

$$\textcircled{1} \quad h = 170 \text{ m}$$

$$c = 340 \text{ m/s}$$

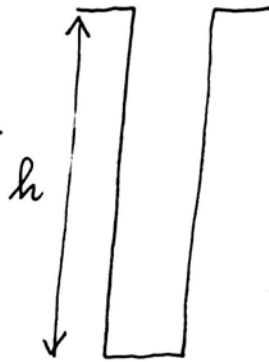
$$t = ?$$

t_p - čas padanja

t_c - čas zvoka

$$t = 5,8 \text{ s} + 0,5 \text{ s}$$

$$t = 6,3 \text{ s}$$



$$t = t_p + t_c$$

$$h = \frac{g t_p^2}{2} = c \cdot t_c$$

$$t_p = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \cdot 170 \text{ m} \cdot \text{s}^2}{10 \text{ m/s}^2}}$$

$$t_p = 5,8 \text{ s}$$

$$t_c = \frac{h}{c} = \frac{170 \text{ m}}{340 \text{ m/s}} = 0,5 \text{ s}$$

$$\textcircled{2} \quad \alpha = 15^\circ$$

$$m_1 = 2 \text{ kg}$$

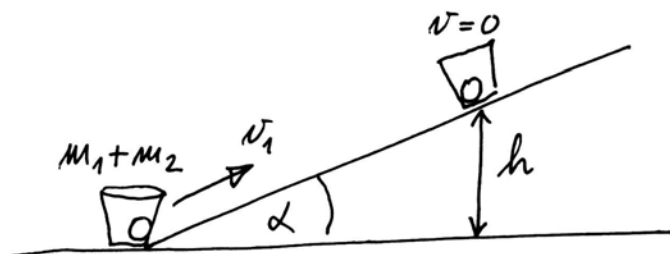
$$m_2 = 1 \text{ kg}$$

$$v_2 = 12 \text{ m/s}$$

$$h = ?$$

$$m = m_1 + m_2$$

$$m = 3 \text{ kg}$$



$$m_2 v_2 = (m_1 + m_2) v_1$$

$$v_1 = \frac{m_2}{m_1 + m_2} v_2 = \frac{1 \text{ kg}}{3 \text{ kg}} \cdot 12 \frac{\text{m}}{\text{s}} = 4 \frac{\text{m}}{\text{s}}$$

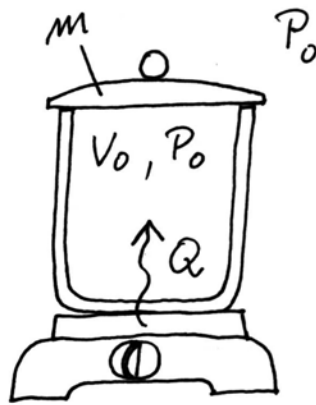
$$W_{k1} + W_{p1} = W_{k2} + W_{p2}$$

$$\frac{m v_1^2}{2} + 0 = 0 + m g h$$

$$h = \frac{v_1^2}{2g} = \frac{16 \text{ m}^2 \text{ s}^{-2}}{2 \cdot 10 \text{ m/s}^2} = 0,8 \text{ m}$$

$$\begin{aligned} \textcircled{3} \quad V_0 &= 5 \text{ l} \\ \rho &= 2 \text{ kg/m}^3 \\ c_v &= 1500 \text{ J/kg}\cdot\text{K} \\ T_0 &= 300^\circ\text{K} \\ P_0 &= 1 \text{ bar} \\ m &= 10 \text{ kg} \\ S &= 100 \text{ cm}^2 \end{aligned}$$

$$Q = ?$$



$$Q = m_p \cdot c_v \cdot \Delta T$$

$$Q = \rho \cdot V_0 \cdot c_v (T_1 - T_0)$$

$$\frac{P_0}{T_0} = \frac{P_1}{T_1} \Rightarrow T_1 = T_0 \frac{P_1}{P_0}$$

$$P_1 = P_0 + \Delta P$$

$$\Delta P \cdot S = m \cdot g$$

$$\Delta P = \frac{m \cdot g}{S}$$

$$\Delta P = \frac{10 \text{ kg} \cdot 10 \text{ m/s}^2}{100 \cdot 10^{-4} \text{ m}^2}$$

$$\Delta P = 10^4 \frac{\text{N}}{\text{m}^2} = 0,1 \text{ bar}$$

$$P_1 = 1 \text{ bar} + 0,1 \text{ bar} = 1,1 \text{ bar}$$

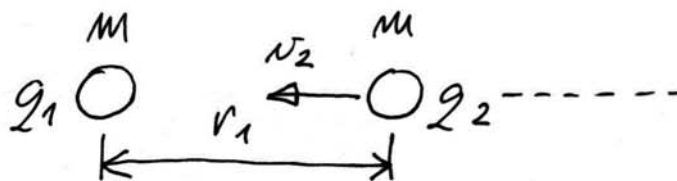
$$T_1 = 300^\circ\text{K} \cdot \frac{1,1 \text{ bar}}{1 \text{ bar}} = 330^\circ\text{K}$$

$$Q = 2 \text{ kg m}^{-3} \cdot 5 \cdot 10^{-3} \text{ m}^3 \cdot 1500 \text{ J kg}^{-1} \text{ K}^{-1} \cdot 30 \text{ K}$$

$$Q = 450 \text{ J}$$

④ $m = 10 \text{ g}$
 $q_1 = 10^{-6} \text{ As}$
 $q_2 = -10^{-6} \text{ As}$
 $v_1 = 1 \text{ m}$

