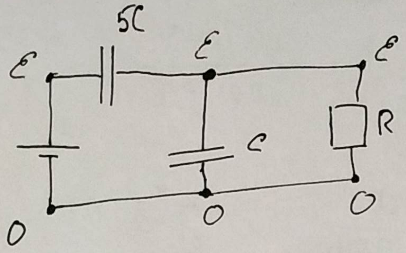
$\frac{\upsilon_0}{3} \cdot \frac{16R}{B^2L^2} =$

$\frac{\text{кг} \cdot \text{м}^2}{\text{Вт}}$ $\frac{\text{кг} \cdot \text{м} \cdot \text{м}}{\text{Вт}} =$ $\frac{mh}{p} = \frac{t}{g}$ $\frac{\text{с}}{\text{кг}}$

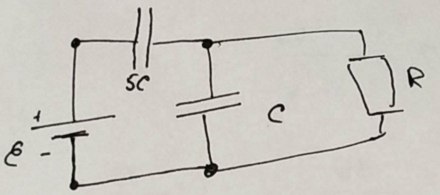
$\frac{\upsilon_0 16R}{3B^2L^2}$

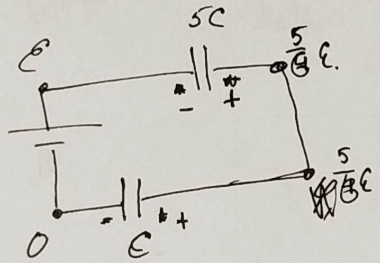
$\frac{\text{с} \cdot \text{м}}{\text{м}^2} = \frac{\text{с}}{\text{м}}$

ЧЕРНОВИК 1.



Сразу после замыкание





был 0 стал $-(\mathcal{E}-\varphi_1)5C$

был 0 стал $\varphi_1 C$

$5C(\varphi_1-\mathcal{E}) = \varphi_1 C$

$5\varphi = 5\mathcal{E}+\varphi$

$4\varphi = 5\mathcal{E}$

$\varphi = \frac{5}{4}\mathcal{E}$.

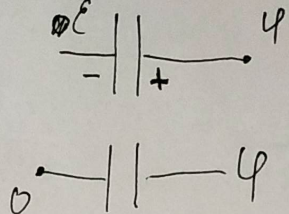
$0+0 = +(\varphi-\mathcal{E})5C + \varphi C = 0$.

$(\varphi-\mathcal{E})5 + \varphi = 0$

$5\varphi+\varphi = \mathcal{E}\varphi$

$\cancel{\varphi = \frac{5}{6}}$

$I_c = CU' \quad (q') = C(U')$.



$-(\mathcal{E}-\varphi)5C$
$+(\varphi-\mathcal{E})5C$

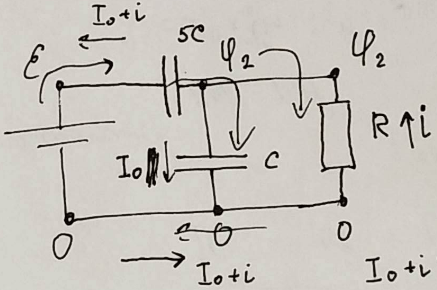
$0+0 = 5(\varphi-\mathcal{E}) + \varphi C$

$6\varphi - 5\mathcal{E} = 0$

$\varphi = \frac{5}{6}\mathcal{E}$.

$I = CU'$

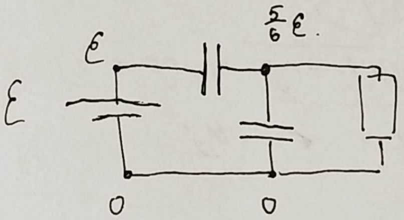
$U' = \frac{\Delta U}{\Delta t}$.



