Часть 1

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

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ID профиля: **855868**

Вариант 7

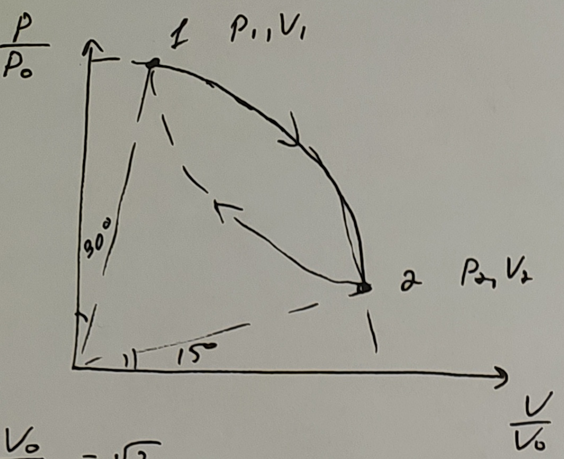
Чистовик ②

Ответ:

1. $a_{кл} = \frac{4}{3} g$
2. [illegible] $a_{отн} = \frac{38}{39} g$
3. $\tau = \sqrt{\frac{65H}{19g}}$

Чистовик ③

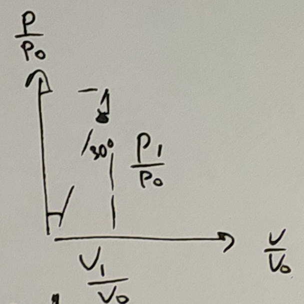
№2 $i = 3$; ИГ 21 — неравновес. процесс
21 : $Q_{21} = 0$

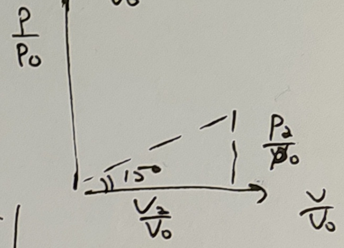


Решение.

1 1: P_1, V_1
2: P_2, V_2

$$P_1V_1 = \nu R T_1$$
$$P_2V_2 = \nu R T_2$$
$$\left[\frac{T_1}{T_2} = \frac{P_1V_1}{P_2V_2}\right]$$





$$\frac{P_1 V_0}{V_1 P_0} = \sqrt{3}$$
$$\frac{P_2 V_0}{V_2 P_0} = tg15°$$

При этом:

$$\frac{\frac{P_1}{P_0}}{\frac{V_1}{V_0}} = ctg30° = \sqrt{3}$$
$$\frac{\frac{P_2}{P_0}}{\frac{V_2}{V_0}} = tg15° \quad \Rightarrow \quad \frac{P_1}{P_0} = \frac{V_1}{V_0}\sqrt{3}; \quad \frac{P_2}{P_0} = \frac{V_2}{V_0} tg15°$$

Обозначу $\frac{1}{P_0} = a$

$\frac{1}{V_0} = \text{в}$; $\frac{V_0}{P_0} = C$

$$\left(\frac{P_1}{P_0}\right)^2 + \left(\frac{V_1}{V_0}\right)^2 = \left(\frac{P_2}{P_0}\right)^2 + \left(\frac{V_2}{V_0}\right)^2 = R \quad \text{(из геометрии)}$$

$$3\left(\frac{V_1}{V_0}\right)^2 + \left(\frac{V_1}{V_0}\right)^2 = \left(\frac{V_2}{V_0}\right)^2 tg^2 15° + \left(\frac{V_2}{V_0}\right)^2 \Longleftrightarrow 4\frac{V_1^2}{V_0^2} = (1 + tg^2 15°)\frac{V_2^2}{V_0^2} \Big| \cdot V_0^2$$

$$4V_1^2 = \frac{1}{\cos^2 15°} V_2^2 \Longleftrightarrow 2V_1 = \frac{V_2}{\cos 15°}; \quad \boxed{V_2 = 2\cos 15° V_1}; \quad \frac{V_2}{V_0} = 2\cos 15° \frac{V_1}{V_0}$$

$$\frac{P_1}{P_0} = \frac{V_1}{V_0}\sqrt{3}; \quad \frac{P_2}{P_0} = \left(2\cos 15° \frac{V_1}{V_0}\right) tg 15° = 2\sin 15° \frac{V_1}{V_0}$$

$$\frac{T_1}{T_2} = \frac{P_1V_1}{P_2V_2} = \frac{\frac{P_1}{P_0}\cdot\frac{V_1}{V_0}}{\frac{P_2}{P_0}\cdot\frac{V_2}{V_0}} = \frac{\left(\frac{V_1}{V_0}\sqrt{3}\right)\cdot\frac{V_1}{V_0}}{\left(2\sin 15° \frac{V_1}{V_0}\right)\cdot\left(2\cos 15° \frac{V_1}{V_0}\right)} = \frac{\sqrt{3}}{2\sin 30°} = \sqrt{3}$$

$$T_1 = \sqrt{3} T_2, \quad \left[\frac{T_1 - T_2}{T_2} = \frac{\sqrt{3}T_2 - T_2}{T_2} = \frac{\sqrt{3} - 1}{1} = \sqrt{3} - 1\right]$$ — ответ на первый вопрос

3. процесс 1-2; $Q = \frac{3}{2}\nu R (T_2 - T_1) + A_{12}$
процесс 2-1: $0 = \frac{3}{2}\nu R (T_1 - T_2) + A_{21}$; $\begin{cases} Q = -\frac{3}{2}\nu R(\sqrt{3} - 1)T_2 + A_{12} \\ A_{21} = -\frac{3}{2}\nu R(\sqrt{3} - 1)T_2 \end{cases}$

$$Q - A_{21} = A_{12}; \quad Q = A_{12} + A_{21}$$

В процессе 2-1 теплообмена нет, поэтому:

$$\left[\eta = \frac{A_{12} + A_{21}}{Q} = \frac{A_{12} + A_{21}}{A_{12} + A_{21}} = 1 = 100\%\right]$$

