Часть 1

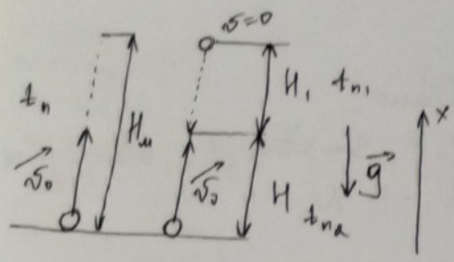
Олимпиада: **Физика, 10 класс (1 часть)**

Шифр: **21206142**

ID профиля: **887345**

Вариант 1

Чистовик №1



Дано:

H, $v_{01} = v_{02}$, $t_{n_1} = t_{n_2}$

Найти:

$t_2 - ?$

$v_0 - ?$ $H_2 - ?$

Решение:

$$S_x = \frac{v^2 - v_0^2}{2a_x}$$

$$H_m = \frac{0 - v_0^2}{-2g}; \quad \boxed{H_m = \frac{v_0^2}{2g}}$$

$$H_1 = \frac{g \cdot t_{n_1}^2}{2} = \frac{g \cdot t_{n_2}^2}{2} \quad \boxed{H_1 = \frac{g \cdot t_{n_2}^2}{2}}$$

$$H = \frac{v^2 - v_0^2}{-2g}; \quad H = v_0 \cdot t_{n_2} - \frac{g t_{n_2}^2}{2}$$

$$H = H_m - H_1$$

$$v_0 \cdot t_{n_2} - \frac{g t_{n_2}^2}{2} = \frac{v_0^2}{2g} - \frac{g \cdot t_{n_2}^2}{2}$$

$$v_0 \cdot t_{n_2} = \frac{v_0^{\cancel{2}}}{2g}$$

$$t_{n_2} = \frac{v_0}{2g}$$

$$v_0 = 2g \cdot t_{n_2}$$

$$H = 2g \cdot t_{n_2}^2 - \frac{g t_{n_2}^2}{2}$$

$$H = t_{n_2}^2 \left(2g - \frac{g}{2}\right)$$

$$\boxed{t_{n_2} = \sqrt{\frac{H}{1,5\, g}}}$$

1

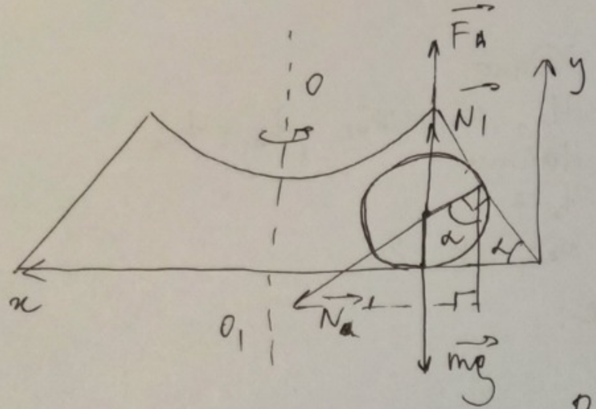
$$v_0 = 2g \cdot \sqrt{\frac{H}{1,5 g}} = \sqrt{\frac{4 g^{\cancel{2}} H}{1,5 \cancel{g}}} = \sqrt{\frac{4gH}{1,5}}; \quad \boxed{v_0 = \sqrt{\frac{4gH}{1,5}}}$$

$$H_2 = H_m + H_1 = \cancel{2} \cdot \frac{v_0^2}{\cancel{2} g} - H = \frac{4gH}{1,5 \cancel{g}} - H = H\left(\frac{4}{1,5} - 1\right) = H\left(\frac{2,5}{1,5}\right) = \frac{5}{3} H$$

Ответ: $t_{n_2} = \sqrt{\frac{H}{1,5g}}$, $v_0 = \sqrt{\frac{4gH}{1,5}}$, $H_2 = \frac{5}{3} H$

Чистовик

52



Дано:

$\omega, \rho, \rho_ш = 3\rho, R_ш, 2R, tg\alpha = 2$

$N_1 - ?$ $N_2 - ?$

Решение:

1.) $N_1 + F_A = mg$

$N_1 = mg - F_A$

$N_1 = 3\rho \cdot V_ш g - \rho \cdot g \cdot V_ш$

$N_1 = \rho \cdot V_ш (3g - g)$

$N_1 = 2\rho \cdot \frac{4}{3}\pi R^3 \cdot g$

$N_1 = \frac{8}{3}\rho \pi R^3 g$

2) $x: N' \cdot \sin\alpha = m \cdot a$

$N' = \frac{m \cdot v^2}{\sin\alpha \, 2R}$

$N' = \frac{m \cdot \omega^2 2R}{\sin\alpha}$

$y: N_2 + F_A = mg + N' \cdot \cos\alpha$

$N_2 = 3\rho \cdot V_ш \cdot g + 2\frac{m \cdot \omega^2 \cdot R \cdot \cos\alpha}{\sin\alpha} - \rho g \cdot V_ш$