$U = (\mathcal{E}-\varphi_2)'$

$I_0+i = 5CU'$

$i = \frac{\varphi_2}{R}$



$I_0+i = 5C(\mathcal{E}-\varphi_2)'$

$U = (\mathcal{E}-\varphi)' =$

$\mathcal{E} - \varphi'$

был

I_0

$+18$
5

-150
90
$+15$

$40+50$

$60+15 = 75$

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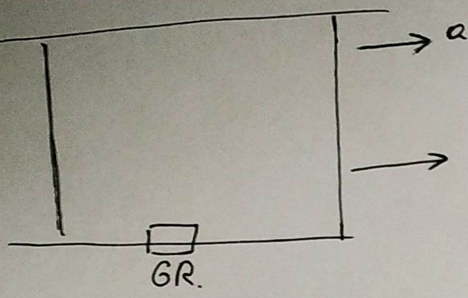
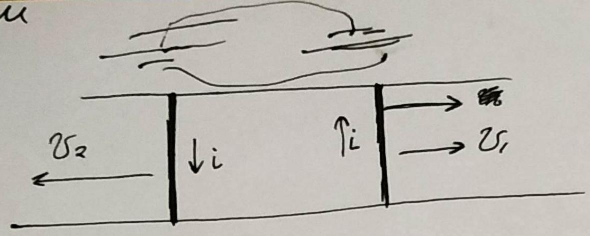




Fa. ~~работу~~

$F(A)(I)$.

$F(A)$.

$F(A) = BIL$.

$I = \frac{\mathcal{E}}{R} = \frac{BvL}{R}$.

$FA = \frac{B^2L^2v}{R} \to v_{изм}$.

$a = F(v)$.

$i = \frac{\mathcal{E}_\Sigma}{6R}$ $\mathcal{E}_\Sigma = Bv_2L - BLv_1 =$

$BL(v_1 - v_2)$

$\frac{BL(v_1-v_2)}{6R} = i$

$\frac{B^2L^2(v_1-v_2)}{6R} = F_a$.

$2ma_1 + \frac{m}{2}a_2$.

$\frac{B^2L^2(v_1-v_2)}{6R} = 2ma_1$

$\frac{B^2L^2(v_1-v_2)}{6R} = \frac{m}{2}a_2$.

v' u u u u

$$\frac{B^2L^2(v_1-v_2)}{3} = \cancel{2}\, m\left(2a_1 + \frac{a_2}{2}\right)$$

$$B^2L^2v_1 - B^2L^2v_2 = 3m\left(2\frac{\Delta v_1}{\Delta t} + \frac{\Delta u_2}{\Delta t \cdot 2}\right)$$

$$B^2L^2\underbrace{v_1\Delta t}_{S_1} - B^2L^2\underbrace{v_2\Delta t}_{S_2} = 3m\left(2\Delta v_1 + \Delta u_2 \frac{1}{2}\right).$$

$$B^2L^2S_1 - B^2L^2S_2 = 3m\left(2(u - v_0) + \frac{1}{2}(u)\right) =$$

u - ?

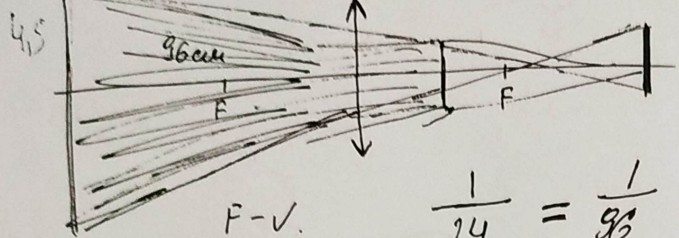
$$B^2L^2(S_1 + S_2) = 3m\left(2u_1 - 2v_0 + \frac{1}{2}u\right).$$

$$S_1 + S_2 = \frac{3m\left(\frac{5}{2}u_1 - 2v_0\right)}{B^2L^2}$$

черновик 3

черновик 4.

4,5



F-V.

$$\frac{1}{24} = \frac{1}{96} + \frac{1}{x}.$$

24·3=

$$\frac{4}{96} - \frac{1}{96} = \frac{1}{x}.$$

$$\frac{3}{96} = \frac{1}{x}$$

$x = 32$ см.

$$32 \quad \frac{1}{x} = \frac{1}{32}$$

$$\frac{\cancel{2}mv_0^2}{\cancel{2}} = \frac{mv_1^2}{2\cdot 2} + \frac{2mv_2^2}{2}.$$

$$4v_0^2 = v_1^2 + 4v_2^2$$

$$2mv_0 = \cancel{2} \frac{m}{2} v_1 + 2mv_2$$

$$\begin{cases} 4v_0 = v_1 + 4v_2 \\ 4v_0^2 = v_1^2 + 4v_2^2 \end{cases} \quad v_1 = 4(v_0 - v_2)$$

