Часть 1

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

Шифр: **21204566**

ID профиля: **129090**

Вариант 1

Чистовик

№1

1

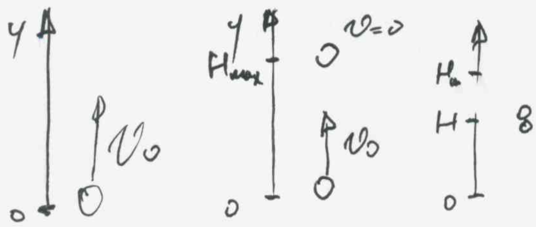
Дано: H

τ - ?

v_0 - ?

S_1 - ?

Решение:



1. Если $y = H_{max}$, то $v = 0$

2. $H_{max} = \frac{v^2 - v_0^2}{-2g} = \frac{v_0^2}{2g}$

3. $H = H_{max} - \frac{g\tau^2}{2}$ (1) $\Rightarrow H_{max} = H + \frac{g\tau^2}{2} \Rightarrow \frac{v_0^2}{2g} = H + \frac{g\tau^2}{2}$

4. $H = v_0\tau - \frac{g\tau^2}{2}$ (2) $\Rightarrow v_0\tau = H + \frac{g\tau^2}{2}$

5. (1) − (2)

$$\cancel{H} - \cancel{H} = H_{max} - v_0\tau - \cancel{\frac{g\tau^2}{2}} + \cancel{\frac{g\tau^2}{2}}$$

$$H_{max} = v_0\tau$$

6. $\frac{v_0^2}{2g} = H + \frac{g\tau^2}{2}$

$$v_0^2 = 2g\left(H + \frac{g\tau^2}{2}\right)$$

7. $v_0\tau = H + \frac{g\tau^2}{2}$

$$v_0^2 = \frac{1}{\tau^2}\left(H + \frac{g\tau^2}{2}\right)^2$$

8. $2g\cancel{\left(H + \frac{g\tau^2}{2}\right)} = \frac{1}{\tau^2}\left(H + \frac{g\tau^2}{2}\right)^{\cancel{2}}$

$$2g\tau^2 = H + \frac{g\tau^2}{2}$$

Чистовик

$$\frac{3}{2} g \tau^2 = H$$

$$\tau^2 = \frac{2H}{3g}$$

$$\tau = \sqrt{\frac{2H}{3g}}$$

2

9. $H_{max} = \frac{v_0^2}{2g} = v_0 \tau$

$$\frac{v_0^{\cancel{2}}}{2g} = \cancel{v_0} \tau$$

$$v_0 = 2g\tau = 2g\sqrt{\frac{2H}{3g}} = 2\sqrt{\frac{2}{3}gH}$$

10. ~~Hmax~~ $S_1 = H_{max} + (H_{max} - H) = 2H_{max} - H =$

$$= \cancel{2} \cdot \frac{v_0^2}{\cancel{2}g} - H = \frac{8H\cancel{g}}{3\cancel{g}} - H = \frac{5}{3}H$$

Ответ: $\tau = \sqrt{\frac{2H}{3g}}$; $v_0 = 2\sqrt{\frac{2}{3}gH}$;

$S_1 = \frac{5}{3}H$

Чистовик

№ 2

Дано:

ω

ρ

3ρ

R

$2R$

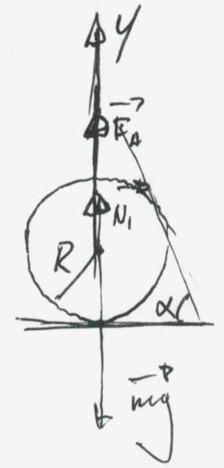
$tg\alpha = 2$

N_1 - ?

N_2 - ?

Решение:

3



$$\vec F_A + \vec N_1 + m\vec g = 0$$

Oy: $F_A + N_1 - mg = 0$

$$N_1 = mg - F_A$$

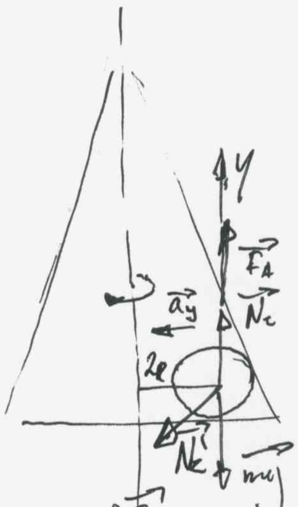
$$N_1 = 3\rho V g - \rho V g = 2\rho V g =$$

$$= 2\rho g \cdot \frac{4}{3}\pi R^3 = \frac{8}{3}\pi R^3 \rho g$$

$$a_y = \omega R^2$$

$$tg\beta = \frac{1}{ctg\beta} = \frac{1}{tg\alpha} = \frac{1}{2}$$

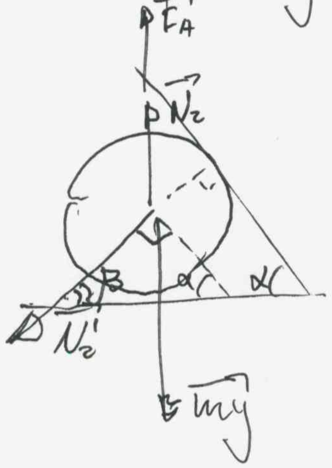
$$\vec F_A + \vec N_2 + \vec N_2' + m\vec g = m\vec a_y$$



