Часть 1

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

Шифр: **21202178**

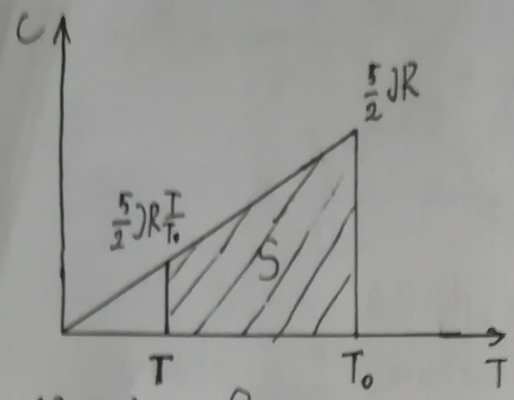
ID профиля: **282696**

Вариант 2

Чистовик

№2

Найдём зависимость Q от T, до которого охладим гелий:



$$Q = -S = -\left[(T_0 - T)\cdot\frac{5}{2}\nu R\frac{T}{T_0} + (T_0 - T)\cdot\frac{\frac{5}{2}\nu R - \frac{5}{2}\nu R\frac{T}{T_0}}{2}\right] =$$

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

$$= (T - T_0)\frac{5}{2}\nu R\left(\frac{1}{2} + \frac{T}{2T_0}\right) = (T - T_0)\frac{5}{4}\nu R\left(1 + \frac{T}{T_0}\right)$$

1. Найдём Q_1:

$$Q_1 = -Q\left(\frac{T_0}{2}\right) = \left(T_0 - \frac{T_0}{2}\right)\frac{5}{4}\nu R\left(1 + \frac{1}{2}\right) = \frac{15}{16}\nu R T_0$$

2. Пусть $T = T_0 k$, тогда

$$Q = (T_0 k - T_0)\frac{5}{4}\nu R(1+k) = (1+k)(k-1)\frac{5}{4}\nu R T_0$$

3. По ЗСЭ:

$$Q = \Delta U + A \Rightarrow A = Q - \Delta U = (1+k)(k-1)\frac{5}{4}\nu R T_0 - \frac{3}{2}\nu R(T - T_0) =$$

$$= (1+k)(k-1)\frac{5}{4}\nu R T_0 - \frac{3}{2}\nu R T_0(k-1) = \nu R T_0(k-1)\left(\frac{5}{4}(k+1) - \frac{3}{2}\right) =$$

$$= \nu R T_0(k-1)\left(\frac{5}{4}k + \frac{5}{4} - \frac{6}{4}\right) = \nu R T_0(k-1)\left(\frac{5}{4}k - \frac{1}{4}\right) = \frac{1}{4}\nu R T_0(k-1)(5k-1)$$

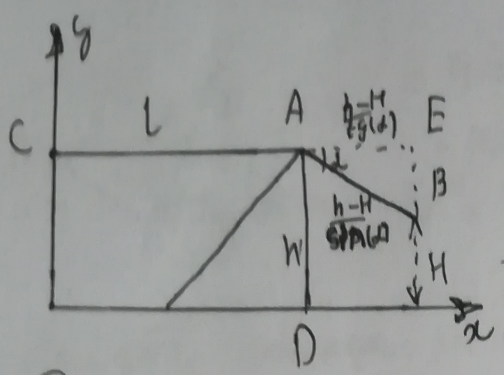
4. $(k-1)(5k-1)$ – парабола, корни $k_1 = 1$, $k_2 = \frac{1}{5} \Rightarrow k_{min} = \frac{k_1 + k_2}{2} = \frac{\left(\frac{6}{5}\right)}{2} = \frac{3}{5}$

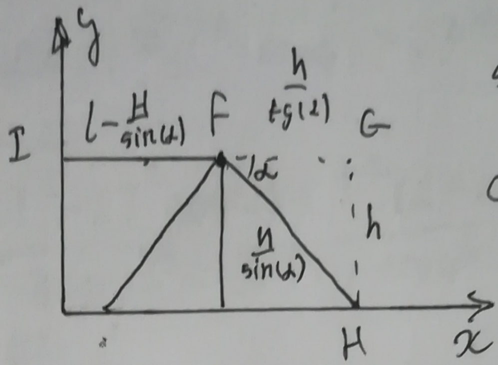
5. $A_{min} = \frac{1}{4}\nu R T_0\left(\frac{3}{5} - 1\right)(3 - 1) = \frac{1}{4}\cdot\left(-\frac{2}{5}\right)\cdot 2\,\nu R T_0 = -\frac{1}{5}\nu R T_0$

Ответ: $\frac{15}{16}\nu R T_0$; $\frac{3}{5}T_0$; $-\frac{1}{5}\nu R T_0$

Чистовик

N1.





$\cos(\alpha)=\frac{4}{5} \Rightarrow$

$\sin(\alpha)=\frac{3}{5}$

$tg(\alpha)=\frac{3}{4}$

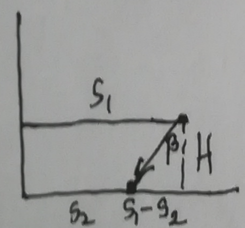
$ctg(\alpha)=\frac{4}{3}$

1. Пусть $AC=l$, $AD=h$, тогда $EB=h-H \Rightarrow$ $\Rightarrow AB=\frac{h-H}{\sin(\alpha)}$, тогда длина нити $l+\frac{h-H}{\sin(\alpha)}$; $AE=\frac{h-H}{tg(\alpha)}$

2. После того, как шар упал:

$GH=h \Rightarrow FH=\frac{h}{\sin(\alpha)}$, но $CA+AB=IF+FH \Rightarrow IF=CA+AB-FH=$ $=l+\frac{h-H}{\sin(\alpha)}-\frac{h}{\sin(\alpha)}=l-\frac{H}{\sin(\alpha)}$; $FG=\frac{h}{tg(\alpha)}$

3. Изобразим начальное и конечное положение шара:



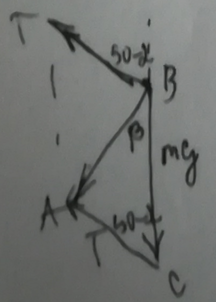
$$S_1=CA+AE=l+\frac{h}{tg(\alpha)}-\frac{H}{tg(\alpha)}$$

$$S_2=IF+FG=l-\frac{H}{\sin(\alpha)}+\frac{h}{tg(\alpha)}$$

$$S_1-S_2=\frac{H}{\sin(\alpha)}-\frac{H}{tg(\alpha)}=H\left(\frac{1}{\sin(\alpha)}-\frac{1}{tg(\alpha)}\right)$$