$$4v_0^2 = 16(v_0 - v_2)^2 + 4v_2.$$

$$4v_0 = 16v_0^2 + 16v_2 - 32v_0v_2 + 4v_2.$$

$$4(v_0 - v_2) = v_1$$

$$4(v_0 - v_2)(v_0 + v_2) = v_1^2$$

$$v_1(v_0 + v_2) = v_1^2$$

$$v_1 = v_0 + v_2.$$

$$4v_0 = v_0 + v_2 + 4v_2$$

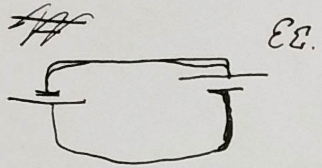
$$3v_0 = \cancel{\;\;} 5v_2$$

$$v_2 = \frac{3}{5} v_0$$

$$v_1 = v_0 + \frac{3}{5} v_0 = \frac{8}{5} v_0$$

$v_1 = v_0 \ldots\ldots$

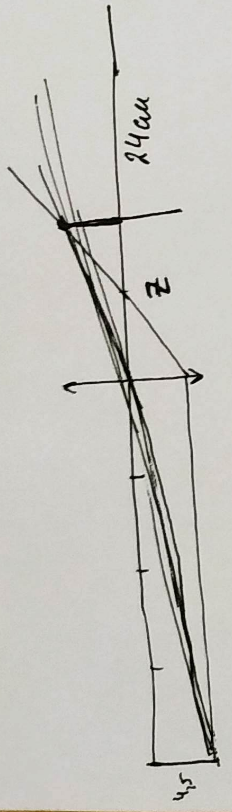
В какой-то момент они сравняются скорости.



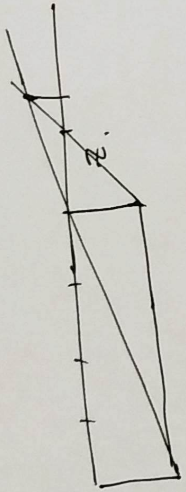
$V_0 2m = V \frac{5}{42} m$

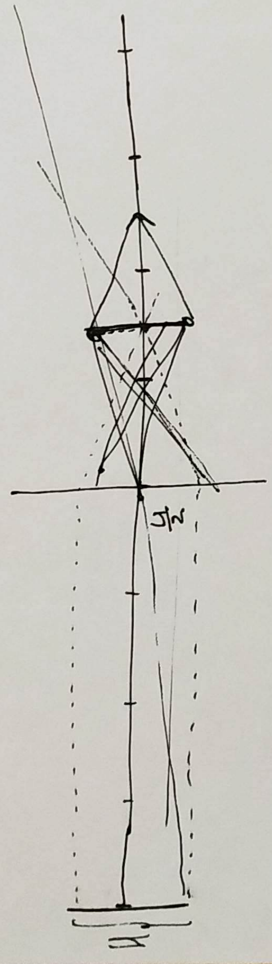
$\frac{4}{5} V_0$ иметь будут.

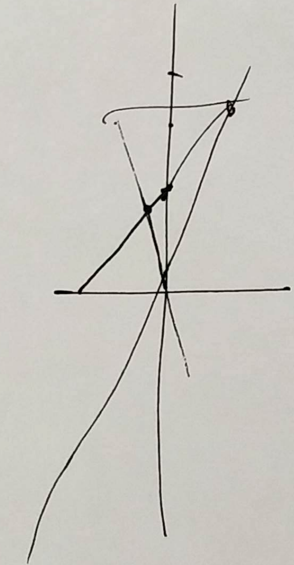
черновик 5.

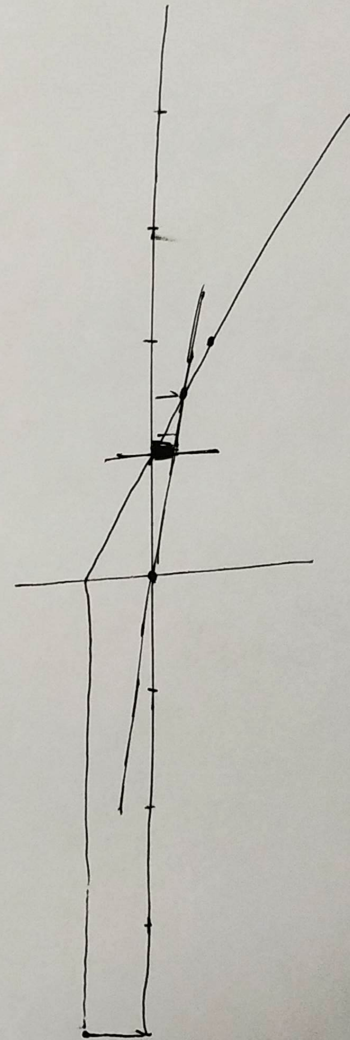


Z.



