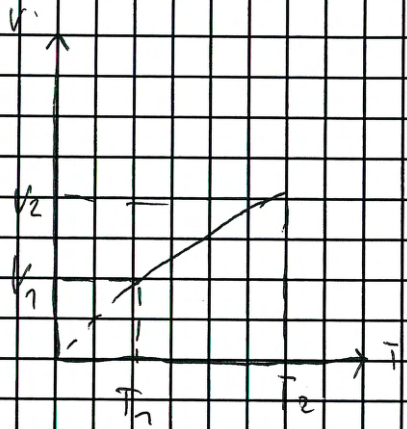


Открытая региональная межвузовская олимпиада вузов Томской области (ОРМО)

Общий балл	Дата	Ф.И.О. членов жюри	Подписи членов жюри
368.			

N 4
 Дано:
 $\lambda = 3$
 J
 $T_1 \rightarrow T_2$
 $V = \alpha \sqrt{T}$
 $Q = ?$
 $\eta = ?$
 $\rho = ?$

Ищем: 208.



$$V = \alpha \sqrt{T} \Rightarrow T = \left(\frac{V}{\alpha}\right)^2$$

$$V_1 = \alpha \sqrt{T_1}$$

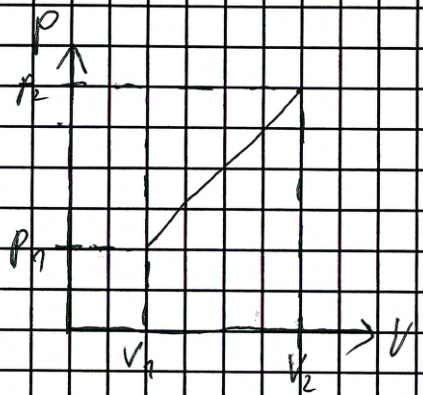
$$V_2 = \alpha \sqrt{T_2}$$

По м. Менд. - Клапейн.

$$pV = \nu RT$$

$$pV = \nu R \left(\frac{V}{\alpha}\right)^2$$

$$p = \frac{\nu R}{\alpha^2} V$$



$$Q = \Delta V + A$$

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

$$A = \frac{p_1 + p_2}{2} (V_2 - V_1)$$

$$p_1 = \frac{\nu R}{\alpha^2} V_1 = \frac{\nu R}{\alpha} \sqrt{T_1}$$

$$p_2 = \frac{\nu R}{\alpha^2} V_2 = \frac{\nu R}{\alpha} \sqrt{T_2}$$

$$A = \frac{\frac{\nu R}{\alpha} (\sqrt{T_1} + \sqrt{T_2})}{2} \cdot \alpha (\sqrt{T_2} - \sqrt{T_1}) = \frac{\nu R (T_2 - T_1)}{2}$$

$$Q = \frac{3}{2} \nu R (T_2 - T_1) + \frac{\nu R (T_2 - T_1)}{2} = 2 \nu R (T_2 - T_1)$$

$$\eta = \frac{A}{Q} = \frac{\frac{\nu R (T_2 - T_1)}{2}}{2 \nu R (T_2 - T_1)} = \frac{1}{4} = 0,25 \cdot 100\% = 25\%$$

$$Q = C \sqrt{(T_2 - T_1)} \quad | \Rightarrow C \sqrt{(T_2 - T_1)} = 2 \sqrt{R} (T_2 - T_1)$$

$$Q = 2 \sqrt{R} (T_2 - T_1)$$

$$C = \frac{2 \sqrt{R} (T_2 - T_1)}{\sqrt{(T_2 - T_1)}} = 2 \sqrt{R}$$

Эта теплоемкость является постоянной. т.к. кон-во вещества не меняется в теч. процесса

