Часть 1

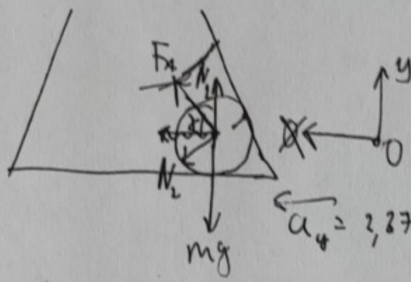
Олимпиада: **Физика, 10 класс (1 часть)**

Шифр: **21206613**

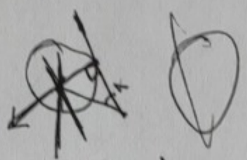
ID профиля: **332483**

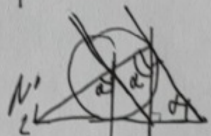
Вариант 2

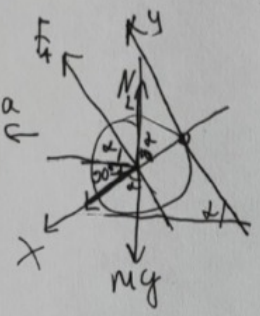
Черновик. IV



$a_ц = 2,37\,w^2 R$







$ma = F_{Ax} + N'_{2x}$

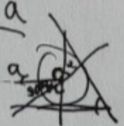
$mg = N_2 + F_{AB} + N'_2 \cdot \sin\alpha$

$2,37 m w^2 R = F_{Ax} + N_{2x}$

$N_2 = 5\rho g V - N'_2 \cdot \cos\alpha$

Oy:

Ox: ma



$\sin\alpha = a$

Ox: $ma \cdot \sin\alpha = mg\cos\alpha + N'_2 - N'_2\cos\alpha$

Oy: $ma \cdot \cos\alpha = -mg\sin\alpha + F_A + N_2 \cdot \sin\alpha$

$ma = -mg\frac{\sin\alpha}{\cos\alpha} + \frac{F_A}{\cos\alpha} + N_2 \cdot tg\alpha$

$ma = -mg\,tg\alpha + \frac{F_A}{\cos\alpha} + N_2\,tg\alpha.$

$ma + mg\,tg\alpha - \frac{F_A}{\cos\alpha} = N_2 \cdot tg\alpha$

$2,37\, m w^2 R + mg\,tg\alpha - \frac{6\rho g V}{\cos\alpha} = N_2 \cdot tg\alpha.$

$2,37\, m w^2 R \cdot \frac{2}{3} + mg - \frac{6\rho g V\sqrt{13}}{3} = N_2$

$2,37 \cdot 6\rho \cdot V w^2 \cdot R \cdot \frac{2}{3} + 6\rho V g - \frac{\rho g V}{5} = N_2$

$2,37 \cdot 8 \cdot \frac{4}{3} \cdot \frac{2}{3} \cdot \rho R^4 \cdot w^2 + 8\pi R^3 g - \frac{12}{5}\pi R^3 g = V.$

$2,37 \cdot \frac{16}{3} \cdot \rho R^4 w^2 + 5,6\,\pi R^3 g =$

$\sin\alpha = \frac{3}{\sqrt{13}}$

$\frac{1}{\cos\alpha} \cdot \frac{1}{tg\alpha} = \frac{1}{\sin\alpha}$

$\frac{1}{\cos\alpha}$

$\frac{3}{2} \cdot \frac{4}{3}$

4 · 2,4

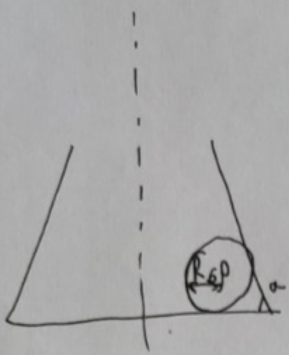
8 − 2,4 = 5,6

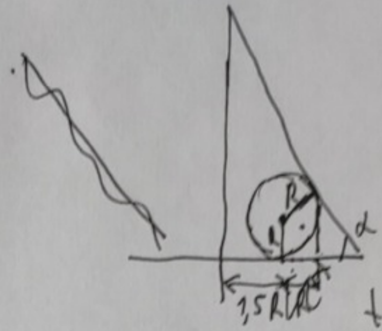
12,64 − 5,6

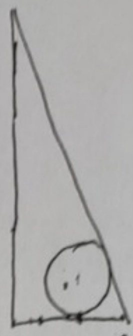
7,04

Черновик.

