

Часть 1

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

Шифр: **21206042**

ID профиля: **286786**

Вариант 3

4 условия

№2

①

Дано:

$$\alpha = 30^\circ$$

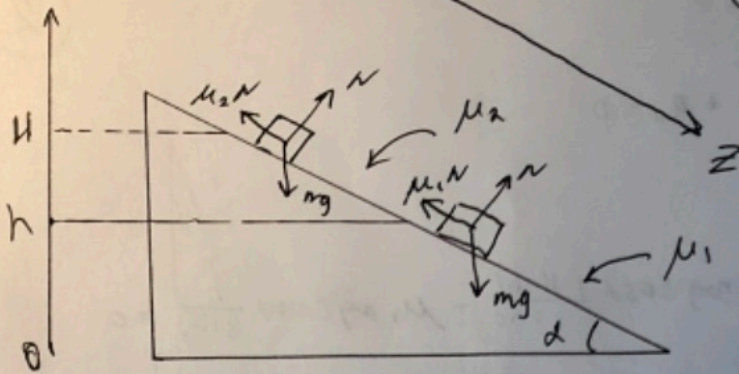
$$h = 2\text{ м}$$

$$\mu_1 = 0,81$$

$$\mu_2 = 0,11$$

$$v_H = 0$$

$$v_K = 0$$



- 1) Сопоставим силы на ось OZ и найдем куда направлены ускорения в том и другом случае:

1) T = ?

2) H = ?

$$m a_{2z} = mg \sin \alpha - \mu_2 N$$

$$N = mg \cos \alpha$$

$$m a_{2z} = mg \sin \alpha - \mu_2 mg \cos \alpha$$

$$a_{2z} = \frac{1}{2} g - \frac{\sqrt{3}}{2} \mu_2 g = \frac{1}{2} g (1 - \sqrt{3} \mu_2) = \frac{1}{2} \cdot 10 (1 - \sqrt{3} \cdot 0,11) =$$

$$= \frac{1}{2} \cdot 10 \cdot \frac{0,4}{1,8} = 4 \frac{m}{c^2} > 0 \Rightarrow \text{на участке выше } h \text{ тело разгоняется.}$$

$$m a_{1z} = mg \sin \alpha - \mu_1 mg \cos \alpha$$

$$a_{1z} = \frac{1}{2} g (1 - \sqrt{3} \mu_1) = \frac{1}{2} \cdot 10 \cdot (1 - \sqrt{3} \cdot 0,81) = \frac{1}{2} \cdot 10 \cdot (-0,4) = -2 \frac{m}{c^2} < 0$$

\Rightarrow на участке ниже h тело тормозит
найдём T непрерывно на участке A (ниже h)

$$S = \frac{h}{\sin \alpha} = 2h$$

$$S = vT - \frac{a_1 T^2}{2}$$

$$0 = v - a_1 T \Rightarrow a_1 T = v$$

$$S = \frac{a_1 T^2}{2}; S = 2 \cdot T = \sqrt{\frac{2S}{a_1}} = \sqrt{\frac{2 \cdot 2 \cdot 2}{2}} = 2c.$$

2) ЗСЭ:

(2)

$$mgH + A_1 + A_2 = 0$$

$$A_1, A_2 < 0$$

$$mgH - \mu_2 mg \cos \alpha \frac{(H-h)}{\sin \alpha} - \mu_1 mg \cos \alpha \frac{h}{\sin \alpha} = 0$$

$$H - \mu_2 \operatorname{ctg} \alpha H + \mu_2 \operatorname{ctg} \alpha h - \mu_1 \operatorname{ctg} \alpha h = 0$$

$$H(1 - \mu_2 \operatorname{ctg} \alpha) = \operatorname{ctg} \alpha h(\mu_1 - \mu_2)$$

$$H = \frac{\operatorname{ctg} \alpha h(\mu_1 - \mu_2)}{1 - \mu_2 \operatorname{ctg} \alpha} = \frac{\sqrt{3} \cdot 2 \cdot 0,7}{1 - 0,11 \cdot \sqrt{3}} = 3 \text{ м}$$

Ответ: $T = 2 \text{ с}$; $H = 3 \text{ м}$

Чистовик.

№3.

3

Дано:

$R = 5 \text{ см}$

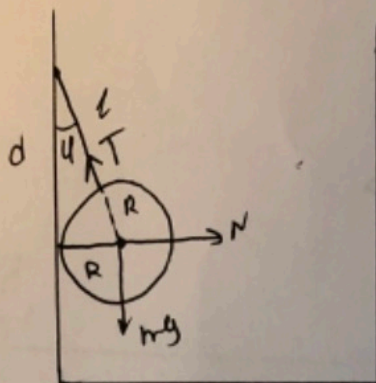
$l = 15 \text{ см}$

$m = 0,8 \text{ кг}$

$\omega = 10 \text{ с}^{-1}$

1) $N = ?$

2) $l = ?$



1) $\sin \varphi = \frac{R}{l+R} = \frac{5}{15+5} = \frac{1}{4}$

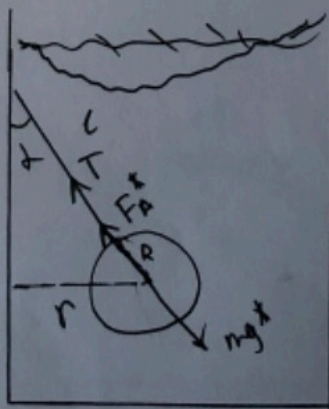
$d = \sqrt{(l+R)^2 - R^2} = \sqrt{400 - 25} = \sqrt{375} \text{ см.}$