$tg(\beta)=\frac{S_1-S_2}{H}=\frac{1}{\sin(\alpha)}-\frac{1}{tg(\alpha)}=\frac{5}{3}-\frac{4}{3}=\frac{1}{3} \Rightarrow \boxed{tg(\beta)=\frac{1}{3}}$, β - угол между ускорением шара и вертикалью

4. Рассмотрим силы, действующие на шар:

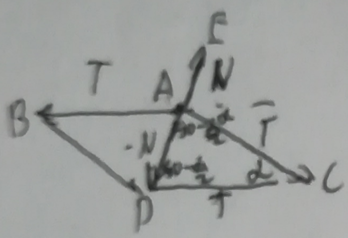


$\Delta BAC=180-\beta-90+\alpha=90-\beta+\alpha$

$$\frac{mg}{\sin(90-(\beta-\alpha))}=\frac{T}{\sin(\beta)} \quad T=\frac{\sin(\beta)}{\cos(\beta-\alpha)}mg$$

Чистовик

5. Рассмотрим силы, действующие на A.



$\angle BAD = \angle DAC = \frac{180-\alpha}{2} = 90 - \frac{\alpha}{2} \Rightarrow \angle ADC = \angle DAC = 90 - \frac{\alpha}{2} \Rightarrow$

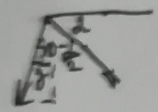
$\Rightarrow \angle C = \alpha$

$N^2 = T^2 + T^2 - 2T^2\cos(\alpha) = T^2(2 - 2\cos(\alpha)) \Rightarrow$

$\Rightarrow N = T\sqrt{2-2\cos(\alpha)} = \sqrt{2}\,T\sqrt{1-\cos(\alpha)} = 2T\sin(\frac{\alpha}{2})$

6. Найдём проекцию N на Ox:

$\gamma = (90 - \frac{\alpha}{2} + \alpha) - 90 = \frac{\alpha}{2} \Rightarrow N_x = 2T\sin(\frac{\alpha}{2})\cdot\sin(\frac{\alpha}{2}) = 2T\sin^2(\frac{\alpha}{2})$

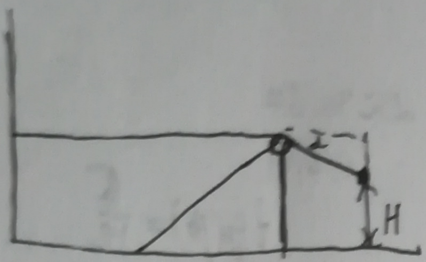


7. По ЗСЭ: $mgH = \frac{MV_к^2}{2} + \frac{mV_м^2}{2}$

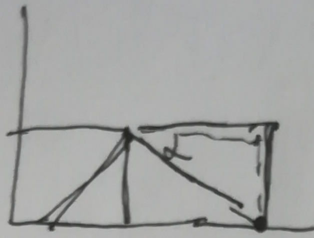
Ответ: 1) $\mathrm{arctg}(\frac{1}{3})$

Черновик

1. $\frac{5}{12}$

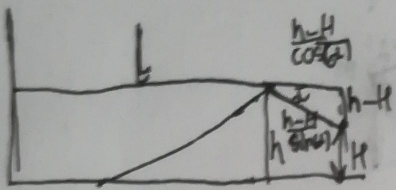


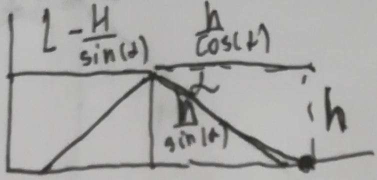
$=>$

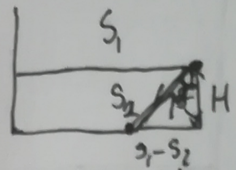


$\cos(\alpha)=\frac{4}{5}$

$\sin(\alpha)=\frac{3}{5}$







$H\left(\frac{1}{\sin(\alpha)}-\frac{1}{\cos(\alpha)}\right)$

$L+\frac{h-H}{\sin(\alpha)}$ − длина нити

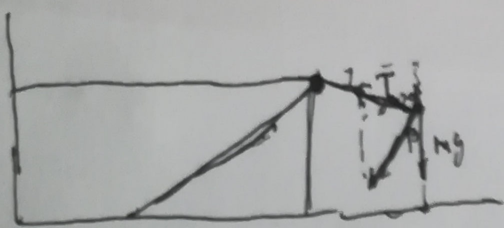
$L+\frac{h}{\sin(\alpha)}-\frac{H}{\sin(\alpha)}$

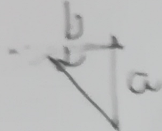
$tg(\beta)=\frac{H\left(\frac{1}{\sin(\alpha)}-\frac{1}{\cos(\alpha)}\right)}{H}=\frac{1}{\sin(\alpha)}-\frac{1}{\cos(\alpha)}=\frac{5}{3}-\frac{5}{4}=\frac{20}{12}-\frac{15}{12}=\frac{5}{12}$

$S_1=L+\frac{h-H}{\cos(\alpha)}$ $\qquad S_2=L-\frac{H}{\sin(\alpha)}+\frac{h}{\cos(\alpha)}$

$S_1-S_2==\cancel{L}+\frac{h-H}{\cos(\alpha)}\cancel{-L}+\frac{H}{\sin(\alpha)}-\frac{h}{\cos(\alpha)}=\frac{H}{\sin(\alpha)}-\frac{H}{\cos(\alpha)}$

$\frac{1}{\sin(\alpha)}-\frac{1}{\cos(\alpha)}=\frac{\cos(\alpha)-\sin(\alpha)}{\sin(\alpha)\cos(\alpha)}$ $\qquad tg(\beta)=\frac{5}{12}$