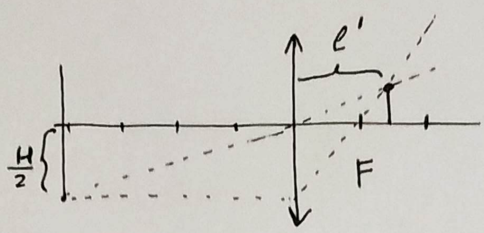






чистовик 3

№5.
$H = 9$ см
$L = 96$ см $F = 24$ см
$l = 24$ см $x - ?$
$D_м - ?$ $Z - ?$



1. l' – расстояние, на котором видно чёткое изображение, т.е глаз сфокусирован именно сюда.

т.е $x = l' + l$ Найдем l' $\frac{1}{F} = \frac{1}{L} + \frac{1}{l'}$ $\frac{4}{96} - \frac{1}{96} = \frac{1}{l'}$

$l' = 32$ см.

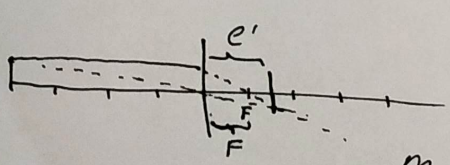
$x = 24 + 32 = 56$ см.

2. Из рисунка видно, что параллельн Г.О.О пучок света прилипится лишь тогда, когда $R_м \geq 4{,}5$ см $\rightarrow D_{мин} \geq 9$ см.

$D_{мин} = 9$ см.

3 ~~(Малый экран стоит поставить в точке пересечения приломленных лучей, т.е на расстоянии $L + l' = 96 +$)~~

Чтобы размер экрана был минимальным, необходимо чтобы он закрыл участок, где рассто меж лучами минимально – это на расстояние F от линзы.



т.е $Z = L + F = 120$ см.

Ответ: 56 см; 9 см; 120 см.

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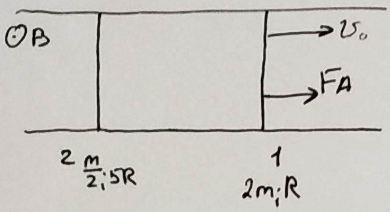
a_0 U_1-? ~~...~~ S_1+S_2. чистовик 2
U_2

№4. В начальный момент из-за v_0 возникнет $\mathcal{E}_{si}$ индукции, из-за которой возникнет I, который породит силу ампера → из-за которой возникнет ускорение.



$$\mathcal{E}_{si} = BvL$$

$$I_0 = \frac{\mathcal{E}_{si}}{R_\Sigma} = \frac{BvL}{6R}$$

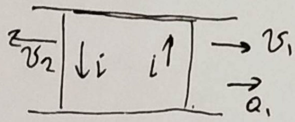
$$F_A = I_0 BL = \frac{B^2L^2v}{6R}$$

По 2 з Н

$$\frac{B^2L^2v}{6R} = 2ma_0$$

$$a_0 = \frac{B^2L^2v}{12Rm}$$

Рассмотрим произвольный момент времени:



$$\mathcal{E}_\Sigma = BL(v_1+v_2) \quad I = \frac{\mathcal{E}_\Sigma}{6R} = \frac{BL(v_1+v_2)}{6R}$$

$$F_A = \frac{B^2L^2(v_1+v_2)}{6R} = 2ma_1$$

$$\frac{B^2L^2(v_1+v_2)}{6R} = 2m\frac{\Delta v_1}{\Delta t} \quad v_1+v_2 = u_{отн}.$$

$$\frac{u_{отн}\cdot\Delta t\cdot B^2L^2}{6R} = 2m\Delta v_1 \quad \text{Просуммируем: } \frac{(\sum u_{отн}\cdot\Delta t)B^2L^2}{6R} = 2m\sum\Delta v_1$$

$\sum u_{отн}\cdot\Delta t = S_1+S_2$ – расстояние между перемычками.

$$(S_1+S_2)B^2L^2 = 6R\cdot 2m(U_2-v_0) \quad S_1+S_2 = \frac{12mR(U_2-v_0)}{B^2L^2} \text{ где}$$

U_2 – скорость через пр. пром. времени.

