Часть 1

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

Шифр: **21204997**

ID профиля: **213646**

Вариант 2

~~Чистовик~~ Черновик

Физика 10 класс
~~Мат~~

3) Дано:

$T_1 = 354\,K = T_2$

$V_2 = \frac{1}{7} V_1 = 1{,}7\,л = 1{,}7 \cdot 10^{-3}\,м^3$

$p_2 = 3{,}6\,p_1$

$p_н = 0{,}5 \cdot 10^5\,Па$

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

$R = 8{,}31\,\frac{Дж}{моль \cdot K}$

Найти:

$p_1 = ?$

$m_1 = ?$

Решение:

$pV = \frac{m}{\mu} RT$; $p_1 V_1 = \frac{m_1}{\mu} R T_1$; $p_2 V_2 = \frac{m_2}{\mu} R T_2$

$\frac{p_1 V_1}{m_1} = \frac{R T_1}{\mu} = \frac{R T_2}{\mu} = \frac{p_2 V_2}{m_2}$; $\frac{p_1 V_1}{m_1} = \frac{3{,}6 \cdot \frac{1}{7} p_1 V_1}{m_2}$; $m_2 = \frac{3{,}6}{7} m_1$,

Т.к. $m_2 < m_1$, то часть пара выпала в осадок $\Rightarrow p_2 = p_н$.

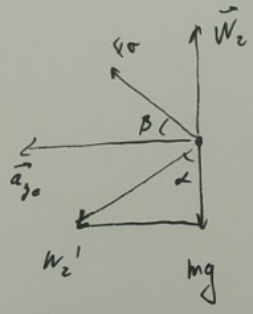
$p_1 = \frac{p_2}{3{,}6} = \frac{p_н}{3{,}6} = \frac{0{,}5 \cdot 10^5\,Па}{3{,}6} = 0{,}139 \cdot 10^5\,Па$

$m_1 = \frac{p_1 V_1 \mu}{R T_1} = \frac{0{,}139 \cdot 10^5\,Па \cdot 7 \cdot 1{,}7 \cdot 10^{-3}\,м^3 \cdot 18 \cdot 10^{-3}\,кг}{8{,}31\,\frac{Дж}{моль \cdot K} \cdot 354\,K} \approx 0{,}001\,кг =$

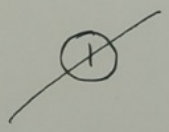
$= 1{,}012\,11\,г$

Ответ: $p_1 = 0{,}139 \cdot 10^5\,Па$

$m_1 = 1{,}012\,11\,г$



$tg\beta = \frac{g}{a_{yc}}$



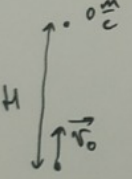
1) Дано:

$v_0; g$

Найти:

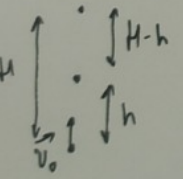
$\tau_1; \frac{\tau_1}{\tau_2}; h = ?$

Решение:



$H = v_0 \tau_0 - \frac{g \tau_0^2}{2}$; $v_1 = v_0 - g\tau_0 = 0$; $v_0 = g\tau_0$; $H = \frac{v_0^2}{2g}$; $\tau_0 = \frac{v_0}{g}$

$h = v_0 \tau_2 - \frac{g \tau_2^2}{2}$; $H - h = \frac{g \tau_1'^2}{2}$; $\tau_1' = \tau_2$ (время от начала подъема и броска до столкновения будут одинаковыми по условию (бросили в тот же момент, когда и мяч начали падать)



$h = v_0 \tau_2 - \frac{g \tau_2^2}{2}$; $H - h = \frac{g \tau_2^2}{2}$; $h = v_0 \tau_2 - (H - h)$; $H = v_0 \tau_2 = \frac{v_0^2}{2g}$;

$\tau_2 = \frac{v_0}{2g}$; $\tau_1 = \tau_0 + \tau_1' = \tau_0 + \tau_2 = \frac{v_0}{g} + \frac{v_0}{2g} = \frac{3v_0}{2g}$; $\frac{\tau_1}{\tau_2} = \frac{\frac{3v_0}{2g}}{\frac{v_0}{2g}} = 3$

