

1. 1) $a_2 = \frac{1}{2}a_1 = \frac{y}{1} = 1 / 2$ (1)
 2) $m_1g - T = m_1a_1$ (2)
 $2T - m_2g = m_2a_2 = \frac{1}{2}m_2a_1$ (3)
 Из (2),(3): $(2m_1 - m_2)g = (2m_1 + \frac{1}{2}m_2)a_1 = (2m_1 + \frac{1}{2}m_2)\frac{y}{5} \Rightarrow \Rightarrow \frac{m_1}{m_2} = \frac{1}{1}$

2. $H - U_0 - 1 - 2 -$
 1) $H = \frac{(v_0 \sin \alpha)^2}{2g}$ (1)
 $\frac{v_0^2}{2g} = 2H = \frac{(v_0 \sin \alpha)^2}{g} \Rightarrow U_0 = \sqrt{2}v_0 \sin \alpha$ (2)
 2) $t_1, t_2 -$
 $H = U_0 t_2 - \frac{gt_2^2}{2}; gt_2^2 - 2U_0 t_2 + 2H = 0$
 $t_2 = \frac{U_0 - \sqrt{U_0^2 - 2gH}}{g}$ (3)
 (1) - (3): $t_2 = (\sqrt{2} - 1)\frac{v_0 \sin \alpha}{g}; t_1 = \frac{v_0 \sin \alpha}{g} \Rightarrow \Rightarrow \Delta t = t_1 - t_2 = (2 - \sqrt{2})\frac{v_0 \sin \alpha}{g}$

3. 1) $F = F_{мин} - \mu = m$
 $\mu = 2m$ } $\Rightarrow \frac{F_{мин} - \mu}{\mu} = \frac{1}{2}$
 $F_{мин} = \frac{3}{2}\mu$
 2) $F > F_{мин}:$
 $F - \mu = ma_1; a_1 = \frac{F}{m} - \mu$ (1)
 $\mu = 2ma_2; a_2 = \frac{1}{2}\mu$ (2)
 Из (1), (2): $a_{1 отн} = a_1 - a_2 = \frac{F}{m} - \frac{3}{2}\mu$ (3)
 $L = \frac{a_{1 отн} \cdot t^2}{2}$
 (3): $t = \sqrt{\frac{2L}{a_{1 отн}}} = \sqrt{\frac{4m}{2F - 3\mu}}$

4. 1) $\rho_{ц} \pi r^2 H = \rho r^2 \frac{H}{2} g \Rightarrow \rho_{ц} = \frac{\rho}{2}$
 $M = \rho_{ц} \pi r^2 H = \frac{1}{2} \rho r^2 H$
 2) $\rho r^2 H = \rho_{ц} \pi r^2 H + K \Delta l = \frac{\rho}{2} \pi r^2 H + K \Delta l \Rightarrow \Delta l = \frac{\rho r^2 H}{2K}$
 $h = \frac{H}{2} + \Delta l = \frac{H}{2} \left(1 + \frac{\pi r^2 \rho}{K} \right)$

5. $R -$
 1) $P_1 = \frac{U^2}{R}, P_2 = \frac{(0,9U)^2}{R} \Rightarrow \frac{P_2}{P_1} = 0,81$
 2) $\left. \begin{aligned} \frac{U^2}{R} t_1 &= c_B m (T_{кип} - T) \\ \frac{(0,9U)^2}{R} t_2 &= c_B \cdot 3m (T_{кип} - T) \end{aligned} \right\} \Rightarrow \frac{t_1}{c_B \cdot t_2} = \frac{1}{3}; t_2 = \frac{1}{2} t_1 \approx 3,7 t_1$

1. 1) . . . , $a_1 = 2a_2 = \frac{g}{5} = 2 \text{ / } ^2$ (1)

2) (-): $T - m_1g = m_1a_1 = 2m_1a_2$ (2)

$m_2g - 2T = m_2a_2$ (3)

Из (2), (3): $(m_2 - 2m_1)g = (4m_1 + m_2)a_2 = (4m_1 + m_2)\frac{g}{1} \Rightarrow \Rightarrow \frac{m_1}{m_2} = \frac{3}{8}$

2. $H - U_0 - \dots$ 1- 2- .