$N_2 = 2\rho V_ш \cdot g + 2 \cdot V_ш \cdot \rho \cdot \omega^2 \cdot R \cdot \frac{1}{tg\alpha}$

$N_2 = 2\rho V_ш \cdot g + V_ш \cdot \rho \cdot \omega^2 \cdot R$

$N_2 = 2 \cdot \rho \cdot \frac{4}{3}\pi R^3 \cdot g + \frac{4}{3}\pi R^3 g \cdot \rho \cdot \omega^2 \cdot R$

$N_2 = \cancel{2} \cdot \rho \cdot \frac{4}{3}\pi R^3 \cdot g (2 + \omega^2 \cdot R)$

Ответ: $N_1^+ = \frac{8}{3}\rho \pi R^3 \cdot g$, $N_2 = \rho \cdot \frac{4}{3}\pi R^3 \cdot g (2 + \omega^2 \cdot R)$.

2

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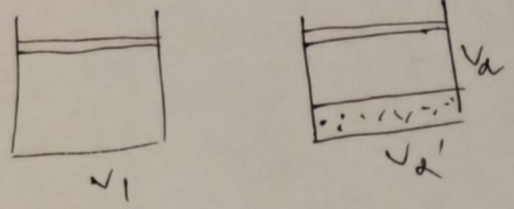
Чистовик

№3

Дано:
$m = 3$ кг, $81°C$,
$V_1 = 3,5 V_2$
$p_2 = 1,8 p_1$; $p = 0,5 \cdot 10^5$ Па
$M = 18$ г/моль
$R = 8,31 \frac{Дж}{(моль \cdot К)}$
$V_2 - ?$ $p_1 - ?$



$$V_2 = V_2' - V_ж$$

$$\frac{V_1}{3,5} = \frac{V_1}{1,8} - V_ж$$

$$V_ж = \frac{V_1}{1,8} - \frac{V_1}{3,5}$$

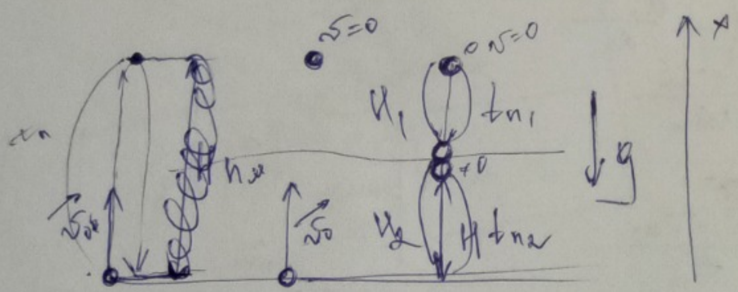
$$V_ж = \frac{3,5 V_1 - 1,8 V_1}{6,3} = \frac{1,7 V_1}{6,3}$$

$$p_2 = 0,5 \cdot 10^5 \text{ Па}$$

$$p_1 = \frac{0,5 \cdot 10^5 \text{ Па}}{1,8}$$

3

№1 черновик



$t_n = \frac{v_0}{}$ $\quad a = \frac{v_0 - v}{t_n}$ $\quad a_x = \frac{v_x - v_{0x}}{t_n}$

$t_n = \frac{(v_0 - v)}{a}$ $\quad -g = \frac{v_x - v_{0x}}{t_n}$

$t_{n2} = \frac{v_{0x} - v_x}{g}$

$t_{n_1} = \frac{v}{}$

$-g = \frac{-v}{t_n}$ $\quad \boxed{v_0 = \sqrt{2gH}}$ $\quad \boxed{t_{n_1} = \sqrt{\frac{2H_1}{g}}}$

$t_{n_1} = \frac{v_1}{g}$ $\quad -H_1 = -\frac{g t_{n_1}^2}{2} \quad t_{n_1} =$

$\frac{v_1}{g} = \frac{v_0 - v_2}{g}$ $\quad H_1 = \frac{g t_{n_1}^2}{2}$

$t_{n_1} = \sqrt{\frac{2H_1}{g}}$

$H = v_0 \cdot t - \frac{g t^2}{2}$ $\quad H_1 = H - H_2$

$H_x = \frac{v_x^2 - v_{0x}^2}{2a_x}$ $\quad H_2 = v_0 \cdot t_{n2} - \frac{g t_{n2}^2}{2}$

$H = \frac{-v_{0x}^2}{-2g}$ $\quad H_2 = \frac{v^2 - v_0^2}{2g}$

$H = \frac{v_0^2}{2g}$ $\quad t_{n_1} = t_{n2},\ g_1 = g_2$

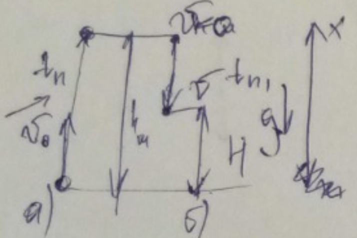
$\frac{v - v_0}{-g} = t_{n_1}$

$\frac{v_0^2}{2g} = v_0 \cdot t_{n_1} - \frac{g t_{n_1}^2}{2}$ $\quad t_{n_1} = \frac{v_0 - v}{g}$