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

Ответ: $\tau_1 = \frac{3v_0}{2g}$

$\frac{\tau_1}{\tau_2} = 3$

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

Термовек

(2)

$T_1 = 354\ K = T_2$

$V_2 = \frac{1}{2} V_1 = 1{,}7\ л = 1{,}7 \cdot 10^{-3}\ м^3$

$P_2 = 3{,}6 P_1$

$P_н = 0{,}5 \cdot 10^5\ Па$

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

$R = 8{,}31\ \frac{Дж}{моль \cdot К}$

$P_1 = ?$

$m_1 = ?$

$pV = \frac{m}{\mu} RT$; $P_1 V_1 = \frac{m_1}{\mu} R T_1$; $P_2 V_2 = \frac{m_2}{\mu} R T_2$

$\frac{P_1 V_1}{m_1} = \frac{RT_1}{\mu} = \frac{RT_2}{\mu} = \frac{P_2 V_2}{m_2}$; $\frac{P_1 V_1}{m_1} = \frac{3{,}6 P_1 \cdot \frac{1}{2} V_1}{m_2}$; $m_2 = \frac{3{,}6}{2} m_1$

$P_2 = P_н$ (т.к. $m_2 < m_1$ → часть пара выпала в осадок)

$P_1 = \frac{P_н}{3{,}6} = \frac{0{,}5 \cdot 10^5\ Па}{3{,}6}$; $P_1 V_1 = \frac{m_1}{\mu} R T_1$; $m_1 = \frac{P_1 V_1 \mu}{RT_1} = \frac{2 P_н V_2 \mu}{3{,}6 R T_1} =$

$= \frac{2 \cdot 0{,}5 \cdot 10^5\ Па \cdot 1{,}7 \cdot 10^{-3}\ м^3 \cdot 18 \cdot 10^{-3} \frac{кг}{моль}}{3{,}6 \cdot 8{,}31 \frac{Дж}{моль \cdot К} \cdot 354\ К} = \frac{2 \cdot 0{,}5 \cdot 1{,}7 \cdot 18 \cdot 10^{-11}}{3{,}6 \cdot 8{,}31 \cdot 354}\ кг \approx 0{,}001\ кг =$

$= 1{,}011306\ г$

$N_2 + F_a \sin\beta = mg + N_2' \cos\alpha$

$mg a_{yc} = N_2' \sin\alpha + F_a \cos\beta$

$F_a = \frac{m a_{yc} - N_2' \sin\alpha}{\cos\beta}$

$N_2 = mg + N_2' \cos\alpha - F_a \sin\beta = -''- \left(m a_{yc} - N_2' \sin\alpha / tg\beta\right)$

$= mg + N_2' \cos\alpha - \left(m a_{yc} - N_2' \sin\alpha\right) tg\beta \frac{g}{a_{yc}} = mg + N_2' \cos\alpha - mg + \frac{N_2' \sin\alpha \cdot g}{a_{yc}} =$

$= N_2' \cos\alpha + \frac{N_2' \sin\alpha g}{a_{yc}} = N_2' \left(\frac{\cos\alpha a_{yc} + g \sin\alpha}{a_{yc}} \right)$

$\frac{\sqrt{\frac{2}{13}} \cdot a_{yc} + g\sqrt{\frac{9}{26}}}{a_{yc}} = \sqrt{\frac{2}{13}} + \frac{g\sqrt{\frac{9}{26}}}{a_{yc}}$

$\frac{g}{a_{yc}} \geq tg\beta$ $\omega^2 R$

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

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

$2\sin\alpha = 3\cos\alpha$

$\sin\alpha = \frac{3}{2}\cos\alpha$ $\frac{9}{4}\cos^2\alpha + \cos^2\alpha = 1$

$13\cos^2\alpha = 4$

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

$\sin\alpha = \frac{3}{2}\sqrt{\frac{2}{13}} = \sqrt{\frac{9 \cdot 2}{4 \cdot 13}} = \sqrt{\frac{9}{26}}$

$tg\alpha = \frac{tg\frac{\alpha}{2} + tg\frac{\alpha}{2}}{1 - tg^2\frac{\alpha}{2}} = \frac{2 tg\frac{\alpha}{2}}{1 - tg^2\frac{\alpha}{2}} = \frac{3}{2}$