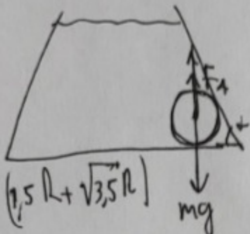
V





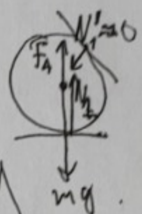


$\operatorname{tg}\alpha = \frac{3}{2} = R$



$a_y = \omega^2 \cdot r = \omega^2 \cdot (1{,}5R + \sqrt{3{,}5}R)$ 3,742

$a_y = 3{,}37\,\omega^2 R$



$F_A + N_1 = mg$

$\rho g V + N_1 = mg$

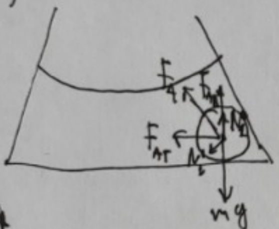
$N_1 = mg - \rho g V$

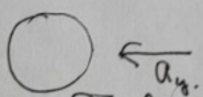
$N_1 = 6\rho V g - \rho g V =$

$N_1 = 5\rho V g$

~~$N_1 = \frac{5\cdot 4}{3}\rho V g$~~

$\boxed{N_1 = 5\rho g \cdot \frac{4}{3}\pi R^3}$





$1{,}5 + 1{,}871 = 3{,}37$

$\operatorname{tg}\alpha = \frac{3}{2}$

$\operatorname{tg}\beta = \sqrt{\frac{2}{7}} = \frac{R}{x}$

$\frac{\sin\alpha}{\cos\alpha} = \frac{3}{2}$

$x = \sqrt{\frac{7}{2}}R$

$x = 1{,}87R$

$\frac{\sin 2\beta}{\cos 2\beta} = \frac{2\cdot\sin\beta\cdot\cos\beta}{}$

$\cos^2\alpha + \sin^2\alpha = 1$

$\cos^2\alpha + \left(\frac{3}{2}\cos\alpha\right)^2 = 1$

$\cos^2\alpha + \frac{9}{4}\cos^2\alpha = 1$

$\frac{13}{4}\cos^2\alpha = 1$

$\cos^2\alpha = \frac{4}{13}$

$\boxed{\cos\alpha = \frac{2}{\sqrt{13}}}$

$\cos 2\beta = \cos^2\beta - \sin^2\beta = 2\cos^2\beta - 1$

~~4+9=13~~

$\cos 2\beta = 1 - 2\sin^2\beta$

$\cos 2\beta = 2\cdot\cos^2\beta - 1$

$2\sin^2\beta = \frac{1+\cos 2\beta}{2}$

$\sin^2\beta = \sqrt{\frac{1-\cos\alpha}{2}}$

$\cos\beta = \sqrt{\frac{1+\cos\alpha}{2}}$

$\operatorname{tg}\beta = \frac{\sin\beta}{\sin\alpha} = \frac{\sqrt{1-\cos\alpha}}{\sqrt{1+\cos\alpha}}$

$\operatorname{tg}\beta = \frac{\sqrt{1-\frac{5}{9}}}{\sqrt{1+\frac{5}{9}}} = \frac{\sqrt{\frac{4}{9}}}{\sqrt{\frac{14}{9}}}$

$\sin\alpha = \frac{3}{2}\cdot\frac{2}{\sqrt{13}}$

$\boxed{\sin\alpha = \frac{3}{\sqrt{13}}.}$

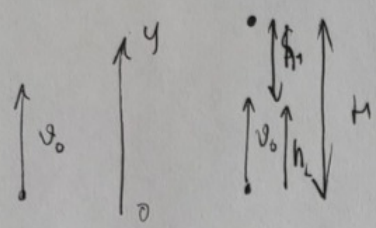
$\operatorname{tg}\beta = \sqrt{\frac{4}{9}}\cdot\sqrt{\frac{9}{14}} = \frac{2}{\sqrt{14}} = \sqrt{\frac{4}{14}} = \sqrt{\frac{2}{7}}$

