

Чистовик

5) Дано:

$$U_0 = 12 \text{ В}$$

$$U_{V_1} = 11 \text{ В}$$

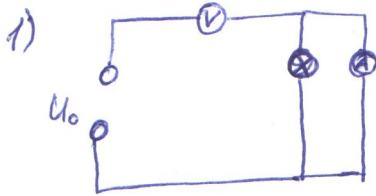
$$I_{A_1} = 0,2 \text{ А}$$

$$R_V = 50 \text{ Ом}$$

$$I_{A_2} = ?$$

$$U_{V_2} = ?$$

Решение:



$$U_{R_1} = U_0 - U_{V_1} \quad U_{R_1} = 12 \text{ В} - 11 \text{ В} = 1 \text{ В}$$

$$I = \frac{U_{R_1}}{R_V} \quad I = \frac{1 \text{ В}}{50 \text{ Ом}} = 0,02 \text{ А}$$

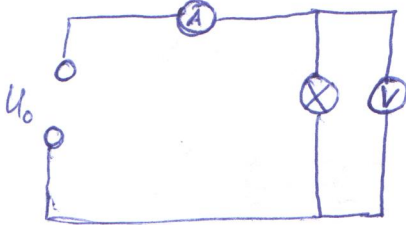
$$I_{R_1} = I - I_{A_1} \quad I_{R_1} = 0,02 \text{ А} - 0,2 \text{ А} = 0,02 \text{ А}$$

$$R_{R_1} = \frac{U_{R_1}}{I_{R_1}} \quad R_{R_1} = \frac{1 \text{ В}}{0,02 \text{ А}} = 50 \text{ Ом} \oplus$$

$$R_A = \frac{U_{R_1}}{I_{A_1}} \quad R_A = \frac{1 \text{ В}}{0,2 \text{ А}} = 5 \text{ Ом} \oplus$$

$$U_{R_1} = U_{V_1}$$

2)



$$\frac{1}{R_{RV}} = \frac{1}{R_1} + \frac{1}{R_V} \quad \frac{1}{R_{RV}} = \frac{1}{50 \text{ Ом}} + \frac{1}{50 \text{ Ом}} = \frac{1}{25 \text{ Ом}}$$

$$R_{RV} = 25 \text{ Ом}$$

$$R = R_{RV} + R_A \quad R = 25 \text{ Ом} + 5 \text{ Ом} = 30 \text{ Ом} \oplus$$

$$I = \frac{U_0}{R} \quad I = \frac{12 \text{ В}}{30 \text{ Ом}} = 0,4 \text{ А}$$

$$I = I_{A_2} = I_{RV}$$

$$I_{RV} = 2 I_{V_2}, \text{ т.к. } U_{R_1} = U_{V_2} \text{ и } R_1 = R_V$$

$$2 I_{V_2} = 0,4 \text{ А} \quad I_{V_2} = 0,2 \text{ А}$$

$$U_{V_2} = I_{V_2} \cdot R_V \quad U_{V_2} = 0,2 \text{ А} \cdot 50 \text{ Ом} = 10 \text{ В}$$

Ответ:  $I = 0,4 \text{ А}$ ;  $U = 10 \text{ В}$ .  $\oplus$

Дано:  
 $H = 0,04 \text{ м}$   
 $m = 80 \text{ кг}$   
 $\rho_0 = 1800 \text{ кг/м}^3$   
 $\rho_1 = 900 \text{ кг/м}^3$   
 $n = 2$   
 $S_1 = ?$

Решение!

$$\Delta H = \frac{H}{n_0 H} \quad \Delta H = \frac{0,04 \text{ м}}{2} = 0,02 \text{ м}$$

$$H_n = \frac{H}{0,1} \quad H_n = \frac{0,04 \text{ м}}{0,1} = 0,4 \text{ м}$$

$$H_0 = H_n - \Delta H \quad H_0 = 0,4 \text{ м} - 0,02 \text{ м} = 0,38 \text{ м}$$

$$m_1 g + m_2 g = \rho_0 \cdot g \cdot H_0 \cdot S_1$$

$$m + \rho_1 \cdot H_n \cdot S_1 = \rho_0 \cdot H_0 \cdot S_1$$

$$m = S_1 (\rho_0 \cdot H_0 - \rho_1 \cdot H_n)$$

$$S_1 = \frac{m}{\rho_0 H_0 - \rho_1 H_n}$$

$$S_1 = \frac{80 \text{ кг}}{1800 \text{ кг/м}^3 \cdot 0,38 \text{ м} - 900 \text{ кг/м}^3 \cdot 0,4 \text{ м}} = \frac{80 \text{ кг}}{580 \text{ кг/м} - 360 \text{ кг/м}} = \frac{80 \text{ кг}}{220 \text{ кг/м}} = 4 \text{ м}^2$$