1) $H = \frac{(V_0 \sin \alpha)^2}{2g}$ (1)

$\frac{U_0^2}{2g} = 4H = \frac{2(V_0 \sin \alpha)^2}{g} \Rightarrow U_0 = 2V_0 \sin \alpha$ (2)

2) $t_1, t_2 -$

$H = U_0 t_2 - \frac{gt_2^2}{2}; gt_2^2 - 2U_0 t_2 + 2H = 0$

$t_2 = \frac{U_0 - \sqrt{U_0^2 - 2gH}}{g}$ (3)

(1) - (3): $t_2 = (2 - \sqrt{3})\frac{V_0 \sin \alpha}{g}; t_1 = \frac{U_0 \sin \alpha}{g} \Rightarrow \Rightarrow \Delta t = t_1 - t_2 = (\sqrt{3} - 1)\frac{V_0 \sin \alpha}{g}$

2- 1- .

3.

1) $F = F$, $\left. \begin{matrix} F_{\text{мин}} - \mu = m \\ \mu = 4m \end{matrix} \right\} \Rightarrow \frac{F_{\text{мин}} - \mu}{\mu} = \frac{1}{4}$,

$F_{\text{мин}} = \frac{5}{4}\mu$

2) $F > F_{\text{мин}}$:

$F - \mu = ma_1; a_1 = \frac{F}{m} - \mu$ (1)

$\mu = 4ma_2; a_2 = \frac{1}{4}\mu$ (2)

Из (1), (2): $a_{1 \text{ отн}} = a_1 - a_2 = \frac{F}{m} - \frac{5}{4}\mu$ (3)

$L = \frac{a_{1 \text{ отн}} \cdot t^2}{2}$

(3): $t = \sqrt{\frac{2L}{a_{1 \text{ отн}}}} = \sqrt{\frac{8m}{4F - 5\mu}}$

4.

1) $\rho_{\text{ц}} \pi r^2 H = \rho r^2 \frac{2}{3} H \Rightarrow \rho_{\text{ц}} = \frac{2}{3} \rho$

$M = \rho_{\text{ц}} \pi r^2 H = \frac{2}{3} \rho r^2 H$.

2) (l -):

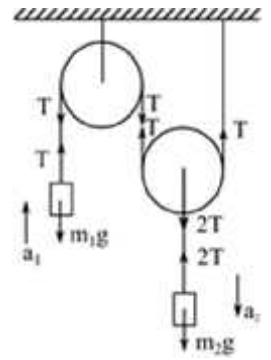
$\rho r^2 H = \rho_{\text{ц}} \pi r^2 H + K\Delta l = \frac{2}{3} \rho r^2 H + K\Delta l \Rightarrow \Delta l = \frac{\rho r^2 H}{3K}$

$h = \frac{H}{3} + \Delta l = \frac{H}{3} \left(1 + \frac{\pi r^2 \rho}{K} \right)$

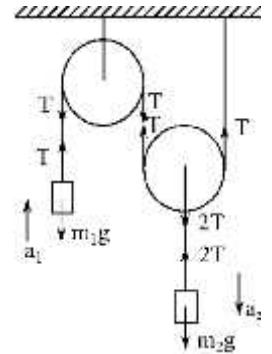
5. $R -$

1) $P_1 = \frac{U^2}{R}, P_2 = \frac{(0,8U)^2}{R} \Rightarrow \frac{P_2}{P_1} = 0,64$

2) $\left. \begin{matrix} \frac{U^2}{R} t_1 = c_B m (T_{\text{кип}} - T) \\ \frac{(0,8U)^2}{R} t_2 = c_B \cdot 2m (T_{\text{кип}} - T) \end{matrix} \right\} \Rightarrow \frac{t_1}{0,64 t_2} = \frac{1}{2}; t_2 = \frac{2}{8} t_1 \approx 3,1 t_1$