$\begin{cases} mg = T \cos \varphi \\ N = T \sin \varphi \end{cases}$

$\frac{N}{mg} = \operatorname{tg} \varphi = \frac{5}{\sqrt{375}} = \sqrt{\frac{25}{375,15}} = \frac{1}{\sqrt{15}}$

$N = \frac{mg}{\sqrt{15}} = \frac{0,8 \cdot 10}{\sqrt{15}} = \frac{8}{\sqrt{15}} = \frac{8}{3,87} = 2,07 \text{ Н}$

2)



Перейдем во вращающуюся
Ке и со сосуда

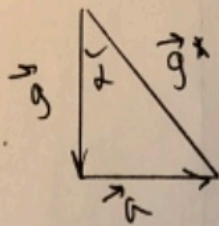
Тогда возникает величина g^* эквивалентная ускорению, по которому будет направлена сила тяжести и сила Архимеда.

Следовательно где по то то то бы была статика необходимо, то то и сила T была направлена по g^* .

Чистовик

(4)

После того как дается энергия g^* и g



$$\operatorname{tg} \alpha = \frac{a}{g}$$

$$a = \omega^2 r$$

$$r = (l+R) \sin \alpha$$

$$a = \omega^2 (l+R) \sin \alpha$$

$$\frac{\sin \alpha}{\cos \alpha} = \frac{\omega^2 (l+R) \sin \alpha}{g}$$

$$\cos \alpha = \frac{g}{\omega^2 (l+R)} = \frac{10}{100 \cdot 0,2} = \frac{1}{2} \Rightarrow \alpha = 60^\circ$$

Ответ: $N = 2,07 \text{ Н}$; $\alpha = 60^\circ$.

Dano:

$\alpha = 60^\circ$

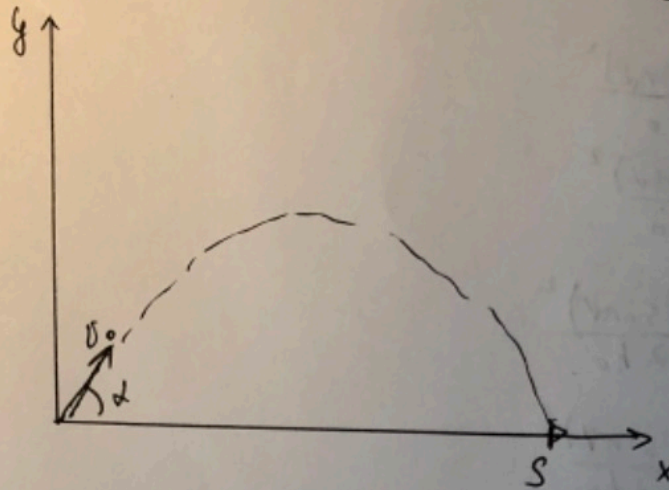
$S = 17 \text{ m}$

$v = \frac{v_0}{4}$

$m = 1 \text{ kg}$

1) $v_0 = ?$

2) $F = ?$



1) $S = v_0 \cos \alpha \cdot t$

$0 = v_0 \sin \alpha \cdot t - \frac{g \cdot t^2}{2}$

$t = \frac{2 v_0 \sin \alpha}{g}$

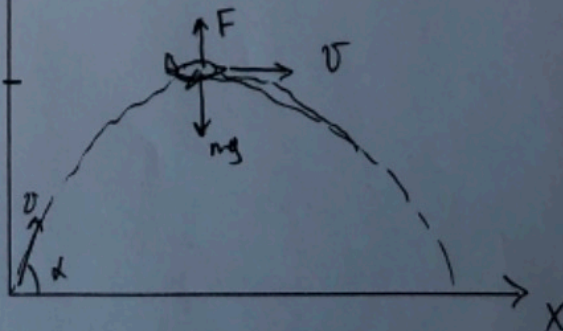
$S = \frac{2 v_0^2 \sin \alpha \cos \alpha}{g} = \frac{v_0^2 \sin 2\alpha}{g}$

$v_0 = \sqrt{\frac{Sg}{\sin 2\alpha}}$

$v_0 = \sqrt{\frac{17 \cdot 10 \cdot 2}{\sqrt{3}}} = \sqrt{\frac{340}{\sqrt{3}}} = \sqrt{\frac{340}{1.732}} = 14 \frac{\text{m}}{\text{s}}$

2) y

м.к. равномерно
на зее, но $a_{\text{зее}} = \text{const}$,
а м.к. $mg = \text{const}$, но h_0
 F зггем const.



