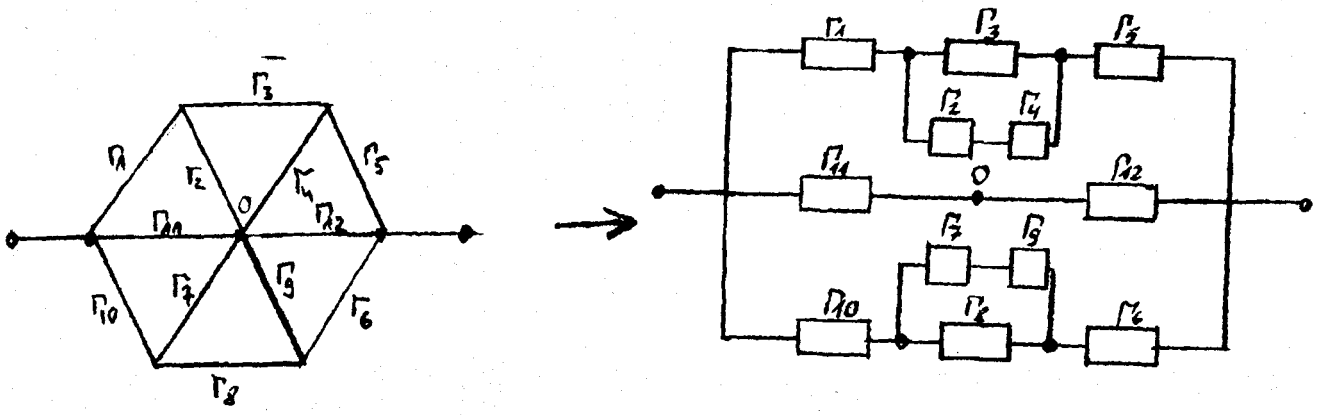
1.



$$R_{2,4} = r_2 + r_4 = 2r$$

$$\frac{1}{R_{2,3,4}} = \frac{1}{2r} + \frac{1}{r} = \frac{3}{2r}$$

$$R_{2,3,4} = \frac{2}{3}r$$

$$R_{1\to5} = \frac{2}{3}r + r + r = \frac{8}{3}r$$

$$R_{6\to10} = R_{1\to5} = \frac{8}{3}r$$

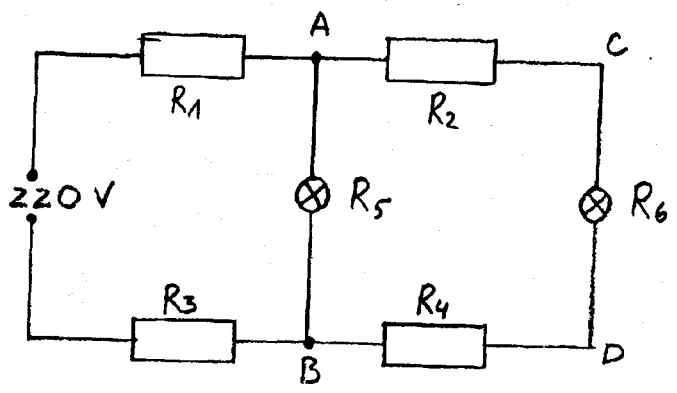
$$R_{11,12} = 2r$$

$$\frac{1}{R} = \frac{1}{R_{1\to5}} + \frac{1}{R_{6\to10}} + \frac{1}{R_{11,12}}$$

$$\frac{1}{R} = \frac{3}{8r} + \frac{3}{8r} + \frac{1}{2r} = \frac{5}{4r}$$

$$R = \frac{4}{5}r$$

2.



$R_1 = R_2 = R_3 = R_4 = 4\ \Omega$

$R_5 = R_6 = 10\ \Omega$

$\mathcal{E} = 220\ V$

$U_{AB} - ?\quad U_{CD} = ?$

$U_{AB} = J_{AB} \times R_5$

$U_{CD} = J_{CD} \times R_6$

$R = R_1 + R_3 + R_{AB}$

$\frac{1}{R_{AB}} = \frac{1}{R_5} + \frac{1}{R_2 + R_6 + R_4}$, $R_{AB} = 6{,}43\ \Omega$

$R = 14{,}43\ \Omega$

$J = \frac{\mathcal{E}}{R}$ $\quad J = 15{,}25\ A$

$\frac{J_{AB}}{J_{ACDB}} = \frac{R_{ACDB}}{R_{AB}} = 1{,}8$ | $J_{AB} = 1{,}8\, J_{ABCD}$

$J = J_{AB} + J_{ACDB}$

$J = 1{,}8\, J_{ACDB} + J_{ACDB} = 2{,}8\, J_{ACDB}$

$J_{ACDB} = \frac{J}{2{,}8} = 5{,}45\ A$

$J_{AB} = J - J_{ACDB} = 9{,}80\ A$

$U_{AB} = 9{,}8\ A \cdot 10\ \Omega = 98\ V$

$U_{CD} = 5{,}45\ A \cdot 10\ \Omega = 54{,}5\ V$

3.