Ответ:

1. $\frac{T_1 - T_2}{T_2} = \sqrt{3} - 1$

3. $\eta = 100\%$

Теплоёмкость 0

$C_m = \frac{3}{2}\nu R\Delta T + A$; $A = -\frac{3}{2}\nu R\Delta T$

$\Delta U = Q - A_{12}$

$-\Delta U = -A_{21}$

$A_{21} + A_{12} = Q$

$pV^{\gamma} = const$

$dA = -\frac{3}{2}\nu R\, dT$

Я знаю $\frac{T_1}{T_2}$; $\Rightarrow$

ν мне не нужно, раз не дано

Чудесовик

$A_{21} - Q = A_{12}$

$Q = A_{21} - A_{12}$?

$\cancel{A} = \frac{A_{12} + A_{21}}{Q} = \frac{A_{12} + A_{21}}{A_{21} - A_{12}} =$

12: $Q = \frac{3}{2}\nu R\Delta T_{12} + A_{12}$

21: $0 = \frac{3}{2}\nu R\Delta T_{21} + A_{21}$

$\frac{3}{2}\nu R(T_2 - T_1) + A_{12} = Q$

$-\frac{3}{2}\nu R(T_1 - T_2) = A_{21}$

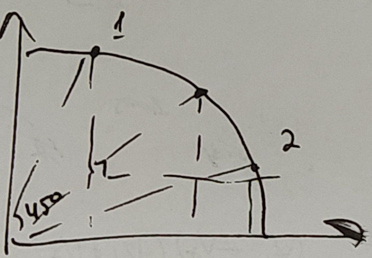
$$\begin{cases} A_{21} = -\frac{3}{2}\nu R(\sqrt{3}-1)T_2 \\ Q = \frac{3}{2}\nu R(1-\sqrt{3})T_2 + A_{12} \end{cases}$$

$$\begin{cases} A_{21} = -\frac{3}{2}\nu R(\sqrt{3}-1)T_2 \\ Q = -\frac{3}{2}\nu R(\sqrt{3}-1)T_2 + A_{12} \end{cases}$$

$\textcircled{A_{21}}$; A_{12} - ?

$A_{12} = Q + \frac{3}{2}\nu R(\sqrt{3}-1)T_2$

$$\xi = \frac{Q + \frac{3}{2}\nu R(\sqrt{3}-1)T_2 - \frac{3}{2}\nu R(\sqrt{3}-1)T_2}{-\frac{3}{2}\nu R(\sqrt{3}-1)T_2 - Q - \frac{3}{2}\nu R(\sqrt{3}-1)T_2} = \frac{Q}{-3\nu R(\sqrt{3}-1)T_2 - Q}$$



$$\left(\frac{P_\cdot}{P_0}\right)^2 + \left(\frac{V}{V_0}\right)^2 = R^2$$

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

$Q = \frac{3}{2}\nu R(T_2 - T_1) + A$

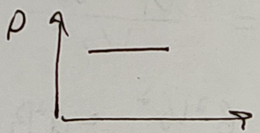
$-\frac{3}{2}\nu R\, dT = PdV + dPV$

$-\frac{3}{2}\nu R(P_xV_x - P_yV_y) =$

$= P_x(V_y - V_y) + (P_y - P_x)V_x$

$\frac{P_n}{P_0} = \frac{V_n}{V_0}$ - ?

$dA = PdV$

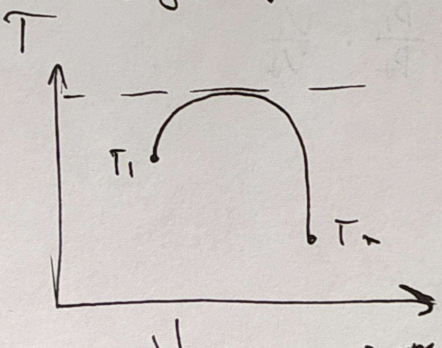


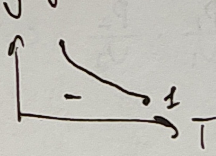
$-\frac{3}{2}\nu R(P_yV_y - P_xV_x) =$

$= P_xV_y - P_xV_x + P_yV_x - P_xV_x$

12: $V\uparrow\uparrow$, $T\downarrow\downarrow$; $P\downarrow\downarrow$

газ отдаёт теплоту





$\frac{P_nV_n}{T_n} = pV^{\gamma}$

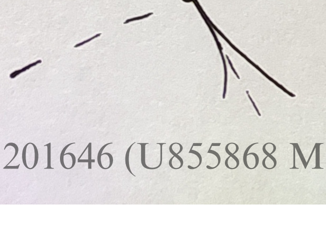
$\frac{V}{T} = V^{\gamma}$

$T = V^{1-\gamma}$

$T = \frac{pV}{\nu R}$

$\frac{pV}{\nu R} = V^{1-\gamma}$

$\nu R = pV^{1-(1-\gamma)} = pV^{\gamma}$



$pV^{\gamma} = const$

$\frac{P}{P_0}\left(\frac{V}{V_0}\right)^{\gamma} = const$

$\left(\frac{P}{P_0}\right)' \cdot \gamma\left(\frac{V}{V_0}\right)^{\gamma-1} = f'(x)$

$\frac{\nu R}{P} = V^{\gamma}$

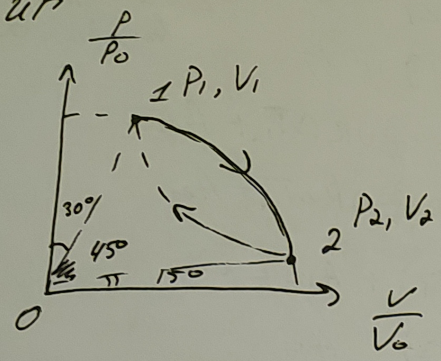
$V = \sqrt[\gamma]{\frac{\nu R}{P}}$

$Q - A_{21} = A_{12}$ | $Q = A_{12} + A_{21}$

$i = 3$ $\boxed{P_0}$, $\boxed{V_0}$ 21: $Q = 0$ | **Черновик**

ИГ

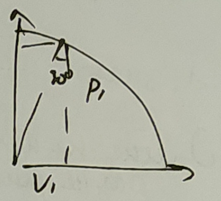
21 – неравновесный процесс



1) $\frac{T_1 - T_2}{T_2}$ – ?