(+) 20 Сантов

Ответ: 4 м<sup>2</sup> размерности, но в репутации м<sup>2</sup>

4) Дано:

$m_1 = 20 \text{ кг}$   
 $m_2 = 15 \text{ кг}$   
 $\Delta m_1 = 0,1 \text{ кг}$   
 $t_1 = 298 \text{ К} = 15 \text{ °C}$   
 $t_{\text{тн}} = 600 \text{ К} = 327 \text{ °C}$   
 $t_k = 573 \text{ К} = 100 \text{ °C}$   
 $c_1 = 4190 \text{ Дж/(кг} \cdot \text{°C)}$   
 $c_2 = 130 \text{ Дж/(кг} \cdot \text{°C)}$   
 $L = 2,25 \cdot 10^6 \text{ Дж/кг}$   
 $\lambda = 30 \cdot 10^3 \text{ Дж/кг}$   
 $t = ?$

Решение!

(+) 25

Уравнение теплового баланса:

$$Q_1 = Q_2$$

$$Q_1 = m_1 c_1 (t_k - t_1) + \Delta m_1 L$$

$$Q_2 = m_2 \lambda + m_2 c_2 (t_{\text{тн}} - t) + m_1 c_1 (t_k - t)$$

$$m_1 c_1 (t_k - t_1) + \Delta m_1 L = m_2 \lambda + m_2 c_2 (t_{\text{тн}} - t) + m_1 c_1 (t_k - t)$$

$$t (m_2 c_2 + m_1 c_1) = \frac{m_2 \lambda + m_2 c_2 t_{\text{тн}} + m_1 c_1 t_k - m_1 c_1 (t_k - t_1) + \Delta m_1 L}{m_2 c_2 + m_1 c_1}$$

$$t = \frac{15 \cdot 30 \cdot 10^3 + 15 \cdot 130 \cdot 327 + 20 \cdot 4190 \cdot 100 - 15 \cdot 4190 \cdot 75 - 0,1 \cdot 2,25 \cdot 10^6}{15 \cdot 130 + 20 \cdot 4190}$$

$$= \frac{450000 + 637650 + 838000 - 471750 - 225000}{1950 + 83800} = \frac{2915750}{85331} \approx 34 \text{ °C}$$

Ответ: 34 °C = 307 K (+)

① Дано:

$$E_k = 8 \text{ Дж}$$

$$m = 4 \text{ кг}$$

$v_0 = ?$

Решение:

$$E_k = \frac{mv^2}{2} \quad v = \sqrt{\frac{2E_k}{m}}$$

$$v = \sqrt{\frac{2 \cdot 8 \text{ Дж}}{4 \text{ кг}}} = 2 \text{ м/с.}$$

$$l = v_0 t - \frac{at^2}{2}$$

$$l = 2vt_2 - at_2^2$$

$$v_0 t - \frac{at^2}{2} = 2vt_2 - at_2^2$$

$$v_0 t = 2vt_2 + \frac{a(t^2 - 2t_2^2)}{2}$$

$$v_0 = \frac{2vt_2 + \frac{a(t^2 - 2t_2^2)}{2}}{t}$$

$$v_0 = \frac{4vt_2 + a(t^2 - 2t_2^2)}{2t}$$

$$v_0 = v + a(t - t_2)$$

$$v + a(t - t_2) = \frac{4vt_2 + a(t^2 - 2t_2^2)}{2t}$$

$$-t_2^2 + 4t_2 = 4t_2 - at_2^2$$

$$-t_2^2 + at_2^2 = 0$$

$$t_2^2(a-1) = 0$$

$$\begin{cases} t_2 = 0 \\ a = 1 \end{cases}$$

т.к.  $t_2 \neq 0$  брали и  $t_2 > 0$  но получили  $a = 1$ .

$$v = at_2 \quad t_2 = \frac{v}{a} \quad t_2 = \frac{2 \text{ м/с}}{1 \text{ м/с}^2} = 2 \text{ с.}$$

$$v_0 = at$$

$$v_0 = at_2$$

$$v_0 = 2 + 2 - 2$$

$$v_0 = 2$$

$$t^2 - \frac{1}{2}t^2 = 8 - 4$$

$$\frac{1}{2}t^2 = 4$$

$$t^2 = 8$$

$$t = 2\sqrt{2} \Rightarrow v_0 = 2\sqrt{2} \text{ м/с}$$

Ответ:  $2\sqrt{2} \text{ м/с}$ .