$3 - 3tg^2\frac{\alpha}{2} = 4 tg\frac{\alpha}{2}$

$3tg^2\frac{\alpha}{2} + 4tg\frac{\alpha}{2} - 3 = 0$

$D_1 = 4 + 9 = 13$

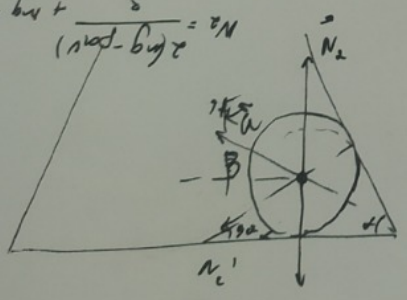
$tg\frac{\alpha}{2} = \frac{-2 \pm \sqrt{13}}{3} = \frac{-2 + \sqrt{13}}{3}$

$\frac{\sin\beta}{\cos\beta} = \frac{-2 + \sqrt{13}}{3}$

$\sin\beta = \frac{-2 + \sqrt{13}}{3} \cos\beta$

$\frac{4 - 4\sqrt{13} + 13}{9} \cos^2\beta = 9$

$28 - 4\sqrt{13}$



$ma = mg + N_2 + N_2' + F_a$

Oy: $N_2 + F_a \sin\frac{\alpha}{2} = mg + \cos\alpha N_2'$

$ma = F_a \cos\frac{\alpha}{2} + N_2 \sin\alpha$

$N_2 + \rho g V = mg + N_2' \cos\alpha$

$ma = \rho g V + N_2' \sin\alpha$

$N_2 + F_a = mg + N_2' \cos\alpha$

$ma = F_a + N_2' \sin\alpha$

$N_2 + F_a \sin\beta = mg + N_2' \cos\alpha$

$ma = F_a \cos\beta + N_2' \sin\alpha$

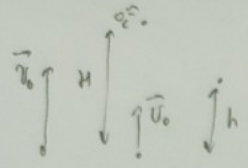
$F_a = \rho g V$

$N_2' = \frac{mg - \rho g V}{\sin\alpha}$

Черновик

Математика 10 класс
Физика

1.



$h = v_0\tau - \frac{g\tau^2}{2}$ $\quad h = v_0\tau - (H-h)$

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

$H = v_0\tau$

Дано:
$v_0; g$

$v_1 = v_0 - g\tau_0 = 0$ $\quad v_0 = g\tau_0$ $\quad H = v_0\tau_0 - \frac{g\tau_0^2}{2} = g\tau_0^2 - \frac{g\tau_0^2}{2} = \frac{g\tau_0^2}{2}$,

$\tau_0 = \frac{v_0}{g}$ $\quad = \frac{v_0^2}{2g}$ $\quad H - h = \frac{v_0^2}{2g}$

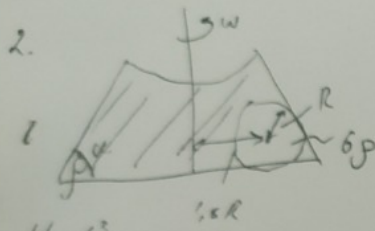
$\frac{v_0^2}{2g} = v_0\tau$ $\quad \tau = \frac{v_0}{2g}$ $\quad h = H - \frac{v_0^2}{2g} = \frac{v_0^2}{2g} - \frac{v_0^2}{8g} = \boxed{\frac{3v_0^2}{8g}}$

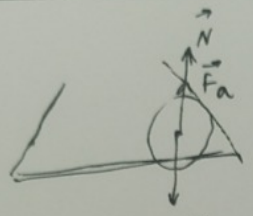
$\tau_1 = \tau_0 + \tau = \frac{v_0}{g} + \frac{v_0}{2g} = \frac{3v_0}{2g}$

$\tau_2 = \tau$

$\frac{\tau_1}{\tau_2} = \frac{\frac{3v_0}{2g}}{\frac{v_0}{2g}} = 3:1$

2.