2) α – ?

3) η – ?



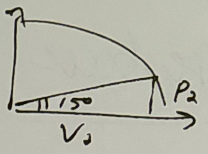
$Q = \Delta U + A$

$P_1V_1 = \nu RT_1$

$P_2V_2 = \nu RT_2$

$\frac{T_1}{T_2} = \frac{P_1V_1}{P_2V_2}$

$\frac{P_1}{V_1} = ctg\,30° = \cancel{\frac{\sqrt{3}}{3}}\ \sqrt{3}$



$\frac{P_2}{V_2} = tg\,15°$

$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$

$P_2^2 + V_2^2 = P_1^2 + V_1^2$ $P_1 = \sqrt{3}V_1$

$tg^2 15°\, V_2^2 + V_2^2 = 3V_1^2 + V_1^2 = 4V_1^2$ $P_2 = tg\,15°\, V_2$

$(1 + tg^2 15°)\, V_2^2 = 4V_1^2,$ $\frac{1}{\cos^2 15°} V_2^2 = 4V_1^2$

$\frac{P_1V_0}{V_1P_0} \cdot \frac{V_2P_0}{P_2V_0} = \frac{\sqrt{3}}{tg\,15°}$

$\frac{V_2}{\cos 15°} = 2V_1$

$\frac{P_1V_2}{V_1P_2} = \frac{\sqrt{3}}{tg\,15°}$ $[P_1V_2\, tg\,15° = V_1P_2\sqrt{3}]$ $[V_2 = 2\cos 15°\, V_1]$

$\left(\frac{P_2}{P_0}\right)^2 + \left(\frac{V_2}{V_0}\right)^2 = \left(\frac{P_1}{P_0}\right)^2 + \left(\frac{V_1}{V_0}\right)^2 = R$

~~15~~ 8

~~34~~ ~~12~~

$\frac{P_2^2 - P_1^2}{P_0^2} = \frac{V_1^2 - V_2^2}{V_0^2},$ $\frac{(P_2 - P_1)(P_2 + P_1)}{P_0^2} = \frac{(V_1 - V_2)(V_1 + V_2)}{V_0^2}$

$a^2P_2^2 + b^2V_2^2 = a^2P_1^2 + b^2V_1^2 \Leftrightarrow a^2(P_2 - P_1)(P_2 + P_1) = b^2(V_1 - V_2)(V_1 + V_2)$

$\frac{P_1}{V_1} \cdot \frac{V_2}{P_2} \Leftrightarrow P_1P_2 = V_1V_2 \Leftrightarrow \frac{P_1}{V_1} \cdot \frac{P_2}{V_2} \Leftrightarrow \frac{P_1}{P_2} \cdot \frac{V_1}{V_2}$

$\frac{P_1}{\ } = \frac{V_1V_2}{P_2}$

$\frac{P_2}{P_0} = \frac{V_2}{V_0} tg\,15°$

$$\frac{\frac{P_1}{P_0} \cdot \frac{V_1}{V_0}}{\frac{P_2}{P_0} \cdot \frac{V_2}{V_0}}$$

Черновик

$\cos\alpha = \frac{5}{13}$, нить нерастяжима

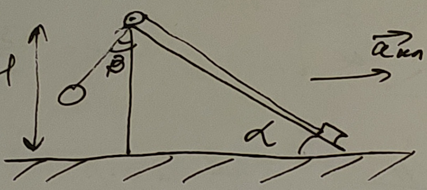
$\frac{m}{2}$ – брусок, m – шарик

$\cos\beta = \frac{3}{5}$

$\vec{a}_{кл} = const$

1) $a_{кл}$ – ? 2) $a_{отн}$ – ?

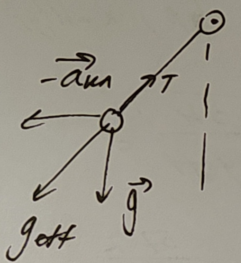
3) τ – ?



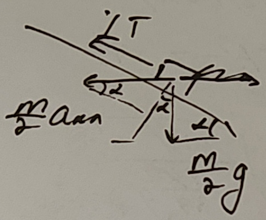
Решение.

$\vec{g}_{eff} = \vec{g} - \vec{a}_{кл}$; $\frac{a_{кл}}{g} = tg\,\beta$, $1 + tg^2\beta = \frac{1}{\frac{9}{25}} = \frac{25}{9}$

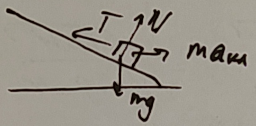
$tg^2\beta = \frac{16}{9}$, $tg\beta = \frac{4}{3}$