$\cos\alpha = \frac{2}{3{,}6} = \frac{20}{36} = \frac{10}{18}$

$\cos\alpha = \frac{10}{18} = \frac{5}{9}$

Черновик

VI



$\vec{v}_к = \vec{v}_0 + \vec{a} t_0$

$0 = v_0 - g t_0$

$v_0 = g t_0$

$t_0 = \frac{v_0}{g}$

$t' = t_1 + t_0 = \frac{v_0}{2g} + \frac{v_0}{g}$

$\boxed{t' = \frac{3}{2}\frac{v_0}{g}}$

$\cancel{H = v_0}$

$H = \frac{v_0^2}{2g}$

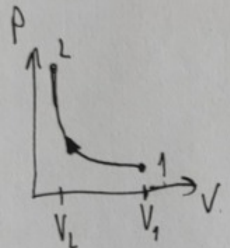
$h_1 = \frac{g t_1^2}{2}$

$h_1 + h_2 = H$

$h_2 = v_0 t_1 - \frac{g t_1^2}{2}$

$\cancel{\frac{g t_1^2}{2}} + v_0 t_1 - \cancel{\frac{g t_1^2}{2}} = H$

$v_0 t_1 = H$

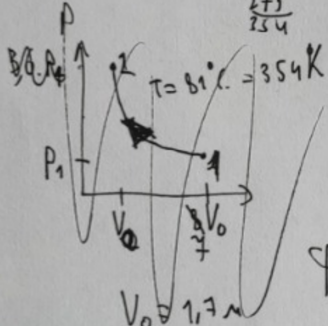


$V_1 = 7 V_2 = 7 \cdot 1{,}4 = 11{,}2л$

$t_1 = \frac{H}{v_0}$

$t_1 = \frac{v_0}{2g} = \frac{v_0}{2g}$

81 + 273 = 354



$\frac{\cancel{2} \cdot 18 \cdot 10^{-3} \cdot 0{,}5 \cdot 10^{5} \cdot 1{,}7 \cdot 10^{-3}}{354 \cdot 8{,}31}$

$\frac{t}{t_1} = \frac{3 v_0}{2g} \cdot \frac{2g}{v_0} =$

$\varphi = \frac{P_{абс}}{P_{н.п}}$

$\frac{18 \cdot 1{,}7 \cdot 10^{-1}}{354 \cdot 8{,}31}$

$\frac{18 \cdot 17}{354 \cdot 831}$

$h_2 = H - h_1 = \frac{v_0^2}{2g} - \frac{g t_1^2}{2}$

$\varphi = \frac{3{,}6 P_1}{P_{н.п} = 0{,}5 \cdot 10^5 Па}$

$h_2 = \frac{v_0^2}{2g} - \frac{g \cdot v_0^2}{4g^2 \cdot 2}$

$P_1 V_1 = \nu R T$

$P_1 = \frac{m_п}{\mu V_1} R T$

$P_2 =$

$P_{нп} = P_2$

$\frac{v_0^2}{2g} - \frac{v_0^2}{8g} =$

$m_п = \frac{\mu P_1 V_1}{RT} =$

$P_{нп_1} = 3{,}6 P_1$

$m_п = \frac{18 \cdot 10^{-3} \cdot \frac{5}{36} \cdot 10^5 \cdot 7 \cdot 1{,}4 \cdot 10^{-3}}{8{,}31 \cdot 354}$

$P_1 = \frac{0{,}5 \cdot 10^5}{3{,}6}$

$\frac{4 v_0^2}{8g} - \frac{v_0^2}{8g} = \frac{3 v_0^2}{8g}$

0, 1 3, 8, 8, 8, 8.

$P_1 = \frac{5}{36} \cdot 10^5 = 13888 Па$

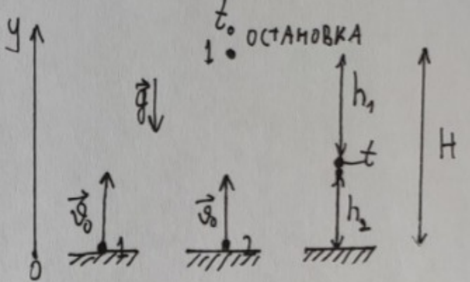
$m_п = \frac{\frac{5}{2} \cdot 10^{2} \cdot 7 \cdot 1{,}7 \cdot 10^{-3}}{8{,}31 \cdot 354} = \frac{\frac{5}{2} \cdot 10^{-1} \cdot 7 \cdot 1{,}4}{8{,}31 \cdot 354} = \frac{5 \cdot 7 \cdot 1{,}4}{4 \cdot 8{,}31 \cdot 354} = \frac{7 \cdot 1{,}4}{4 \cdot 8{,}31 \cdot 354} = 0{,}001 кг = 1{,}01 грам$