~~м.к. гбурдее но меем зее равномерно~~ $F = \text{const}$, м.к. $a = \text{const}$
 $ma = mg - F$

$a = g - \frac{F}{m}$

$h_0 = \frac{(v \sin \alpha)^2}{2a}$

$$h_0 = \frac{(v_0 \sin \alpha)^2}{2g} = \frac{(14 \cdot \frac{\sqrt{3}}{2})^2}{20} = \frac{49 \cdot 3}{20} = 7,35 \text{ м}$$

6

$$2a = \frac{(v \sin \alpha)^2}{h_0}$$

$$a = \frac{(v \sin \alpha)^2}{2h_0}$$

$$g - \frac{F}{m} = \frac{(v \sin \alpha)^2}{2h_0}$$

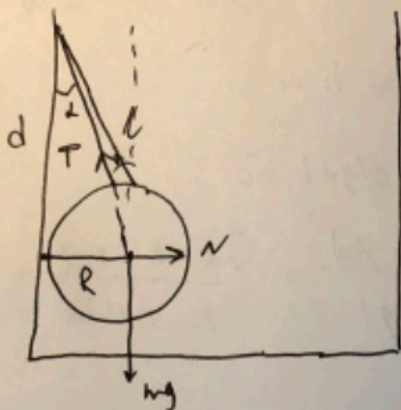
$$\frac{F}{m} = g - \frac{(v \sin \alpha)^2}{2h_0}$$

$$F = \left(g - \frac{(v \sin \alpha)^2}{2h_0} \right) m$$

$$F = \left(10 - \frac{(3,5 \cdot \frac{\sqrt{3}}{2})^2}{2 \cdot 7,35} \right) \cdot 1 = 10 - \frac{9,19}{2 \cdot 7,35} = 10 - 0,63 = 9,37 \text{ Н}$$

Ответ: $v_0 = 14 \frac{\text{м}}{\text{с}}$; $F = 9,37 \text{ Н}$.

№3 Кепно Вил



$R = 5 \text{ cm}$
 $l = 15 \text{ cm}$
 $m = 0,8 \text{ кг}$
 $N = ?$

$$325 = 25 \cdot g$$

$$\sqrt{1 - \frac{1}{16}} = \frac{\sqrt{15}}{4}$$

$$d = \sqrt{225 - 25} = 2,5\sqrt{2} = 10\sqrt{2}$$

$$\sin \alpha = \frac{R}{l} = \frac{5}{15} = \frac{1}{3}$$

$$\cos \alpha = \sqrt{1 - \frac{1}{9}} = \frac{\sqrt{8}}{3} = \frac{2\sqrt{2}}{3}$$

$$mg = T \cos \alpha$$

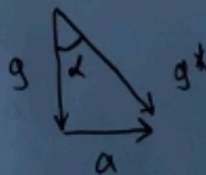
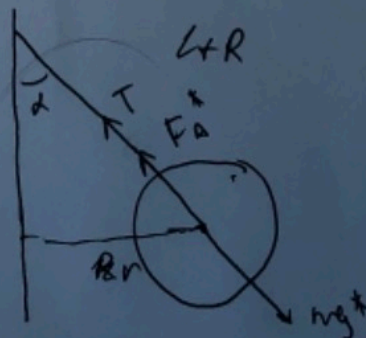
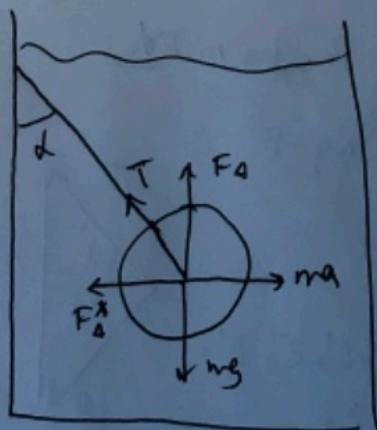
$$\tan \alpha = \frac{1}{2\sqrt{2}} = \frac{1}{2\sqrt{2}}$$

$$N = T \sin \alpha$$

$$\frac{mg}{N} = \frac{\cos \alpha}{\sin \alpha}$$

$$\frac{N}{mg} = \tan \alpha$$

$$N = \tan \alpha \cdot mg = \frac{1}{2\sqrt{2}} \cdot 0,8 \cdot 10^5 = \frac{4}{\sqrt{2}} = \frac{4 \cdot \sqrt{2}}{2} = 2\sqrt{2} = 2,83 \text{ Н}$$



$$a = \omega^2 r$$

$$N = (l+R) \cos \alpha$$

$$\tan \alpha = \frac{a}{g}$$

$$\frac{\sin \alpha}{\cos \alpha} = \frac{\omega^2 \cdot (l+R) \sin \alpha}{g}$$

$$\cos \alpha = \frac{g}{\omega^2 (l+R)} = \frac{10}{100 \cdot 0,2} = \frac{1}{2}$$

$$\alpha = 60^\circ$$

Упрощение

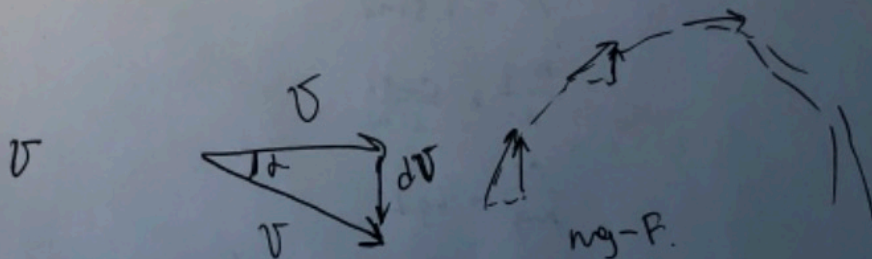
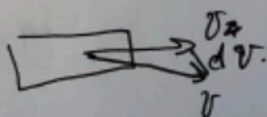
$$\text{ctg } 30^\circ = \frac{\sqrt{3}}{1} = \sqrt{3}$$