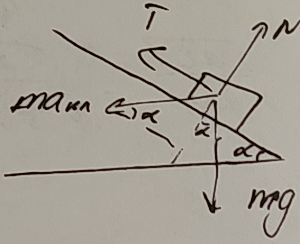


$a_{кл} = \frac{4}{3}g$

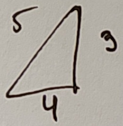


$\frac{m}{2}a_{кл}\cos\alpha + T - \frac{m}{2}g\sin\alpha = \frac{m}{2}a$



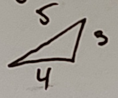


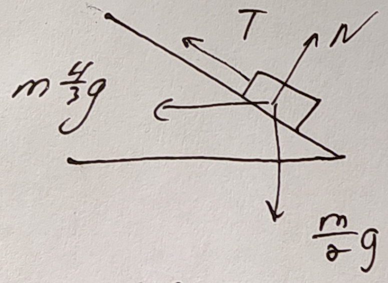
$g_{eff} = a_{бр}$



$\frac{4}{3}$

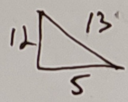
$\frac{a}{g} = \frac{4}{3}$,





$m\sqrt{g^2 + a_{кл}^2} - T = ma_{отн}$

$T = m\sqrt{g^2 + \frac{16}{9}g^2} - ma_{отн} =$



$= m\cdot\frac{5}{3}g - ma_{отн}$

$\frac{5}{3}mg - ma_{отн} + \frac{2}{3}mg\cos\alpha - \frac{m}{2}g\sin\alpha = \frac{m}{2}a_{отн}$

$\frac{5}{3}mg + \frac{2}{3}mg\cdot\frac{5}{13} - \frac{m}{2}g\cdot\frac{12}{13} = \frac{3}{2}ma_{отн}$

$\frac{5}{3}g + \overset{\cdot 2}{\frac{10}{39}}g - \overset{\cdot 3}{\frac{12}{26}}g = \frac{3}{2}a_{отн}$

$\begin{array}{r}\times 26\\ 5\\ \hline 130\end{array}$

$\frac{20\cancel{g} - 36 + 26\cdot 5}{78}g = \frac{130-16}{78}g = \frac{114}{78}g = \frac{57}{39}g$

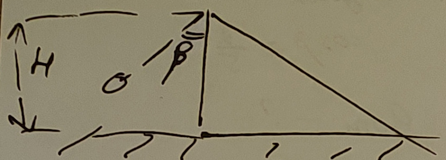
$90 + 27 = 117$

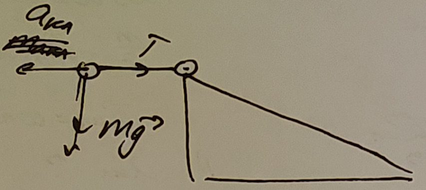
$130 - 16 = \frac{114}{78} = \frac{\cancel{57}}{39}$

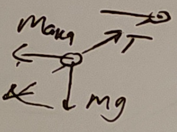
$a_{отн} = \frac{57}{39}\cdot\frac{2}{3} = \frac{114}{117}g$

$\frac{5}{3} + \frac{10}{39} - \frac{6}{13} = \frac{5\cdot 13 + 10 - 18}{39} = \frac{65-8}{39} = \frac{57}{39}\cdot\frac{2}{3} = \frac{\cancel{114}}{} \frac{19\cdot 2}{39} = \frac{38}{39}$

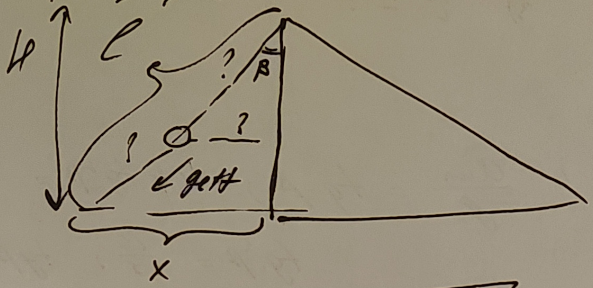
$\frac{104}{3\cdot\frac{38}{39}g} = \sqrt{\frac{104}{\frac{38}{13}g}} = \sqrt{\frac{130}{38}\frac{4}{9}} = \sqrt{\frac{65\cancel{4}}{19\,9}}$







$\cos\beta = \frac{3}{5}$



$l = \frac{H}{\cos\beta}$

$x = \cancel{\frac{H}{tg\beta}}$

$\frac{H}{l} = \cos\beta$

$l = \frac{H}{\cos\beta}$

$\frac{x}{H} = tg\beta$; $x = H\,tg\beta$

$l = \frac{g_{eff}\tau^2}{2}$ $\tau = \sqrt{\frac{2l}{g_{eff}}} = \sqrt{\frac{2H}{g_{eff}\cos\beta}} = \sqrt{\frac{10H}{3g_{eff}}} =$

$= \frac{10H}{\frac{114}{39}} = \sqrt{\frac{390H}{114}}$ $117 | 3 = 79$ $\frac{57\cdot 2}{39}$

$\tau = \sqrt{\frac{2l}{g_{eff}}} = \sqrt{\frac{2H}{\frac{3}{5}g_{eff}}} = \sqrt{\frac{10H}{3g_{eff}}} = \sqrt{\frac{10H}{\frac{114}{39}g}} =$

$\frac{10\cdot 39}{57\cdot 2} = \frac{5\cdot 39}{57} =$

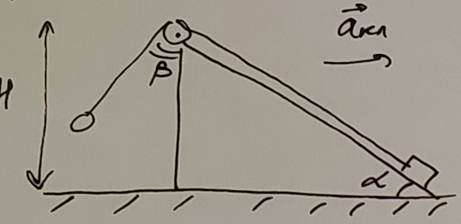
$= \frac{5\cdot 13}{19} = \frac{65}{19}\frac{H}{g}$

Чистовик ②

$\cos\alpha = \frac{5}{13}$; $\cos\beta = \frac{3}{5}$

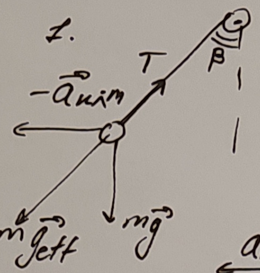
$\frac{m}{2}$ – брусок; m – шарик

№1



Решение.