Чистовик

I

№1

1) $\vec{v}_к = \vec{v}_0 + \vec{a} t_0$ – для 1 шарика до остановки



OY: $0 = v_0 - g t_0$

$t_0 = \frac{v_0}{g}$

$h_1 = \frac{g t_1^2}{2}$, где $t_1 = t - t_0$ – время от остановки до столкновения

$h_2 = v_0 \cdot t_1 - \frac{g t_1^2}{2}$

$H = \frac{v_0^2}{2g}$

$H = h_1 + h_2 \Rightarrow \frac{g t_1^2}{2} + v_0 \cdot t_1 - \frac{g t_1^2}{2} = \frac{v_0^2}{2g} \Rightarrow v_0 t_1 = \frac{v_0^2}{2g} \Rightarrow t_1 = \frac{v_0}{2g}$

$t = t_1 + t_0 = \frac{v_0}{2g} + \frac{v_0}{g} = \frac{3v_0}{2g}$

2) $\frac{t}{t_1} = \frac{3v_0}{2g} \cdot \frac{2g}{v_0} = 3$

3) $h_2 = H - h_1 = \frac{v_0^2}{2g} - \frac{g t_1^2}{2} = \frac{v_0^2}{2g} - \frac{g \cdot v_0^2}{2 \cdot 4 g^2} = \frac{v_0^2}{2g} - \frac{v_0^2}{8g} = \frac{3 v_0^2}{8g}$

Ответ: 1) $t = \frac{3v_0}{2g}$

2) $\frac{t}{t_1} = 3$

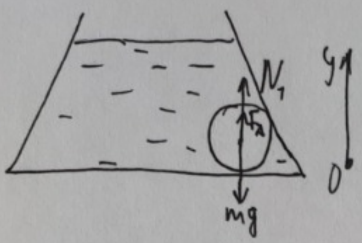
3) $h_2 = \frac{3 v_0^2}{8g}$

Чистовик

№2

II

1)



По усл. равновес.

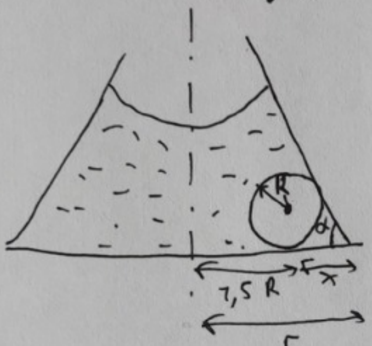
OY: $mg = N_1 + F_A$

$mg - F_A = N_1$

$|\vec{P}_1| = |\vec{N}_1| = 6\rho g V - \rho g V = 5\rho g V$

$P_1 = 5\rho g \cdot \frac{4}{3}\pi R^3 = \frac{20}{3}\rho g \pi R^3$

2)



$\alpha = 2\beta$

$tg\beta = \frac{\sqrt{1-\cos\alpha}}{\sqrt{1+\cos\alpha}}$; $\sin\alpha = \frac{3}{2}\cos\alpha$

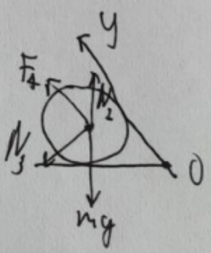
$\cos^2\alpha + \frac{9}{4}\cos^2\alpha = 1 \Rightarrow \cos\alpha = \frac{2}{\sqrt{13}} \approx \frac{2}{3,6} \approx \frac{5}{9}$

$\sin\alpha \approx \frac{3}{2}\cdot\frac{5}{9} = \frac{5}{6}$

$tg\beta = \frac{\sqrt{1-\frac{5}{9}}}{\sqrt{1+\frac{5}{9}}} = \frac{2}{\sqrt{14}} = \sqrt{\frac{2}{7}}$

$x = \frac{R}{tg\beta} = \sqrt{\frac{7}{2}}R \approx \cancel{5,37}\ 1,87R$

$a_ц = w^2 \cdot r = 2,37 w^2 R.$



По 2. ЗН:

OY: $ma_ц \cos\alpha = -mg\cdot\sin\alpha + F_A + N_2\cdot\sin\alpha.$

$2,37\cdot mw^2R\cdot\frac{2}{3} + mg - \frac{\cancel{6}\rho g V}{\frac{5}{9}} = N_2$

$2,37\, mw^2\cdot\frac{2}{3}R + mg - \frac{9\rho g V}{5} = N_2.$

$6\cdot 2,37\cdot\frac{4}{3}\pi R^4\cdot w^2\cdot\frac{2}{3} + 6\rho g V - \frac{9}{5}\rho g V = N_2. \Rightarrow N_2 = 7,04\pi R^3 g \approx 7\pi R^3 g\rho$