$$m_1 g \sin \alpha - \mu_1 m_1 g \cos \alpha = \frac{m_1 (v_1 - v_2) \sin \alpha}{\Delta t} - \mu_1 m_1 g \cos \alpha = 0$$

$$v_1 - \mu_2 \text{ctg} \alpha (v_1 - v_2) - \mu_1 \text{ctg} \alpha v_2 = 0$$

$$v_1 - \mu_2 \text{ctg} \alpha v_1 + \mu_2 \text{ctg} \alpha v_2 - \mu_1 \text{ctg} \alpha v_2 = 0$$

$$v_1 (1 - \mu_2 \text{ctg} \alpha) = \frac{\text{ctg} \alpha v_2 (\mu_1 - \mu_2)}{1 - \mu_2 \text{ctg} \alpha} = \frac{\sqrt{3} \cdot 2 \cdot 0,7}{1 - 0,11 \cdot \sqrt{3}} = \frac{1,4 \cdot \sqrt{3}}{1 - 0,19} = 3 \mu$$



$$\vec{F} dt = m d\vec{v} \quad v \sin \alpha$$

$$R dt = m v d\alpha$$

$$R = mg - F$$

$$\Delta v^2 = v_1^2 + v_2^2 + 2 \cdot \frac{1}{2} v_1 v_2 \cos \alpha$$

$$\Delta v^2 = v \sqrt{3}$$

$$a_1 = mg - F \quad a_2 = mg$$

$$a_2 = F - mg$$



$$\frac{14}{4} = 3,5 \quad 12,25 \cdot \frac{9}{4}$$

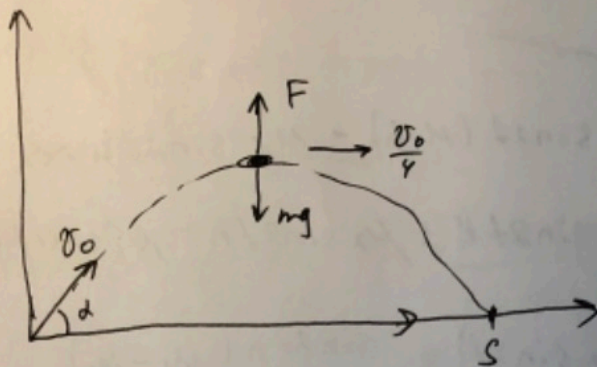
$$1,75 \cdot 1,732$$

$$3,03$$

Упробуи

$\alpha = 60^\circ$

$S = 17 \text{ м}$



1) $v_0 \cos \alpha t = S$

$0 = v_0 \sin \alpha t - \frac{gt^2}{2}$

$\sin 120 = \frac{\sqrt{3}}{2}$

$t = \frac{2v_0 \sin \alpha}{g}$

Или $\frac{2v_0^2 \sin \alpha \cos \alpha}{g} = S$

$\frac{v_0^2 \sin 2\alpha}{g} = S$

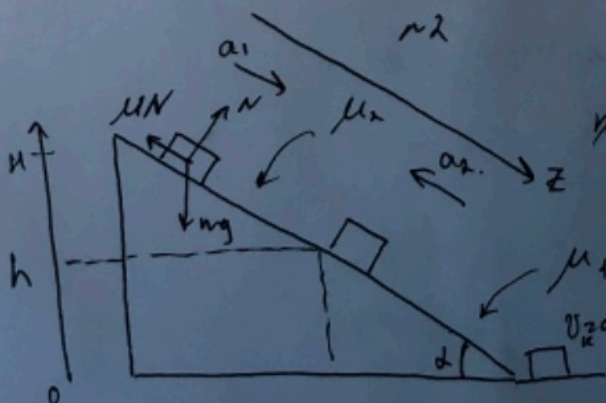
$v_0 = \sqrt{\frac{Sg}{\sin 2\alpha}} = \sqrt{\frac{17 \cdot 10 \cdot 2}{\sqrt{3}}} = \sqrt{\frac{340}{\sqrt{3}}} = \sqrt{\frac{340}{1.732}} = 14 \frac{\text{м}}{\text{с}}$

2) $m = 1 \text{ кг}$

$v = \frac{v_0}{4}$

$F = mg$

$\alpha = 30^\circ$
 $h = 2 \text{ м}$
 $\mu_1 = 0,8$
 $\mu_2 = 0,1$



$ma = mg \sin \alpha - \mu_2 mg \cos \alpha$

$a_1 = \frac{1}{2}g - \frac{\sqrt{3}}{2}g \cdot 0,1 = \frac{1}{2}g(1 - \frac{\sqrt{3}}{2} \cdot 0,1) > 0$