1. 1) $T = m_1 g; 2T = m_2 g \Rightarrow \frac{m_1}{m_2} = \frac{1}{2}$
 2) (-):
 $T - m_1 g = m_1 a_1$ (1)
 $m_2 g - 2T = m_2 a_2$ (2)
 Из (1), (2): $(m_2 - 2m_1)g = m_2 a_2 + 2m_1 a_1$ (3)
 \dots , $a_1 = 2a_2$ (4)



Из (3), (4):

$$(m_2 - 2m_1)g = \left(2m_1 + \frac{m_2}{2}\right)a_1 = \left(2m_1 + \frac{m_2}{2}\right)\frac{g}{5} \Rightarrow \frac{m_1}{m_2} = \frac{3}{8}$$

2.

$$H_0 = \frac{V_0^2}{2g} \Rightarrow V_c = \sqrt{2gH_c} \quad (1)$$

$t -$

1-

0.

$$\frac{y t^2}{2} + \left(V_0 t - \frac{y t^2}{2}\right) = H_0; \quad t = \frac{H_0}{V_0} \quad (2)$$

$$H_c - H = \frac{y t^2}{2} = \frac{y}{2} \cdot \frac{H_0^2}{V_0^2} = \frac{y}{2} \cdot \frac{H_0^2}{2gH_0} = \frac{H_0}{4} \Rightarrow H_c = \frac{4}{3}H = \frac{4}{3} \cdot 1,8 = 2,4$$

3.

$$\left. \begin{array}{l} 1) F = F \\ F_{\text{мин}} - \mu = 3m \\ \mu = m \end{array} \right\} \Rightarrow \frac{F_{\text{мин}} - \mu}{\mu} = 3, \\ F_{\text{мин}} = 4\mu$$

2) $F > F_{\text{мин}}$:

$$F - \mu = 3ma_1; \quad a_1 = \frac{F}{3m} - \frac{\mu}{3} \quad (1)$$

$$\mu = ma_2; \quad a_2 = \frac{\mu}{m} \quad (2)$$

$$\text{Из (1), (2): } a_{1 \text{ отн}} = a_1 - a_2 = \frac{F}{3m} - \frac{4}{3}\mu \quad (3)$$

$$L = \frac{a_{1 \text{ отн}} \cdot t^2}{2}$$

$$(3): \quad t = \sqrt{\frac{2L}{a_{1 \text{ отн}}}} = \sqrt{\frac{6m}{F - 4\mu}}$$

4.

$$1) \quad : \rho_6 a^2 H = \rho a^2 \cdot \frac{3}{4} H \Rightarrow \rho_6 = \frac{3}{4} \rho$$

$$: M = \rho_6 a^2 H = \frac{3}{4} \rho a^2 H.$$

2) (l -):

$$\rho a^2 H = \rho_6 a^2 H + k \Delta l = \frac{3}{4} \rho a^2 H + k \Delta l \Rightarrow \Delta l = \frac{\rho a^2 H}{4k}$$

$$h = \frac{H}{4} + \Delta l = \frac{H}{4} \left(1 + \frac{a^2 \rho}{k}\right)$$

5.

$$1) R = \frac{U}{l} = \frac{9}{1/2} = 18$$

2)

$$r_{\text{KB}} = \frac{3r \cdot r}{3r + r} = \frac{3}{4} r \quad (1)$$

$$R = \frac{3r_{\text{KB}} \cdot r_{\text{KB}}}{3r_{\text{KB}} + r_{\text{KB}}} = \frac{3}{4} r_{\text{KB}} \quad (2)$$

$$(1), (2): \quad R = \frac{9}{1} r \Rightarrow r = \frac{1}{9} R = \frac{1}{9} \cdot 18 = 2$$

1.