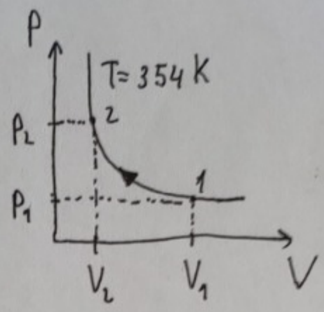
Ответ: 1) $P_1 = \frac{20}{3}\rho g\pi R^3$

2) $N_2 \approx 7\pi\cdot R^3 g \cancel{R}\cdot\rho$

III

Чистовик

№3



1) Заметим, что графики изотермы являются гипербола в p,V координатах =>
=> должно выполнятся соотношение:

$$\frac{P_2}{P_1} = \frac{V_1}{V_2}$$

но $\frac{P_2}{P_1} = 3,6$, $\frac{V_1}{V_2} = 7$ => противорение

Значит давление пара в P_2 равно давлению насыщенного пара при $T = 354K$

$$P_2 = P_{н.п}$$

$$3,6 P_1 = P_{нп}$$

$$P_1 = \frac{P_{нп}}{3,6} = \frac{5}{36} \cdot 10^5 \text{ Па} \approx 13889 \text{ Па} \approx \cancel{14}\ 13,9 \text{ кПа}$$

2) Т.к. пар можно считать идеальным, то по уравн. Менделеева-Клапейрона:

$$P_1 V_1 = \frac{m}{\mu} RT \Rightarrow m = \frac{\mu P_1 V_1}{RT} = \frac{\cancel{3,6}\ \mu P_{нп} \cdot 7 V_2}{3,6\ RT}$$

$$m = \frac{7 \mu P_{нп} \cdot V_2}{3,6\ RT} = 0,001 \text{ кг} = 1 \text{ г}$$

Ответ: 1) $P_1 = 13,9$ кПа

2) $m = 1$ г

Часть 2

Олимпиада: **Физика, 10 класс (2 часть)**

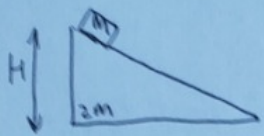
Шифр: **21206613**

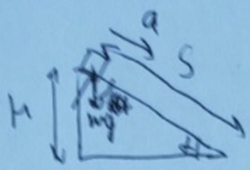
ID профиля: **332483**

Вариант 2

Черновик

III





$\cancel{mgH = \frac{mv^2}{2}}$

$H = \frac{v^2}{2g}$

$N = \frac{5}{12} mg$

По 2 з. Н:

$\cancel{mg \cdot \sin\alpha = ma}$

$\frac{3}{5} g = a$

$S = \frac{at^2}{2}$

$S = \frac{\frac{4}{5} g \cdot t}{2}$

$\frac{S}{2} = \frac{3 g \cdot t}{5 \cdot 2} \Rightarrow$

$\frac{4}{5} g = a$

$S \quad \sin\alpha = \frac{H}{S}$

$S = \frac{H}{\sin\alpha} = \frac{H}{\frac{4}{5}} = \frac{5}{4} H$

$mg \cdot \sin\alpha = ma$

$\frac{2}{3} mg - mg = N \frac{4}{5}$

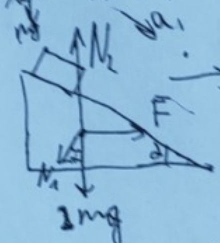
$\frac{2}{3} mg - mg = N \frac{4}{5}$

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

$N_1 \sin\alpha = \frac{4}{5}$

$N_1 = mg \cdot \cos\alpha$

2)



$S = \frac{at^2}{2} \Rightarrow \frac{H}{\sin\alpha} = \frac{g \cdot \sin\alpha \cdot t^2}{2}$

$2m \frac{g}{3} = mg + N \cdot \frac{4}{5}$

$2m \frac{g}{3} - mg$

$\frac{2H}{g \cdot \sin^2\alpha} = t^2$

$t = \sqrt{\frac{2H}{g}} \cdot \frac{1}{\sin\alpha} = \sqrt{\frac{2H}{g}} \cdot \frac{5}{4}$