Ox: $N_2' \cos\beta = m a_y$

$$N_2' = \frac{m a_y}{\cos\beta}$$

Oy: $F_A + N_2 - N_2' \sin\beta - mg = 0$



$$N_2 = mg + N_2' \sin\beta - F_A$$

$$N_2 = 3\rho V g + \frac{3\rho V a_y \sin\beta}{\cos\beta} - \rho V g$$

$$N_2 = \rho V g \left(2 + \frac{12\omega R^2 tg\beta}{g}\right)$$

$$N_2 = 2\rho V\left(g + 3\omega R^2\right) = \frac{8}{3}\pi R^3 \rho (g + 3\omega$$

Ответ: $N_1 = \frac{8}{3}\pi R^3 \rho g$; $N_2 = \frac{8}{3}\pi R^3 \rho \left(g + 3\omega R^2\right)$

Чистовик

№3

Дано:

$m = 3г = 3 \cdot 10^{-3} кг$

$T = 81°C = 354 K$

$T = const$

$V_2 = \frac{V_1}{3,5}$

$P_2 = 1,8 P_1$

$P_{н.п.} = 0,5 \cdot 10^5 Па$

$M = 18 \cdot 10^{-3} \frac{кг}{моль}$

$P_1 - ?$

$V_2 - ?$

Решение:

4

$\varphi_2 = \frac{P_2}{P_{н.п}}$

$P_2 = \varphi_2 P_{н.п}$

$\varphi_2 = 100\%$

$\Downarrow$

$P_2 = P_{н.п}$

$1,8 P_1 = P_2$

$P_1 = \frac{P_2}{1,8} = \frac{P_{н.п}}{1,8} \approx 27777,8 Па$

$P_1 V_1 = \frac{m}{M} RT$

$V_1 = \frac{mRT}{MP_1}$

$V_2 = \frac{V_1}{3,5} = \frac{mRT}{MP_1 \cdot 3,5} = \frac{1,8\, mRT}{3,5 \cdot M P_{н.п.}} =$

$= \frac{1,8 \cdot 3 \cdot 10^{-3} \cdot 8,31 \cdot 354}{3,5 \cdot 18 \cdot 10^{-3} \cdot 0,5 \cdot 10^5} \approx$

$\approx 0,005043 м^3 = 5043 см^3$

Ответ: $P_1 \approx 27777,8 Па$;

$V_2 \approx 5043 см^3$

№3

~~Дано:~~

$m = 3 \cdot 10^{-3}$ кг

$T = 81\,°C = 354\,K$

T - const

$V_2 = \frac{V_1}{3{,}5}$

$P_2 = 1{,}8\,P_1$

$P_{н.п} = 0{,}5 \cdot 10^5$ Па

$\mu = 18 \cdot 10^{-3} \frac{кг}{моль}$

P_1 - ?

V_2 - ?

Решение:

$\varphi_2 = \frac{P_2}{P_{н.п}}$

Т.к. процесс происходит над водяным паром, а конечное давление $\neq 0$ => => не весь водяной пар перешёл в состояние воды. => $\varphi_2 =$

$P_2 = \varphi_2$

Черновик

$m = 3 \cdot 10^{-3}$ кг

$T = const$

$t = 81^\circ C = 354 K$

$V_2 = \frac{V_1}{3,5}$

$P_2 = 1,8 P_1$

$P_{н.п} = 0,5 \cdot 10^5$ Па

$M = 18 \cdot 10^{-3} \frac{кг}{моль}$

$P_\varphi - ?$

$V_2 - ?$

$\cancel{P_1 V_1 = \frac{m_1}{M} RT}$

$P_2 V_2 = \frac{m_2}{M} RT$

$P_1 V_1 = \frac{m_1}{M} RT$

$\varphi = 100\%$

$\cancel{\varphi = \frac{P_1}{P_{н.п}}}$

$P_1 = \cancel{P_{н.п} = 0,5 \cdot 10^5}$ Па

$\cancel{P_1 V_1 = \frac{m_1}{M} RT}$

$\cancel{P_{н.п} V_1 = \frac{m_1}{M} RT}$

$\cancel{V_1 = \frac{m_1 RT}{M}}$

$\cancel{V_2 = \frac{P_1 \cdot m_1 RT}{3,5 \cdot M}}$

Черновик

$m = 3г = 3 \cdot 10^{-3}$ кг

$T = 81°C = const = 354 K$

$V_2 = \frac{V_1}{3,5}$

$P_2 = 1,8 P_1$

$P_{н.п} = 0,5 \cdot 10^5 Па$

$\mu = 18 \frac{г}{моль}$

$P_1 - ?$

$V_2 - ?$

$\downarrow P\uparrow$

Решение:

$\varphi_2 = \frac{P_2}{P_{н.п}}$

$\varphi_2 = 100\%$

(т.к. процесс происходит над водяным паром, а давление в конце процесса $\neq 0 \Rightarrow$
$\Rightarrow$ не весь водяной пар превратился в воду)

$\Downarrow$

$P_2 = \varphi_2 P_{н.п} = P_{н.п}$

$1,8 P_1 = P_2$

$P_1 = \frac{P_2}{1,8} = \frac{P_{н.п}}{1,8} \approx 27777,8$

$P_1 V_1 = \frac{m}{\mu} RT$

$V_1 = \frac{m \cdot RT}{\mu P_1}$

$V_2 = \frac{V_1}{3,5} = \frac{mRT}{\mu P_1 \cdot 3,5} = \frac{1,8\, mRT}{3,5\, \mu P_{н.п}} =$

$= \frac{1,8 \cdot 3 \cdot 10^{-3}}{}$

Черновик

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

$$= \frac{8825{,}22}{1250000} = 0{,}005042982\ м^3$$

Черновик

$Ox: N_2' \cos\beta = m a_y \qquad a_y = 4\omega R^2$

$N_2' \cos\beta = \cancel{\frac{3\rho V \cdot 4\omega R^2}{\cos\beta}} \qquad \frac{m a_y}{\cos\beta}$

$Oy: F_A + N_2 - N_2' \sin\beta - mg = 0$

$\rho V g +$

$N_2 = mg + N_2' \sin\beta - F_A$

$\cancel{N_2 = 3\rho V g + 3\rho V \cdot 4\omega}$

$N_2 = mg + \frac{m a_y \sin\beta}{\cos\beta} - F_A$

$N_2 = 3\rho V g + \frac{3\rho V \cdot a_y \sin\beta}{\cos\beta} - \rho V g$

$N_2 = \rho V g \left(3 + \frac{3 a_y \sin\beta}{g \cos\beta} - 1\right)$

$N_2 = 2\rho V g \left(2 + \frac{12\omega R^2 \operatorname{tg}\beta}{g}\right)$

$N_2 = \rho V g \left(2 + \frac{6\cancel{2}\omega R^2}{\cancel{2} g}\right) = 2\rho V (g + 3\omega R^2)$

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

Черновик

ω

ρ

3ρ

R

$2R$

$tg\alpha = 2$

$N_1 - ?$

$N_2 - ?$

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

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

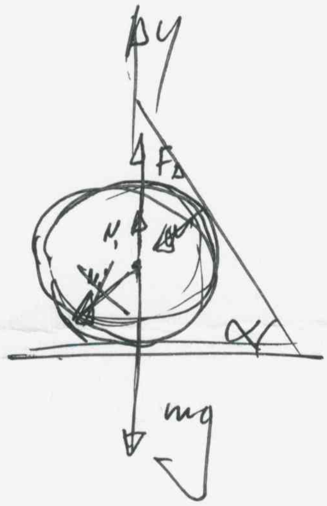
$4 + 1 = \frac{1}{\cos^2\alpha}$

$\cos^2\alpha = \frac{1}{5}$

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

$\sin\beta = \frac{\sqrt{5}}{5}$

$\cos\beta = \sqrt{1 - \frac{1}{5}} = \frac{2\sqrt{5}}{5}$



$V_ш = \frac{4}{3}\pi R^3$

I

$\vec{F_A} + \vec{N_1} + m\vec{g} = 0$

$ctg\beta = tg\alpha = 2$

$ctg\beta \cdot tg\beta = 1$

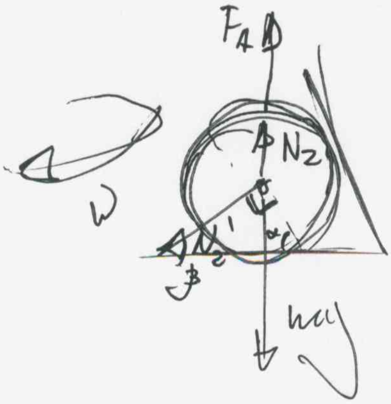
$tg\beta = \frac{1}{2}$

$Oy: F_A + N_1 - mg = 0$

$N_1 = mg - F_A$

$N_1 = 3\rho Vg - \rho Vg = 2\rho Vg = \frac{8}{3}\pi R^3 \rho g$

II



$\vec{F_A} + \vec{N_2} + \vec{N_2'} + m\vec{g} = m\vec{a}$

Черновик

$$\frac{1}{\tau^2}\left(H+\frac{g\tau^2}{2}\right)^{\cancel{2}} = 2g\cancel{\left(H+\frac{g\tau^2}{2}\right)}$$