$ma_2 = mg \sin \alpha - \mu_1 mg \cos \alpha$

$a_2 = \frac{1}{2}g - \frac{\sqrt{3}}{2}g \mu_1 = \frac{1}{2}g(1 - \sqrt{3} \mu_1) < 0$
 $= \frac{1}{2}g(1 - \sqrt{3} \cdot 0,8) = 0,4 \cdot \frac{1}{2} \cdot 10 = 2 \frac{\text{м}}{\text{с}^2}$

$S = \frac{h}{\sin \alpha} = 2h$

$S = v_0 t - \frac{a_1 t^2}{2}$

$v = v_0 - a_1 t = 0 \Rightarrow v_0 = a_1 t$

$a_1 t = \sqrt{\frac{2S}{a_2}} = \sqrt{\frac{4h}{a_2}} = \sqrt{\frac{4 \cdot 2}{2}} = 2 \text{ с}$

$$2) \quad \mu_1 g H - \mu_2 g \cos \alpha (H-h) \sin \alpha - \mu_1 g \cos \alpha h \sin \alpha = 0 \quad | : 2$$

$$H - \mu_2 \sin \alpha$$

$$2H - \mu_2 \sin \alpha (H-h) - \mu_1 \sin \alpha h = 0$$

$$2H - \mu_2 \sin \alpha H + \mu_2 \sin \alpha h - \mu_1 \sin \alpha h = 0$$

$$H (2 - \mu_2 \sin \alpha) = \sin \alpha h (\mu_1 - \mu_2)$$

$$H = \frac{\sin \alpha h (\mu_1 - \mu_2)}{(2 - \mu_2 \sin \alpha)} = \frac{\frac{\sqrt{3}}{2} \cdot 2 \cdot (0,81 - 0,11)}{(2 - 0,11 \cdot \frac{\sqrt{3}}{2})} = \frac{\sqrt{3} \cdot 0,7}{2 - 0,095}$$

$$v_0 = at = 4 \frac{m}{s}$$

$$a_1 = \frac{1}{2} \cdot g (1 - \sqrt{3} \cdot 0,11) = \frac{1}{2} \cdot 10 \cdot (1 - 0,2) = 8 \cdot \frac{1}{2} = 4 \frac{m}{s^2}$$

$$v_0 = at_2$$

$$t_2 = \frac{v_0}{a_1} = 1 \text{ s}$$

$$s_2 = \frac{a_1 t_2^2}{2} = \frac{4}{2} = 2 \text{ m}$$

$$\Delta H = s_2 \cdot \sin \alpha = 2 \cdot \frac{1}{2} = 1 \text{ m}$$

$$H = h + \Delta H = 3 \text{ m}$$

Часть 2

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

Шифр: **21206042**

ID профиля: **286786**

Вариант 3

Циркован
н5.

1

Дано:

$$R = 24 \text{ Ом}$$

$$U = 6 \text{ В}$$

1) $P = ?$

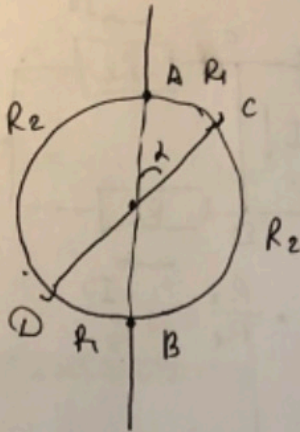
$$\alpha = 30^\circ$$

2) $n = ?$

$$I = \frac{2}{3} \text{ А}$$

3) $P_2 = ?$

1)



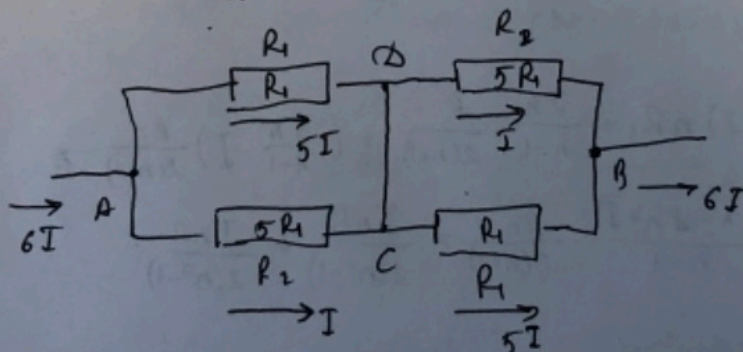
Вычис AC - это R_1

$$\frac{R_1}{R} = \frac{30^\circ}{360^\circ} = \frac{1}{12}$$

$$R_1 = \frac{R}{12} = \frac{24}{12} = 2 \text{ Ом}$$

$$\frac{R_1}{R_2} = \frac{30}{150} = \frac{1}{5}$$

$$R_2 = 5R_1$$



$$I_1 R_1 = I_2 5R_1$$

$$I_1 = 5I_2 \Rightarrow \text{Вычис } I_2 = I$$

$$U = 5IR_1 + 5IR_1 = 10IR_1$$

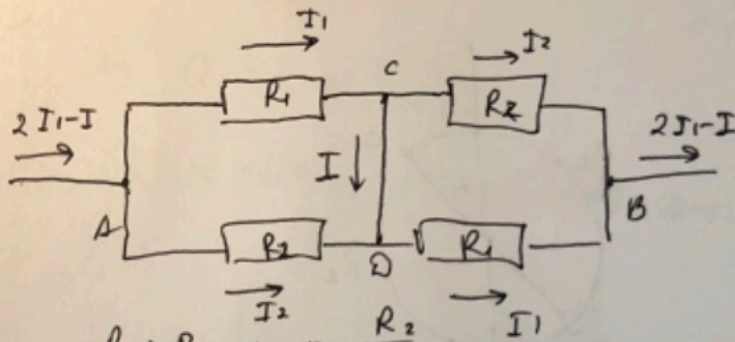
$$I = \frac{U}{10R_1}$$

$$P = 6IU = \frac{6 \cdot 36}{5 \cdot 10R_1} = \frac{3 \cdot 36}{5 \cdot 2} = \frac{54}{5} = 10,8 \text{ Вт}$$

Цустовух.