$mg = N + F_a$; $F_a = V\rho g$

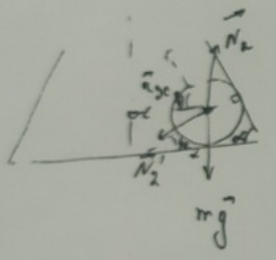
$mg = V_6\rho g$; N_1

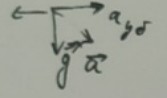
$\rho g V = N_1 + \rho g V$

$N_1 = 5\rho g V$; $V = \frac{4}{3}\pi R^3$ $\quad N_1 = \frac{20}{3}\pi R^3 \rho g$

(1)

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





$\vec{a} + \vec{a}_{yo} = \vec{g}$

$\vec{a} = \vec{g} - \vec{a}_{yo}$

$ma = F = m\frac{v^2}{R}$

Отн. $a_{yc} = \frac{v^2}{R} = \omega^2 R$

$m\vec{a}_{yc} = m\vec{g} + \vec{N}_2 + \vec{N}_2' + \vec{F}_a$

Oy: $N_2 + F_a\sin\beta = mg + N_2'\cos\alpha$

$ma_{yc} = N_2'\sin\alpha + F_a\cos\beta$

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3. $T = \text{const} = 81 + 273$ К $\quad pV = \nu RT$ $\quad p_1V_1 = \nu RT_1$ $\quad T_1 = T_2$ $\quad p_1V_1 = p_2V_2$

$p_2V_2 = \nu RT_2$

$V_2 = \frac{1}{7}V_1 = 1{,}7$ л

$p_2 = 3{,}6\,p_1$

$p_1V_1 = \frac{m_1}{M}RT_1$ $\quad \frac{p_1V_1}{m_1} = \frac{p_2V_2}{m_2} = \frac{\frac{1}{7}V_1 \cdot 3{,}6p_1}{m_2} = \frac{3{,}6V_1p_1}{7m_2}$

$p_2V_2 = \frac{m_2}{M}RT_2$

$p_н = 0{,}5\cdot 10^5$ Па

$M = 18\ \frac{г}{моль}$

$R = 8{,}31\ \frac{Дж}{моль\cdot К}$

$m_2 = \frac{7}{3{,}6}m_1$ $\quad \frac{5{,}6}{7}m_1$

$\frac{p_1V_1}{m_1} = \frac{p_2V_2}{\frac{5{,}6}{7}m_1}$

$p_1V_1 = \frac{m_1}{M}RT_1$ $\quad p_1 = \frac{m_1RT_1}{MV_1} = \frac{m_1 \cdot 8{,}31 \cdot 354\ \frac{Дж}{моль\cdot К}\cdot К}{18\ \frac{г}{моль}\cdot 1{,}7\ л\cdot 10^{-3}\cdot 10^{-3}} =$

$7\cdot 3{,}6p_1V_1 = 7p_2V_2$

$= m_1 \cdot 96{,}13\cdot 10^6$

$p_2 = 0{,}5\cdot 10^5$ Па $\quad p_1 = \frac{0{,}5\cdot 10^5}{3{,}6} = m_1\cdot 96{,}13\cdot 10^6$

$m_1 = \frac{0{,}5}{3{,}6\cdot 96{,}13} = 0{,}144$ г

Чистовик

Физика 10 класс

2) Дано:

$\rho_ж = \rho$

$\rho_м = 6\rho$

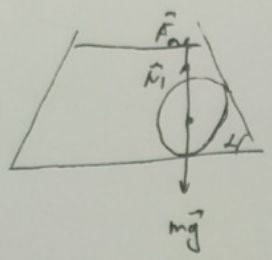
ω; R; $L = 1{,}5R$

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

Найти:

N_1; N_2

Решение

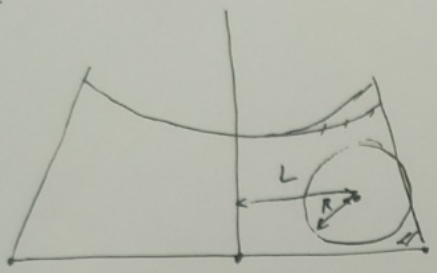


$m\vec{a} = m\vec{g} + \vec{N_1} + \vec{F_a} = 0$

$mg = N_1 + F_a$; $F_a = \rho g V_м$; $V_м = \frac{4}{3}\pi R^3$

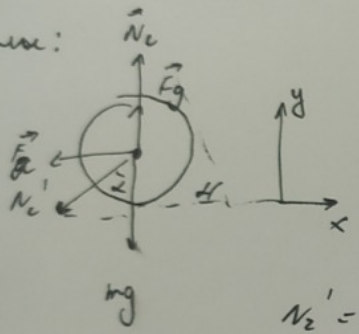
$m = \rho_м V_м$

$N_1 = 6\rho V_м g - \rho g V_м = 5\rho g V_м = \frac{20}{3}\pi\rho g R^3$



(3)

