Часть 1

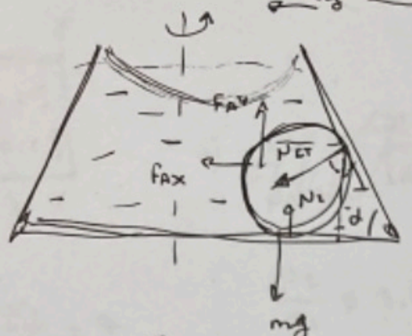
Олимпиада: **Физика, 10 класс (1 часть)**

Шифр: **21205212**

ID профиля: **377158**

Вариант 2

Черновик



$\frac{кг}{м^3} \cdot \frac{Н}{кг} \cdot м^3$

$[F_{AX} = \rho a V_{пог} = \rho \omega^2 1{,}5R V_{пог}]$

2зН: $F_{AX} + N_{CT}\sin\alpha = ma_y$

$\rho \omega^2 1{,}5 R V_{пог} = m$

$N_2 = mg - F_A$

$\rho_0 a V + N\sin\alpha = ma$

$\rho_B g V + N_2 - \rho_0 V g N\cos\alpha = 0$

2зН: $N_{CT} = \frac{(m - \rho_B V) a}{\sin\alpha}$

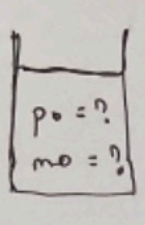
F_{AX}

$\rho g V = V \rho g$

$mg - \rho g V - N_2 + \frac{(m - \rho_B V) a \cdot \cos\alpha}{\sin\alpha} = 0$

$N_2 = mg - \rho g V + \frac{(m - \rho_B V) a \cos\alpha}{\sin\alpha}$

черновик



$T = 354\ K$

1) $p_1V_1 = \frac{m_1}{M}RT$

$p_2V_2 =$

оба пар сжимался сильно задолго не стал насыщ

$\frac{V_1}{V_2} = 7$ $\quad \frac{p_2}{p_1} = 3{,}6$

$p_2V_2 = \frac{m}{M}RT$

$\left[p_2 = \frac{mRT}{\mu V_2}\right]$

$\left[p_1 = \frac{mRT}{\mu V_2 \cdot 3{,}6}\right]$

$p_1V_1 = \frac{m_1RT}{M}$

0,50000

10·10·10·10·10

100000

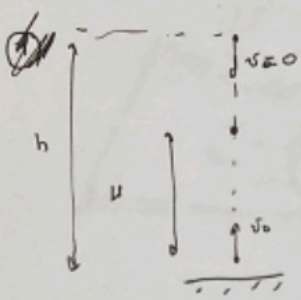
50,000

10^{-3}

5,95

5883,48

C

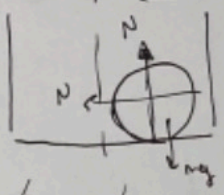


9 Черновик

1) $0 = v_0 - g t_{под}$

$\left[t_{под} = \frac{v_0}{g} \right]$

$\left[h = \frac{1}{2} v_0 t_{под} = \frac{v_0^2}{2g} \right]$



2) $H = v_0 t - \frac{g t^2}{2}$ → $h - v_0 t + \frac{g t^2}{2} = \frac{g t^2}{2}$

$h - H = \frac{g t^2}{2}$

$h = v_0 t$

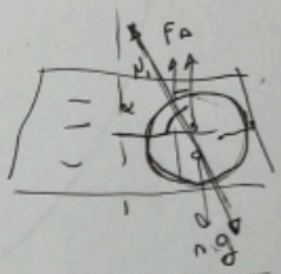
$\left[t = \frac{h}{v_0} = \frac{v_0}{2g} \right]$

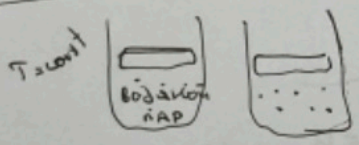
$H = v_0 t - h + H$

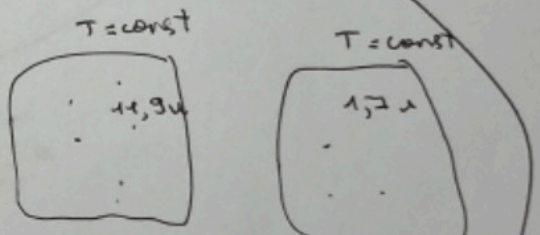
$\left[H = v_0 t - h \right]$

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

$\left[H = h - \frac{g v_0^2}{8 g^2} = \frac{v_0^2}{2g} - \frac{v_0^2}{8g} \right]$