$\frac{a}{b}=tg(\alpha)$

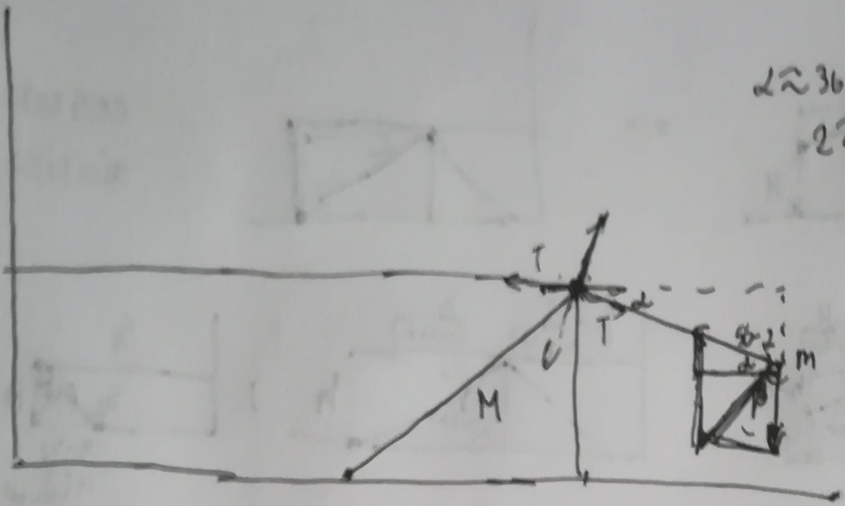
$b=\frac{a}{tg(\alpha)}$

Черновик

$\alpha \approx 36.87$

$22{,}61$

$tg(\beta) = \frac{5}{12}$



Черновик

$A = (T_0 - T)\frac{5}{4}\nu R\left(1+\frac{T}{T_0}\right) - \frac{3}{2}\nu R(T_0 - T$

$T = kT_0$

$A = (T_0 - kT_0)\frac{5}{4}\nu R k - \frac{3}{2}\nu R(T_0 - T)$

$(Q<0) = (T - T_0)\frac{5}{4}\nu R\left(1+\frac{T}{T_0}\right)$

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

$A = (T - T_0)\frac{5}{4}\nu R\left(1+\frac{T}{T_0}\right) - \frac{3}{2}\nu R(T - T_0)$

$A = (kT_0 - T_0)\frac{5}{4}\nu R(1+k) - \frac{3}{2}\nu R(kT_0 - T_0) = \nu R T_0(k-1)\left(\cancel{\frac{5}{4}} - \frac{3}{2}\right.$

$= \nu R T_0(k-1)\left(\frac{5}{4}(k+1) - \frac{3}{2}\right) =$

$= \nu R T_0(k-1)\left(\frac{5}{4}k + \frac{5}{4} - \frac{6}{4}\right) =$

$= \nu R T_0(k-1)\left(\frac{5}{4}k - \frac{1}{4}\right) =$

$= \frac{1}{4}\nu R T_0(k-1)(5k-1)$

$k_1 = 1$

$k_2 = \frac{1}{5}$ $\quad k_{min} = \frac{1+\frac{1}{5}}{2} =$

$= \frac{3}{5}$

$A_{min} = \frac{1}{4}\nu R T_0\left(\frac{3}{5} - 1\right)(3-1) =$

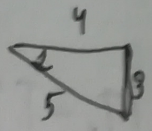
$= \frac{1}{4}\nu R T_0\left(-\frac{2}{5}\right)(2) = -\frac{1}{5}\nu R T_0$

21202178 (U282696 M1265285)

Черновик

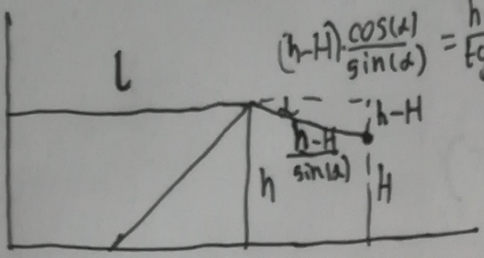
$\sin(\alpha) = \frac{3}{5}$

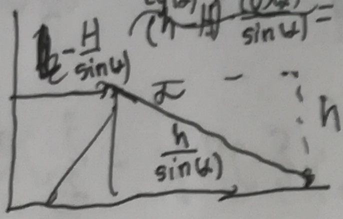
$\frac{h}{tg(\alpha)}$ $\quad tg(\alpha) = \frac{3}{4}$

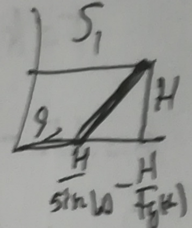


$(h-H)\frac{\cos(\alpha)}{\sin(\alpha)} = \frac{h-H}{tg(\alpha)}$

$\cancel{(h-H)}\frac{\cos(\alpha)}{\sin(\alpha)} =$







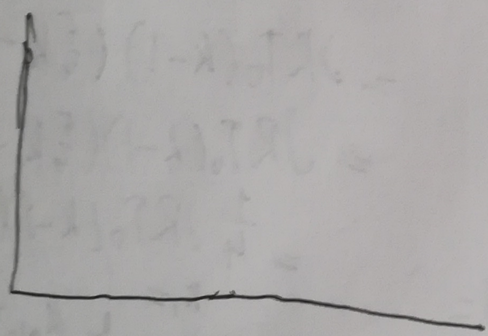
$L_{общ} = l + \frac{h-H}{\sin(\alpha)}$

$S_1 = l + \frac{h-H}{tg(\alpha)}$ $\qquad S_2 = l - \frac{H}{\sin(\alpha)} + \frac{h}{tg(\alpha)}$ $\qquad tg(\beta) = \frac{1}{\sin(\alpha)} - \frac{1}{tg(\alpha)}$

$= \frac{5}{3} - \frac{4}{3} = \frac{1}{3}$

$tg(\alpha) = \frac{1}{3}$

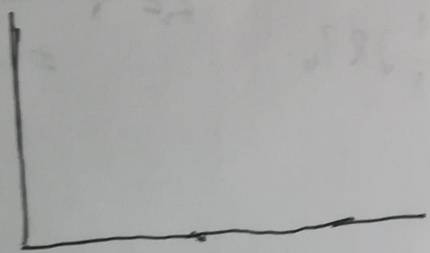
$S_1 - S_2 = \cancel{l} + \cancel{\frac{h}{tg(\alpha)}} - \frac{H}{tg(\alpha)} - \cancel{l} + \frac{H}{\sin(\alpha)} - \cancel{\frac{h}{tg(\alpha)}} = \frac{H}{\sin(\alpha)} - \frac{H}{tg(\alpha)}$