$\cancel{2ma_2 = F - N_1 \cdot \sin\alpha}$

$\cancel{2ma_2 = 2mg - mg \cdot \sin\alpha \cdot \cos\alpha}$

$\boxed{1) \quad t = \frac{5}{4}\sqrt{\frac{2H}{g}}}$

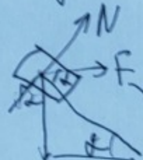
$\frac{1}{3} mg$

$\cancel{2a_2 = g(2 - \sin\alpha \cdot \cos\alpha) = g\left(2 - \frac{4}{5} \cdot \frac{3}{5}\right) = g\left(1 - \frac{12}{25}\right) = g \frac{13}{25}} = \frac{130}{25}$

$2a_2 = \frac{13}{25} g \Rightarrow a_2 = \frac{13}{50} g$

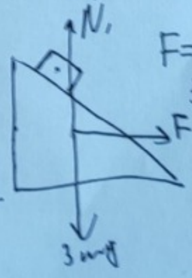
$2ma \frac{g}{3} = mg + N \cdot \sin\alpha$

$\cancel{mgH = \frac{mv^2}{2} + \frac{2mv^2}{2}}$



$2ma_2 = mg - mg \sin\alpha \cos\alpha$

$2a_2 = g\left(1 - \frac{12}{25}\right) \Rightarrow a_2 = \frac{13}{50} g$



$F = mg$

$3ma_2 = mg$

$a_2 = \frac{g}{3}$

$ma_1 = F \cdot \cos\alpha + mg \cdot \sin\alpha$

$\cancel{\frac{5}{12} mg + mg \cdot \sin\alpha = mg \cos\alpha +}$

$\cancel{\frac{5}{12} + \frac{4}{5} = \frac{3}{5}}$

Черновик

IV

$P_2 = 0{,}99 P_1$

$V_2 = 1{,}02 V_1$

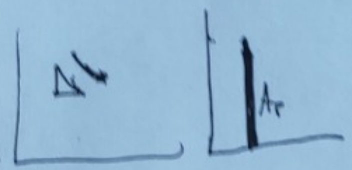
$P_1 V_1 = \nu R T_1$

$P_2 V_2 = \nu R T_2$

$0{,}99 P_1 \cdot 1{,}02 \cdot V_1 = \nu R T_2$

$\frac{t}{t_3} = \frac{\frac{S}{t_1}\sqrt{2}}{\frac{S}{\sqrt{2}} t} = \frac{\sqrt{2}\sqrt{2}}{t_1} =$

$P_1 V_1 = \frac{\nu R T_2}{0{,}99 \cdot 1{,}02} = \nu R T_1$



$1{,}3537$

$T_2 = 0{,}99 \cdot 1{,}02 T_1$

$T_2 = 1{,}0098 T_1$

$\frac{\Delta P}{P} << 1$ A_r

$A_r = \frac{a+b}{2} \cdot h \cdot \frac{(P_2 + P_1)}{2}(V_2 - V_1) = \frac{1}{2}(P_2 + P_1)(V_2 - V_1)$

$\frac{T_2}{T_1} = \cancel{+0}$ T_2 изменилось на $0{,}98\%$

$Q = \Delta U + A_r$

$Q = \frac{3}{2}(P_2 V_2 - P_1 V_1) + P_2 V_2 - P_1 V_1$

$\frac{3}{2} + 1 = \frac{5}{2}$

$Q = \Delta U + P_2 V_2 - P_1 V_1$

$(0{,}99 P_1 + P_1) = 1{,}99 P_1$

$(1{,}02 V_1 - V_1) = 0{,}02 V_1$ $\frac{Q}{\Delta U} = \frac{\Delta U + A_r}{\Delta U} = \frac{\frac{3}{2} P_2 V_2 - \frac{3}{2} P_1 V_1 + P_2 V_2 - P_1 V_1}{P_2 V_2 - P_1 V_1} =$

$\frac{2 \cdot 0{,}02}{3 \cdot 0{,}01} =$ $\delta Q =$ δ $\delta Q = \Delta U + \Delta A_r$

$\frac{1{,}99 \cdot 0{,}02 P_1 V_1}{2} = 0{,}0199 P_1 V_1$

$A_r = 0{,}02 P_1 V_1$

$\frac{\Delta U + \Delta A_r}{\Delta U} = \frac{3}{2}(P_2 V_2 - P_1 V_1)$

$ma = -F \cdot \cos\alpha + m g \cdot \sin\alpha$

$\frac{1}{3} mg = mg - N_1 \cdot \sin\alpha$

$a = g\cos\alpha + g \cdot \sin\alpha$

$\frac{2}{3} mg =$ $\frac{1}{3} mg = N_1 \sin\alpha$

$a_1 = g\left(-\frac{3}{5} + \frac{4}{5}\right) = \frac{7}{5} g$

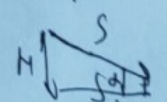
$\frac{4}{3} mg = N_1 \cdot \frac{4}{5}$