$\frac{1}{2} - \frac{1}{8}$

$\frac{4}{8} - \frac{1}{8} = \frac{3}{8}$

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

$p_1 V_1 = p_2 V_2$

$\frac{p_1}{p_2} = \frac{1}{3{,}6}$

$3{,}6\, p_1 V_2$

$7\, p_1 = p_2$

$F_{A\,выд} = mg + N_1$

$\rho_в g V = m g + N_1$

$\rho_в V = \rho_м \cdot V_м$

$\rho V = 6\rho \cdot V_м$

$V = 6 V_м$

$N_1 = \rho g (V - 6 V_м)$

$N_1 = 5 \rho g V_м$

$\rho_{масла}$

$-t^2 \longrightarrow h = v_0 t + \frac{gt^2}{2} = \frac{v_0}{2}$

③

Дано:

$\frac{V_1}{V_2} = 7$

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

$\mu = 18$ г/моль

$R = 8{,}31$ Дж/моль·К

$p_{нп} = 0{,}5 \cdot 10^5$ Па

$V_2 = 1{,}7$ л

1) $p_1 = ?$

2) $m_1 = ?$

Условия

1) При изотермич. процессе должно соблюд. $p_1V_1 = p_2V_2$
но здесь не так. →
→ пар сжимался изм. давление пока не стал насыщ.
после чего объем продолжал уменьш. а давл не менял.

2) $\frac{p_2}{p_1} = 3{,}6 \rightarrow \left[p_1 = \frac{p_2}{3{,}6} = \frac{p_{нп}}{3{,}6}\right] = \frac{0{,}5 \cdot 10^5}{3{,}6} \approx 13889$ Па

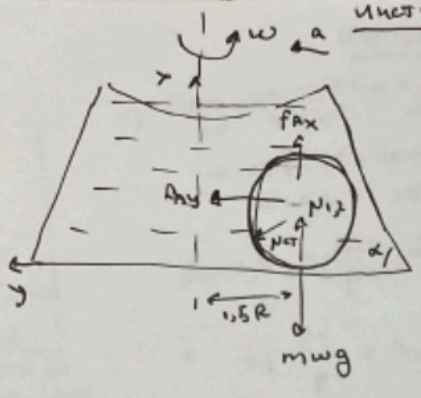
$p_1V_1 = \frac{m_1}{\mu} RT$

$p_1 7V_2 = \frac{m_1}{\mu} RT$

$\left[m_1 = \frac{7\mu p_1 V_2}{RT} = \frac{7 \cdot 18 \cdot 10^{-3} \cdot 0{,}5 \cdot 10^5 \cdot 1{,}7 \cdot 10^{-3}}{8{,}31 \cdot 354 \cdot 3{,}6 \cdot 10} = 0{,}001011 \text{ кг} \approx 1 \text{ г}\right]$

Ответ: $[p_1 = 13889$ Па$]$
$[m_1 = 1$ г$]$

②



Дано:

$\rho_w = 6\rho$

$\rho_ш = \rho$

R, ω

1) $N_1 = ?$

2) $N_2 = ?$

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

Инерциальная

① сосуд не вращается:

$N_1 + \rho g V = mwg$

$N_1 = g(mw - \rho V)$

$\left[N_1 = \rho g \cdot 5V = 5\rho g \cdot \frac{4}{3}\pi R^3\right]$

② сосуд вращается:

y: $\rho aV + N_{ст}\sin\alpha = m_w a$

$\left[N_{ст} = \frac{ma - \rho aV}{\sin\alpha}\right]$

x: $\rho gV + N_2 - mwg - N_{ст}\cos\alpha = 0$

$N_2 = N_{ст}\cos\alpha + mwg - \rho gV$

$N_2 = \left(\frac{ma - \rho aV}{\sin\alpha}\right)\cdot\cos\alpha + \rho \cdot 6V g - \rho gV$