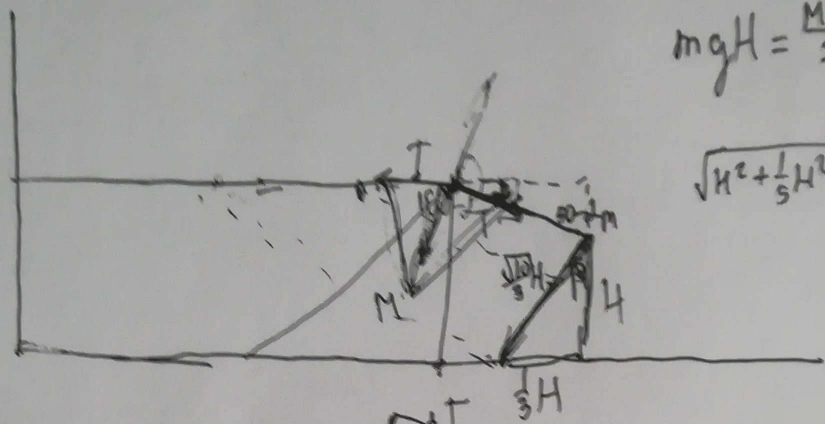
$E_1 = mgH$

$E_2 = 0$

$\Rightarrow mgH = \frac{MV^2}{2}$

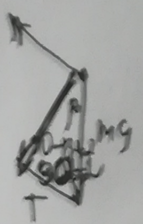


черновик



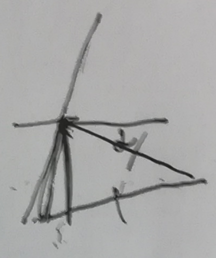
$$mgH = \frac{MV_k^2}{2}$$

$$\sqrt{H^2+\frac{1}{9}H^2} = H\sqrt{\frac{10}{9}} = \frac{\sqrt{10}}{3}H$$



$$\frac{T}{\sin(\beta)} = \frac{mg}{\sin(90-\beta+\alpha)}$$

$$T = \frac{\sin(\beta)}{\cos(\beta-\alpha)}mg$$



Черновик

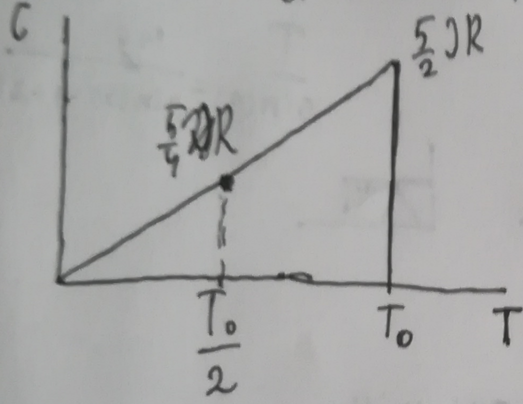
1. ν моль T_0 $C(T)=\frac{5}{2}R\frac{T}{T_0}$

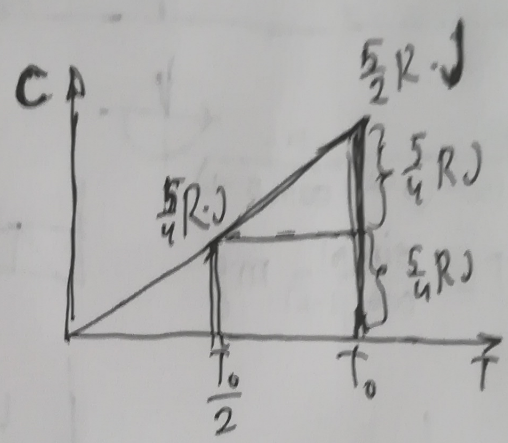
$c_m=\frac{\Delta Q}{\nu\Delta T}=C(T)=\frac{5}{2}R\frac{T}{T_0}$

$C=\frac{\Delta Q}{\Delta T}$

ΔQ $\frac{Q'}{\nu}=\frac{5}{2}R\frac{T}{T_0}$ $U=$ $E\sim RT$ $\Delta Q=C\cdot\Delta T=$ $C=\frac{\Delta Q}{\Delta T}$

$Q'=\frac{5}{2}\nu R\frac{T_0}{T_0}$



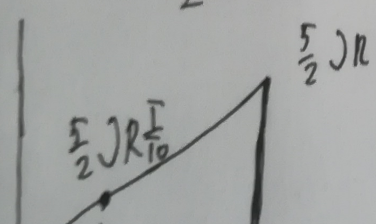


$C=\frac{\Delta Q}{\Delta T}$

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

$\frac{T_0}{2}\cdot\frac{5}{4}\nu R+\frac{1}{2}\left(\frac{T_0}{2}\cdot\frac{5}{4}\nu R\right)=\frac{3}{2}\cdot\frac{T_0}{2}\cdot\frac{5}{4}\nu R=\frac{15}{16}\nu RT_0$

$Q=\frac{3}{2}\nu R\Delta T+A=$



$Q=(T_0-T)\cdot\frac{5}{2}\nu R\frac{T}{T_0}+\underline{(T_0-T)\left(\frac{5}{2}\nu R-\frac{5}{2}\nu R\frac{T}{T_0}\right)}=$

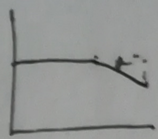
$=(T_0-T)\left(\frac{5}{2}\nu R\frac{T}{T_0}+\frac{\frac{5}{2}\nu R\left(1-\frac{T}{T_0}\right)}{2}\right)=$

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

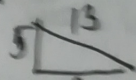
$=(T_0-T)\cdot\frac{5}{2}\nu R\left(\frac{1}{2}+\frac{T}{2T_0}\right)$

$A=(T_0-T)\frac{5}{2}\nu R\left(\frac{1}{2}+\frac{T}{2T_0}\right)-\frac{3}{2}\nu RT$ $T=\frac{T_0}{2}$ $\frac{T_0}{2}\cdot\frac{5}{2}\nu R\left(\frac{2}{4}+\frac{1}{4}\right)=\nu RT_0\frac{15}{16}$

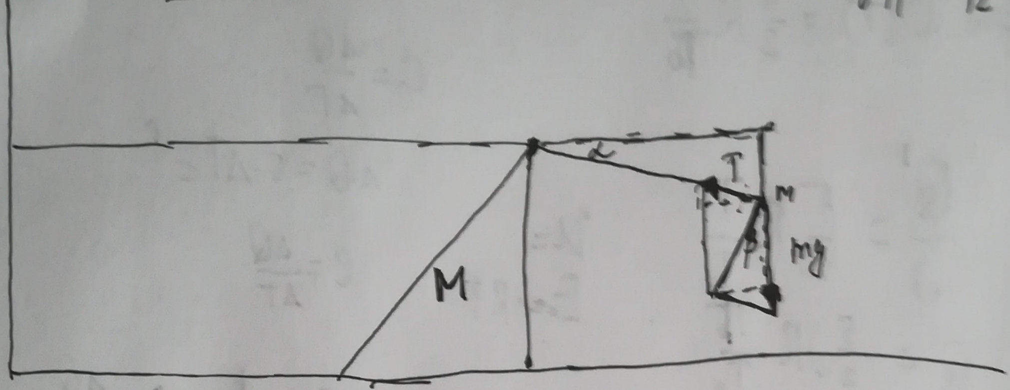
Черновик

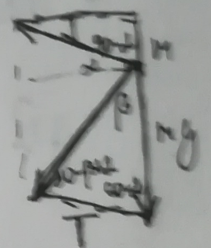


$\sqrt{144+25}=\sqrt{169}=13$



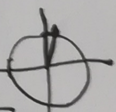
$tg(\beta)=\frac{5}{12}$ $\quad \sin(\beta)=\frac{5}{13}$