$t_{n_1}^2 \left(\frac{g}{2}\right) - t_{n_1} \cdot v_0 + \frac{v_0^2}{2g}$

1

1 мяч:



черновик

дано

$$\begin{cases} S_x = v_{0x} t + \frac{a_x t^2}{2} \\ S_x = \frac{v_x^2 - v_{0x}^2}{2a_x} \\ a = \frac{v_x - v_{0x}}{t_n} \end{cases}$$

$m\ S = \frac{v^2 - v_0^2}{-2g}$

$S = \frac{v_0^2 - v^2}{2g}$

$S = \frac{v_0^2 - v^2}{2g}$

$-S = \frac{v^2 - v_0^2}{-2g}$

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

а) $\cancel{H_m = -v_0 t + \frac{g t^2}{2}}$

$H_m = v_0 \cdot t_n - \frac{g t_n^2}{2}$ $\qquad H_m = \frac{-v_0^2}{-2g} = \frac{v_0^2}{2g}$

б) $-(H_m - H) = -\frac{g t_{n1}^2}{2}$ $\qquad -g = \frac{-v_0}{t_n} \Rightarrow t_n = \frac{v_0}{g}$

$H_m - H = \frac{g t_{n1}^2}{2}$ $\qquad t_{n2}^2 = \sqrt{\frac{2(H_m - H)}{g}}$

$H_m = \frac{g t_{n1}^2}{2} + H$

$\cancel{(H_m - H) = -\frac{v^2}{g}}$ $\qquad \cancel{-S = \frac{-v^2}{2g}}$ $\qquad H_m - H = \frac{v^2}{2g}$

$-S = \frac{v^2 - v_0^2}{-2g}$ $\qquad -g = \frac{-(v - v_0)}{t_{n1}}$ $\qquad$ (2)

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

$g = \frac{v}{t_{n1}}$ $\qquad \boxed{t_{n1} = \frac{v}{g}}$

в) $t_{n2} =$

$H = v_0 \cdot t_{n2} - \frac{g t_{n2}^2}{2}$ $\qquad -g = \frac{v - v_0}{t_{n2}}$

$H = \frac{v^2 - v_0^2}{-2g}$ $\qquad t_{n2} = \frac{v - v_0}{-g} = \frac{v_0 - v}{g}$

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

$H - v_0 \cdot t_{n2} + g \frac{t_{n2}^2}{2} = 0$

$t_{n1} = t_{n2}$ $\qquad t_{n2} = \frac{v_0 + \sqrt{v_0^2 - 2gH}}{2H}$

$\frac{v}{g} = \frac{v_0 - v}{g}$

$\sqrt{2H}$

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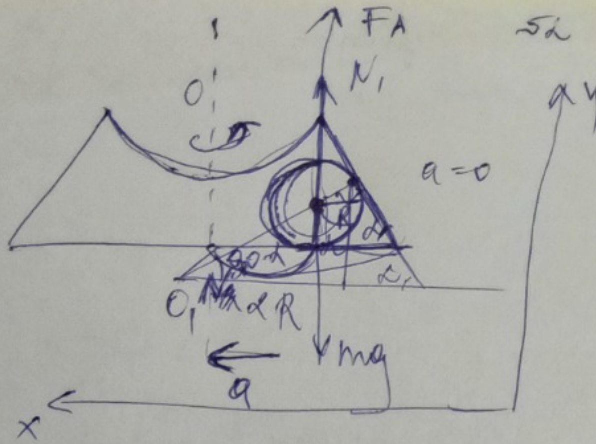
52 Черновик

Дано:
ω, ρ, $\rho_{ш}=3\rho$, R, $2R$



$\cancel{N_1 = mg}$

$N_1 = \rho_{ш} \cdot V_{ш} = \rho_{ш} \cdot \frac{4}{3}\pi R^3 = 3$

ω

$N_1 + F_A = mg$

(3)

$N_1 = mg - F_A$

$N_1 = \rho_{ш} \cdot V_{ш} - \rho_в \cdot g \cdot V = 3\rho \cdot V_{ш} - \rho \cdot g V_{ш} =$

$N_1 = V_{ш} \cdot \rho (3 - g)$

$\omega = \frac{v}{R}$

$N_1 = \frac{4}{3}\pi R^3 \cdot \rho (3 - g)$

$a = \frac{v^2}{R} = \omega^2 R$

$x: N' \cdot \sin\alpha = m \cdot a$

$a = \omega \cdot R$ $\frac{\omega^2}{R^2 \cdot R}$

$N' \cdot \sin\alpha = m \cdot \omega^2 \cdot R$

$\omega = v \cdot R$

$v = \frac{\omega}{R}$

$N' = \frac{m \cdot \omega^2 R}{\sin\alpha}$

$v = \omega \cdot R$

$y: N_1 + F_A = mg + N' \cdot \cos\alpha$

$a = \frac{\omega^2 \cdot R^2}{R} = \omega^2 R$

$N_1 = 3\rho \cdot V_{ш} \cdot g + \frac{m\omega^2 R \cdot \cos\alpha}{\sin\alpha} - \rho \cdot V_{ш}$