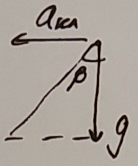
1.



2ЗН для шарика в СО клина [redacted].

$m\vec{g} + m(-\vec{a}_{кл}) +$ [redacted] $\vec{T} = m\vec{g}_{eff}$

Т не влияет на направление g_{eff}, лишь изменяет модуль.



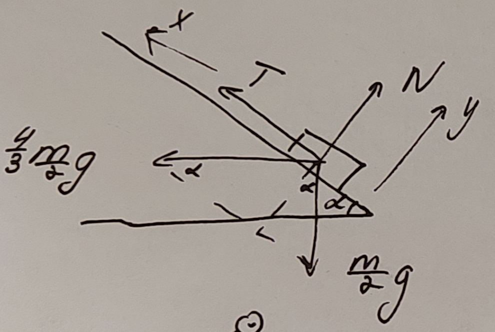
$\frac{a_{кл}}{g} = tg\beta$;

$1 + tg^2\beta = \frac{1}{\frac{9}{25}}$; $tg^2\beta = \frac{16}{9}$

$tg\beta = \frac{4}{3}$; $\left[a_{кл} = \frac{4}{3}g\right]$;

2. Брусок и шарик связаны нерастяжимой нитью, которая натянута => скорости и ускорение каждой из точек нити по модулю равны (есть блок, поэтому направление меняется)

2ЗН для бруска в СО клина [redacted]:

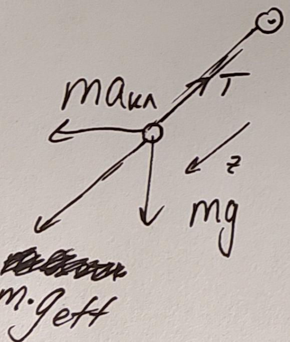


OY: $N - \frac{m}{2}g\cos\alpha - \frac{2}{3}mg\sin\alpha = 0$

(т.к. брусок не отрывается от клина)

OX: $T + \frac{2}{3}mg\cos\alpha - \frac{m}{2}g\sin\alpha = \frac{m}{2}a_{отн}$ (1)

$|g_{eff}|$ шарика равно $|a_{отн}|$ бруска т.к. нить нерастяжима



2ЗН для шарика в СО клина:

$$m\underbrace{\sqrt{g^2 + a_{кл}^2}}_{\frac{5}{3}g} - T = ma_{отн}$$

$\frac{5}{3}mg - ma_{отн} = T$ (2)

Подставим (2) в (1)

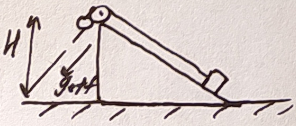
$\frac{5}{3}mg - ma_{отн} + \frac{2}{3}mg\cos\alpha - \frac{m}{2}g\sin\alpha = \frac{m}{2}a_{отн}$;

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

$\frac{5}{3}g + \frac{2}{3}\cdot\frac{5}{13}g - \frac{1}{2}\cdot\frac{12}{13}g = \frac{3}{2}a_{отн}$; $\frac{5}{3}g + \frac{10}{39}g - \frac{12}{26}g = \frac{3}{2}a_{отн}$

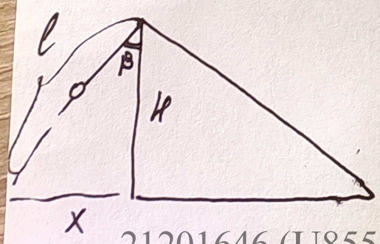
$\frac{5\cdot 26 + 20 - 36}{78}g = \frac{3}{2}a_{отн}$; $\frac{57}{39}g = \frac{3}{2}a_{отн}$; $\left[a_{отн} = \frac{114}{117}g\right] = \frac{38}{39}g\,]$

3.



Почти мгновенно после начала движения клина шарик начинает двигаться с ускорением g_{eff}, и до встречи со столом проходит путь $l = \frac{H}{\cos\beta}$

В момент времени $t \to 0$ $v_{шарика} \to 0$ =>



$l = \frac{g_{eff}\tau^2}{2}$, где τ – время, через которое шарик достигнет стола.

$$\left[\tau = \sqrt{\frac{2l}{g_{eff}}} = \sqrt{\frac{2H}{\frac{3}{5}g_{eff}}} = \sqrt{\frac{10H}{\frac{44}{39}g}} = \sqrt{\frac{65H}{19g}}\right]$$

Часть 2

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

Шифр: **21201646**

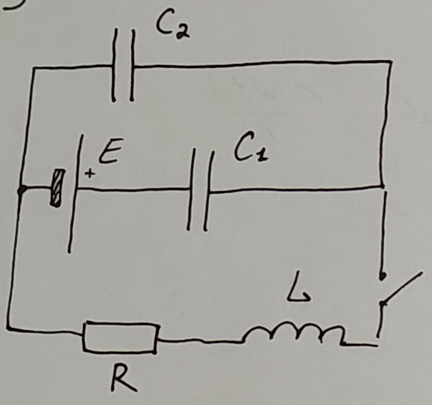
ID профиля: **855868**

Вариант 7

Чистовик ①

№3

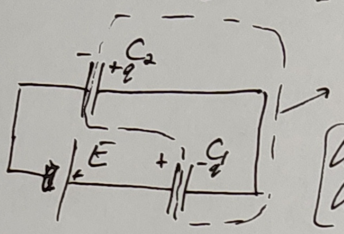
$C_1 = C$; $C_2 = 4C$

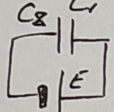


Решение.