(2)

2)



норме $R_2 > R_1 \rightarrow n = \frac{R_2}{R_1}$

$$R_2 = n R_1$$

$$R_1 + R_2 = R_1(n+1) = \frac{R}{2}$$

$$R_1 = \frac{R}{2(n+1)}$$

н.к. $R_2 > R_1 \Rightarrow I_1 > I_2 \Rightarrow I_2 = I_1 - I$

$$I_1 R_1 = I_2 R_2$$

$$I_1 R_1 = n R_1 (I_1 - I)$$

$$I_1 = I_1 n - I n$$

$$I_1 = \frac{I n}{n-1}$$

$$u = I_1 R_1 + (I_1 - I) n R_1 = \frac{I n}{n-1} \cdot \frac{R}{2(n+1)} + \left(\frac{I n}{n-1} - I \right) \frac{R n}{2(n+1)} \neq$$

$$u = \frac{I n R}{2(n^2-1)} + \frac{I n - I n + I}{n-1} \cdot \frac{R n}{2(n+1)} = \frac{I n R}{2(n^2-1)} + \frac{I n R}{2(n^2-1)}$$

$$u n^2 - u = I n R$$

$$6 n^2 - 16 n - 6 = 0 \quad | : 2$$

$$3 n^2 - 8 n - 3 = 0$$

$$D = 64 + 36 = 100$$

$$n = \frac{8 \pm 10}{6} = \left[\begin{matrix} 3 \\ -\frac{1}{3} \text{ н.к.} \end{matrix} \right.$$

$$n = 3$$

$$3) P_2 = u (2I_1 - I) = u \left(\frac{2I n}{n-1} - I \right) = u \frac{I n + I}{n-1} = 2 u I$$

$$P_2 = 2 \cdot 6 \cdot \frac{2}{3} = 8 \text{ Вт}$$

Ответ: $P = 10,8 \text{ Вт}$; $n = 3$; $P_2 = 8 \text{ Вт}$.

Чистовик

3)

Дано:

$$m = 5,52$$

$$t_0 = 200^\circ\text{C}$$

$$t_k = 100^\circ\text{C}$$

$$S = 500 \text{ см}^2$$

$$p_0 = 10^5 \text{ Па}$$

$$1) Q_1 = ?$$

$$2) H = ?$$

$$Q_2 = 17430 \text{ Дж}$$

$$C = 4180 \frac{\text{Дж}}{\text{кг} \cdot \text{К}}$$

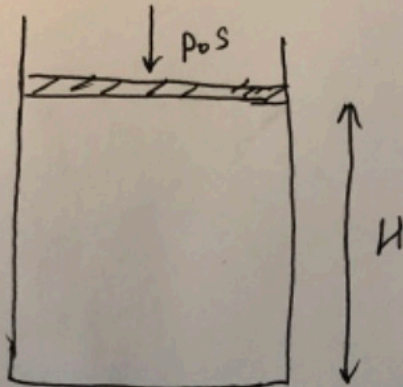
$$L = 2,26 \cdot 10^6 \frac{\text{Дж}}{\text{кг}}$$

$$C_p = 2200 \frac{\text{Дж}}{\text{кг} \cdot \text{К}}$$

$$1) Q_1 = C m (t_k - t_0)$$

$$Q_1 = 4180 \cdot 5,5 \cdot 10^{-3} \cdot 100 = 2299 \text{ Дж}$$

2)



Найдем кол-во теплоты необходимое для испарения всей воды.

$$Q_{\text{исп}} = L m = 2,26 \cdot 10^6 \cdot 5,5 \cdot 10^{-3} = 2,26 \cdot 5,5 \cdot 10^3 = 12430 \text{ Дж}$$

$$\Delta Q = Q_2 - Q_{\text{исп}} = 17430 - 12430 = 5000 \text{ Дж}$$

$$\Delta Q = C_p m \Delta T$$

$$\Delta T = \frac{\Delta Q}{C_p m} = \frac{5000}{2200 \cdot 5,5 \cdot 10^{-3}} = 413 \text{ К}$$

$$p_0 S H = \frac{m}{M} R (T_k + \Delta T) ; T_k = 373 \text{ К}$$

$$H = \frac{m R (T_k + \Delta T)}{M p_0 S} = \frac{5,5 \cdot 10^{-3} \cdot 8,31 \cdot 786}{0,018 \cdot 10^5 \cdot 500 \cdot 10^{-4}} = 0,4 \text{ м}$$

Незначительной высотой парника можно пренебречь, так объем воды гораздо меньше объема пара.