$v_2 = ?$



$$W_{k2} + W_{p2} = W_{k1} + W_{p1}$$

$$0 + 0 = \frac{m v_2^2}{2} - \frac{q_1 \cdot q_2}{4\pi \epsilon_0 v_1}$$

$$\frac{1}{4\pi \epsilon_0} = 9 \cdot 10^9 \text{ N} \frac{\text{m}^2}{(\text{As})^2}$$

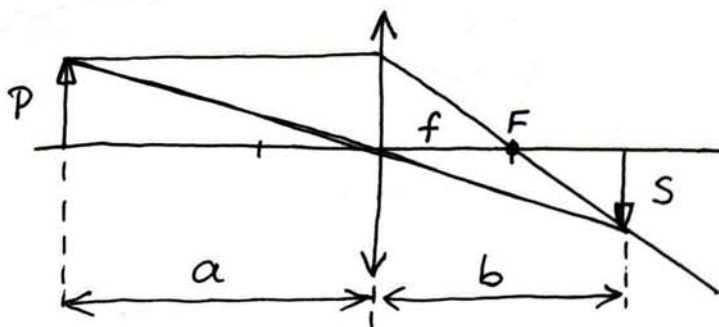
$$v_2^2 = \frac{2}{4\pi \epsilon_0} \frac{q^2}{m \cdot v_1}$$

$$v_2^2 = 2 \cdot 9 \cdot 10^9 \frac{\text{m} \cdot \text{kg} \cdot \text{m}^2}{(\text{As})^2 \text{ s}^2} \cdot \frac{10^{-12} (\text{As})^2}{10^{-2} \text{ kg} \cdot 1 \text{ m}} = 1,8 \frac{\text{m}^2}{\text{s}^2}$$

$$v_2 = 1,3 \frac{\text{m}}{\text{s}}$$

⑥ $a = 2,1 \text{ m}$
 $P = 1 \text{ m}$
 $S = 5 \mu\text{m}$

$f = ?$



$$\frac{P}{a} = \frac{S}{b} \Rightarrow b = a \frac{S}{P} = 2,1 \text{ m} \frac{0,05 \text{ m}}{1 \text{ m}} = 0,105 \text{ m}$$

$$\frac{1}{f} = \frac{1}{a} + \frac{1}{b} \quad | \cdot (f \cdot a \cdot b) \Rightarrow a \cdot b = f \cdot b + f \cdot a$$

$$f = \frac{a \cdot b}{a + b} = \frac{2,1 \text{ m} \cdot 0,105 \text{ m}}{2,205 \text{ m}} = 0,1 \text{ m} = 100 \text{ mm}$$

$$\textcircled{5} \quad C = 6 \text{ mF}$$

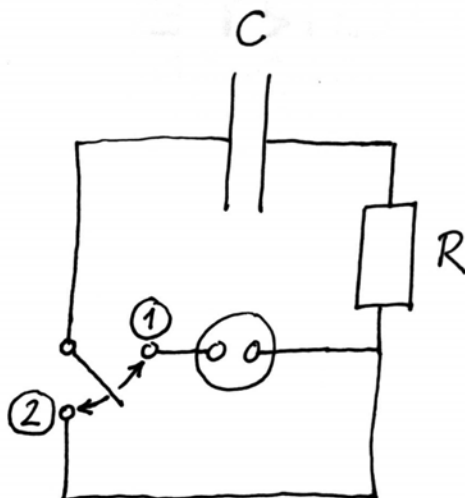
$$U_0 = 12 \text{ V}$$

$$R = 100 \text{ } \Omega$$

$$U_1 = 9 \text{ V}$$

$$U_2 = 4,5 \text{ V}$$

$$t = ?$$



t_1 - čas polnjenja (stikalo v legi ①) } $t = t_1 + t_2$
 t_2 - čas praznjenja (stikalo v legi ②)

$$\textcircled{1} \quad U_1 = U_0 (1 - e^{-\frac{t_1}{RC}}) \Rightarrow e^{-\frac{t_1}{RC}} = 1 - \frac{U_1}{U_0}$$

$$t_1 = -RC \ln \frac{U_0 - U_1}{U_0}, \quad RC = 100 \frac{\text{V}}{\text{A}} \cdot 6 \cdot 10^{-3} \frac{\text{As}}{\text{V}}$$
$$RC = 0,6 \text{ s}$$

$$t_1 = -0,6 \text{ s} \cdot \ln \frac{3 \text{ V}}{12 \text{ V}}$$

$$t_1 = 0,83 \text{ s}$$

$$\textcircled{2} \quad U_2 = U_1 e^{-\frac{t_2}{RC}} \Rightarrow e^{-\frac{t_2}{RC}} = \frac{U_2}{U_1}$$

$$t_2 = -RC \ln \frac{U_2}{U_1}$$

$$t_2 = -0,6 \text{ s} \cdot \ln \frac{1}{2} = 0,42 \text{ s}$$

$$t = t_1 + t_2 = 0,83 \text{ s} + 0,42 \text{ s} = 1,25 \text{ s}$$