$$H+\frac{g\tau^2}{2} = 2g\tau^2$$

$$H = \frac{3}{2}g\tau^2$$

$$\tau^2 = \frac{2}{3}\frac{H}{g}$$

$$\tau = \sqrt{\frac{2H}{3g}}$$

$$H_{max} = \frac{v_0^2}{2g} = v_0\tau$$

$$\frac{v_0^{\cancel{2}}}{2g} = \cancel{v_0}\tau$$

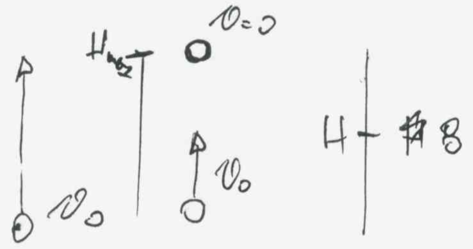
$$v_0 = 2g\tau = 2g\sqrt{\frac{2H}{3g}} =$$

$$= 2\sqrt{\frac{2Hg^{\cancel{2}}}{3\cancel{g}}} = 2\sqrt{\frac{2}{3}Hg}$$

$$S = H_{max} + (H_{max}-H) = 2H_{max} - H =$$

$$= \cancel{2}\cdot\frac{v_0^2}{\cancel{2}g} - H = \frac{8H\cancel{g}}{3\cancel{g}} - H = \frac{5}{3}H$$

Черновик



$t = t_{пол}$

$0 = v_0 \tau - \frac{g\tau^2}{2}$

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

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

$\cancel{y = v_0 t - \frac{gt^2}{2}}$

$\cancel{H_{max} = v_0 t - \frac{gt^2}{2}}$

$\cancel{a = v_0}$

$v = v_0 - gt$

Если $H = H_{max}$, то $v = 0$

$0 = v_0 - gt$

$v_0 = gt$

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

$\cancel{H_{max} = v_0 t - \frac{gt^2}{2}}$

$\cancel{H_{max} = \frac{v_0^2}{g} - \frac{v_0^2}{2g}}$

$$\boxed{H_{max} = \frac{v^2 - v_0^2}{-2g} = \frac{v_0^2}{2g}}$$

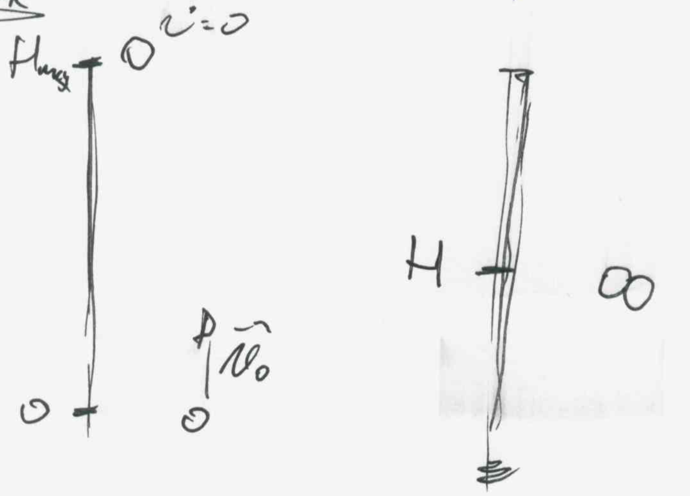
$H = y_1 = H_{max} - \cancel{\frac{g\tau^2}{2}} \underbrace{v_0'\tau}_{=0} - \frac{g\tau^2}{2}$

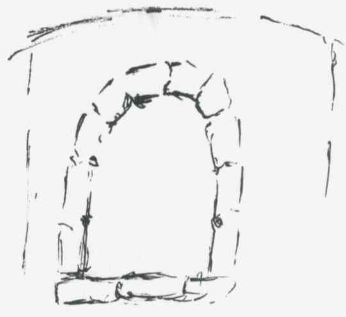
$H = y_2 = v_0 \tau - \frac{g\tau^2}{2}$

$H_{max} - \cancel{\frac{g\tau^2}{2}} = v_0 \tau - \cancel{\frac{g\tau^2}{2}}$

$\frac{v_0^2}{2g} = \cancel{v_0}\tau$

Черновик





H

τ - ?

v_0 - ?