Силы:



$m\vec{a}_{yc} = m\vec{g} + \vec{F_g} + \vec{N_2} + \vec{N_2'} + \vec{F_a}$

Oy: $mg + N_2'\cos\alpha = N_2 + F_g$

Ox: $ma_{yc} = F_a + N_2'\sin\alpha$; $F_g = \rho_ж g V_м$; $F_a = \rho_ж a_{yc} V_м$

$N_2' = \frac{ma_{yc} - F_a}{\sin\alpha}$; $N_2' = \frac{N_2 + F_g - mg}{\cos\alpha}$; $a_{yc} = \omega^2 \cdot 1{,}5R$

$ma_{yc} - F_a = \operatorname{tg}\alpha(N_2 + F_g - mg)$; $N_2 = \frac{ma_{yc} - F_a}{\operatorname{tg}\alpha} - F_g + mg =$

$= \frac{ma_{yc} - \rho a_{yc} V_м}{\frac{3}{2}} - \rho g V_м + mg = \frac{2}{3}ma_{yc} + mg - \frac{2}{3}\rho a_{yc} V_м - \rho g V_м = m\left(\frac{2}{3}a_{yc} + g\right) - \rho V_м\left(\frac{2}{3}a_{yc} + g\right)$

$= \left(\frac{2}{3}a_{yc} + g\right)(m - \rho V_м) = \left(\frac{2}{3}\cdot 1{,}5\cdot\frac{3}{2}\omega^2 R + g\right)(6\rho V_м - \rho V_м) = (\omega^2 R + g)\,5\rho V_м = (\omega^2 R + g)\frac{20}{3}\rho R^3\pi$

Ответ: $N_1 = 5\rho V_м g = \frac{20}{3}\pi R^3\rho g$

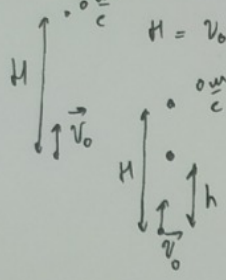
$N_2 = 5\rho V_м(g + \omega^2 R) = \frac{20}{3}\pi R^3\rho(g + \omega^2 R)$

Шаповалов Физика 10 класс

1) Дано: $v_0; g$

Найти: $\tau_1; \frac{\tau_1}{\tau_2}; h$

Решение:



$H = v_0\tau_0 - \frac{g\tau_0^2}{2}$; $v_1 = v_0 - g\tau_0 = 0$; $v_0 = g\tau_0$; $\tau_0 = \frac{v_0}{g}$; $H = \frac{v_0^2}{2g}$

$h = v_0\tau_2 - \frac{g\tau_2^2}{2}$; $H - h = \frac{g\tau_1'^2}{2}$; $\tau_1' = \tau_2$ (по условию)

$H - h = \frac{g\tau_2^2}{2}$; $h = v_0\tau_2 - (H - h)$; $H = v_0\tau_2 = \frac{v_0^2}{2g}$; $\tau_2 = \frac{v_0}{2g}$

$\tau_1 = \tau_0 + \tau_1' = \tau_0 + \tau_2 = \frac{v_0}{g} + \frac{v_0}{2g} = \frac{3v_0}{2g}$; $h = \frac{v_0^2}{2g} - \frac{v_0^2}{8g} = \frac{3v_0^2}{8g}$; $\frac{\tau_1}{\tau_2} = \frac{\frac{3v_0}{2g}}{\frac{v_0}{2g}} = 3$

Ответ: $\tau_1 = \frac{3v_0}{2g}$

$\frac{\tau_1}{\tau_2} = 3$

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

(2)

3) Дано:

$T_1 = T_2 = 354\,К$

$V_2 = \frac{1}{7} V_1 = 1,7 \cdot 10^{-3}\,м^3$

$p_2 = 3,6\,p_1$

$p_н = 0,5 \cdot 10^5\,Па$

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

$R = 8,31\,\frac{Дж}{моль \cdot К}$

Найти: p_1; m_1

Решение:

$pV = \frac{m}{\mu} RT$; $p_1 V_1 = \frac{m_1}{\mu} RT_1$; $p_2 V_2 = \frac{m_2}{\mu} RT_2$

$\frac{p_1 V_1}{m_1} = \frac{RT_1}{\mu} = \frac{RT_2}{\mu} = \frac{p_2 V_2}{m_2}$; $\frac{p_1 V_1}{m_1} = \frac{\frac{1}{7} \cdot 3,6\, p_1 V_1}{m_2}$; $m_1 = \frac{3,6}{7} m_1$

Т.к. $m_2 < m_1$ => газ не пара выпала в осадок => $p_2 = p_н$

$p_1 = \frac{p_2}{3,6} = \frac{p_н}{3,6} = \frac{0,5 \cdot 10^5\,Па}{3,6} = 0,139 \cdot 10^5\,Па$

$m_1 = \frac{p_1 V_1 \mu}{RT_1} = \frac{0,139 \cdot 10^5\,Па \cdot 7 \cdot 1,7 \cdot 10^{-3}\,м^3 \cdot 18 \cdot 10^{-3}\,\frac{кг}{моль}}{8,31\,\frac{Дж}{моль \cdot К} \cdot 354\,К} \approx 0,001\,кг = 1,0121\,г$

Ответ: $p_1 = 0,139 \cdot 10^5\,Па$

$m_1 = 1,0121\,г$

(1)

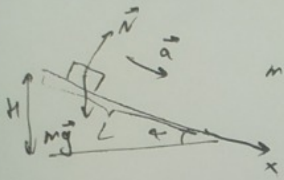
Часть 2

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

Шифр: **21204997**

ID профиля: **213646**

Вариант 2



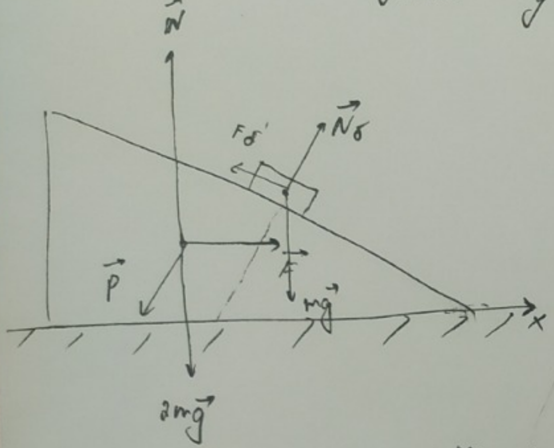
$m\vec{a} = m\vec{g} + \vec{N}$

Ox: $ma = mg\sin\alpha$; $a = g\sin\alpha$; $\sin\alpha = \frac{H}{L}$; $L = \frac{H}{\sin\alpha}$; $L = \frac{a\tau^2}{2}$; $\tau = \sqrt{\frac{2L}{a}}$

$$\tau = \sqrt{\frac{2H}{g\sin^2\alpha}} = \sqrt{\frac{2H}{g(1-\frac{9}{25})}} = \sqrt{\frac{2H}{g\frac{16}{25}}} = \sqrt{\frac{25H}{8g}} = \frac{5}{2}\sqrt{\frac{H}{2g}}$$

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

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



$F_б = F\cos\alpha$

$P = N_б$

$N = mg\cos\alpha$

$2m\vec{a} = 2m\vec{g} + \vec{N} + \vec{F} + \vec{P}$

Ox: $2ma = F - P\sin\alpha$

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

$$a = \frac{g}{2}\left(1 - \frac{3\cdot 4}{25}\right) = \frac{g}{2}\left(\frac{25-12}{25}\right) = \frac{g}{2}\frac{13}{25} = \frac{13g}{50}$$

$ma = mg\sin\alpha - F\cos\alpha = mg(\sin\alpha - \cos\alpha) = mg\frac{1}{5}$

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

$$\tau = \sqrt{\frac{2H}{a\sin\alpha}} = \sqrt{\frac{2H}{\frac{1}{5}g\frac{4}{5}}} = \frac{5}{2}\sqrt{\frac{2H}{g}}$$