(+) (15)

(-)  $\sqrt{2}$  решение не  
помогает в решении  
4 балла

Умножив.

①  $E_k = 8 \text{ Дж}$      $E_k = \frac{mv^2}{2}$      $v = \sqrt{\frac{2E_k}{m}}$      $v = \sqrt{\frac{2 \cdot 8}{4}} = 2 \text{ м/с}$ .

$l = v_0 t - \frac{at^2}{2}$      $\frac{1}{2}l = 2 \text{ м/с} \cdot \frac{t}{2} - \frac{at^2}{2}$      $F_{\text{сп}} \cdot t_2 = \frac{mv^2}{2}$

$v_0 t - \frac{at^2}{2} = 2 \text{ м/с} \cdot \frac{t}{2} - \frac{at^2}{2}$      ~~$v_0 - at_1 = 2$~~      $F_{\text{сп}} \cdot t_2 = 8 \text{ Дж}$ .

$v_0 t = \frac{at^2}{2} + 2 \text{ м/с} \cdot \frac{t}{2}$      $v_0 t = \frac{2l + at^2}{2}$      $2 + at_1 = v_0$      $ma \cdot t_2 = 8$   
 $v_0 = \frac{2l + at^2}{2t}$      $2 = at_2$      $t_2 = \frac{2}{a}$      $a \cdot t_2 = 2$   
 $a = \frac{1}{2t_2}$      $a = 1 \text{ м/с}^2$

$v_0 t - \frac{at^2}{2} = 4t_2 - at_2^2$

$v_0 = \frac{8t_2 + a(t^2 - 2t_2^2)}{2t}$

$v_0 = \frac{4t_2 + \frac{a(t^2 - 2t_2^2)}{2}}{t}$

$\frac{8t_2}{2t} + \frac{at}{2} = \frac{2t_2^2}{2t} \rightarrow v_0$

$\frac{1}{2}v_0 = \frac{8t_2}{2t} - \frac{2t_2^2}{2t} \rightarrow 2$

~~$\frac{-2t^2 + 8t_2}{2t} = 4$~~

$\frac{-t^2 + 4t_2}{2t} = v_0$

$-t^2 + 4t_2 = 4t$

$-t^2 + 4t_2 - 4t > 0$

$D = 16 - 16 > 0$

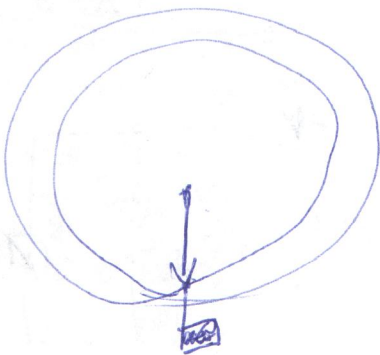
~~$t_2 = \frac{-4 \pm \sqrt{16 - 16}}{-2} = -2$~~      ~~$(t_2 - 2)^2 > 0$~~

$t_2$  не существует.

$v_0 =$

$16 > 16t$

$t < 1$



$$U_0 = 12B$$

$$I_0 = 0,2A$$

$$U_V = 11B$$

$$R_V = 50\Omega$$

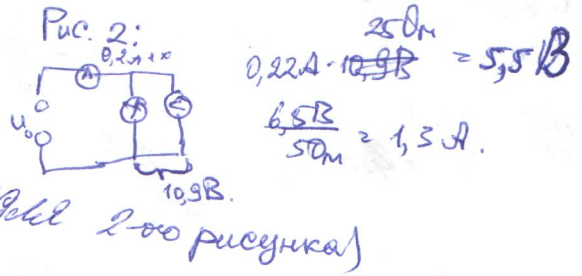
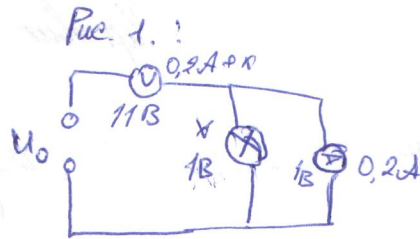
①  $U_n = 1B$  (Gelb 1-100 Puc.)

$$I = \frac{11B}{500\Omega} = 0,22A$$

$$I_n = 0,02A$$

$$R_n = \frac{1B}{0,02A} = 50\Omega$$

$$R_A = \frac{1B}{0,2A} = 5\Omega$$



②  $U_n = 0,22A \cdot 50\Omega = 11B$

$$U_n = 10,9B$$

$$I_n = \frac{10,9B}{500\Omega} = 0,218A$$

(Gelb 2-100 Puc.)