Answer: $Q = 2 \sqrt{R} (T_2 - T_1)$

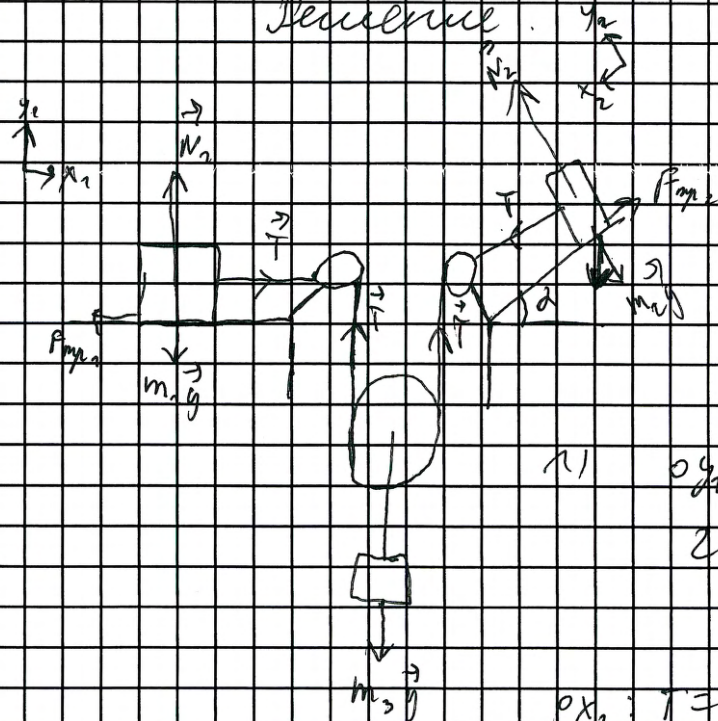
$\eta = 25\%$

$C = 2 \sqrt{R}$

$C = const$

- N 2
- Задача:
- m_1
- m_2
- m_3
- 1) $M = ?$
- $T = ?$

Решение



- 2) $a_1 = ?$
- $a_2 = ?$
- $a_3 = ?$
- $M = ?$

1) оу:

$$2T = m_2 g$$

$$T = \frac{m_2 g}{2}$$

ох₁: $T = F_{fr1}$

оу₁: $N_1 = m_1 g$

ох₂: $m_2 g \sin \alpha + T = F_{fr2}$

оу₂: $m_2 g \cos \alpha = N_2$

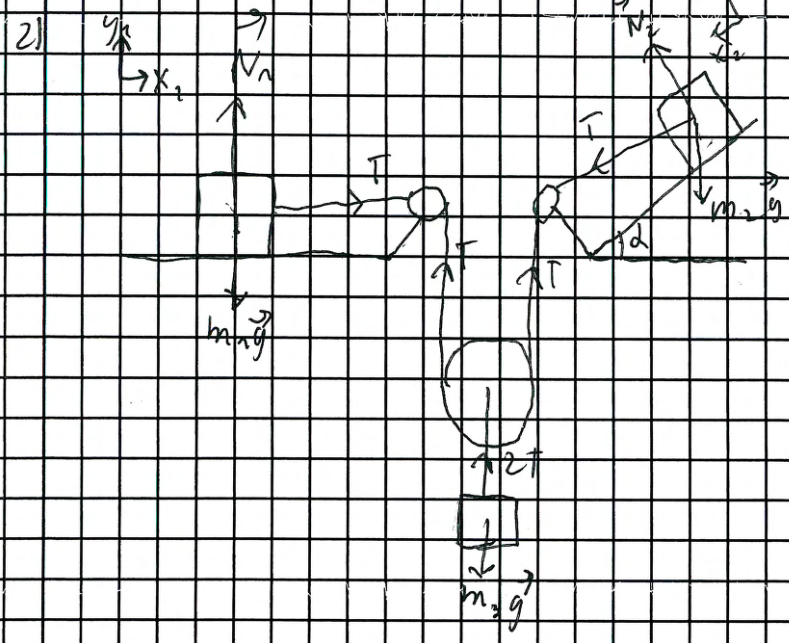
$$F_{\text{пр}2} = m_2 g \sin \alpha + F_{\text{пр}1}$$

$$\mu N_2 = m_2 g \sin \alpha + \mu N_1$$

$$\mu m_2 g \cos \alpha = m_2 g \sin \alpha + \mu m_2 g$$

$$\mu (m_2 g \cos \alpha - m_2 g) = m_2 g \sin \alpha$$

$$\mu = \frac{m_2 g \sin \alpha}{m_2 g \cos \alpha - m_2 g} = \frac{m_2 \sin \alpha}{m_2 \cos \alpha - m_2}$$



$$F_{\text{пр}} = 0$$

$$M = 0$$

0y1:

$$1) \quad m_3 g - 2T = m_3 a_3$$

$$1.1) \quad 0x1: T = m_1 a_1$$

$$0y1: m_2 g = N_1$$

$$1.2) \quad 0x2: m_2 g \sin \alpha + T = m_2 a_2$$

$$0y2: m_2 g \cos \alpha = N_2$$

угловая скорость: $\omega_1 = \omega_2 = \omega_3 = \omega$

$$m_2 g \sin \alpha + m_1 a = m_2 a$$

$$a_1 = a_2 = a = \frac{m_2 g \sin \alpha}{m_2 - m_1}$$

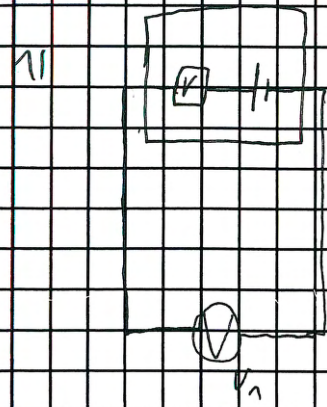
$$m_3 g - 2 m_1 a = m_3 a_3$$

$$a_3 = g - \frac{2 m_1 a}{m_3} = g - \frac{2 m_1 \frac{m_2 g \sin \alpha}{m_2 - m_1}}{m_3} = g - \frac{2 m_1 m_2 g \sin \alpha}{(m_2 - m_1) m_3}$$

Ответ: 1) $\mu = \frac{m_2 \sin \alpha}{m_2 \cos \alpha - m_2}$
 $T = \frac{m_2 g}{2}$

