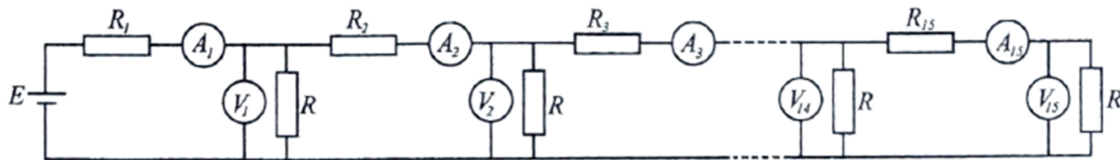


1.



$$\sum_{i=2}^{15} U_i = r \sum_{i=2}^{15} i$$

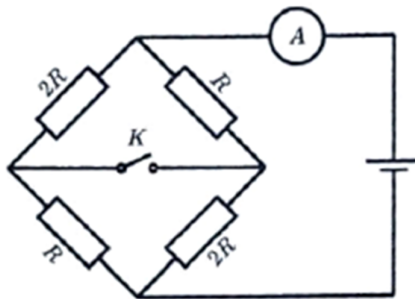
$$\sum_{i=2}^{15} i = (I_2 - I_3) + (I_3 - I_4) + \dots \dots \dots - I_{13}) + (I_{13} - I_{14}) + (I_{14} - I_{15}) = I_2$$

$$\sum U_i = r \cdot I_2$$

$$i_1 = I_1 - I_2$$

$$U_i = i_1 \cdot r \Rightarrow R = \frac{U_i}{I_1 - I_2} = \frac{9}{2,9 - 2,6} = \frac{9}{0,3} = 30 \Omega \Rightarrow \sum_{i=2}^{15} U_i = 30 \cdot 2,6 = 78 V$$

2.



$$K \text{ închis: } \left(\frac{1}{R} + \frac{1}{2R} \right)^{-1} \cdot 2 = R_e \Rightarrow R_{e1} = \frac{2R}{3} \cdot 2 = \frac{4R}{3}$$

$$K \text{ deschis } \left(\frac{2}{3R} \right)^{-1} = R_e \Rightarrow R_{e2} = \frac{3R}{2}$$

$$I_1 R_{e1} = I_2 R_{e2} \Rightarrow \frac{I_1}{I_2} = \frac{R_{e2}}{R_{e1}} = \frac{3R}{2} \cdot \frac{3}{4R} = \frac{9}{8}$$

3.

$$p = a \left[1 - \frac{1}{2} \left(\frac{b}{V} \right)^2 \right] \quad a = 3,328 \cdot 10^5 Pa \quad b = 1,6 \text{ litri}$$

$$p_1 = a \left[1 - \frac{1}{2} \left(\frac{b}{V} \right)^2 \right] = \frac{a}{2}$$

$$p_2 = a \left[1 - \frac{1}{2} \left(\frac{b}{2b} \right)^2 \right] = a \left[1 - \frac{1}{8} \right] = \frac{7a}{8}$$

$$p_1 v_1 = \nu R T_1 \rightarrow \frac{ab}{2} = \nu R T_1 \rightarrow T_1 = \frac{ab}{2\nu R}$$

$$p_2 v_2 = \nu R T_2 \rightarrow \frac{7a}{8} \cdot 2b = \nu R T_2 \Rightarrow \frac{7ab}{4} = \nu R T_2 \rightarrow T_2 = \frac{7ab}{4\nu R}$$

$$\Rightarrow T_2 - T_1 = \frac{7ab}{4\nu R} - \frac{ab}{2\nu R} = \frac{ab}{2\nu R} (3,5 - 1) = \frac{3,328 \cdot 10^5 \cdot 1,6 \cdot 10^{-3}}{2 \cdot 8,32} (2,5) = 32 \cdot 2,5 = 80 K$$

4.

Prima întâlnire

$$t_1 = \frac{AC+CB}{v_2} \Rightarrow v_2 = \frac{700 \text{ m}}{4 \text{ min}} = 175 \frac{\text{m}}{\text{min}}$$

A doua întâlnire

$$\left. \begin{array}{l} \frac{n \cdot p}{t_2} = v_1 \\ \frac{m \cdot p}{t_2} = v_2 \end{array} \right\} \Rightarrow \frac{n}{m} = \frac{v_1}{v_2} = \frac{125}{175} = \frac{5}{7} \Rightarrow n = \frac{5m}{7} \Rightarrow m = 7$$

$$t_2 = \frac{7 \cdot p}{v_2} = \frac{7 \cdot 100(5+3+4)}{175} = 4 \cdot 12 = 48 \text{ min}$$

$$t_{2total} = 48 + 4 = 52 \text{ min}$$

5.

$$\eta = \frac{L}{Q} = \frac{L_{12}+L_{34}}{Q_{41}} = -\frac{\nu C_V(T_2-T_1)-\nu C_V(T_4-T_3)}{\nu C_V(T_1-T_4)} = \frac{(T_1-T_2)+(T_3-T_4)}{T_1-T_4}$$

$$\frac{(800-400)-300}{200} = \frac{100}{200} = 0,5 \text{ nu se verifică}$$

$$\frac{(800-600)-100}{400} = \frac{100}{400} = 0,25$$

6.

$$h_B - h_A = h_C - h_B$$

$$h_C + h_A = 2h_B$$

Pentru ca cele 3 corpuri să rămână coliniare, atunci față de reperul dat de poziția inițială se obține

$$h_A = 3cm$$

$$h_B = -3cm + \Delta x$$

$$h_C = -3cm - \Delta x$$

După înlocuirea în prima relație se obține

$$\Delta x = 2cm \Rightarrow h_B = -1cm \Rightarrow 1cm.$$

7.

$$p_1 V = \nu R T_1$$

$$p_2 V = (\nu - \Delta \nu) R T_1 \Rightarrow p_2 V = \nu R T_1 - \Delta \nu R T_1$$

$$\Delta \nu = \frac{(p_1 - p_2) V}{R T_1} = \frac{\Delta m}{\mu} \Rightarrow \mu = \frac{\Delta m \cdot R T_1}{(p_1 - p_2) V}$$

$$\rho = \frac{m}{V} = \frac{m}{\mu} \cdot \frac{\mu}{V} = \nu \cdot \frac{\mu}{V} = \frac{p V}{R T} \cdot \frac{\mu}{V}$$

$$\Rightarrow \rho = \frac{p}{R T} \cdot \frac{\Delta m \cdot R T_1}{(p_1 - p_2) V} = \frac{p \cdot \Delta m \cdot T_1}{V \cdot S \cdot p T} = \frac{1 \cdot 10^5 \cdot 300 \cdot 10^3}{0,5 \cdot 10^5 \cdot 2 \cdot 10^{-3} \cdot 250} = \frac{300}{250} = \frac{6}{5} = 1,2 \text{ kg/m}^3$$

8.

$$I = \frac{U}{R} = \frac{40}{20} = 2 \text{ A}$$

9.

$$P = F \cdot v = \frac{L}{\Delta t} \Rightarrow \Delta t = \frac{L}{p} = \frac{mgh}{p} = \frac{500 \cdot 9,8 \cdot 10}{98 \cdot 10^3} = \frac{90 \cdot 10}{10^3} = 0,9 \text{ s}$$

10.

$$F(x) = 12 - 0,5x$$

$$L = \frac{(10+4) \cdot 12}{2} = 14 \cdot 6 = 84 \text{ J}$$