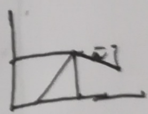
$180-90+\alpha-\beta=$
$=90-\beta+\alpha$

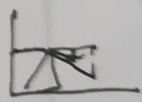
$$\frac{T}{\sin(\beta)}=\frac{mg}{\sin(90-\beta+\alpha)}$$

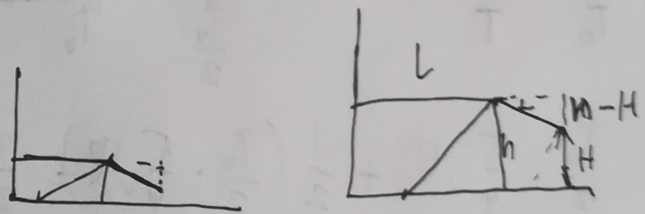


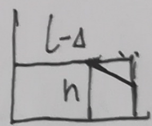
$$\frac{T}{\sin(\beta)}=\frac{mg}{\sin(90-(\beta-\alpha))}=\frac{mg}{\cos(\beta-\alpha)}$$

$$T=\frac{\sin(\beta)}{\cos(\beta-\alpha)}mg$$









Часть 2

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

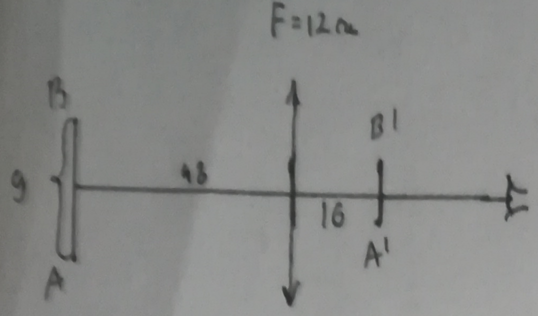
Шифр: **21202178**

ID профиля: **282696**

Вариант 2

Чистовик

N5



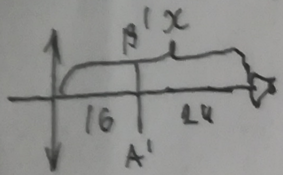
Найдём расстояние от линзы до изобритения циферблата:

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

$$\frac{1}{f}=\frac{1}{F}-\frac{1}{d} \Rightarrow f=\frac{dF}{d-F}=\frac{48\cdot 12}{48-12}=\frac{48}{3}=16\text{ см}$$

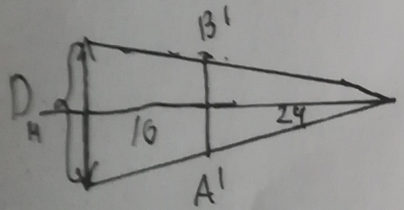
$$\Gamma=\frac{f}{d}=\frac{16}{48}=\frac{1}{3} \Rightarrow h=\frac{1}{3}H=3\text{ см}=A'B'$$

Известно, что глаз аккомодирован на 24 см => расстояние от глаза до изобртения 24 см:



Соотвесвенно глаз отдалён от линзы на $x=16+24=\boxed{40\text{ см}}$

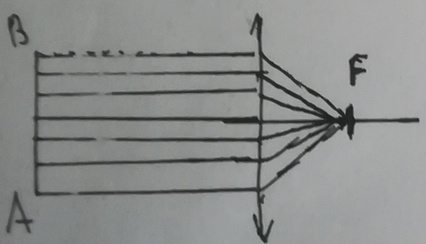
Найдём Dм



Из подобия:

$$\frac{D_м}{A'B'}=\frac{16+24}{24} \Rightarrow D_м=3\cdot\frac{40}{24}=\frac{40}{8}=\boxed{5\text{ см}}$$

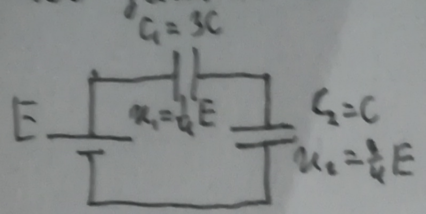
Чтобы не видеть ни одной детали изобр. достаточно поместить небольшой экран в фокусе линзы, т.е. $\boxed{\text{справа на расстоянии 12 см}}$



Ответ: 40см; 5см; справа от линзы на расстоянии 12 см от неё

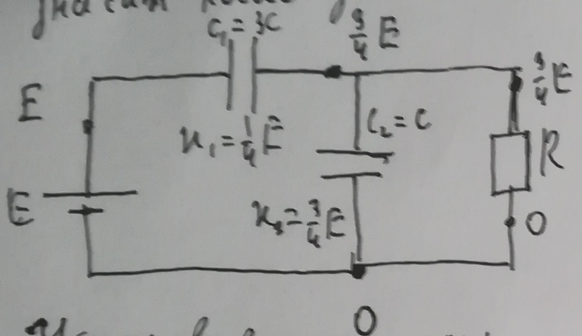
N3

До замыкания ключа цепь выглядит таким образом:



$$C_{общ} = \frac{C_1 C_2}{C_1 + C_2} = \frac{3}{4}C \Rightarrow q = C_{общ}\cdot E = \frac{3}{4}CE \Rightarrow U_1 = \frac{q}{C_1} = \frac{\frac{3}{4}CE}{3C} = \frac{1}{4}E;\ U_2 = \frac{q}{C_2} = \frac{3}{4}E$$

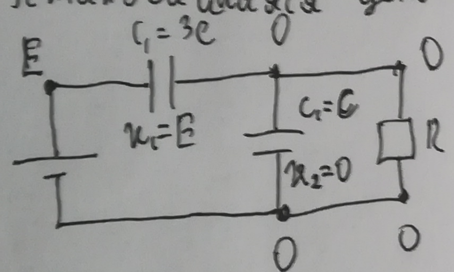
Напряжение на конденсаторах не может меняться скачкообразно, значит после замыкания ключа U_1 и U_2 останутся прежними:



Расставим потенциалы, $U_R = \frac{3}{4}E \Rightarrow$

$$I_R = \frac{U_R}{R} = \boxed{\frac{3E}{4R}}$$

Установившаяся цепь:



Воспользуемся ЗСЭ

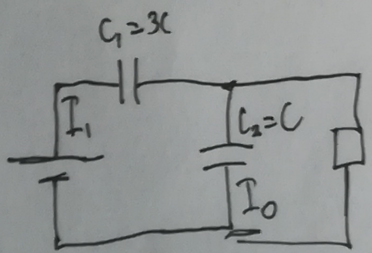
$$E_1 = \frac{3C(\frac{1}{4}E)^2}{2} + \frac{C(\frac{3}{4}E)^2}{2} = \frac{3CE^2}{32} + \frac{9CE^2}{32} = \frac{12CE^2}{32} = \frac{3CE^2}{8}$$

$$E_2 = \frac{3CE^2}{2} + Q$$

$$E_2 - E_1 = A_E = E\Delta q$$

$$\Delta q = 3CE - \frac{3}{4}CE \Rightarrow \frac{3CE^2}{2} + Q - \frac{3CE^2}{8} = E(3CE - \frac{3}{4}CE)$$

$$Q = \frac{3CE^2}{8} - \frac{3CE^2}{2} + E(3CE - \frac{3}{4}CE) = CE^2\cdot\frac{9}{4} - \frac{9}{8}CE^2 = \boxed{\frac{9}{8}CE^2}$$

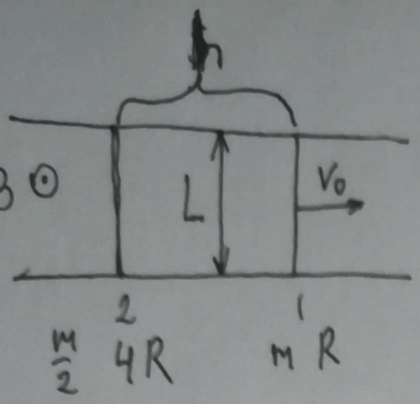


$$I_0 = C_2 U_2' \Rightarrow U_2' = \frac{I_0}{C}$$

$$U_2' = U_1' = \frac{I_1}{C_1} = \frac{I_1}{3C} \Rightarrow \frac{I_1}{3C} = \frac{I_0}{C} \Rightarrow I_1 = 3I_0$$

$$I_R = I_0 + I_1 = 4I_0;\ U_R = I_R\cdot R = \boxed{4I_0R}$$

Ответ: $\frac{3E}{4R}$; $\frac{9}{8}CE^2$; $4I_0R$



Чистовик

№4

1) $\Phi = BS = BLh$

2) $\mathcal{E} = \Phi' = BLh' = BLV_0$

3) $I = \frac{\mathcal{E}}{4R+R} = \frac{BLV_0}{5R}$

4) $F = BIL = B \cdot \frac{BLV_0}{5R} \cdot L = \frac{B^2L^2V_0}{5R}$

5) $a_2 = \frac{F}{m_2} = \boxed{\frac{2B^2L^2V_0}{5mR}}$

7) Через продолжительный промежуток времени скорость перемычек станет равной $V_1 = V_2 = V$

По ЗСЭ:

$E_1 = E_2$

$E_1 = \frac{mV_0^2}{2}$

$E_2 = \frac{\left(\frac{m}{2}\right)V^2}{2} + \frac{mV^2}{2}$

$\Rightarrow \frac{mV_0^2}{2} = \frac{\left(\frac{m}{2}\right)V^2}{2} + \frac{mV^2}{2}$

$mV_0^2 = \frac{m}{2}V^2 + mV^2 \Rightarrow V_0^2 = \frac{3}{2}V^2 \Rightarrow V^2 = \frac{2}{3}V_0^2 \Rightarrow \boxed{V = \sqrt{\frac{2}{3}}V_0}$

8. $a_2 = V_2' = \frac{2B^2L^2(V_1 - V_2)}{5mR}$

$a_1 = V_1' = -\frac{B^2L^2(V_1 - V_2)}{5mR}$

$V_1' - V_2' = -\frac{3B^2L^2}{5mR}(V_1 - V)$

$V_1 - V_2 = V$

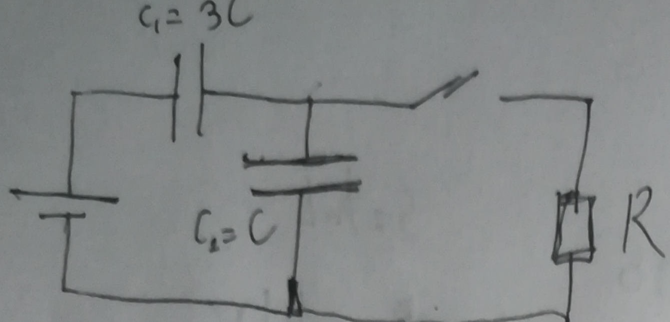
$V' = -\frac{3B^2L^2}{5mR}V \Rightarrow V = e^{-\frac{3B^2L^2}{5mR}t} = V_1 - V_2$