$a_1 = \cancel{\frac{7}{5} g}\ \frac{1}{5} g$

Q

$\frac{5}{12} mg = N_1$

$t = 5\sqrt{\frac{H}{2g}}$



$\frac{\Delta U + A_r}{\Delta U} =$

$N + \cancel{mg} \cdot \sin\alpha = mg\cos\alpha$

$\cancel{t} = \cancel{5H}$

$N = \frac{5}{12} = \frac{3}{5} - \frac{4}{5}$

$1 + \frac{A_r}{\Delta U} = 1 + \frac{0{,}0199 P_1 V_1}{\frac{3}{2}(P_2 V_2 - P_1 V_1)}$

$S = \frac{H}{\sin\alpha} = \frac{5H}{4}$

$\frac{5H}{4} = \frac{7g \cdot t^2}{5 \cdot 2}$

$P_2 V_2 = 1{,}0098 P_1 V_1 - 1$

$\frac{25H}{2 \cdot 7g} = t^2$ $\frac{25H}{2g} = t^2$

$\frac{0{,}0199}{\frac{3}{2} 0{,}0098} = \frac{2 \cdot 0{,}0199}{3 \cdot 0{,}0098} = \cancel{\frac{0{,}0098 P_1 V_1}{3/2}}$ $0{,}1353 + 1$

Черновик

V

2 г

$\frac{4}{5}\cdot\frac{4}{5}-\frac{4}{5}\cdot\frac{3}{5}=\frac{16-12}{25}=\frac{4}{5}$

$\sin^2\alpha-\sin\alpha\cdot\cos\alpha=\frac{4}{5}\cdot\frac{4}{5}=\frac{16}{25}-$ ч.

$\sin\alpha$

$\frac{4}{5}-$

$\sqrt{\frac{2M}{g}}$.

$\frac{5\sqrt{2}}{4}\cdot\frac{\sqrt{4}}{5\sqrt{3}}=\frac{2}{4}$

$\cancel{\sin^3}\ \sin^2\alpha=\sin^2\alpha-\sin\alpha\cdot\cos\alpha$

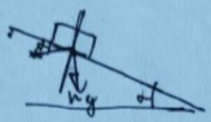
$\left(\frac{4}{5}\right)^2=\frac{4^2}{5}-\frac{4}{5}$.

$\frac{25M}{}$

$\frac{25M\alpha}{4\cdot2g}=$

$ma_1=mg\cdot\sin\alpha=$

$a_1=\frac{4}{5}g$



$\frac{5M}{4g}=\frac{4}{5\cdot2}t^2\Rightarrow t=\frac{5}{4}\sqrt{\frac{2M}{g}}$.

$ma=mg\sin\alpha-mg\cdot\cos\alpha$

$a_2=\frac{1}{5}g$

$\frac{5M}{4g}=\frac{t^2}{5\cdot2}\Rightarrow t=5\sqrt{\frac{2M}{4g}}$

$\frac{25\cdot2M}{4g}=t^2$

$5\sqrt{\frac{M}{2g}}$.

$\sqrt{5}\ \frac{M}{5}$

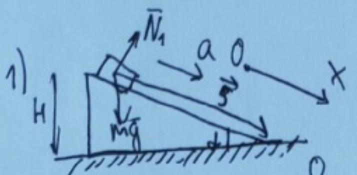
I

Чистовик

~~№1~~

№4

1)



По 2 З.Н.:

OX: $mg\sin\alpha = ma$

$a = g\cdot\sin\alpha$

$$\vec S = \underbrace{\vec v_0}_{=0}\cdot t + \frac{\vec a t^2}{2}$$

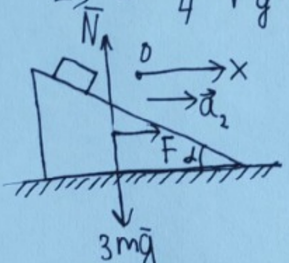
OX: $S = \frac{at^2}{2}$

$$\frac{H}{\sin\alpha} = \frac{g\cdot\sin\alpha\cdot t^2}{2} \Rightarrow t^2 = \frac{2H}{g\cdot\sin^2\alpha} \Rightarrow t = \frac{1}{\sin\alpha}\cdot\sqrt{\frac{2H}{g}} \Rightarrow$$