~~3.~~
$$\cancel{\begin{cases}\frac{2mv_0^2}{2} = \frac{2mU_2^2}{2} + \frac{mU_1^2}{2\cdot 2} \to 4v_0^2 - 4U_2^2 = U_1^2 \quad 4(v_0-U_2)(v_0+U_2) = U_1^2\\ 2mv_0 = 2mU_2 + \frac{m}{2}U_1 \to 4(v_0-U_2) = U_1 \quad \to U_1(v_0+U_2) = U_1^2 \quad U_1 = v_0+U_2\end{cases}}$$

~~Тогда: $4v_0 - 4U_2 = v_0+U_2$ $U_2 = \frac{3}{5}v_0$ $U_1 = \frac{5v_0}{5} + \frac{3}{5}v_0 = \frac{8}{5}v_0$.~~

~~S_1+S_2~~

Ответ: 1. $\frac{B^2L^2v}{12mR}$ 2. — 3. $\frac{12mR(U_2-v_0)}{B^2L^2}$

где U_2 – ответ на вопрос 2

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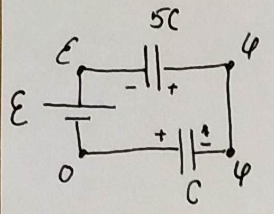
чистовик 1.

№3 Рассмотрим уст. режим:

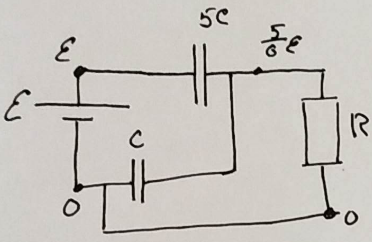


1. Из ЗСЗ и метода узл. потенциалов:

$0+0 = +5C(\varphi-\varepsilon) + -C(0-\varphi) \to 5\varphi - 5\varepsilon + \varphi = 0 \quad \varphi = \frac{5}{6}\varepsilon.$

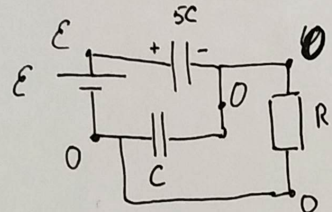
Не верно стоят знаки зарядов, учтем это дальше.

Сразу после замыкания ключа U_C и U_{5C} не изменилось сначала:



Тогда по закону Ома $\underline{I_R = \left(\frac{5}{6}\varepsilon - 0\right)\cdot\frac{1}{R} = \frac{5\varepsilon}{6R}}$

2. В новом уст. режиме $I_C = 0 \to I_R = 0 \to U_R = 0$.



$U_C = 0$, а $U_{5C} = \varepsilon$

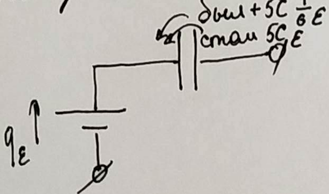
Момент сразу после замыкания:

$W(0) = \frac{1}{2}C\left(\frac{5}{6}\varepsilon\right)^2 + \frac{1}{2}\cdot 5C\left(\frac{1}{6}\varepsilon\right)^2 = \frac{1}{2}C\cdot\frac{25}{36}\varepsilon^2 + \frac{1}{2}5C\cdot\frac{1}{36}\varepsilon^2 =$

$= \frac{25+5}{36\cdot 2}C\varepsilon^2 = \frac{15}{36}C\varepsilon^2$

В новом уст режиме $W(1) = \frac{1}{2}5C\cdot\varepsilon^2 = \frac{5}{2}C\varepsilon^2$.

Найдем q_ε



т.е $q_\varepsilon = 5C\varepsilon - \frac{5}{6}C\varepsilon = \frac{25}{6}C\varepsilon \to$

$A_Б = q_\varepsilon\cdot\varepsilon = \frac{25}{6}C\varepsilon^2$

Тогда: ЗСЭ: $A_Б = W(1) - W(0) + Q \quad Q = A_Б - W(1) + W(0)$

$Q = \frac{25}{6}C\varepsilon^2 - \frac{5}{2}C\varepsilon^2 + \frac{15}{36}C\varepsilon^2 = C\varepsilon^2\left(\frac{25\cdot 6}{36} - \frac{18\cdot 5}{36} + \frac{15}{36}\right) = C\varepsilon^2\frac{75}{36}$

$\underline{Q = \frac{75}{36}C\varepsilon^2}$ 3. ——

Ответ: 1. $\frac{5\varepsilon}{6R}$ 2. $\frac{75}{36}C\varepsilon^2$ 3. —