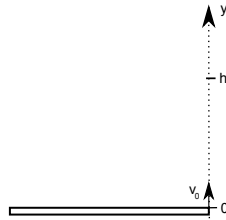# Barem de corectare/Javítókulcs

Problema 1. Feladat

a) (10p)

y_c locul ciocniri/ ütközés magassága

t_c momentul ciocniri/ ütközés pillanata

$$y_c = h - \frac{gt_c^2}{2}; \quad y_c = v_0 t_c - \frac{gt_c^2}{2} \rightarrow t_c = \frac{h}{v_0} = \frac{20m}{20m/s} = 1s$$

$$y_c = h - \frac{gh^2}{2v_0^2} = h\left(1 - \frac{hg}{2v_0^2}\right) = 15m$$

b) (10p)

v_{1c}, v_{2c} viteza corpurilor înainte de ciocnire/ testek sebessége közvetlenül az ütközes elött

$$v_{1_c} = -gt_c; \quad v_{2c} = v_0 - gt_c$$

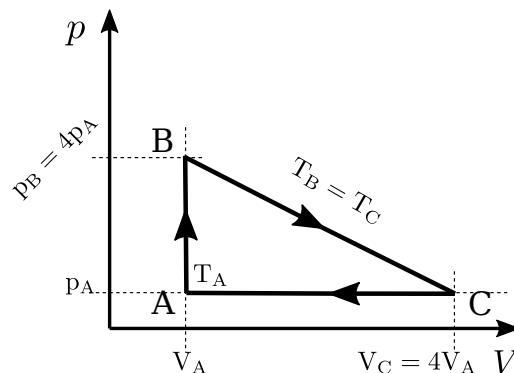$$v_{1c} = -10m/s; \quad v_{2c} = (20 - 10)m/s = 10m/s$$

c) (10p)

v_f viteza comună a corpurilor imediat după ciocnire/ a testek közös sebessége közvetlenül az ütközés után

Ciocnire plastică/ Tökéletesen rugalmatlan ütközés $\Rightarrow$

$$m(v_{1c} + v_{2c}) = (m + m)v_f \Rightarrow v_f = 0m/s$$

d) (10p)

$$\Delta E_c = -Q = \frac{(m+m)v_f^2}{2} - \frac{m(v_{1c}^2 + v_{2c}^2)}{2} \Rightarrow Q = \frac{m(v_{1c}^2 + v_{2c}^2)}{2} = 100kg \cdot m^2/s^2 = 100J$$

Problema 2. Feladat

a) (10p)

$$T_B = T_C:$$

$$\frac{p_B}{V_B} = \frac{p_B}{V_B} \Rightarrow T_B = 4T_A$$

$$\frac{V_C}{T_C} = \frac{V_A}{T_A} \Rightarrow T_C = 4T_A$$

b) (10p)

$$\mu = \frac{iR}{2c_V} = 32 \ kg/kmol \quad \rightarrow \quad O_2$$

c) (10p)

$$|Q_{CA}| > |Q_{AB}| = |Q_{BC}| :$$
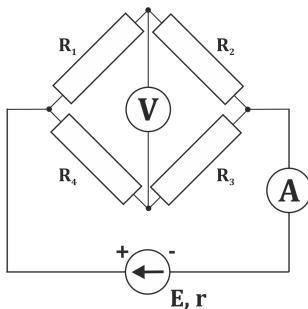
$$Q_{AB} = \nu C_V (T_B - T_A) = \frac{15}{2}\nu R T_A$$

$$Q_{BC} = L_{BC} = \frac{1}{2}(p_B + p_C)(V_C - V_A) = \frac{15}{2}\nu R T_A$$

$$Q_{CA} = \nu C_p(T_A - T_C) = -\frac{21}{2}\nu R T_A$$

d) (10p)

$$\eta = 1 - \frac{|Q_{CA}|}{Q_{AB} + Q_{BC}} = \frac{9}{30} < \frac{3}{4}$$

Problema 3. Feladat

a) (10 p)

$$R_{ech} = \frac{(R_1 + R_2)(R_3 + R_4)}{R_1 + R_2 + R_3 + R_4} = \frac{3 \cdot 7}{10}\Omega = \frac{21}{10}\Omega = 2.1\Omega$$

$$E = I(r + R_{ech}) \Rightarrow I = \frac{E}{r + R_{ech}} = \frac{24}{2.1 + 2.4}A = \frac{24}{4.5}A = \frac{16}{3}A = 5.33(3)A$$

b) (10 p)

$$U \equiv I_{12}(R_1 + R_2) = I_{34}(R_3 + R_4) = E - Ir; \quad U = 24 - \frac{16}{3}2.4 = 11.2 \ \text{V}$$

$$I_{12} = \frac{U}{R_1 + R_2} = \frac{11.2}{3} \ \text{A} = 3.73(3) \ \text{A}$$

$$I_{34} = \frac{U}{R_3 + R_4} = \frac{11.2}{7} \ \text{A} = 1.6 \ \text{A}$$

$$I_{12}R_1 + U_v - I_{34}R_4 = 0 \Rightarrow U_v = I_{34}R_4 - I_{12}R_1 = 2.66(6) \ \text{V}$$

c) (10 p)

$$P_1 = I_{12}^2 R_1 \quad P_4 = I_{34}^2 R_4 \Rightarrow \frac{P_1}{P_4} = \frac{I_{12}^2 R_1}{I_{34}^2 R_4} = \frac{49}{36} = 1.36$$

2

d) (10 p)

$$P_{tot} = I^2 R_{ech}$$

$$\frac{P_1}{P_{ech}} = \frac{I_{12}^2 R_1}{I^2 R_{ech}} = 0.23(3) \equiv 23.(3)\%$$

Problema 4. Feladat

a) (10 p)

Obiect real+ imagine reală mărită/ valós tárgy + nagyított valós kép $\Rightarrow \gamma = -4 = \frac{p_2}{p_1} \Rightarrow p_2 = -4p_1$

$$p_2 = -4p_1; \quad p_2 - p_1 = d \Rightarrow p_1 = -10\text{cm}; \quad p_2 = 40\text{cm}$$

$$\frac{-1}{p_1} + \frac{1}{p_2} = \frac{1}{f} \rightarrow f = \frac{p_1 p_2}{p_1 - p_2} = 8\text{cm}$$

b) (10 p)

$$\frac{1}{f} = (n-1)\frac{1}{R} \Rightarrow n - 1 = \frac{R}{f} \Rightarrow n = 1 + \frac{R}{f} = 1 + \frac{4.8}{8} = 1.6$$

c)(10 p)

$$n \rightarrow n_r = \frac{n}{n_0} \Rightarrow \frac{1}{f'} = \frac{(n_r - 1)}{R} \Rightarrow f' = \frac{R}{n_r - 1} = \frac{n_0 R}{n - n_0} = 20.8\text{cm}$$

$$p'_1 = p_1 = -10\text{cm}; p'_2 = -19.25\text{cm}$$

Imaginea este virtuală/ Virtuális kép keletkezik

d) (10 p)

În cazul lentilelor convergente: Imaginea unui obiect real este real dacă/ Gyüjtőlencsék esetén: Valós tárgy képe valós lesz, ha

$$f = \frac{R}{n_r - 1} < -p_1 \Rightarrow n_r - 1 > \frac{R}{-p_1} \Rightarrow n_r = \frac{n}{n_0} > 1 + \frac{R}{-p_1} \Rightarrow n_0 < \frac{n}{1 + \frac{R}{-p_1}} = \frac{1.6}{1.48} = 1.(081)$$