$\sin\alpha = \sqrt{1-\cos^2\alpha} = \frac{4}{5}$

$$\Rightarrow t = \frac{5}{4}\sqrt{\frac{2H}{g}} = \frac{5\sqrt2}{4\sqrt2}\cdot\sqrt{\frac{2H}{g}} = \frac{5\cdot 2}{4}\sqrt{\frac{H}{2g}} = \frac{5}{2}\sqrt{\frac{H}{2g}}$$

2)



Рассмотрим систему вместе (из двух тел)

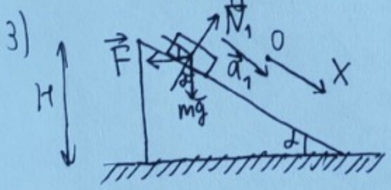
По 2 З.Н.:

OX: ~~3mg~~ $3ma_2 = F$

$3ma_2 = mg$

$a_2 = \frac{g}{3}$

3)



По 2 З.Н. (для бруска)

OX: $ma_1 = mg\sin\alpha - F\cdot\cos\alpha$

$ma_1 = mg\cdot\sin\alpha - mg\cos\alpha$

$a_1 = g(\sin\alpha - \cos\alpha)$

$$\vec S = \vec v_0\cdot t_3 + \frac{\vec a_1 t_3^2}{2}$$

$$OX: \frac{H}{\sin\alpha} = \frac{g(\sin\alpha-\cos\alpha)\cdot t_3^2}{2} \Rightarrow t_3 = \sqrt{\frac{2H}{g\cdot\sin\alpha(\sin\alpha-\cos\alpha)}} = \sqrt{\frac{2H}{g\cdot\frac{4}{5}\cdot\frac{1}{5}}}$$

$$t_3 = 5\sqrt{\frac{H}{2g}}$$

Ответ: 1) $t = \frac{5}{4}\sqrt{\frac{2H}{g}} = \frac{5}{2}\sqrt{\frac{H}{2g}}$

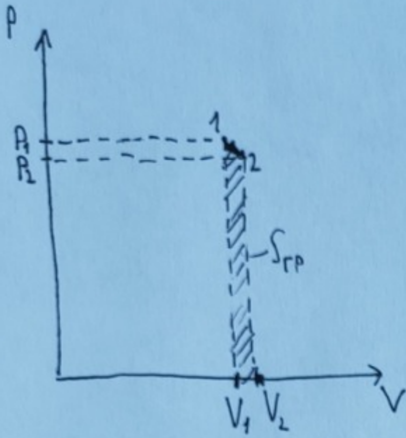
2) $a_2 = \frac{g}{3}$

3) $t_3 = 5\sqrt{\frac{H}{2g}}$

VI

Чистовик

№5.



1) $p_2 = 0{,}99 p_1$

$V_2 = 1{,}02 V_1$

По зак. Менделеева-Клапейрона:

$p_1 V_1 = \nu R T_1$

$p_2 V_2 = \nu R T_2$ $\Big| \Rightarrow$

$p_2 V_2 = 0{,}99 \cdot 1{,}02 \cdot p_1 V_1 = \nu R T_2$

$\Rightarrow T_2 = 0{,}99 \cdot 1{,}02 \cdot T_1 = 1{,}0098\, T_1 \Rightarrow$

$\Rightarrow$ Температура увеличилась на 0,98 %

2) По первому началу термодинамики:

$Q = \Delta U + A_г$

$A_г = +S_{гр} = \frac{1}{2}(p_2 + p_1)(V_2 - V_1) = \frac{1}{2} \cdot 1{,}99 p_1 \cdot 0{,}02 V_1 = 0{,}0199\, p_1 V_1$

$\Delta U = \frac{3}{2}(p_2 V_2 - p_1 V_1) = \frac{3}{2}(1{,}0098 p_1 V_1 - p_1 V_1) = \frac{3}{2} \cdot 0{,}0098 p_1 V_1$

$\frac{Q}{\Delta U} = \frac{\Delta U + A_г}{\Delta U} = 1 + \frac{A_г}{\Delta U} = 1 + \frac{0{,}0199\, p_1 V_1}{\frac{3}{2} \cdot 0{,}0098\, p_1 V_1} = 1 + \frac{2 \cdot 0{,}0199\, \cancel{p_1 V_1}}{3 \cdot 0{,}0098\, \cancel{p_1 V_1}} \approx 2{,}35$

Ответ: 1) Температура увеличилась на 0,98%

2) $\frac{Q}{\Delta U} = 2{,}35$