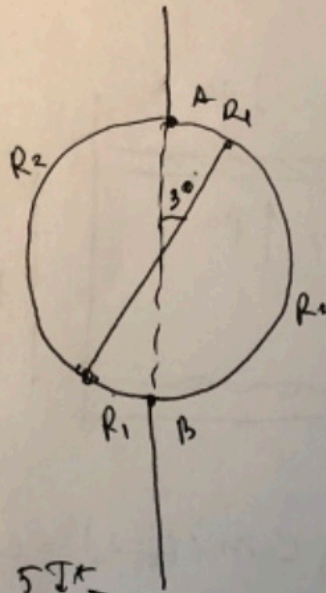
Ответ: $Q_1 = 2299 \text{ Дж}$; $H = 40 \text{ см}$.

~5. Чепровик

$R = 24 \text{ Ом}$

$U = 6 \text{ В}$

$R_1 = \frac{R}{12} = \frac{24}{12} = 2 \text{ Ом}$



$R = \frac{R_0}{12}$

$\frac{R_1}{R_2} = \frac{30}{1505}$

$5IR + 5IR = 10IR$

$U = 10IR$

$I = \frac{U}{10R}$

$P = 26UI = \frac{U^2}{10R} = \frac{36 \cdot 3}{10 \cdot 2} = \frac{54}{10} = 5.4 \text{ Вт}$

$\frac{R \cdot 5R}{6R} = \frac{5}{6} R$

$\frac{5}{3} R$

$P = \frac{U^2}{\frac{5}{3} R} = \frac{3U^2}{5R}$

$= \frac{3 \cdot 36}{5 \cdot 2}$

$\frac{U^2}{3R}$

$\frac{\frac{R}{12} \cdot \frac{5R}{12}}{\frac{6R}{12}} = \frac{\frac{5R^2}{12 \cdot 12}}{\frac{6R}{12}} = \frac{5R}{12 \cdot 6} = \frac{5R}{72}$

$R_0 = \frac{10R}{72} = \frac{10 \cdot 24}{72} = \frac{10}{3} \text{ Ом}$

$P = \frac{U^2}{R_0} = \frac{36 \cdot 3}{10 \cdot 5} = \frac{54}{5} = 10.8 \text{ Вт}$

$U = 6IR$

$U = \frac{IR_0}{2}$

$I_1 R_1 = I_2 R_2 \quad I = \frac{2U}{R_0}$

$P = UI$

$P = \frac{2U^2}{R_0} = \frac{2 \cdot 36 \cdot 3}{10 \cdot 5} = 3 \text{ Вт}$

$$Q = 0$$

$$C = 4150 \frac{\text{Дж}}{\text{кг}}$$

$$L = 2,26 \cdot 10^6 \frac{\text{Дж}}{\text{кг}}$$

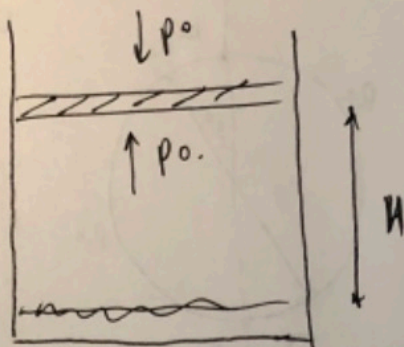
$$C_p = 2200 \frac{\text{Дж}}{\text{кг} \cdot \text{К}}$$

$$m = 5,5 \text{ т}$$

$$S = 500 \text{ м}^2$$

$$t_0 = 20^\circ \text{C}$$

$$Q_2 = 17430 \text{ Дж}$$



$$1) Q_1 = c m (t_k - t_0) = c m t_k$$

$$Q_1 = 4150 \cdot 5,5 \cdot 0,001 \cdot 100 = 2299 \text{ Дж}$$

$$2) Q_n = L m = 2,26 \cdot 10^6 \cdot 5,5 \cdot 10^{-3} = 2,26 \cdot 5,5 \cdot 10^3 = 12430$$

$$p_0 S = \frac{m}{M} R T$$

$$Q_3 = Q_2 - Q_n = 17430 - 12430 = 5000 \text{ Дж}$$

$$Q_3 = C_p \cdot m \Delta T$$

$$\Delta T = \frac{Q_3}{C_p m} = \frac{5000}{2200 \cdot 5,5 \cdot 10^{-3}} = \frac{5000}{2,2 \cdot 5,5}$$

$$\Delta T = \frac{5000}{2200 \cdot 5,5 \cdot 10^{-3}} = \frac{5 \cdot 10^6}{2200 \cdot 5,5} = 413 \text{ К}$$

$$T_0 = 373 \text{ К}$$

$$T_2 = T_0 + \Delta T = 786 \text{ К}$$

$$H = \frac{m R T}{M p_0 S} = \frac{5,5 \cdot 10^3 \cdot 8,31 \cdot 786}{0,016 \cdot 10^5 \cdot 500 \cdot 10^4} = 4 \text{ м}$$

$$k_0 = \frac{m}{S S} = \frac{5,5 \cdot 10^3}{1000 \cdot 500 \cdot 10^4} = 1,1 \cdot 10^{-4} \text{ м}$$

$$H_1 = \frac{m R T}{M S p_0} = \frac{5,5 \cdot 10^3 \cdot 8,31 \cdot 786}{0,016 \cdot 500 \cdot 10^4}$$