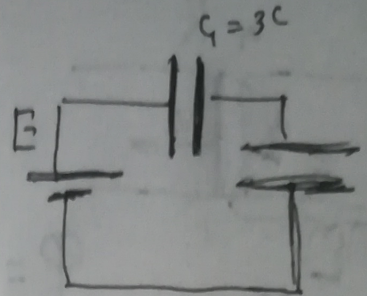
$V(0) = V_0$

$V(t) \to 0$ при $t \to \infty$

Ответ: $\frac{2B^2L^2V_0}{5mR}$; $\sqrt{\frac{2}{3}}V_0$

Черновик



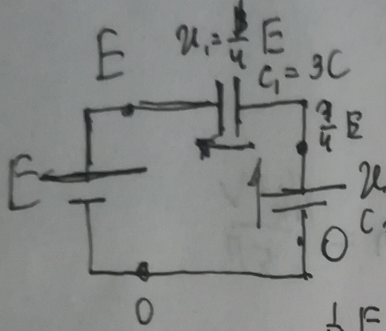


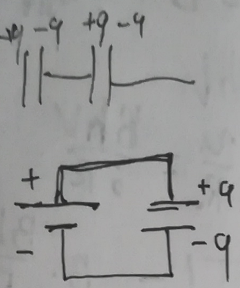
$C = \frac{q}{U}$ $q = CU$

$I = CU'$

$U = LI^2$

$C_{общ} = \frac{3C\cdot C}{C+3C} = \frac{3}{4}C$





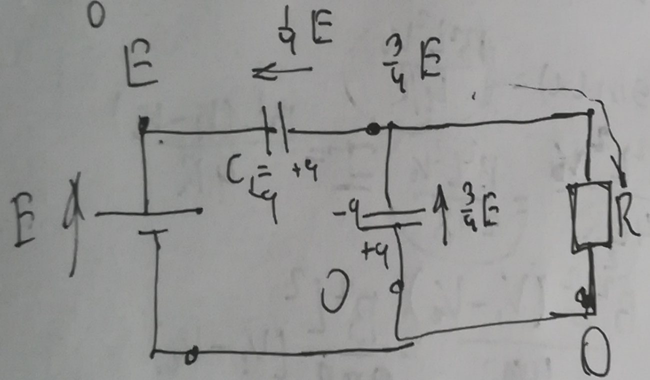
$U = E$

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

$q = \frac{3}{4}CE$

$U_1 = \frac{q}{C_1} = \frac{\frac{3}{4}CE}{3C} = \frac{1}{4}E$

$U_2 = \frac{q}{C_2} = \frac{3}{4}E$

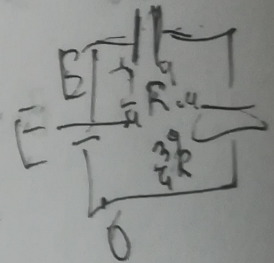


$U_R = \frac{3}{4}E$

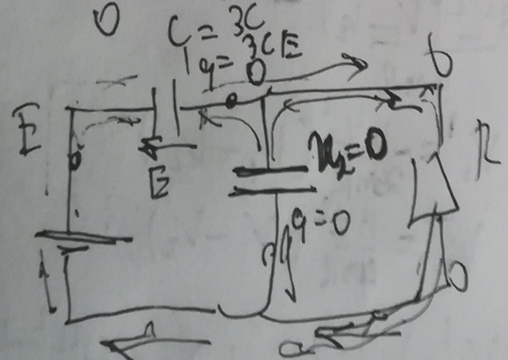
$I_R = \frac{U_R}{R} = \frac{3E}{4R}$

$A = Eq$

$Q = I^2Rt = \frac{q^2}{t^2} = (q')^2Rt$



~~q за t~~

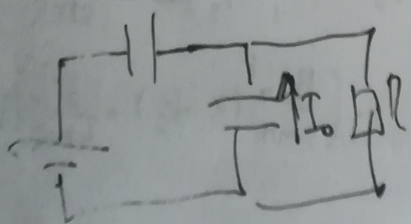


$E_0 = \frac{3C\cdot(\frac{1}{4}E)^2}{2} + \frac{C\cdot(\frac{3}{4}E)^2}{2}$

$E_к = Q + \frac{3CE^2}{2} +$

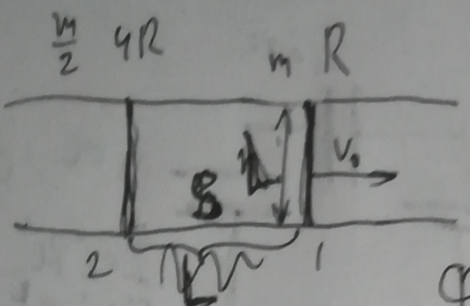
$E_к - E_0 = A = (3CE - \frac{3}{4}CE)E$

$Q + \frac{3CE^2}{2} - \frac{3C(\frac{1}{4}E^2)}{2} + \frac{C(\frac{3}{4}E)^2}{2} = 3CE^2 - \frac{3}{4}CE^2$



$\frac{3CE^2}{32} + \frac{9CE^2}{32}$

Черновик



$S = hL$

$\varphi = BS$

$S = hL$

$\varphi' = u = BS' = B\frac{\Delta S}{\Delta t} = BhV$

$u = BhV$

$\varphi = BS\cos(\alpha)$

$I = \frac{u}{R_0} = \frac{BhV}{5R}$

$\varphi' = -u$

$h\frac{\Delta L}{\Delta t} = hv_0$

$F = BIL = B \cdot \frac{BhV}{5R} \cdot h = \frac{B^2h^2V}{5R}$

$\mathcal{E} = BS' = BhV_0$

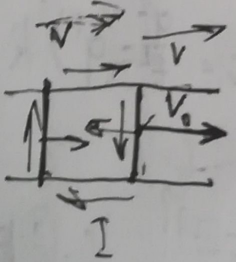
$I = \frac{BhV_0}{4R}$

$F = BIL\sin(\alpha) = \frac{B^2L^2V_0}{4R}$

$I = \frac{BL(V_1-V_2)}{4R}$

$a = \frac{F}{m} = \frac{B^2L^2V_0}{4\frac{m}{2}R} = \frac{B^2L^2V_0}{2mR}$

$E_0 = \frac{mv_0^2}{2}$



B

$a_2 = \frac{B^2L^2(V_1-V_2)}{2mR} = \frac{B^2L^2}{2mR}(V_1-V_2)$

$a_1 = \frac{B^2L^2(V_1-V_2)}{4mR}$

$V_1' = -\frac{B^2L^2}{2mR}(V_1-V_2)$

$V_2' = \frac{B^2L^2}{4mR}(V_1-V_2)$

$S' = V = V_1 + V_2$

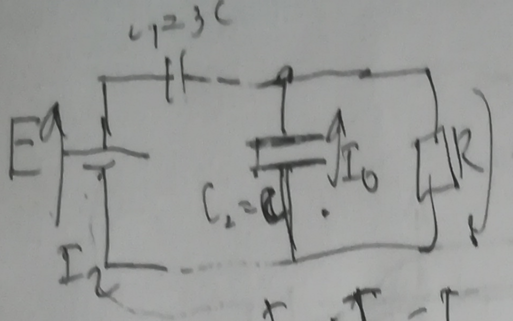
$V_1' - V_2' = (V_1-V_2)' = -\left(\frac{BL^2}{2mR} \cdot \frac{B^2L^2}{2}\right.$

$= -\left(\frac{B^2L^2}{2mR}(V_1-V_2) + \frac{B^2L^2}{4mR}(V_1-V_2)\right) =$

$=$

21202178 (U282696 M1265286)

Черновик



$I = CU'$

$U_2' = \frac{I_0}{C} = U_1' = \frac{I}{3C}$

$I = 3I_0$

$I_2 + I_0 = I_1$

$I_1 = I_0 + I_2$

$I_2 = 3I_0$

$3I_0 + I_0 = 4I_0$

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

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

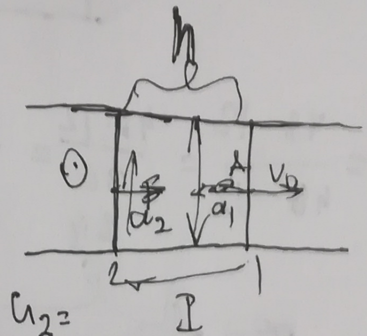
$U = IR = 4I_0R$

$I_2 + I_0 = I_1$

$I_1 = I_0 + I_2$

$I_0 = I_1 - I_2$

$I_0 = I_1$



$a_2 =$

$(e^{kx})' = e^{kx} \cdot k$

$a_2 = \frac{2B^2L^2(V_1 - V_2)}{5mR} = \frac{2B^2L^2}{5mR}(V_1 - V_2) = V_1'$

$a_2 = 2a_1$

$-V_2' = \frac{B^2L^2(V_1 - V_2)}{5mR} \Rightarrow V_1' = -\frac{B^2L^2}{5mR}(V_1 - V_2)$