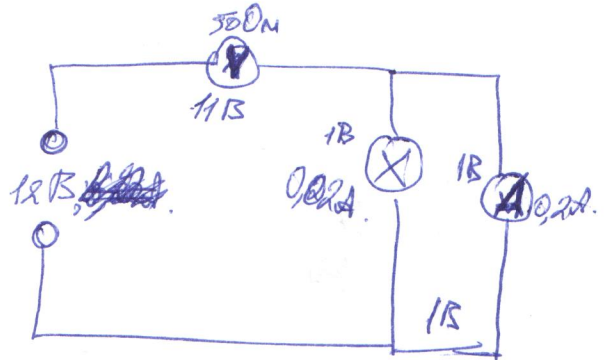
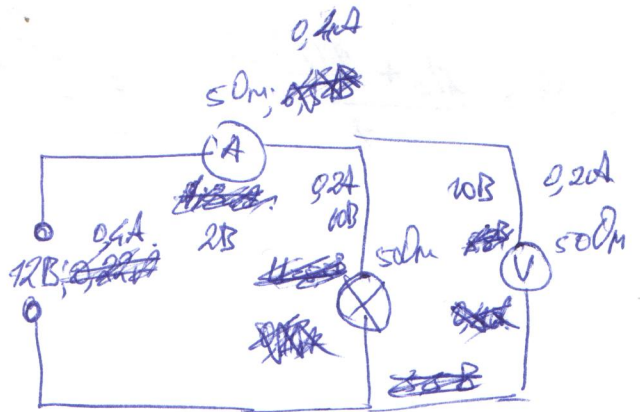
~~$I_A = 0,22A$~~

~~$U_n = 0,22 \cdot 50 = 11B$~~

$$\frac{10,9}{25} = \frac{436}{100} = 0,436A$$

~~$0,22A \cdot 50 = 11B$~~

~~$0,22A \cdot 50 = 11B$~~   $I = 1,3A$



$$\frac{11}{50} = 0,22A$$

$$\frac{1B}{0,2A} = 5\Omega \quad \frac{1B}{0,02A} = 50\Omega$$

~~scribbles~~

$$\frac{11}{30} = 0,4A$$

$$U_0 = I \cdot R_0$$

$$U_0 = 12B - 2B = 10B$$

Antwort:  $I = 0,4A$ ;  $U_V = 10B$

3

$H = 4 \text{ cm}$   
 $m = 800 \text{ kg}$   
 $n = 2$   
 $\rho_0 = 1000 \text{ kg/m}^3$   
 $\rho_1 = 900 \text{ kg/m}^3$

$\Delta H = 2 \text{ cm}$      $mg = 800H$   
 $H_n = \frac{4 \cdot 10}{g} = 40 \text{ cm}$   
 $mg + mg = \rho_0 \cdot g \cdot (H_n \cdot S)$      $m_n = \rho_1 \cdot H_n \cdot S \cdot g$   
 $g \cdot (\rho_0 \cdot H_n \cdot S + m) = \rho_0 \cdot g \cdot H_n \cdot S$

$S(\rho_0 \cdot g \cdot H_n - \rho_1 \cdot g \cdot H_n) = mg$   
 $S = \frac{mg}{\rho_0 \cdot g \cdot H_n - \rho_1 \cdot g \cdot H_n}$

$S = \frac{800}{1000 \cdot 0,38 - 900 \cdot 0,4} = \frac{800}{3800 - 3600} = \frac{800}{200} = 4 \text{ m}^2$

Aber:  $4 \text{ m}^2$  (+)