Черновик

Черновик

$$Q = \Delta U + A$$

$$Q = C_p \frac{\Delta n \cdot i_n}{n \cdot k \cdot \text{mass}}$$

$$C_{pM} = \frac{i+2}{2} = \frac{i}{2} + 1$$

$$Q = \tilde{c} \frac{i}{2}$$

$$A = p_0 S H > 0$$

$$\Delta U > 0.$$

p_0

$$\textcircled{P} = \textcircled{P} \textcircled{R} \textcircled{T}$$

Черновик

$$R_1 + R_2 = \frac{R}{2}$$

$$I_1 R_1 = I_2 R_2$$

$$\frac{R_2}{R_1} = n$$

$$I_1 R_1 = n R_1 (I_1 - I)$$

$$R_2 = n R_1$$

$$I_1 = n I_1 - I n$$

$$I n = I_1 (n-1)$$

$$R_1 + n R_1 = \frac{R}{2}$$

$$I_1 = \frac{I n}{n-1}$$

$$R_1 (n+1) = \frac{R}{2}$$

$$R_1 = \frac{R}{2(n+1)}$$

$$U = I_1 R_1 + (I_1 - I) n R_1$$

$$U = \frac{I_1 R}{2(n+1)} + (I_1 - I) \frac{R n}{2(n+1)}$$

$$\frac{I n R}{n-1} \frac{R}{2(n+1)}$$

~~U =~~

$$U = \frac{I n R}{2(n^2-1)} + \frac{I n - I n + I}{n-1} \cdot \frac{R n}{n+1} = \frac{I n R}{2(n^2-1)} + \frac{I \cdot R n}{2(n-1)(n+1)} = \frac{I R n}{(n^2-1)}$$

$$U (n^2-1) = I R n$$

$$U n^2 - U = I R n$$

$$6 n^2 - 6 = \frac{2}{3} \cdot 24 n$$

$$3 n^2 - 16 n - 6 = 0$$

$$3 n^2 - 8 n - 3 = 0$$

$$D = 64 + 36 = 100$$

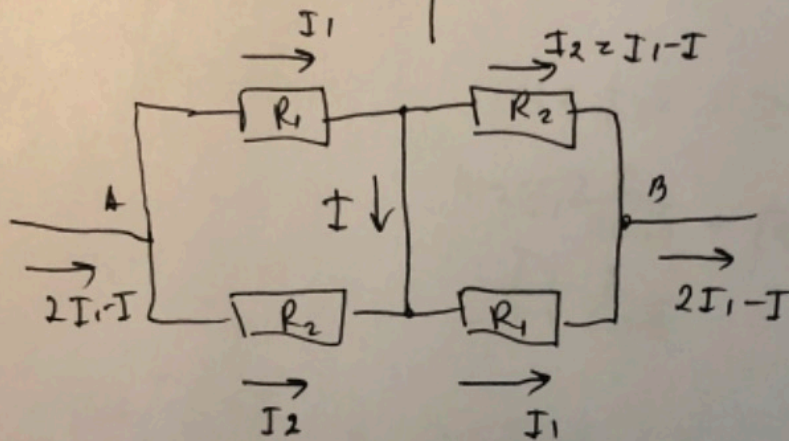
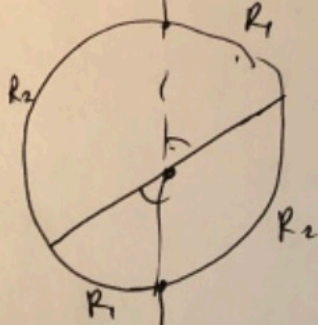
$$n = \frac{8 \pm 10}{6} = \begin{cases} 3 \\ < 0 \end{cases}$$

$$I_1 = \frac{I n}{n-1} = \frac{I \cdot 3}{2}$$

$$3) I_0 = 2 I_1 - I = \frac{2 I n}{n-1} - I = \frac{2 I n - I n + I}{2 n-1} = \frac{I n + I}{n-1} = \frac{4 I}{2} = 2 I = \frac{4}{3} A.$$

$$P = U I = 6 \cdot \frac{4}{3} = 8 \text{ Вт.}$$

Черновик



$$I_1 - I = I_2$$

$$R_2 > R_1$$

$$n = \frac{R_2}{R_1}$$

$$R_2 = nR_1$$

$$U = I_1 R_1 + (I_1 - I) R_2$$

$$R_0 = U = I_1 R_1 + (I_1 - I) n R_1$$

$$\frac{U}{2I_1 - I} = 2 \cdot \frac{R_1 \cdot n R_1}{R_1 (n+1)} = \frac{2nR_1}{n+1}$$

$$\frac{U}{2I_1 - I} = \frac{2nR_1}{n+1}$$

$$U = I_1 R_1 + I_1 n R_1 - I n R_1$$

$$U = \frac{R}{n+1} (I_1 + I_1 n - I n)$$

$$\frac{U}{2I_1 - I} = \frac{2nR}{(n+1)^2}$$

$$R_1 + R_2 = R$$

$$R_1 + nR_1 = R$$

$$R_1 (n+1) = R$$

$$R_1 = \frac{R}{n+1}$$