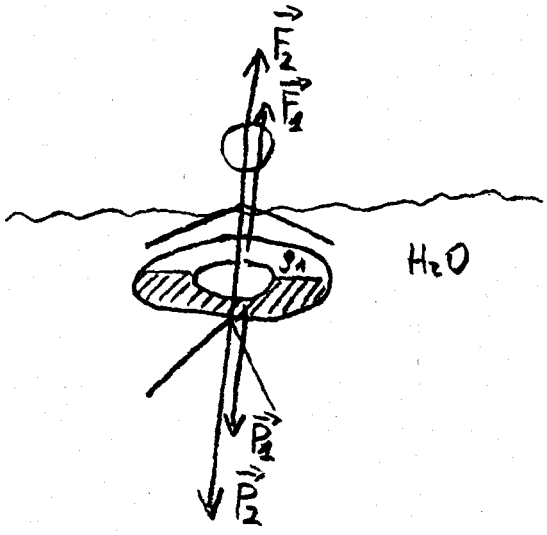
$V_1 = 21,2 \cdot 10^{-3}\ m^3$

$\rho_{H_2O} = 1 \cdot 10^3\ \frac{kg}{m^3}$

$P_2 = 712\ N$

$\rho_2 = 1,2 \cdot 10^3\ \frac{kg}{m^3}$

$\rho_1 - ?$



$$P_1 + P_2 - F_1 - F_2 = 0$$

$$P_1 = \rho_1 g V_1 \ , \quad F_1 = \rho_{H_2O} g \cdot V_1 \ , \quad F_2 = \rho_{H_2O} g \cdot 0,9 V_2$$

$$V_2 = \frac{P_2}{\rho_2 g}, \quad (P_2 = \rho_2 \cdot g \cdot V_2)$$

$$F_2 = \rho_{H_2O} \cdot g \cdot 0,9 \frac{P_2}{\rho_2 g} = \rho_{H_2O} \cdot \frac{0,9 \cdot P_2}{\rho_2}$$

$$\rho_1 \cdot g \cdot V_1 + P_2 - \rho_{H_2O} \cdot g \cdot V_1 - 0,9 P_2 \frac{\rho_{H_2O}}{\rho_2} = 0$$

$$\rho_1 = \frac{\rho_{H_2O}\left(g \cdot V_1 + 0,9 \frac{P_2}{\rho_2}\right) - P_2}{g \cdot V_1}$$

$$\rho_1 = 0,14 \cdot 10^3\ \frac{kg}{m^3}$$

4.

$t = 0°C$

$m_1 = 0,1\ kg$

$m_2 = 5 \cdot 10^{-3}\ kg$

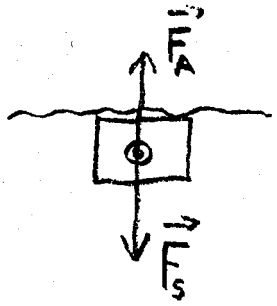
$\rho_1 = 900\ \frac{kg}{m^3}$

$\rho_2 = 11,3 \cdot 10^3\ \frac{kg}{m^3}$

$\rho_{H_2O} = 1 \cdot 10^3\ \frac{kg}{m^3}$

$\lambda = 3,3 \cdot 10^5\ \frac{J}{kg}$

Q - ?



$F_A = F_S$, $F_S = (m_1' + m_2) \cdot g$

m_1' - neištirpusios ledo dalies masė

m_1' - mass of unmelting ice piece

$$Q = (m_1 - m_1') \cdot \lambda$$

$$F_A = \rho_{H_2O} (V_1' + V_2) \cdot g = \rho_{H_2O} \left(\frac{m_1'}{\rho_1} + \frac{m_2}{\rho_2} \right) g$$

$$F_A = F_S = (m_1' + m_2) \cdot g$$

$$\rho_{H_2O} \frac{m_1'}{\rho_1} + \rho_{H_2O} \frac{m_2}{\rho_2} = m_1' + m_2$$

$$m_1' \left(\frac{\rho_{H_2O}}{\rho_1} - 1 \right) = m_2 \left(1 - \frac{\rho_{H_2O}}{\rho_2} \right) , \quad m_1' = \frac{m_2 (\rho_2 - \rho_{H_2O}) \cdot \rho_1}{\rho_2 (\rho_{H_2O} - \rho_1)}$$

$$Q = \left(m_1 - \frac{m_2 \rho_1 (\rho_2 - \rho_{H_2O})}{\rho_2 (\rho_{H_2O} - \rho_1)} \right) \cdot \lambda$$

$Q = 19,5\ kJ$