S_1 - ?

$$g\tau = v_0 - g\tau$$

$$v_0 = 2g\tau$$

$$H = H_{max} - \frac{g\tau^2}{2} \Rightarrow \frac{v_0^2}{2g} = H + \frac{g\tau^2}{2}$$

$$H = v_0\tau - \frac{g\tau^2}{2} \Rightarrow v_0\tau = H + \frac{g\tau^2}{2}$$

$$\Downarrow$$

$$\boxed{H_{max} = v_0\tau}$$

$$\cancel{v_0\tau = \frac{v_0^2}{2g}}$$

$$0 = v_0 - gt$$

$$\boxed{t = \frac{v_0}{g}}$$

$$\boxed{H_{max} = \frac{v^2 - v_0^2}{-2g} = \frac{v_0^2}{2g}}$$

$$\cancel{v_0^2 = 4g^2\left(H + \frac{g\tau^2}{2}\right)^2}$$

$$\Downarrow$$

$$v_0^2 = \frac{1}{\tau^2}\left(H + \frac{g\tau^2}{2}\right)^2$$

Часть 2

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

Шифр: **21204566**

ID профиля: **129090**

Вариант 1

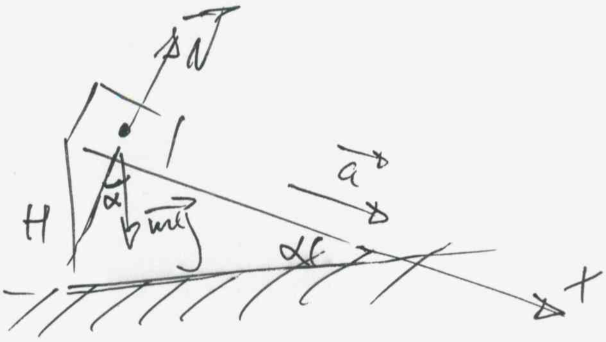
№4

Чистовик

Дано:
$\cos\alpha = \frac{4}{5}$
H
m
$3m$
$F = 2mg$

$\tau_1 - ?$
$a_k - ?$
$\tau_2 - ?$

Решение:



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

$\sin\alpha = \sqrt{1-\cos^2\alpha} = \frac{3}{5}$

$$\vec{N} + m\vec{g} = m\vec{a}$$

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

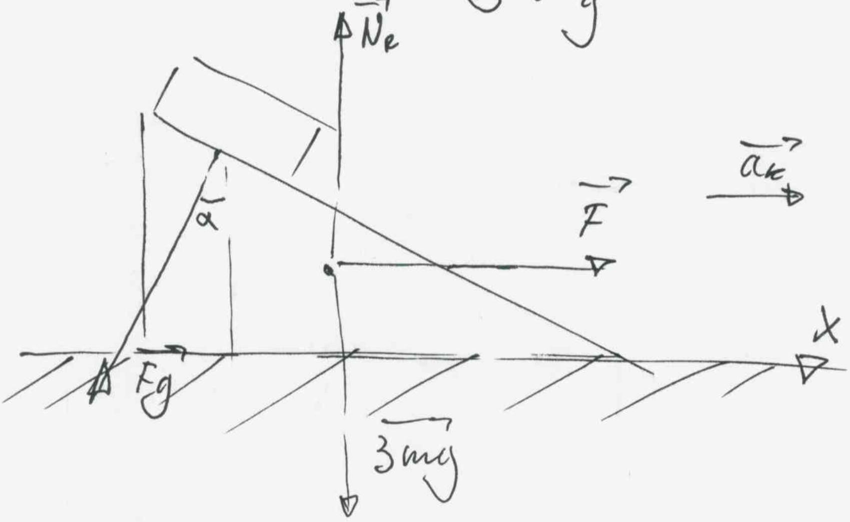
$$a = g\sin\alpha$$

$$S_x = v_{0x}\tau + \frac{a_x\tau^2}{2}$$

$$\frac{H}{\sin\alpha} = \frac{a\tau_1^2}{2}$$

$$\tau_1^2 = \frac{2H}{a\sin\alpha}$$

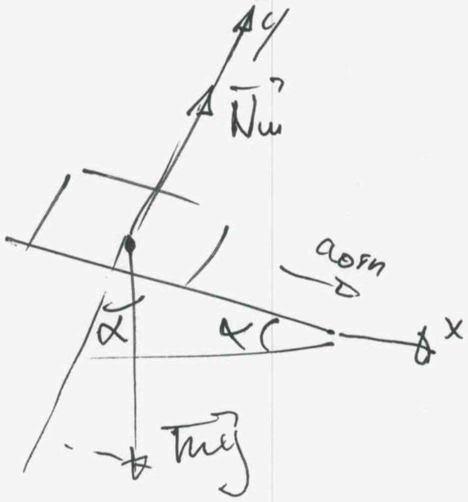
$$\tau_1 = \sqrt{\frac{2H}{g\sin^2\alpha}} = \frac{1}{\sin\alpha}\sqrt{\frac{2H}{g}} = \frac{5}{3}\sqrt{\frac{2H}{g}}$$