2) $a_1 = a_2 = \frac{m_2 g \sin \alpha}{m_2 - m_1}$
 $a_3 = g - \frac{2 m_1 m_2 g \sin \alpha}{(m_2 - m_1) m_3}$

МЗ
E - ?



$$U_1 = I_1 R$$

100.

$$\frac{U_1}{U_2} = \frac{I_1 R}{I_2 R} = \frac{\epsilon_0 R (2R+r)}{(R+r) R \epsilon_0} = \frac{2R+r}{R+r} \approx \frac{2}{1}$$

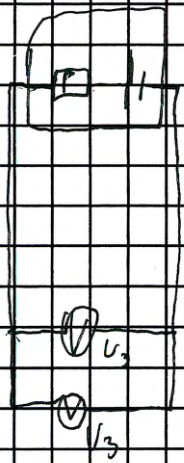
2)



$$U_2 = 2 I_2 R$$

$$\frac{U_2}{U_3} = \frac{I_2 R}{I_3 R \frac{1}{2}} = \frac{\epsilon_0 R (\frac{1}{2}R+r)}{R \epsilon_0 (2R+r)} = \frac{1}{2} \frac{R+r}{R+r} = \frac{1}{2}$$

3)



$$U_3 = I_3 R$$

$$\frac{U_1}{U_3} = \frac{I_1 R}{I_3 R \frac{1}{2}} = \frac{\epsilon_0 R (\frac{1}{2}R+r)}{(R+r) R \epsilon_0} = \frac{\frac{1}{2}R+r}{R+r} \approx \frac{1}{2}$$

$$U_1 = 2U_2$$

$$4U_2 = U_3$$

$$2U_1 = U_3$$

$$U_1 = 2U_2$$

$$4U_2 = U_3$$

$$U_3 = 2U_1$$

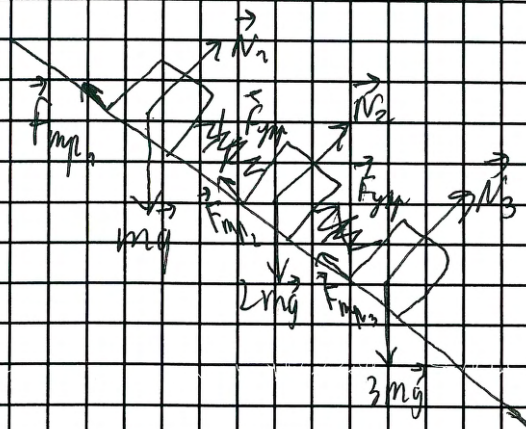
$$E = (r + R_0) I_0$$

$$I_1 R + I_1 r = U_1 + I_1 r = E$$

$$2 I_2 R + I_2 r = 2U_2 + I_2 r = E$$

$$\frac{1}{2} I_3 R + I_3 r = \frac{1}{2} U_3 + I_3 r = E$$

MS



g ↓

1 тело

$$Ox: mg \cos \alpha = N_1$$

$$Oy: mg \sin \alpha + F_{mp1} = F_{mp2}$$

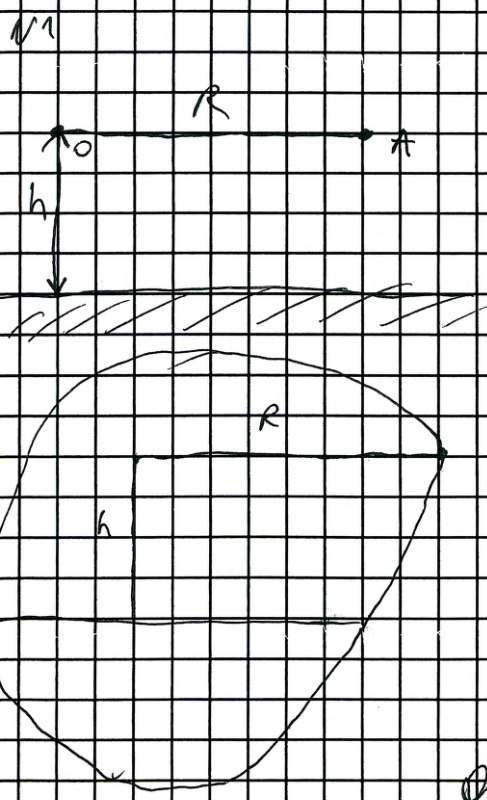
2 тело:

$$Ox: 3mg \cos \alpha = N_2$$

$$Oy: 3mg \sin \alpha + F_{mp2} = F_{mp3}$$

$M = 2mg$
L = ?

$F_{mp2} = N_2 = mg \cos \alpha$
 $M = 2 \sin \alpha mg$



$L = \frac{h}{R} = ?$

ЗСД

$mgh = m \frac{v^2}{2}$

$v = \sqrt{2gh}$

$L = \frac{h}{R} = \frac{1}{2}$

Ответ: $L = \frac{h}{R} = \frac{1}{2}$