1. Устан. режим, ключ разомкнут

$$E = U_{C_1} + U_{C_2} = \frac{q_1}{C_1} + \frac{q_2}{C_2} = \frac{4q+q}{4C} = \frac{5q}{4C}$$



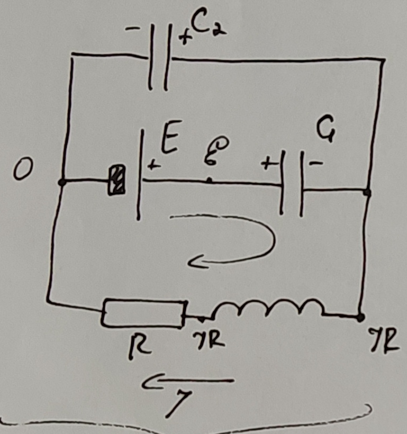


$E = U_{C_э} = \frac{5q}{4C}$; $\frac{q}{C} = \frac{4E}{5}$

$C_э = \frac{1}{\frac{1}{C} + \frac{1}{4C}} = \frac{4C}{5}$

$$\left[\begin{aligned} U_{C_1} &= \frac{q}{C} = \frac{4E}{5} \\ U_{C_2} &= \frac{q}{4C} = \frac{E}{5} \end{aligned}\right]$$

2. Ключ замкнут.



метод потенциалов

Напряжение на конденсаторах и ток через катушку не меняются скачкообразно. Катушка не пропускает ток.

$$E = U_{C_1} + \mathcal{E}_i + 0 \cdot R = U_{C_1} + L\frac{dI}{dt}$$

$$E = \frac{4E}{5} + L\frac{dI}{dt};\ L\frac{dI}{dt} = \frac{E}{5};\ \left[\frac{dI}{dt} = \frac{E}{5L}\right]$$

~~3. Со временем конденсатор C_2 разрядится~~

~~$Q = \frac{C_1 U_{C_1}^2}{2} = \frac{4C \cdot E^2}{25 \cdot 2} = \frac{4CE^2}{50} = \frac{2CE^2}{25}$~~

2. Со временем конденсаторы разрядятся, а затем перезарядятся.

$$\left[Q = W_{C_1} + W_{C_2} = \frac{C \cdot \left(\frac{4E}{5}\right)^2}{2} + \frac{4C\left(\frac{E}{5}\right)^2}{2} = \frac{16CE^2}{50} + \frac{4CE^2}{50} = \frac{2}{5}CE^2\right]$$

Их энергии выделится на резисторе, а затем они зарядятся от источника.

3. В это время оба конденсатора будут заряжаться, напряжение на C_2 и резисторе с катушкой будет в каждый момент времени одинаково. Ток пойдёт через C_2, а не резистор.

$I = 0$

Ответ:

$$\boxed{\begin{aligned} &1.\ \frac{dI}{dt} = \frac{E}{5L} \\ &2.\ Q = \frac{2CE^2}{5} \\ &3.\ I = 0 \end{aligned}}$$

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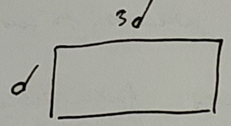
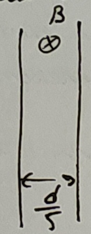
Чистовик ②

№4



P = 8d

[illegible]

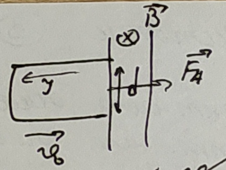


v_0

m, d

R, B

~~1.~~



~~$\mathcal{E}_i = -\frac{d\Phi}{dt} = -\frac{BS}{dt} = -B\cdot\frac{S}{dt} = -B\cdot\frac{d\cdot v_0 dt}{dt} = -Bdv_0$~~

~~$|\mathcal{E}_i| = Bdv_0$; $F_A = IBl = ma$~~

~~$\frac{Bdv_0}{R}Bd = ma$, $\left[a = \frac{B^2d^2v_0}{Rm}\right]$~~

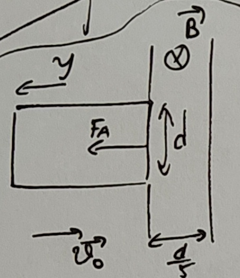
~~2. $\frac{d}{5} = v_0t + \frac{at^2}{2} = v_0t + \frac{B^2d^2v_0}{Rm}t^2$~~

~~$\frac{v_1^2 - v_0^2}{2a} = \frac{d}{5}$; $v_1^2 - v_0^2 = \frac{2ad}{5}$, $v_1^2 = v_0^2 + \frac{2B^2d^3v_0}{5Rm}$~~

~~$v_1 = \sqrt{v_0^2 + \frac{2B^2d^3v_0}{5Rm}}$~~

3\.

1\.

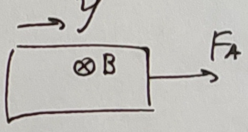


$|\mathcal{E}_i| = \frac{d\Phi}{dt} = \frac{BS}{dt} = B\frac{d\,v_0dt}{dt} = Bdv_0$

$F_A = IBl = ma$, $\frac{Bdv_0}{R}B\cdot d = ma$, $\left[a = \frac{B^2d^2v_0}{Rm}\right]$

2\. $\frac{v_1^2 - v_0^2}{-2a} = \frac{d}{5}$; $v_1^2 = v_0^2 - 2\frac{ad}{5}$, $\left[v_1 = \sqrt{v_0^2 - \frac{2B^2d^3v_0}{5Rm}}\right]$

3\. Внешнее магнитное поле действует на рамку сначала так, что пока поток B через рамку растёт, оно тормозит рамку до v_1; Далее рамка двигается равномерно, т.к. поток через неё не меняется и в ней не течёт ток; Затем поток [illegible] начинает уменьшаться, ток течёт так, что внешнее магнитное поле разгоняет рамку.



На выходе из соображений симметрии рамка будет иметь скорость v_0.