$N_2 = \frac{(6\rho Va - \rho aV)}{\sin\alpha}\cdot\cos\alpha + 5\rho gV$

$N_2 = 5\rho V\left(a\frac{\cos\alpha}{\sin\alpha} + g\right)$

$a = \omega^2 \cdot 1{,}5R \quad ; \quad V = \frac{4}{3}\pi R^3$

$\left[N_2 = 5\rho\frac{4}{3}\pi R^3\left(\omega^2 \cdot 1{,}5R\,ctg\alpha + g\right)\right]$ ← $\left[ctg\alpha = \frac{1}{tg\alpha} = \frac{2}{3}\right]$

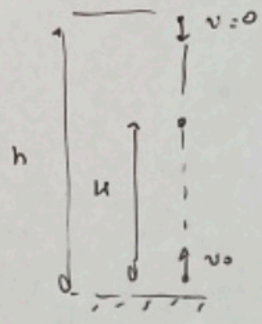
$\left[N_2 = \frac{20}{3}\rho\pi R^3\left(\omega^2 \cdot R + g\right)\right]$

Ответ: $\left[N_1 = \frac{20}{3}\rho g\pi R^3\right]$

$\left[N_2 = \frac{20}{3}\rho\pi R^3\left(\omega^2 \cdot R + g\right)\right]$

1) $N_1 = ?$ ② t: $oaV + N\sin$…

①



1) $H = ?$

2) $t_1 = ?$

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

Чистовик

① $0 = v_0 - g \cdot t_{под}$

$t_{под} = \frac{v_0}{g}$ – (время полета до высш. точки 1го)

[$h = \frac{1}{2} v_0 t_{под} = \frac{v_0^2}{2g}$]

② $H = v_0 t - \frac{gt^2}{2}$

$h - H = \frac{gt^2}{2}$

$H = v_0 t - h + H$

[$t = \frac{h}{v_0} = \frac{v_0}{2g}$] – (время полета второго до столкн. или время первого от высш. точки до столкн.)

[$H = h - g\frac{t^2}{2} = \frac{v_0^2}{2g} - \frac{g v_0^2}{2 \cdot 4 g^2} = \frac{3}{8} \cdot \frac{v_0^2}{g}$]

[$t_1 = t_{под} + t = \frac{v_0}{2g} + \frac{v_0}{g} = \frac{3 v_0}{2 g}$]

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

Ответ: [$H = \frac{3 v_0^2}{8 g}$]

[$t_1 = \frac{3 v_0}{2 g}$]

[$\frac{t_1}{t} = 3$]

1

21205212 (U377158 M1280955)

Часть 2

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

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Вариант 2

Клинышек

(5) ...

(4)

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

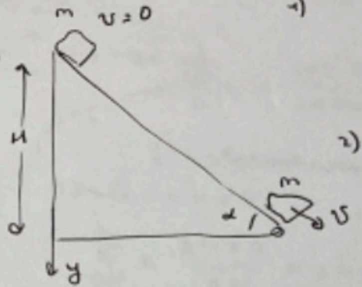
$\sin\alpha = \frac{4}{5}$

1) $t = ?$

2) $a_{кл} = ?$

3) $\tau = ?$

(1)



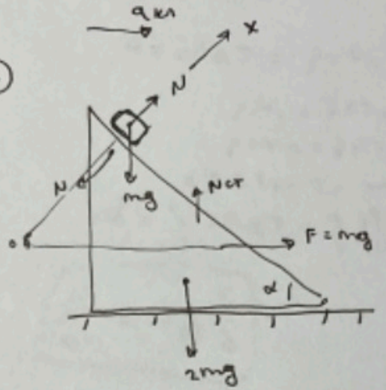
1) ЗСЭ: $mgH = \frac{mv^2}{2}$

$v = \sqrt{gH\cdot 2}$

2) y: $H = \frac{1}{2} v \sin\alpha\, t$

$\left[t = \frac{2H}{v\sin\alpha} = \frac{2H}{\sqrt{2gH}\sin\alpha}\right] = \frac{10H}{4\sqrt{2gH}}$

(2)



1) 2ЗН: для «m»:

x: $N - mg\cos\alpha = m a_{кл} \sin\alpha$

2ЗН: для «2m»:

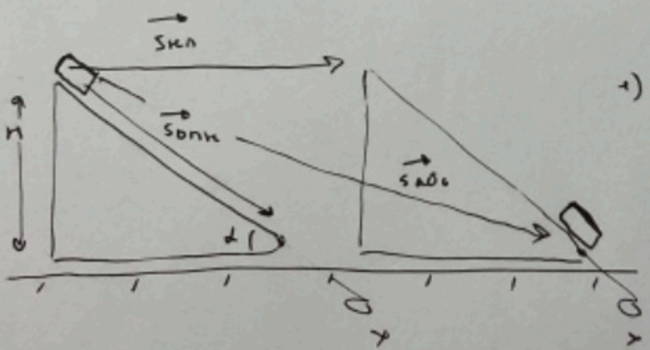
x: $mg - N\sin\alpha = 2m a_{кл}$

$mg - m a_{кл} \sin^2\alpha - mg\cos\alpha\sin\alpha = 2m a_{кл}$

$a_{кл}(2 + \sin^2\alpha) = g(1 - \cos\alpha\sin\alpha)$

$\left[a_{кл} = g\frac{(1 - \cos\alpha\sin\alpha)}{(2 + \sin^2\alpha)} = 10\cdot\frac{(1 - \frac{4}{5}\cdot\frac{3}{5})}{(2 + (\frac{4}{5})^2)} \approx 1{,}969\ \frac{м}{с^2}\right]$

(3)



1). ВСО земли для шайбы

$2a_x \cdot S_{абс\,x} = v^2_{абс\,x} - v^2_{абс\,0\,x}$

• $S_{абс\,x} = -(S_{отн} + S_{кл}\cdot\cos\alpha)$

• $v_{абс\,0\,x} = 0$

• $v_{абс\,x} = -v_{кл}\cos\alpha$

$i = 3$ Чем поровну

$$\frac{p \cdot V}{T} = \frac{p \downarrow V \uparrow}{T}$$

$\frac{1}{2}$

$\frac{2}{3}$

$1 + \frac{3}{3}$

$p - 1\%$

$V + 2\%$

$$\frac{99 \cdot 102}{100 \cdot 100} \qquad \frac{\frac{p \cdot 99}{100} \cdot \frac{V \cdot 102}{100}}{} = \frac{p \cdot V}{T}$$

$$\frac{10098}{10000} \qquad \frac{pV}{T^*} = \frac{pV}{T}$$

T^*

$0{,}98\% \simeq 1\%$

$$\Delta U = \frac{3}{2} \nu R \Delta T$$

$$\frac{Q}{\Delta U} = A + 1 \qquad Q = A + \Delta U$$

$$A + 1 = 1{,}0098\, pV$$

$$A = \nu R \Delta T = p_2 V_2 - p_1 V_1 = \frac{99 \cdot 102}{10000} - 1 = 0{,}0098\, pV$$