(2)

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Листовек Физика 10 класс

4) Дано:

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

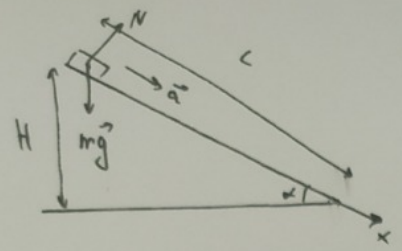
H, m, $2m$

$F = mg$

Найти:

τ_1; a_k; t_2

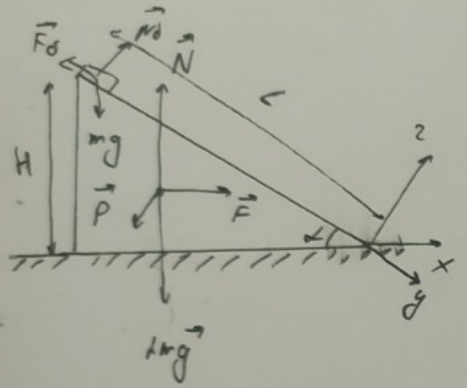
Решение:



$m\vec{a} = m\vec{g} + \vec{N}$; $\cos^2\alpha + \sin^2\alpha = 1 \Rightarrow \sin^2\alpha = \frac{4}{5}$

Ox: $ma = mg\sin\alpha$

$\sin\alpha = \frac{H}{L}$; $L = \frac{a\tau_1^2}{2}$ $\quad \tau_1 = \sqrt{\frac{2L}{a}} = \sqrt{\frac{2H}{g\sin^2\alpha}} = \sqrt{\frac{25\cdot 2H}{16g}} = \frac{5}{4}\sqrt{\frac{2H}{g}}$



$P = N\delta$

$2m\vec{a}_k = 2m\vec{g} + \vec{F} + \vec{P} + \vec{N}$

Ox: $2ma_k = F - P\sin\alpha$ $\quad$ Oy; Oz: $N\delta = mg\cos\alpha$

$2ma_k = mg - mg\cos\alpha\sin\alpha = mg\left(1 - \frac{3}{5}\cdot\frac{4}{5}\right) = mg\frac{13}{25}$

$a_k = \frac{13g}{50}$

$m\vec{a} = \vec{N}\delta + m\vec{g} + \vec{F}\delta$; $F\delta = F\cos\alpha$

Oy: $ma = mg\sin\alpha - F\cos\alpha = mg(\sin\alpha - \cos\alpha) = mg\frac{1}{5}$; $a = \frac{g}{5}$

$\tau_2 = \sqrt{\frac{2L}{a}} = \sqrt{\frac{2H}{\frac{g}{5}\sin\alpha}} = \sqrt{\frac{2H}{\frac{g}{5}\cdot\frac{4}{5}}} = \frac{5}{2}\sqrt{\frac{2H}{g}}$

(1)

Ответ: $\tau_1 = \frac{5}{4}\sqrt{\frac{2H}{g}}$

$a_k = \frac{13g}{50}$

$\tau_2 = \frac{5}{2}\sqrt{\frac{2H}{g}}$

5) Дано:
$p_2 = 0{,}99 p_1$
$V_2 = 1{,}02 V_1$

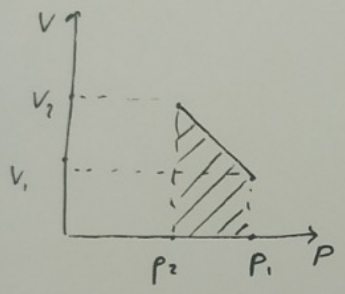
Найти:
ΔT; $\frac{Q}{\Delta U}$

Решение:

$pV = \nu RT$; $p_1V_1 = \nu RT_1$; $p_2V_2 = \nu RT_2$; $\frac{p_1V_1}{T_1} = \nu R = \frac{p_2V_2}{T_2}$; $\frac{p_1V_1}{p_2V_2} = \frac{T_1}{T_2} = \frac{p_1V_1}{0{,}99 \cdot 1{,}02 p_1V_1} \Rightarrow$