1) , $\frac{T_1}{T_2} = \frac{1}{2}$

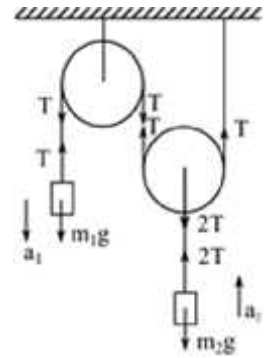
2) (-):

$$m_1 g - T = m_1 a_1 \quad (1)$$

$$2T - m_2 g = m_2 a_2 \quad (2)$$

$$\text{Из (1), (2): } (2m_1 - m_2)g = 2m_1 a_1 + m_2 a_2 \quad (3)$$

$$\dots, \quad a_1 = 2a_2 \quad (4)$$



Из (3), (4):

$$(2m_1 - m_2)g = (4m_1 + m_2)a_2 = (4m_1 + m_2) \frac{g}{10} \Rightarrow \frac{m_1}{m_2} = \frac{11}{16}$$

2. $H_0 = \frac{V_0^2}{2g} \Rightarrow V_0 = \sqrt{2gH_0} \quad (1)$

$t -$, 1-

$$\frac{gt^2}{2} + \left(V_0 t - \frac{gt^2}{2} \right) = H_0; \quad t = \frac{H_0}{V_0} \quad (2)$$

$$H_0 - H = \frac{gt^2}{2} = \frac{g}{2} \cdot \frac{H_0^2}{V_0^2} = \frac{g}{2} \cdot \frac{H_0^2}{2gH_0} = \frac{H_0}{4} \Rightarrow H_0 = \frac{4}{3}H = \frac{4}{3} \cdot 2,1 = 2,8$$

3.

1) $F = F$,

$$\left. \begin{aligned} F_{\text{мин}} - 2\mu &= 5m \\ 2\mu &= 2m \end{aligned} \right\} \Rightarrow \frac{F_{\text{мин}} - 2\mu}{2\mu} = \frac{5}{2},$$

$$F_{\text{мин}} = 7\mu$$

2) $F > F_{\text{мин}}$:

$$F - 2\mu = 5ma_1; \quad a_1 = \frac{F}{5m} - \frac{2}{5}\mu \quad (1)$$

$$2\mu = 2ma_2; \quad a_2 = \frac{\mu}{m} \quad (2)$$

Из (1), (2): $a_{1 \text{ отн}} = a_1 - a_2 = \frac{F}{5m} - \frac{7}{5}\mu \quad (3)$

$$L = \frac{a_{1 \text{ отн}} \cdot t^2}{2}$$

(3): $t = \sqrt{\frac{2L}{a_{1 \text{ отн}}}} = \sqrt{\frac{1 \text{ м}}{F - 7\mu}}$

4.

1) $\rho_6 a^2 H = \rho a^2 \cdot \frac{1}{3} H \Rightarrow \rho_6 = \frac{\rho}{3}$

$$M = \rho_6 a^2 H = \frac{1}{3} \rho a^2 H.$$

2) ($l -$):

$$\rho a^2 H = \rho_6 a^2 H + k\Delta l = \frac{1}{3} \rho a^2 H + k\Delta l \Rightarrow \Delta l = \frac{2\rho a^2 H}{3k}$$

$$h = \frac{2}{3} H + \Delta l = \frac{2}{3} H \left(1 + \frac{a^2 \rho}{k} \right).$$

5.

1) $R = \frac{U}{I} = \frac{6}{1/3} = 18$

2)

$$r_{\text{KB}} = \frac{3r \cdot r}{3r + r} = \frac{3}{4} r \quad (1)$$

$$R = \frac{3r_{\text{KB}} \cdot r_{\text{KB}}}{3r_{\text{KB}} + r_{\text{KB}}} = \frac{3}{4} r_{\text{KB}} \quad (2)$$

(1), (2): $R = \frac{9}{1} r \Rightarrow r = \frac{1}{9} R = \frac{1}{9} \cdot 18 = 2$