$\frac{v^2}{R}$

4 Dано:  
 $m_2 = 15 \text{ kg}$   
 $\Delta m_2 = 0,1 \text{ kg}$   
 $m_1 = 20 \text{ kg}$   
 $T_1 = 298 \text{ K} = 25^\circ \text{C}$   
 $T_2 = 600 \text{ K} = 327^\circ \text{C}$   
 $T_K = 373 \text{ K} = 100^\circ \text{C}$   
 $C_1 = 4190 \text{ Дж/(кг} \cdot \text{K)} = 2190 \text{ Дж/(кг} \cdot \text{C)}$   
 $C_2 = 130 \text{ Дж/(кг} \cdot \text{K)} = 130 \text{ Дж/(кг} \cdot \text{C)}$   
 $\rho_2 = 30 \cdot 10^3 \text{ Дж/кг} = 300000 \text{ Дж/кг}$   
 $L_1 = 2,25 \cdot 10^8 \text{ Дж/кг}$

Решение:

$m_1 \cdot c_1 \cdot (t_K - t_1) + \Delta m_2 \cdot L_1 = m_2 \cdot \rho_2 + m_2 \cdot c_2 \cdot (t_K - t_2)$   
 $20 \cdot 4190 \cdot 75 + 0,1 \cdot 300000 = 15 \cdot 300000 + 15 \cdot 130 \cdot (100 - 327)$   
 $6285000 + 30000 = 4500000 + 15 \cdot 130 \cdot (-227)$   
 $6510000 + 225000 = 4500000 + 15 \cdot 130 \cdot (-227)$   
 $6735000 = 4500000 - 4500000 + 15 \cdot 130 \cdot 227$   
 $2235000 = 15 \cdot 130 \cdot 227$   
 $1507350 = 15 \cdot 130 \cdot 227$   
 $2235000 = 15 \cdot 130 \cdot 227$   
 $2235000 = 15 \cdot 130 \cdot 227$

$6510000 = 1087650 - 1950 t$

$t = -2780^\circ \text{C}$

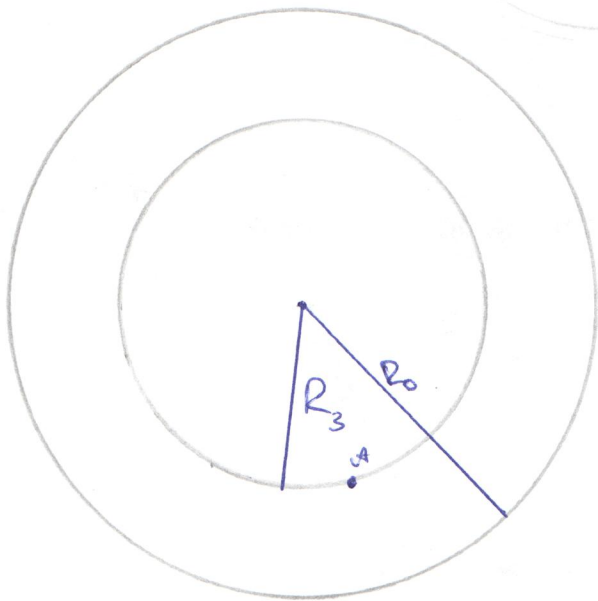
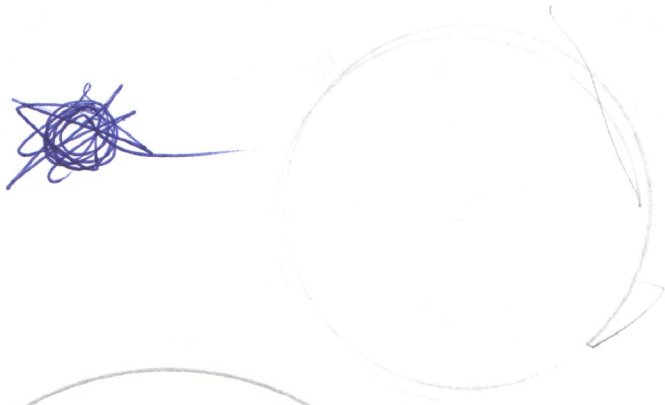
$m_1 c_1 (t_K - t_1) + \Delta m_2 L_1 = m_2 \rho_2 + m_2 c_2 (t_K - t) + (m_1 - \Delta m_1) \cdot c_1 \cdot (t_K - t)$

$2215250$

$t_{\text{до}} 34^\circ \text{C}$

$t(15 \cdot 130 + 19,9 \cdot 4190) = t(1950 + 83381) = 85331 t$

2



Arroka ganyera

Talke  $v = \frac{1}{R}$

$$a = \frac{v}{R_0}$$

$$g = \frac{v}{R_3}$$

$$R_3 = \frac{v}{g}$$

$$R_0 = \frac{v}{a}$$

$$\frac{R_0}{R_3} = \frac{g}{a}$$