$T_2 = 1{,}0098 T_1$. $\Delta T = T_2 - T_1 = 0{,}0098 T_1 = 0{,}98\% T_1$

$Q = A_2 + \Delta U$; $A_2 = \frac{V_1 + V_2}{2}(p_2 - p_1) = \frac{2{,}02 V_1}{2} 0{,}01 p_1 = 1{,}01 \cdot 0{,}01 p_1V_1$



$\Delta U = C\nu\Delta T = \frac{3}{2}\nu R\Delta T = \frac{3}{2}\nu R\, 0{,}0098 T_1$

одноатомный газ

$Q = \frac{3}{2} 0{,}0098 \nu R T_1 + 1{,}01 \cdot 0{,}01 p_1V_1 = 0{,}0248 p_1V_1$

$\frac{Q}{\Delta U} = \frac{0{,}0248 p_1V_1}{\frac{3}{2} 0{,}0098 p_1V_1} = 1{,}6871$

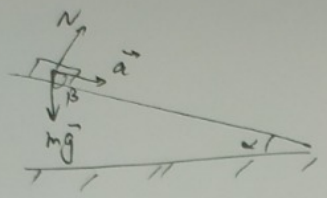
(2)

Ответ: $\Delta T = 0{,}98\%$ (увеличится)

$\frac{Q}{\Delta U} = 1{,}6871$

Черновик

Физика 10 класс

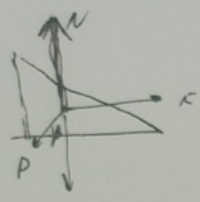


$ma = mg\cos\beta = mg\sin\alpha$

$a = g\sin\alpha$

$V = at \quad \sin\alpha = \frac{H}{L} \quad L = \frac{H}{\sin\alpha}$

$t = \frac{at^2}{2} \quad L = \frac{at^2}{2} \; ; \; t = \sqrt{\frac{2L}{a}} = \sqrt{\frac{2H}{g\sin^2\alpha}} = \frac{1}{\frac{g}{16}}\sqrt{\frac{2OH}{gg}}$



~~$A - 2mg + P$~~ $P = N \quad N = mg\cos\alpha$

$P = mg\cos\alpha$

$2mg \quad ma = F - P_x$

$p_1V_1 = \nu RT_1$

$p_2V_2 = \nu RT_2$

$p_2 = 0{,}09p_1$

$V_2 = 1{,}02V_1$

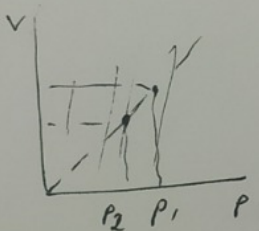
(1)

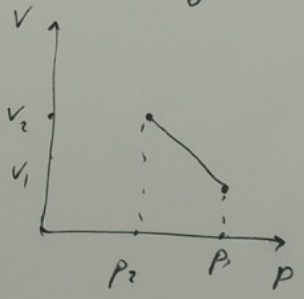
$\frac{p_1V_1}{p_2V_2} = \frac{T_1}{T_2} = \frac{p_1V_1}{0{,}99 \cdot 1{,}02 \, p_1V_1} = \frac{1}{0{,}99 \cdot 1{,}02} = \frac{1}{1{,}0098}$ $\quad T_2 = 1{,}0098\,T_1$ ↗

$+0{,}98\,\%$

$Q = A + \Delta U \quad A = ?$

$\frac{Q}{\Delta U}$ $\quad \frac{Н}{м^2} / м^3$





$\Delta U = C_\nu T$

$A = \frac{V_1 + V_2}{2}(P_1 - P_2) = \frac{2{,}02V_1}{2} \cdot 0{,}01p_1 = 1{,}01 \cdot 0{,}01 p_1V_1 = 0{,}0101\,p_1V_1$

$\Delta U = \frac{3}{2} R \Delta T \quad 0{,}98 \; 0{,}0098 T_1 = \frac{3}{2} 0{,}098 p_1V_1 = 0{,}0147 p_1V_1$

$Q = 0{,}0248\,p_1V_1$

$\frac{Q}{\Delta U} = \frac{0{,}0248}{0{,}0147} \times 1{,}687$

$0{,}0101$

$0{,}0048$

$\frac{0{,}0048}{0{,}0}$