Чистовик

$$\vec{N_к} + \vec{F} + \vec{3mg} + \vec{F_g} = \vec{3ma_к}$$

$$O_x:\ F - F_g \sin\alpha = 3ma_к$$



$$\vec{N_м} + \vec{mg} = \vec{ma_{отн}}$$

$$O_y:\ N_м - mg\cos\alpha = 0$$

$$N_м = mg\cos\alpha$$

$$O_x:\ \cancel{m}a_{отн} = \cancel{m}g\sin\alpha$$

$$a_{отн} = g\sin\alpha$$

По III закону Ньютона:

$$\vec{N_м} = -\vec{F_g}$$

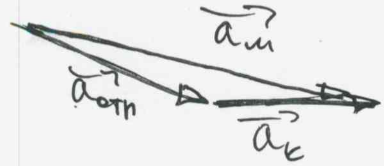
$$F - F_g \sin\alpha = 3ma_к$$

$$2mg - mg\cos\alpha\sin\alpha = 3ma_к$$

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

$$= \frac{38}{75}g$$

$$\vec{a_м} = \vec{a_{отн}} + \vec{a_к}$$



Чистовик

$$a_{му} = a_{отн\,y} = a_{отн.}\sin\alpha = g\sin^2\alpha$$

$$H = \frac{a_{му}\tau_2^2}{2}$$

$$\tau_2 = \sqrt{\frac{2H}{a_{му}}} = \frac{1}{\sin\alpha}\sqrt{\frac{2H}{g}} = \frac{5}{3}\sqrt{\frac{2H}{g}}$$

Ответ: $\tau_1 = \tau_2 = \frac{5}{3}\sqrt{\frac{2H}{g}}$; $a_к = \frac{38}{75}g$

Чистовик

№5

Дано:

$i = 3$

$P_2 = 1{,}02 P_1$

$V_2 = 0{,}99 V_1$

$\frac{T_2}{T_1}$ — ?

$\frac{|Q|}{|A|}$ — ?

Решение:

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{T_2}{T_1} = \frac{P_2 V_2}{P_1 V_1} = \frac{1{,}02 \cdot 0{,}99 \cancel{P_1 V_1}}{\cancel{P_1 V_1}} =$$

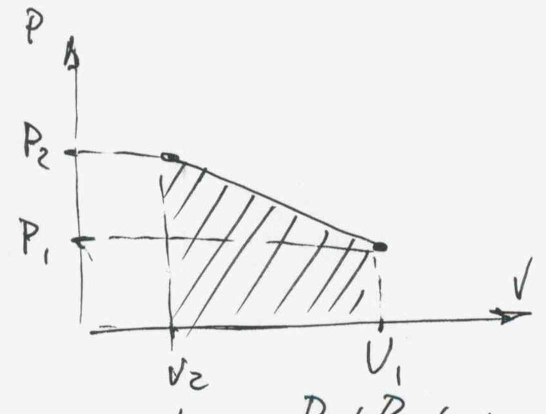
$$= 1{,}0098$$

$$Q = \Delta U + A$$

$$\Delta U = \frac{3}{2} \nu R \Delta T = \frac{3}{2} \nu R (T_2 - T_1) =$$

$$= \frac{3}{2} \cdot 0{,}0098 P_1 V_1 = 0{,}0147 P_1 V_1$$

Т.к отн. изменения P, V и T намного меньше 1, то:



$$A \approx \frac{P_1 + P_2}{2}(V_2 - V_1) = 1{,}01 \cdot (-0{,}01 V_1) =$$

$$= -0{,}0101 P_1 V_1$$

Чистовик.

$$\frac{|Q|}{|A|} = \frac{|\Delta U + A|}{|A|} = \frac{|0{,}0142 P_1 V_1 - 0{,}0101 P_1 V_1|}{|0{,}0101 P_1 V_1|} =$$

$$= \frac{0{,}0046 \cancel{P_1 V_1}}{0{,}0101 \cancel{P_1 V_1}} \approx 0{,}455$$

Ответ: температура увеличилась на 0,98%;

$$\frac{|Q|}{|A|} \approx 0{,}455$$

Черновик

$$\frac{|Q|}{|A|} = \frac{|\Delta U + A|}{|A|} = 1 + \frac{\Delta U}{A} = 1 + \frac{0{,}0147\cancel{RU}}{-0{,}0101\cancel{RU}} \approx$$

$$\approx -0{,}4554$$

Черновик

Дано:

$i = 3$

$P_2 = 1{,}02\, P_1$

$V_2 = 0{,}99\, V_1$

$\frac{T_2}{T_1}$ – ?