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51 черновик

$H_м = \frac{v_0^2}{2g}$

$H_1 = \frac{g \cdot t_{n_2}^2}{2}$

$H = v_0 \cdot t_{n_2} - \frac{g t_{n_2}^2}{2}$

$H = H_м - H_1$

$\frac{v_0^2}{2g} - \cancel{\frac{g t_{n_2}^2}{2}} = v_0 \cdot t_{n_2} - \cancel{\frac{g t_{n_2}^2}{2}}$

$\frac{v_0^{\cancel{2}}}{2g} = \cancel{v_0} \cdot t_{n_2}$

$t_{n_2} = \frac{v_0}{2g}$

$v_0 = t_{n_2} \cdot 2g$

4

$H = 2g t_{n_2}^2 - \frac{g t_{n_2}^2}{2}$

$\frac{H}{g} = t_{n_2}^2 \left(2 - \frac{1}{2}\right)$

$t_{n_2}^2 = \frac{H}{1{,}5\, g}$

$\underline{t_{n_2} = \sqrt{\frac{H}{1{,}5 g}}}$

$v_0 = 2g \cdot t_{n_2} = 2g \cdot \sqrt{\frac{H}{1{,}5 g}} = \sqrt{\frac{4 g^2 H}{1{,}5\, \cancel{g}}} =$

$= 2 \cdot \sqrt{\frac{gH}{1{,}5}}$

$S = H_м + H_1 = 2H_м - H = 2 \cdot \frac{v_0^2}{2g} - H = \frac{4 \cancel{g} H}{1{,}5 \cdot \cancel{g}} - H = \frac{4H}{1{,}5} - H =$

$= H\left(\frac{4}{1{,}5} - 1\right) = H\left(\frac{4 - 1{,}5}{1{,}5}\right) = \frac{\cancel{2{,}5}^{5}}{\cancel{1{,}5}_{3}} \cdot H = \frac{5}{3} H.$

$t_{n_1} = \sqrt{\frac{2(H_m - H)}{g}}$ черновик

$t_{n_1} =$

$\cancel{\frac{g t_{n_1}^2}{2} + H} = \frac{g t_{n_1}^2}{2} = \frac{v^2}{2g}$

$g^2 t_{n_1}^2 = v^2$

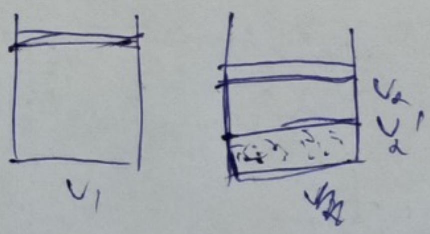
$t_{n_1} = \sqrt{\frac{v^2}{g^2}} = \frac{v}{g}$

$\cancel{H_m = \frac{v_0^2}{}}$ $\frac{v_0^2}{2g} = \frac{v^2}{2g} + H$

$t_{n_2} = t_{n_1}$, $g_1 = g_2$

$\cancel{S_1 = \frac{v^2}{}}$ $H_1 = \frac{v^2}{2g}$ $H_2 = \frac{v_0^2 - v^2}{2g}$

5



v_2

v_3

~~Дано~~

~~ω, 1,8, 3,5, n~~

~~$r = 2R$, α.~~

~~$tg\alpha = 2$.~~

Дано:

$m = 8г$,

$T = 81°C$

$n = const$

$p = \frac{1}{3} \cdot m_0 \cdot \overline{v}^2 \cdot n$

$p = \frac{1}{3} \frac{m_0 \cdot N}{V} \cdot \overline{v}^2$

$\cancel{p = \frac{1}{3} \frac{m}{V} \cdot \overline{v}^2}$

$V_1 = 1,8 V_2'$

$V_2' = \frac{V_1}{1,8}$

$\cancel{V_1 = 1,8 V_2}$

$V_2 = V_2' - V_ж$

$\frac{V_1}{3,5} = \frac{V_1}{1,8} - V_ж$

$V_ж = \frac{V_1}{1,8} - \frac{V_1}{3,5}$

$V_ж = \frac{3,5V_1 - 1,8V_1}{6,3} = \frac{1,7 V_1}{6,3}$

№3 Черновик

Дано:
$m = 3г.$
$t = 81°C$
$V_1 = 3,5 V_2$
$p_2 = 1,8 p_1$
$T = const$
$M = 18$ г/моль.
$p = 0,5 \cdot 10^5$ Па
$R = 8,31$ Дж/(моль · К)
$p_2 - ?$
$V_2 - ?$