$p_1 V_1 = \nu R T_1$

$p_2 V_2 = \nu R T_2$

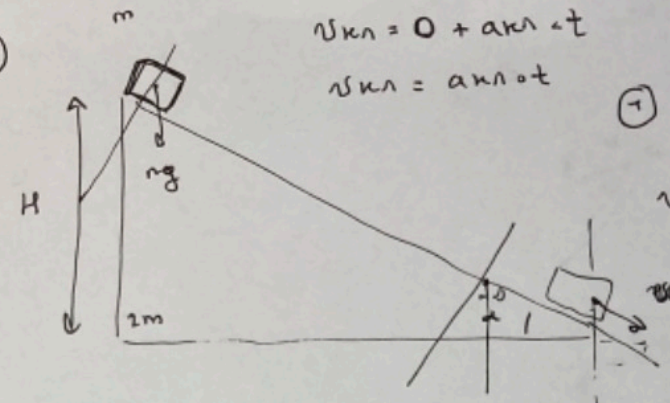
$T_2 - T_1 = \Delta T$

4

Черновик

$v_{кл} = 0 + a_{кл} \cdot t$

$v_{кл} = a_{кл} \cdot t$

① 

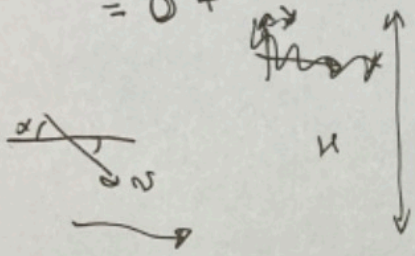
① $Hmg = \frac{mv^2}{2}$

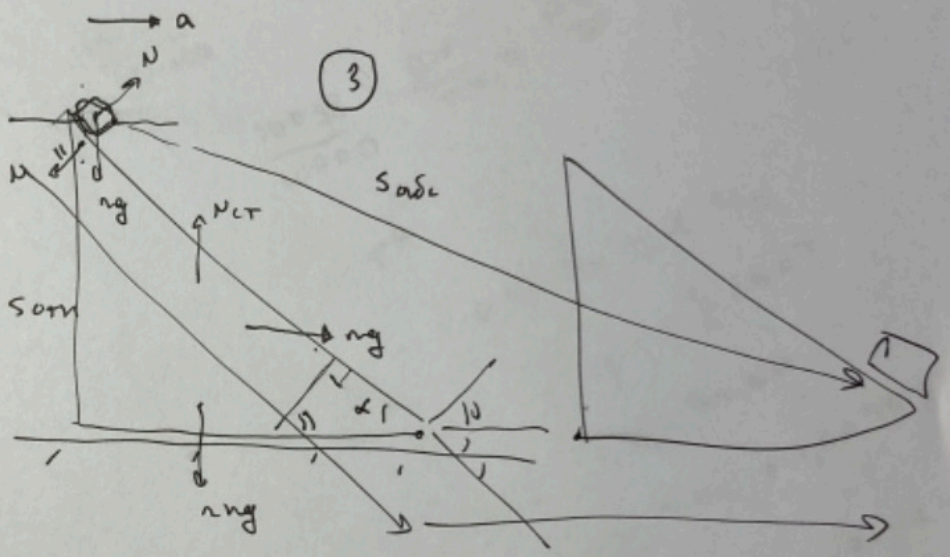
$v = \sqrt{2gH}$

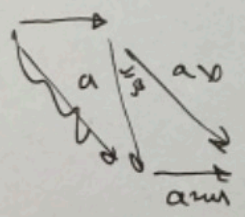
$H = \frac{1}{2} v \sin\alpha \cdot t$

$t = \frac{2H}{v\sin\alpha} = \frac{2H}{\sqrt{2gH}\sin\alpha}$

② $= 0 + a_x t$







2ЗН:

$X: -N\sin\alpha + \frac{1}{2}mg = 2ma$

$N\cos\alpha + 2mg = N_{СТ}$

$S_{абс} = a_x t$

$t = \frac{v_{абс} x}{a_x}$

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

$-\frac{1}{2}mg\cos\alpha \cdot \sin\alpha - \frac{1}{2}ma\sin^2\alpha + \frac{1}{2}mg = 2ma$

$a(2 + \sin^2\alpha) = g - g\cos\alpha\sin\alpha$

$a = \frac{g(1 - \cos\alpha\sin\alpha)}{(2 + \sin^2\alpha)} = g \cdot \frac{(1 - \frac{4}{5}\cdot\frac{3}{5})}{2 + (\frac{4}{5})^2}$

$\approx 1{,}969$ 3

Физика

(5) $i=3$

1) $\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2} = \frac{\frac{99}{100} \cdot p_1 \cdot \frac{102}{100} V_1}{T_2}$

p уменьш на 1%
V увелич на 2%

1) T_2 увелич или уменьш и на сколь %

$\left[T_2 = \frac{10098}{10000} T_1 = 1019,98\%\, T_1\right]$

2) $\frac{Q}{\Delta U} = ?$

[T_2 увеличилось на 0,98%]

5/3

2) $Q = \Delta U + A$

$\frac{Q}{\Delta U} = \frac{\Delta U + A}{\Delta U} = 1 + \frac{A}{\Delta U} = 1 + \left(\left(\frac{99}{100}\frac{102}{100} - 1\right) p_1 V_1\right) : \frac{3}{2}\left(\frac{99}{100}\frac{102}{100} - 1\right) p_1 V_1 =$

$A = \nu R \Delta T = p_2 V_2 - p_1 V_1 = \left(\frac{99}{100} \cdot \frac{102}{100} - 1\right) p_1 V_1$

$p_1 V_1 = \nu R T_1$

$p_2 V_2 = \nu R T_2$

$\Delta T = T_2 - T_1$

$\Delta U = \frac{3}{2} \nu R \Delta T = \frac{3}{2}\left(\frac{99}{100} \cdot \frac{102}{100} - 1\right) p_1 V_1$

$\frac{Q}{\Delta U} = \frac{5}{3}$

Ответ: T_2 увелич. на 0,98%

$\left[\frac{Q}{\Delta U} = \frac{5}{3}\right]$

2

=