Ответ:

1\. $a = \frac{B^2d^2v_0}{Rm}$

2\. $v_1 = \sqrt{v_0^2 - \frac{2B^2d^3v_0}{5Rm}}$

3\. $v_2 = v_0$

Чистовик ③

№3 Пусть D_1 – опт. сила очков для рассм. удал. пр-тов

D_2 – опт. сила очков для чтения текста с расст. 25 см

1. $x = 0$ см, т.к. предел аккомодации глаза человека практически нулевой.

$$\begin{cases} \frac{1}{\infty} + \frac{1}{f} = D_1 \\ \frac{1}{0{,}25} + \frac{1}{f} = D_2 \end{cases};$$

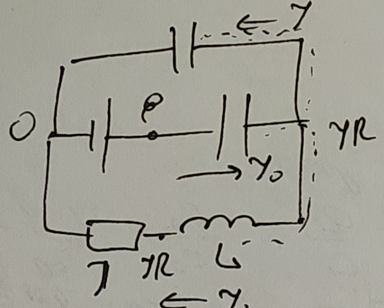
$0 - 4 = D_1 - D_2$, $D_1 < D_2$, $\frac{D_2}{D_1} = 3$ (по усл.)

$-4 = D_1 - 3D_1 = -2D_1$, $\left[D_1 = 2 \text{ (дптр.)}\right]$

2. $\frac{1}{f} = 2 - 0 = 2$; $\frac{1}{0{,}5} + 2 = D$; $D = 4$ (дптр.)

Ответ:
1. $x = 0$ см; $D_1 = 2$ дптр.
2. $D = 4$ дптр.

Черновик



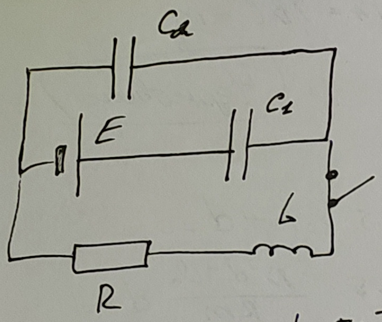
$$IR = \frac{q_0}{4C\mathcal{E}}$$

$$\mathcal{E} - IR = \frac{q}{C};$$

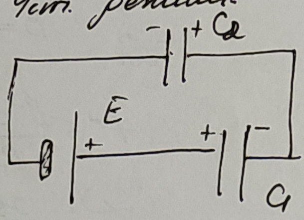
$$\mathcal{E}_i = Bd\upsilon_1$$

$$F = ma = \frac{Bd\upsilon_1}{R} \cdot Bd = \frac{B^2d^2\upsilon_1}{R}$$

Чдоновик



1 Уст. режим.

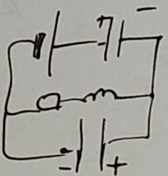


$E = \frac{q_1}{C_1} + \frac{q_2}{C_2} =$

$= U_{c_1} + U_{c_2}$

$C_1 = C$

$C_2 = 4C$



$\frac{q_1}{C} + \frac{q_2}{4C} = \frac{4q_1 + q_2}{4C}$

$\frac{1}{C_\Sigma} = \frac{1}{C_1} + \frac{1}{C_2} = \frac{1}{C} + \frac{1}{4C} = \frac{5}{4C}$

$C_\Sigma = \frac{4C}{5}$

$E = U_{C_\Sigma} = \frac{5q}{4C};\ \frac{q}{C} = \frac{4E}{5}$

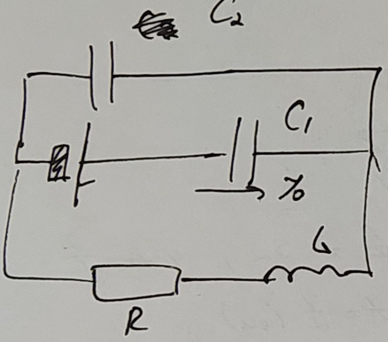
$\frac{q}{C} + \frac{q}{4C} =$

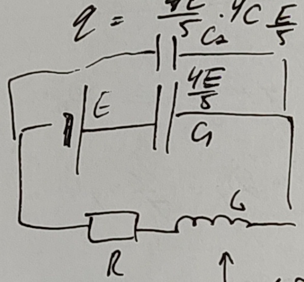
Тогда $U_{c_1} = \frac{4q}{4C} = \frac{q}{C} = \frac{4E}{5}$