Решение:

$p \cdot V = \nu R T$

$p \cdot V = \frac{m}{M} R T$

$p_1 \cdot 3,5 V_2 = \frac{m}{M} R T$

$1,8 p_1 \cdot V_2 = \frac{m}{M} R T$

$p \cdot V = \frac{m}{M} R T$

$V = \cancel{\frac{m}{M} RT}$ $\frac{mRT}{M \cdot p}$

№1

Дано:
H, g

(6)

$H_м = \frac{v_0^2}{2g}$

$H_1 = H_м - H = \frac{v^2}{2g}$

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

$t_{п_1} = t_{п_2}$

$H_1 = \frac{g t_{п_1}^2}{2} = \frac{g t_{п_2}^2}{2}$

$H = v_0 \cdot t_{п_2} - \frac{g t_{п_2}^2}{2}$

$H_м = \frac{v_0^2}{2g}$

$H = 2g \cdot t_{п_2}^2 - \frac{g t_{п_2}^2}{2}$ $\Big|$

$\frac{H}{g} = 2 t_{п_2}^2 - \frac{t_{п_2}^2}{2}$

$H = H_м - H_1$

$\frac{H}{g} = t_{п_2}^2 \left(2 - \frac{1}{2}\right)$

$v_0 \cdot t_{п_2} - \cancel{\frac{g t_{п_2}^2}{2}} = \frac{v_0^2}{2g} - \cancel{\frac{g t_{п_2}^2}{2}}$

$1,5 t_{п_2}^2 = \frac{H}{g}$

$\cancel{v_0} \cdot t_{п_2} = \frac{v_0^{\cancel{2}}}{2g}$

$t_{п_2} = \sqrt{1,5 \frac{H}{g}}$

$t_{п_2} = \frac{v_0}{2g}$

$v_0 = 2g \cdot t_{п_2}$

Часть 2

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

Шифр: **21206142**

ID профиля: **887345**

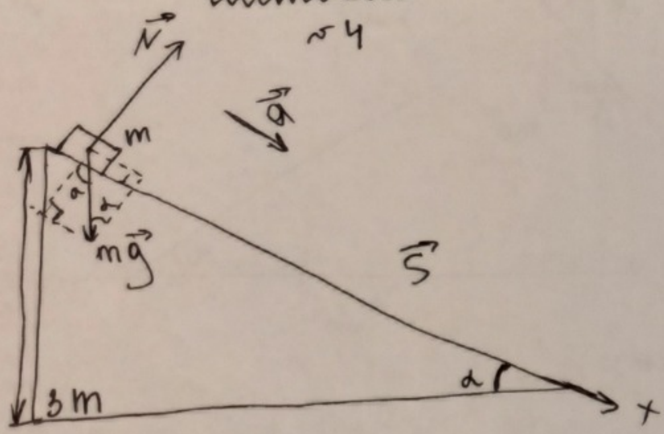
Вариант 1

Чистовик №4

Дано:
α, $\cos\alpha = \frac{4}{5}$

а) H, m, $3m$
1) t - ?
б) $F = 2mg$
2) $a_{ш}$ - ?
3) $t_{ш}$ - ?

а)



$\cos\alpha = \frac{4}{5}$;

$\sin\alpha = \sin(a\cos(\frac{4}{5})) = 0{,}6 = \frac{3}{5}$

а) $\frac{H}{S} = \sin\alpha$

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

$S = \frac{a \cdot t^2}{2}$

II закон Ньютона для шайбы:

x: $mg \cdot \sin\alpha = ma$

$a = g \cdot \sin\alpha$

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

1

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

$\frac{2H}{g \cdot 0{,}36} = t^2$

$t = \sqrt{\frac{2H}{g}} \cdot \frac{1}{0{,}6} = \frac{5}{3} \cdot \sqrt{\frac{2H}{g}}$

$$\boxed{t = \frac{5}{3}\sqrt{\frac{2H}{g}}}$$

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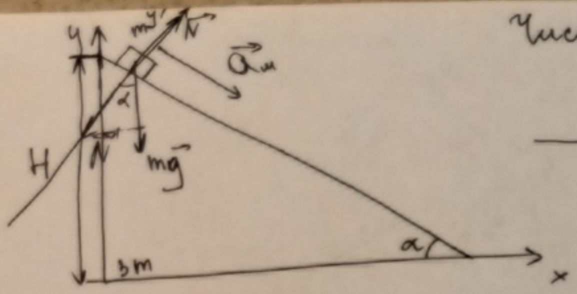
б) $F = 2mg$

Чистовик



$\vec{a}_ш$

2) II з. Ньютона для клина:

$x: 2mg - N \cdot \sin\alpha = 3ma$

II з. Ньютона для шайбы:

$y': N = mg \cdot \cos\alpha$

$2mg - mg \cdot \cos\alpha \cdot \sin\alpha = 3ma$

$m \cdot \left(2g - g \cdot \frac{4}{5} \cdot \frac{3}{5}\right) = 3ma$

$m \cdot \left(2g - \frac{12}{25} g\right) = 3ma$

$m \cdot \left(\frac{38}{25} g\right) = 3ma$

$ma = \frac{38g}{25 \cdot 3 \cdot m}$

$a = \frac{38 \cdot g}{25 \cdot 3}$

$\boxed{a = \frac{38}{75} \cdot g}$

2

3) $s = \frac{g \frac{38}{2 \cdot 75} \cdot t^2}{} = \frac{g t^2 \cdot 38}{150}$

$S_ш = \frac{s + l}{\cos\alpha} = \frac{5 \cdot (s + l)}{4}$;

$l = \frac{H \cdot \sin\alpha}{\cos\alpha} = H \cdot \frac{3}{\cancel{5}} \cdot \frac{\cancel{5}}{4} = H \cdot \frac{3}{4}$

$S_ш = \frac{5 \cdot \left(\frac{g t^2 \cdot 38}{150} + H \cdot \frac{3}{4}\right)}{4}$; $S_ш = \frac{a_ш \cdot t^2}{2}$

$\frac{5 \cdot \left(\frac{g t^2 \cdot 38}{150} + H \cdot \frac{3}{4}\right)}{4} = \frac{g \cdot \sin\alpha \cdot t^2}{2} \quad \Big| \cdot 2$

$\frac{g t^2 38}{30 \cdot 2} + H \frac{15}{4 \cdot 2} = g \cdot \sin\alpha \cdot t^2$

Чистовик

$t^2 \cdot \left(\frac{3}{5}g - g \cdot \frac{38}{60}\right) = \frac{15}{8}H$

(3)

$t^2 = 56{,}25\frac{H}{g}$

$t = 7{,}5\sqrt{\frac{H}{g}}$

Ответ: 1) $t = \frac{5}{3}\sqrt{\frac{2H}{g}}$; 2) $a = \frac{38}{75}g$; 3) $t = 7{,}5\sqrt{\frac{H}{g}}$

№5 Чистовик

Дано:
$i=3$
$p_2=1{,}02p_1$
$V_2=0{,}99V_1$
ΔT – ?
η – ?

Решение:

$$\frac{p_1\cdot V_1}{T_1}=\frac{p_2\cdot V_2}{T_2}$$

$$\frac{p_1\cdot V_1}{T_1}=\frac{1{,}02\cdot p_1\cdot 0{,}99\cdot V_1}{T_2}$$

$\cancel{3}$

$$\frac{1}{T_1}=\frac{1{,}0098}{T_2}$$

4

$$T_2=1{,}0098T_1$$

T увеличилась на 0,98%

$$\eta=\frac{Q_{получ}}{A_2}$$

$$A_2=\frac{1}{2}(p_1+p_2)(V_2-V_1)=\frac{1}{2}(p_1+1{,}02p_1)\cdot(0{,}99V_1-V_1)=\approx -0{,}0101p_1\cdot V_1$$

$$\Delta U=\frac{3}{2}\nu R\Delta T=\frac{3}{2}(\nu RT_2-\nu RT_1)=\frac{3}{2}(p_2\cdot V_2-p_1\cdot V_1)=\frac{3}{2}(1{,}02p_1\cdot 0{,}99V_1-p_1\cdot V_1)=$$
$$=0{,}0147p_1\cdot V_1$$

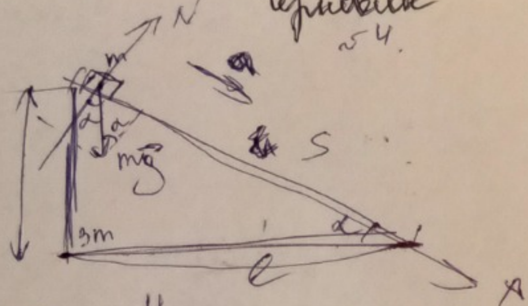
$$Q=0{,}0046$$

$$\eta\approx 0{,}46\approx 46\%$$

Черновик
№4.

Дано:
$\cos\alpha = \frac{4}{5}$
$H, m, 3m$
$\cancel{\cos\alpha = \frac{4}{5}}$

1) t_1 - ?
2) a - ?
t_2 - ?