$\frac{Q}{A}$ – ?

Решение:

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{T_2}{T_1} = \frac{P_2 V_2}{P_1 V_1} =$$

$$= \frac{1{,}02\, \cancel{P_1} \cdot 0{,}99\, \cancel{V_1}}{\cancel{P_1}\, \cancel{V_1}} = 1{,}0098$$

Ответ: темп увеличилась на 0,98 %

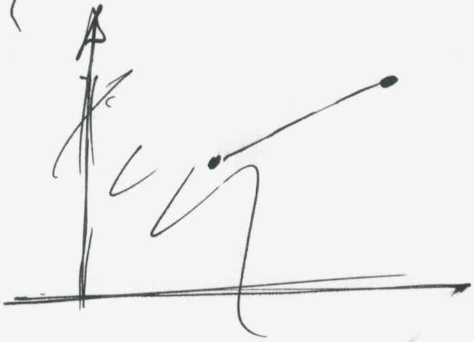
~~Q = ΔU +~~

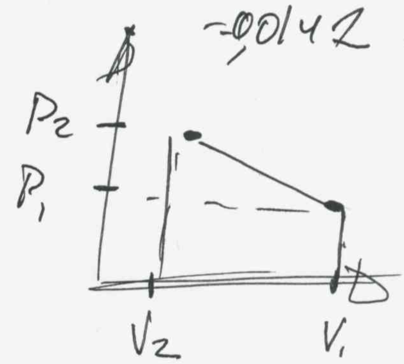
$\cancel{PV} = \frac{m}{M} RT$

Черновик

$$\Delta U = \frac{3}{2}\nu R\Delta T = \frac{3}{2}\nu R(T_2 - T_1) =$$

$$= \frac{3}{2} \cdot 0{,}0098 \cdot P_1V_1 = 0{,}0147\, P_1V_1$$





$$A \approx \frac{P_1 + P_2}{2}(V_2 - V_1) =$$

$$= \frac{2{,}02\, P_1}{2}(0{,}99V_1 - V_1) =$$

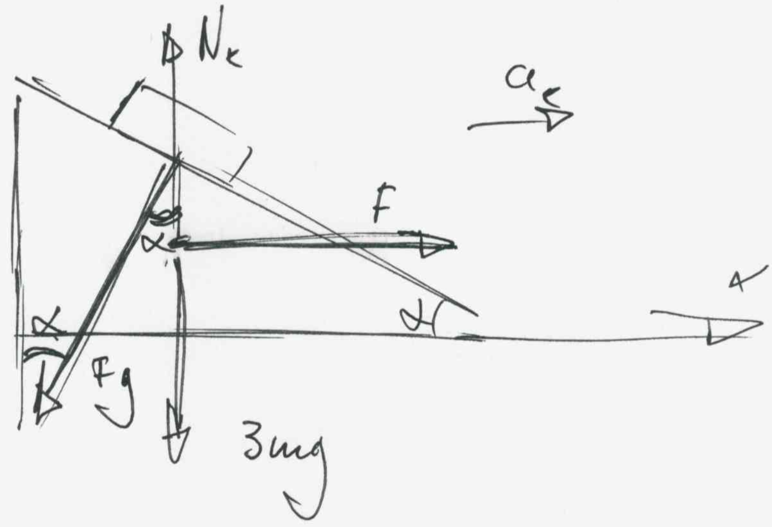
$$= -1{,}01 P_1 \cdot 0{,}01 V_1 =$$

$$= -0{,}0101\, P_1V_1$$

$$\frac{|Q|}{|A|} = \frac{0{,}0147\cancel{P_1V_1} - 0{,}0101\cancel{P_1V_1}}{0{,}0147\cancel{P_1V_1}} = \frac{0{,}0046}{0{,}0147} \approx 0{,}3129$$

(11)