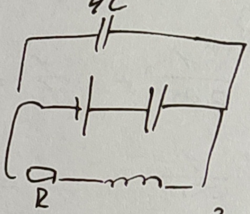
$q = \frac{4E}{5} 4C$

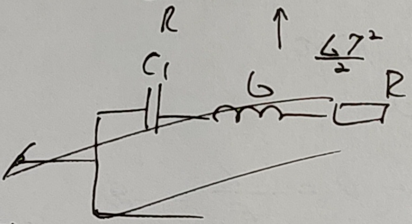
$q = \frac{4E}{5} \cdot 4C$

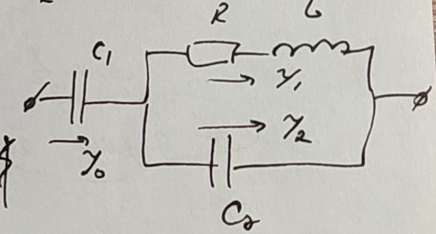
$U_{c_2} = \frac{q}{4C} = \frac{E}{5}$

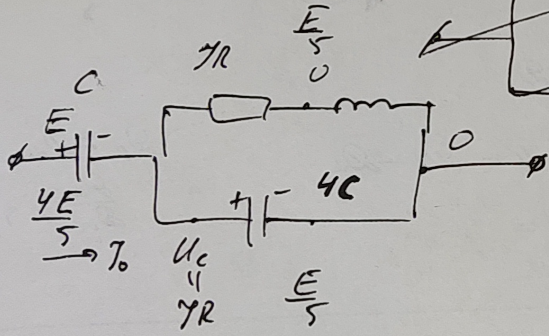




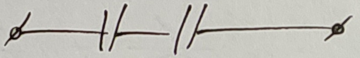






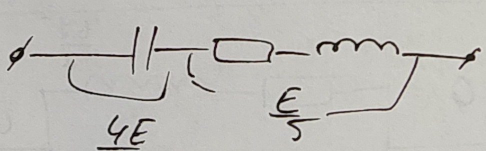


$\cancel{\frac{1}{C\omega}}$



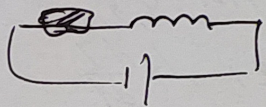
$\frac{4E}{5} = E - IR$

и It



$\frac{dq}{dt} = I_0$

$dq = I_0 dt$



$\mathcal{E} = IR + L\frac{dI}{dt}$

$\frac{4E}{5} \longrightarrow I_0$

$\mathcal{E} - IR = L\frac{dI}{dt};$

$\frac{E}{5} = IR,\ R$

$\frac{2CE^2}{25} = \frac{LI^2}{2} =$

$=$

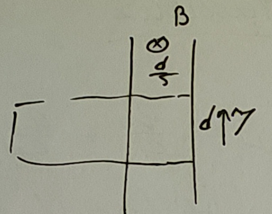
$\mathcal{E} =$

< >

$\frac{C \cdot 16E^2}{50} + \frac{2CE^2}{25} = \frac{8CE^2}{25} + \frac{2CE^2}{25} = \frac{10CE^2}{25} = \frac{2CE^2}{5}$

$C \cdot \frac{4E}{5}$

IR



$F = IBl =$

~~$Q = IBl$~~

$F_A = IBl = \frac{m}{8} a$

Черновик

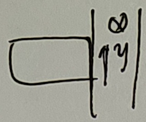
$B = \frac{Il}{2^2}$

$\overrightarrow{v_0 t}$

$t^2 5 \frac{B^2 d^2 v_0}{Rm} + 5 v_0 t - d = 0$

$3d + 3d + 2d = 8d$

$\mathcal{D} = 25 v_0^2 + 4.5 \cdot \frac{B^2 d^2 v_0}{Rm} d =$



~~$25 v_0^2 \cdot 20$~~

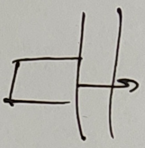
$=$

~~$\frac{at^2}{2} + v_0 t =$~~

$\frac{v_к^2 - v_н^2}{2a} = \frac{d}{5}$; $\frac{a^2 - v_0^2}{2a} = \frac{d}{5}$

~~[illegible]~~

$v_1^2 =$



$BIl = H$

$B \cdot \frac{Ом}{с \cdot Ом}$ Тл·м = Н·А

~~$\frac{Н^2 А^2 \cdot м/с}{Ом \cdot м}$~~

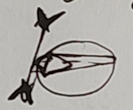
№3

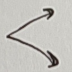
$\frac{1}{0{,}25} + \frac{1}{f} = \mathcal{D}_p$; $4 + \frac{1}{f} = \mathcal{D}_p$ $\frac{\mathcal{D}_p}{\mathcal{D}_y} = 3$

$\frac{1}{\infty} + \frac{1}{f} = \mathcal{D}_y$; $\mathcal{D}_y = \frac{1}{f}$; $4 + \frac{1}{f} = \frac{3}{f}$, $4 = \frac{2}{f}$

$f = \frac{1}{2}$ (м)

$\infty + \frac{1}{f} = \frac{1}{F}$, $F \to 0$





f задано глазом

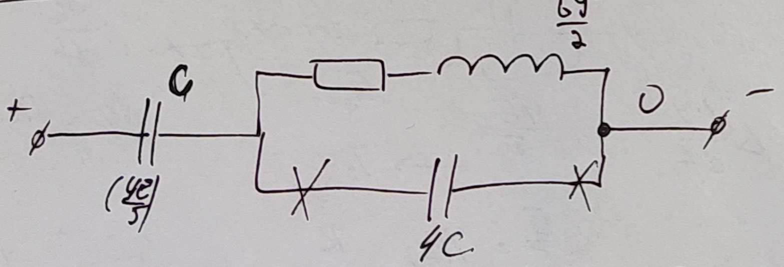
$\frac{1}{\infty} + 0 = -\frac{1}{F} = -\mathcal{D}$

$\mathcal{D}_1 < \mathcal{D}_2$

$\frac{1}{\infty} + \frac{1}{f} = \mathcal{D}_1$ $0 - 4 = \mathcal{D}_1 - \mathcal{D}_2$ $\frac{\mathcal{D}_2}{\mathcal{D}_1} = 3$

$0 - 4 =$

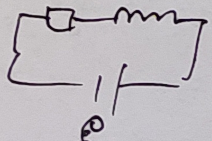
$\frac{1}{0{,}25} + \frac{1}{f} = \mathcal{D}_2$



$\frac{E}{5} = IR + 0$;

$\frac{E}{5} = IR + L\frac{dI}{dt}$

$\frac{E}{5} dt = IR + L dI$



$\mathcal{E} = L\frac{dI}{dt}$

$\left(\frac{E}{5}\right)$

$I\left(\frac{E}{5} - L\frac{dI}{dt}\right) dt = dQ$

$\mathcal{E} dt = L dI$

~~$\frac{E}{5} dt - L dI$~~ $\frac{EI}{5} dt - L\frac{dI}{1} = dQ$

$\mathcal{E} = U_c + IR = \frac{q}{c} + \frac{dq}{dt} R$, $\frac{\mathcal{E}C}{R} dt = \frac{q}{R}$

$\frac{dq}{\sim q} = \cdot - dt$

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