$\cos\alpha$
$\sin\alpha$

①

$\cancel{\frac{H}{l} = \sin\alpha}$

$\cancel{l = \frac{H}{\sin\alpha}}$

$\frac{l}{S} = \cos\alpha$

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

$\cancel{S = l \cdot \cos\alpha}$ $S = \frac{l}{\cos\alpha}$

$l = \sqrt{S^2 - H^2}$

$\cancel{S =}$

$\cos(90-\alpha)$

$\frac{H}{S} = \sin\alpha$ $\qquad \frac{H}{S} = \cos(90-\alpha)$

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

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

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

$x: \cancel{m}g \cdot \sin\alpha = \cancel{m}a$

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

$\sin^2\alpha = 1 - \frac{16}{25} =$

$\boxed{a = g \cdot \sin\alpha}$

$\frac{25-16}{25} = \frac{9}{25}$

$\frac{3}{5}$

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

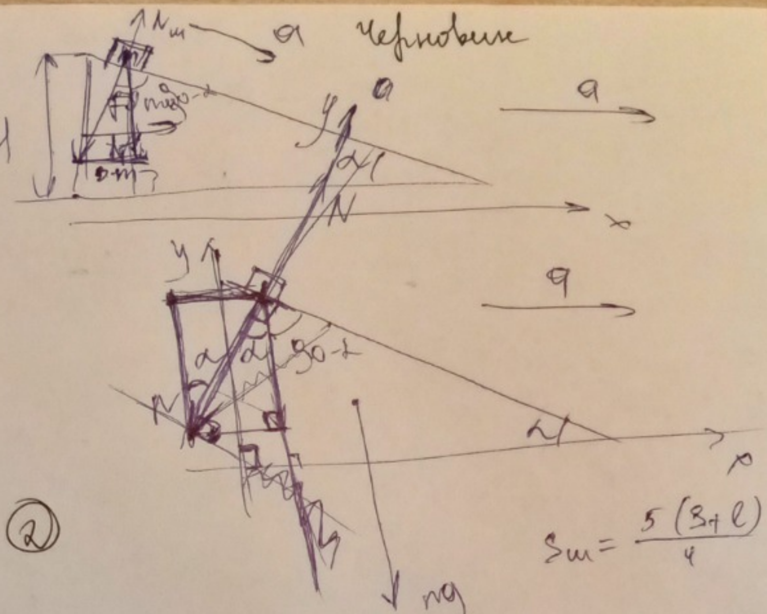
$\frac{2H}{g \cdot \sin^2\alpha} = t^2$

$\frac{2H \cdot 25}{17g} = t^2$

$t_1 = 5\sqrt{\frac{2H}{17g}}$

2) $F = 2mg$

а Черновик



1) ~~ка~~ a клина

II з для клина:

~~Rкл~~

x: $\frac{N_x}{N} = \sin\alpha$

(2)

$N_x = N \cdot \sin\alpha$

$\cancel{N \cdot \sin\alpha = 2mg}$

$\cancel{2mg - N \cdot \sin\alpha = 3mg}\ a$

$2mg - N \cdot \sin\alpha = 3ma$

y': $\cancel{N - mg \cdot \cos\alpha = \ldots}$

$N = mg \cdot \cos\alpha$

$2mg - mg \cdot \sin\alpha \cdot \cos\alpha = 3ma$

$2g - g \cdot \sin\alpha \cdot \frac{4}{5} = 3a$

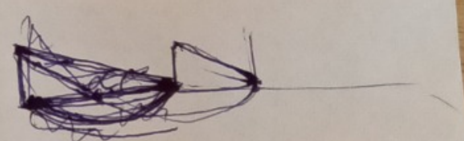
$$\boxed{a = \frac{g\left(2 - \sin\alpha \cdot \frac{4}{5}\right)}{3}}$$

$S_{кл} = \frac{5(S+l)}{4}$

$S_{кл} = \frac{S+l}{\cos\alpha}$

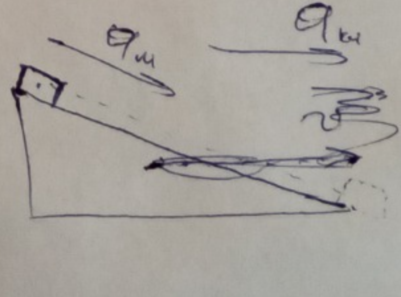
$\frac{S+l}{S_{кл}} = \cos\alpha$

$S + l$



$\tan\alpha = \frac{H}{l}$

$l = \frac{H}{\tan\alpha} = \frac{H \cdot \sin\alpha\, 5}{4}$



3)

$$S = \frac{g\left(2 - \sin\alpha \cdot \frac{4}{5}\right)}{6} \cdot t^2$$

$$S_{кл} = \frac{5 \cdot \left(\frac{g\left(2 - \sin\alpha \cdot \frac{4}{5}\right)}{6} \cdot t^2 + \frac{H \cdot \sin\alpha\, 5}{4}\right)}{\cancel{\cos\alpha}\ 4}; \quad S_{кл} = \frac{a_{кл} \cdot t^2}{2}$$