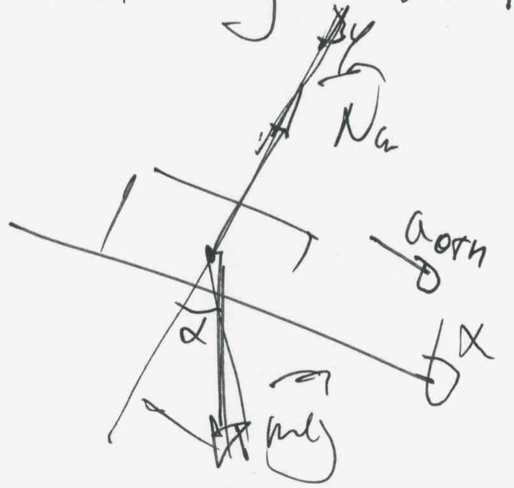
Черновик.



$$\vec{N_k} + \vec{F} + 3m\vec{g} + \vec{F_g} = 3m\vec{a_k}$$

Ox : ~~$F + F_g \sin\alpha = ma$~~

Ox : $-F_g \sin\alpha + F = 3ma_k$



$$\vec{N} + m\vec{g} = m\vec{a}_{отн}$$

Oy : $N_ш - mg\cos\alpha = 0$

$N_ш = mg\cos\alpha$

Ox : ~~m~~$a_{отн} =$ ~~m~~$g\sin\alpha$

$a_{отн} = \frac{3}{5} g$

По III закону Ньютона

$$\vec{N_ш} = -\vec{F_g}$$

Черновик

4. Дано:

α

$\cos\alpha = \cancel{4/3}\ \frac{4}{5}$

H

m

$3m$

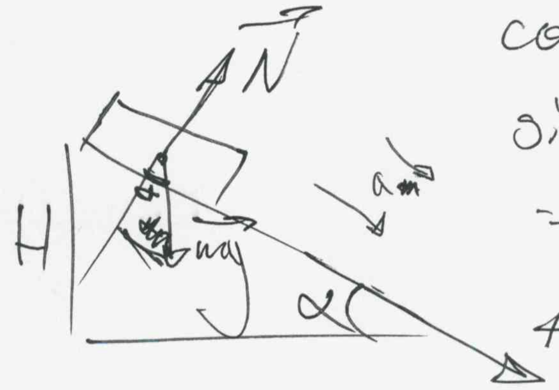
$F = 2mg$

$\tau_1 - ?$

$a_2 - ?$

$\tau_2 - ?$

Решение:



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

$\sin\alpha = \sqrt{1-\cos^2\alpha} = \sqrt{1-\frac{16}{25}} = \frac{3}{5}$

$\vec N + m\vec g = m\vec a$

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

Ox: $\cancel{mg\cos\alpha = ma}$

$a = g\sin\alpha$

$S_x = v_{0x}\tau + \frac{a_x\tau^2}{2}$

$$\frac{H}{\sin\alpha} = \frac{a\tau_1^2}{2}$$

$$\tau_1^2 = \frac{2H}{a\sin\alpha}$$

$$\tau_1 = \sqrt{\frac{2H}{g\sin^2\alpha}} = \sqrt{\frac{2H\cdot 25}{9\cdot g}} =$$

$$= \frac{1}{\sin\alpha}\sqrt{\frac{2H}{g}} = \frac{5}{3}\sqrt{\frac{2H}{g}}$$

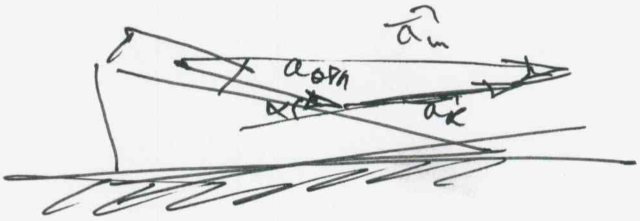
Черновик

$-F_g \sin\alpha + F = 3ma_k$

$-\cancel{m}g\cos\alpha\sin\alpha + 2\cancel{m}g = 3\cancel{m}a_k$

$a_k = \frac{g}{3}(-\cos\alpha\sin\alpha + 2)$

$a_k = \frac{g}{3}\left(2 - \frac{4}{5}\cdot\frac{3}{5}\right) = g\left(2 - \frac{12}{25}\right) = \frac{38}{75}g$



$\vec{a}_{отн\ НПСО} = \vec{a}_{отн\ ПСО} + \vec{a}_{ПСО\ отн\ НПСО}$

$\vec{a}_m = \vec{a}_{отн} + \vec{a}_k$

$a_m = \sqrt{\frac{38^2}{75^2}g^2 + \frac{9}{25}g^2 + 2\cdot\frac{38}{75}\cdot\frac{3}{25}\cdot\frac{4}{5}} =$

$= \sqrt{}$

$H = \frac{a_{отн}\sin\alpha\,\tau_2^2}{2}$

$a_{my} = a_{отн}\sin\alpha$

$\tau_2 = \sqrt{\frac{2H}{a_{отн}\sin\alpha}} = \sqrt{\frac{2H}{g\sin^2\alpha}}$