$V_1' - V_2' = (V_1 - V_2)\left(\frac{2B^2L^2}{5mR} - \frac{B^2L^2}{5mR}\right)$

$= +\frac{B^2L^2}{5mR}(V_1 - V_2)$

$V_2' = a_2 = \frac{2B^2L^2(V_1 - V_2)}{5mR}$

$V_1' = -\frac{B^2L^2(V_1 - V_2)}{5mR}$

$V_1 - V_2 = V_a$

$V_a' = +V_a \cdot \frac{B^2L^2}{5mR}$

$V_1' - V_2' = -\frac{B^2L^2(V_1 - V_2)}{5mR} - \frac{2B^2L^2(V_1 - V_2)}{5mR} =$

$V_1 - V_2 = e^{-\frac{3B^2L^2}{5mR}t}$

$-\frac{3B^2L^2}{5mR} = \ln(a) \quad a = e$

$(e^x)' = e^x$

$(a^x)' = \ln(a) \cdot a^x$

$= -\frac{3B^2L^2(V_1 - V_2)}{5mR}$

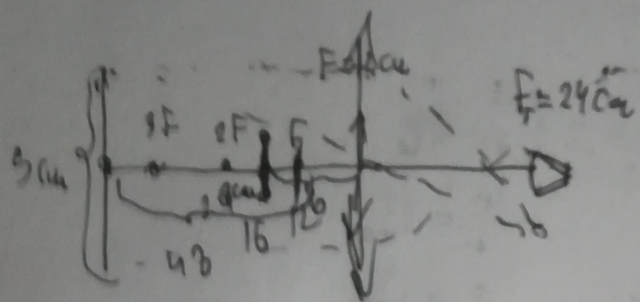
$V' = -\frac{3B^2L^2}{5mR}V$

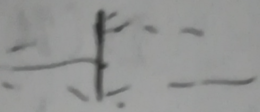
$V = e^{-\frac{3B^2L^2}{5mR}t}$

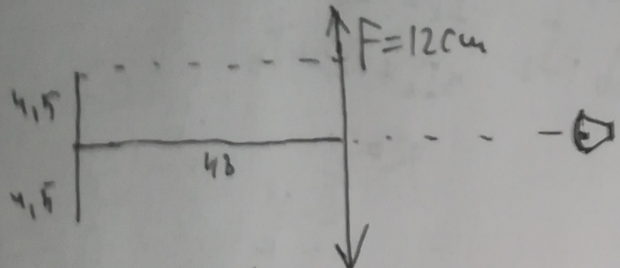
$V_1 - V_2 = V$

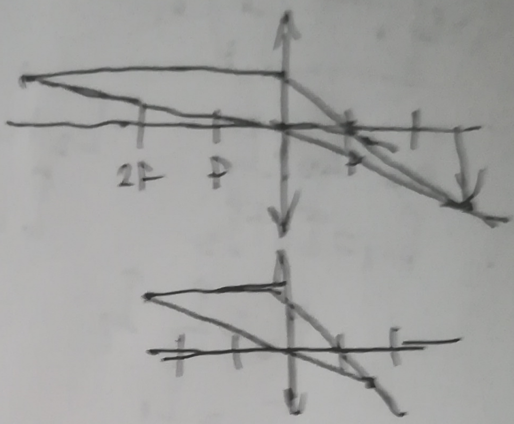
21202178 (U282696 M1265286)

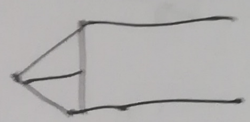
Черновик

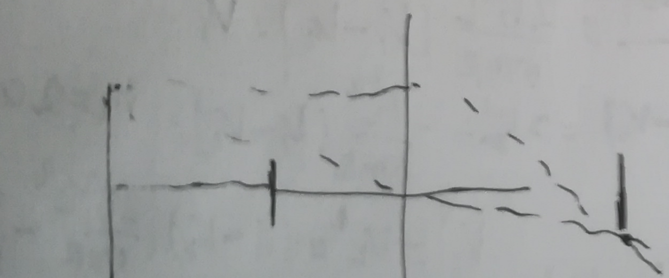










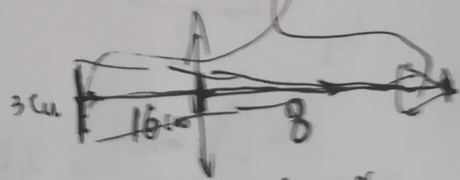


$$\frac{1}{f}+\frac{1}{d}=\frac{1}{F}$$

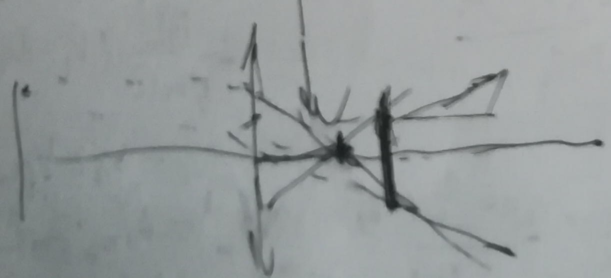
$$\frac{1}{f}=\frac{1}{F}-\frac{1}{d}$$

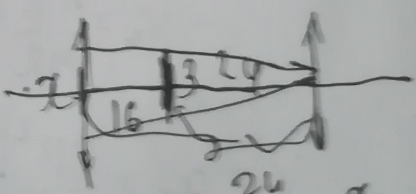
$$f=\cancel{dF}=\frac{dF}{d-F}=\frac{48\cdot 12}{48-12}=\frac{48\cdot 12}{36}=\frac{48}{3}=16 \text{ см}$$

$$\Gamma=\frac{f}{d}=\frac{16}{48}=\frac{1}{3}$$



$$\frac{3}{24}=\frac{x}{8}\Rightarrow x=\frac{24}{24}=1 \text{ см}$$





1) 40

$$\frac{x}{40}=\frac{3}{24}$$

$$x=\frac{120}{24}=5 \text{ см}$$