Черновик

$$\frac{5\cdot\left(\frac{g\cdot(2-\sin\alpha\cdot\frac{4}{5})}{6}\cdot t^2+\frac{H\cdot\sin\alpha\cdot 5}{4}\right)}{\cos\alpha}=\frac{g\cdot\sin\alpha\cdot t^2}{2}$$

$$\frac{\frac{5}{6}\cdot g\left(2-\sin\alpha\cdot\frac{4}{5}\right)\cdot t^2+\frac{25H\cdot\sin\alpha}{4}}{4}=\frac{g\cdot\sin\alpha\cdot t^2}{2}\ \Big|\cdot 2$$

$$\frac{5}{12}\cdot g\left(2-\sin\alpha\cdot\frac{4}{5}\right)\cdot t^2+\frac{25}{8}\cdot H\cdot\sin\alpha=g\cdot\sin\alpha\cdot t^2$$

$$\cancel{t^2\left(\frac{5}{12}g\,2\right.}$$

$$\left(\frac{5}{6}g-\frac{1}{3}\cdot g\cdot\sin\alpha\right)t^2+\frac{25}{8}H\cdot\sin\alpha=g\cdot\sin\alpha\cdot t^2$$

$$t^2\left(g\cdot\sin\alpha+\frac{1}{3}g\cdot\sin\alpha-\frac{5}{6}g\right)=\frac{25}{8}H\cdot\sin\alpha$$

$$t^2\left(\frac{4}{3}g\cdot\sin\alpha-\frac{5}{6}g\right)=\frac{25}{8}H\cdot\sin\alpha$$

5

$$t^2\cdot\frac{1}{3}\left(4g\cdot\sin\alpha-\frac{5}{2}g\right)=\frac{25}{8}H\cdot\sin\alpha\ \Big|\cdot 3$$

$$t^2\cdot\cancel{g}\left(4g\cdot\sin\alpha-\frac{5}{2}g\right)=\frac{75}{8}H\cdot\sin\alpha$$

$$t^2=\frac{75H\cdot\sin\alpha}{8\cdot g\left(4\cdot\sin\alpha-\frac{5}{2}\right)}$$

$$\sin\left(\arccos\left(\frac{4}{5}\right)\right)=0{,}6$$

$$t^2=\frac{45H}{8\cdot g\cdot 0{,}1}=56{,}25\frac{H}{g}.$$

$$t=7{,}5\frac{H}{g}.$$

21206142 (U887345 M1280914)

Дано:

$\nu = 3$

$p_2 = p_1 + 0{,}02 \cdot p_1$

$V_2 = V_1 - 0{,}01 \cdot V_1$

$\Delta T - ?$

$\eta - ?$

№ 5 Черновик

Решение:

$p_1 \cdot V_1 = \nu R T$

$$\frac{p_1 \cdot V_1}{T_1} = \frac{p_2 \cdot V_2}{T_2}$$

$$\frac{p_1 \cdot V_1}{T_1} = \frac{1{,}02 \cdot p_1 \cdot 0{,}99 \cdot V_1}{T_2}$$

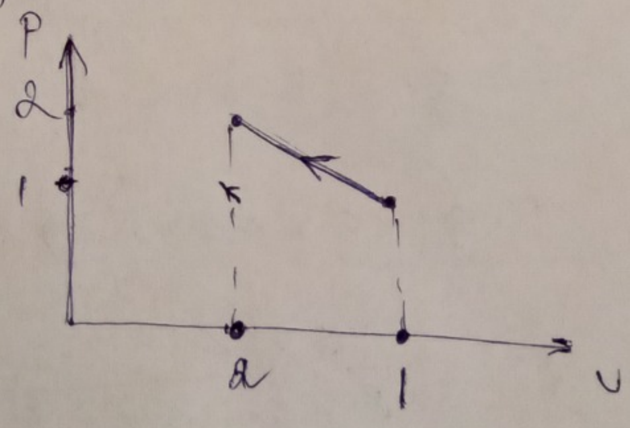
$$\frac{1}{T_1} = \frac{1{,}0098}{T_2}$$

$$T_2 = 1{,}0098 \cdot T_1$$

T. увеличилась на 0,98 %.

4

$$\eta = \frac{Q_{получ}}{A_г}$$



$Q = A + \Delta U =$

$~~A_г = (V_1 - V_2)~~$

$$A_г = \frac{1}{2}(p_1 + p_2) \cdot (V_2 - V_1) =$$

$$= \frac{1}{2}(p_1 + 1{,}02 p_1) \cdot (0{,}99 V_1 - V_1) = -\frac{1}{2} \cdot 2{,}02 p_1 \cdot 0{,}01 V_1 = -0{,}0101 p_1 V_1$$

$$\Delta U = \frac{3}{2}\nu R \Delta T = \frac{3}{2}(\nu R T_2 - \nu R T_1) = \frac{3}{2}(p_2 \cdot V_2 - p_1 \cdot V_1) = \frac{3}{2}(1{,}02 p_1 \cdot 0{,}99 V_1 - p_1 \cdot V_1)$$

$$= \frac{3}{2}(0{,}0098 p_1 \cdot V_1) = 0{,}0147 p_1 \cdot V_1$$

$Q = 0{,}0046$

$\eta \approx 0{,}46 \approx 46\%$