

4.) $pV = \nu RT \Rightarrow T = \frac{pV}{\nu R}, R = 8,314 \text{ J/mol} \cdot \text{K}$
 $T_A = 120 \text{ K}, T_B = 180 \text{ K}, T_C = 120 \text{ K}, T_D = 180 \text{ K}$

5.) $pV = \nu RT, \nu = \frac{m}{M}$

a) $p_1 V_1 = \nu RT_1$

$$V_1 = \frac{\nu RT_1}{p_1} = \frac{\frac{m}{M} \cdot R \cdot T_1}{p_1} = 8,17 \cdot 10^{-4} \text{ m}^3$$

b) $m_{\text{использ}} = m_{\text{пол}} - m_{\text{остаток}} = 11,0 - \frac{p_2 V}{RT_2} \cdot M =$
 $m_{\text{остаток}} = m_{\text{остаток}} \cdot M = \underline{\underline{2,3 \text{ g}}}$

$$p_2 V_2 = \nu_2 RT_2 \Rightarrow \nu_2 = \frac{p_2 V_2 \rightarrow V_1}{RT_2} =$$

6.) $m = 3 \text{ kg}$
 $r = 1,5 \text{ m}$
 $T = 305 \text{ K}$
 $\rho_7 = 1,19 \text{ kg/m}^3$
 $\rho = ?$

лебди: $G = F_{\text{вз}}$

$$G_{\text{вк}} = m_{\text{вк}} g = \rho_7 \cdot g \cdot V_B = 164,9 \text{ N}$$

$$G_{\text{вк}} = G_B + G_{\text{He}} \Rightarrow G_{\text{He}} = G_{\text{вк}} - m_B g$$

$$G_{\text{He}} = 135,5 \text{ N} \Rightarrow m_{\text{He}} = \underline{\underline{13,8 \text{ kg}}}$$

$$\nu = \frac{m}{M} = \frac{13,8}{4,0026 \cdot 10^{-3} \text{ kg/mol}} = 3450 \text{ mol}$$

$$pV = \nu RT$$

$M = 4,0026 \text{ g/mol} \quad p = \frac{\nu RT}{V} = 6,19 \cdot 10^5 \text{ Pa}$

7.] $\mu = 2,0 \text{ mol}$
 $m_H = 8,0 \cdot 10^{-3} \text{ kg}$
 $N_H = 770 \text{ m/s}$

$T = ?$

$$\overline{E_k} = \frac{3}{2} k \cdot T$$

$$T = \frac{2 \overline{E_k}}{3 k}$$

$$k = \frac{R}{N_A}$$

$$\overline{E_{k_{\text{vek}}}} = E_{k_{\text{ve}}} = \frac{1}{2} m_H \cdot v_H^2$$

$$\overline{E_k} (\text{jedne mol.}) = \frac{\overline{E_{k_{\text{vek}}}}}{N} = \frac{\overline{E_{k_{\text{vek}}}}}{\mu \cdot N_A}$$

$$T = \frac{2 \cdot \frac{\overline{E_{k_{\text{vek}}}}}{\mu \cdot N_A}}{3 k} = \frac{2 \overline{E_{k_{\text{vek}}}}}{3 k \cdot \mu \cdot N_A} = \frac{m_H \cdot v_H^2}{3 k \cdot \mu \cdot N_A}$$

$$T = \frac{m_H \cdot v_H^2}{3 \cdot \frac{R}{N_A} \cdot \mu \cdot N_A} = \frac{m_H \cdot v_H^2}{3 R \cdot \mu} = \underline{\underline{95 \text{ K}}}$$

8.] $a = 0,300 \text{ m}$

$\mu = 1 \text{ mol} \Rightarrow 1 \text{ mol sachrži } N_A \text{ atoma plus}$

$T = 293 \text{ K}$

$N = N_A$

$m = 3,35 \cdot 10^{-26} \text{ kg}$

$\frac{1}{2} m v^2 = \frac{3}{2} k T$ (za svak. atom)

$N/t = ?$

$N = \frac{S}{t} = \frac{2a}{t} \Rightarrow t = \frac{2a}{v}$ (između 2 sudara s istim zidom čemu pređe $2a$)

- 3 zida $\rightarrow \frac{1}{3}$ atoma se sudari sa obredjenim zidom

$\frac{N}{t} = \frac{N_A}{3t} = \frac{N_A}{3 \frac{2a}{v}} = \frac{N_A v}{6a} = \frac{N_A}{6a} \cdot \sqrt{\frac{3kT}{m}} = 2,01 \cdot 10^{26} \text{ atom/s}$

9.] $V = 10 \text{ L} = 10 \cdot 10^{-3} \text{ m}^3$

$$p = 0,62 \text{ MPa} = 6,2 \cdot 10^5 \text{ Pa}$$

$$P = 0,25 \text{ kW} = 250 \text{ W}$$

$$P = \frac{E}{t} = \frac{U}{t}$$

$$t = ?$$

$$P = \frac{\frac{3}{2} nRT}{t} = \frac{\frac{3}{2} p \cdot V}{t} \Rightarrow t = \frac{\frac{3}{2} p \cdot V}{P}$$

$$t = \frac{\frac{3}{2} p \cdot V}{2P} = \underline{\underline{50 \text{ s}}}$$

10.]

$$\begin{aligned}
 10. \quad W &= +48,0 \text{ J} \\
 \Delta Q &= +76,0 \text{ J} \\
 \hline
 \Delta U &= ?
 \end{aligned}$$

$$\begin{aligned}
 \Delta Q &= W + \Delta U \\
 \Delta U &= \Delta Q - W = 28,0 \text{ J}
 \end{aligned}$$

$$\begin{aligned}
 11. \quad n &= 3 \text{ mol} \\
 T_1 &= 345 \text{ K} \\
 \Delta Q &= +2438 \text{ J} \\
 W &= -962 \text{ J} \\
 \hline
 T_2 &= ?
 \end{aligned}$$

$$\begin{aligned}
 \Delta Q &= W + \Delta U \\
 \Delta U &= \Delta Q + W = 3400 \text{ J} \\
 \Delta U &= \frac{3}{2} n R T_2 - \frac{3}{2} n R T_1 \\
 \frac{3}{2} n R T_2 &= \frac{3}{2} n R T_1 + \Delta U \\
 T_2 &= \underline{\underline{435,88 \text{ K}}}
 \end{aligned}$$

$$\begin{aligned}
 12. \quad \Delta Q &= +2780 \text{ J} \\
 p &= 1,26 \cdot 10^5 \text{ Pa (const)} \\
 \Delta U &= +3990 \text{ J} \\
 \hline
 \Delta V &= ?
 \end{aligned}$$

$$\begin{aligned}
 \Delta Q &= W + \Delta U \\
 W &= \Delta Q - \Delta U = -1210 \text{ J} \\
 W &= p \cdot \Delta V = -1210 / p \\
 \Delta V &= -9,6 \cdot 10^{-3} \text{ m}^3
 \end{aligned}$$

shrink &
volume ($\Delta V < 0$)

13.] $V_0 = 1,4 \cdot 10^{-3} \text{ m}^3$

$\beta = 69 \cdot 10^{-6} \text{ K}^{-1}$

$t_1 = 20^\circ\text{C}$

$t_2 = 320^\circ\text{C}$

$p = 1,01 \cdot 10^5 \text{ Pa} = \text{const.}$

$W = p \cdot (V_2 - V_1)$

$V_1 = V_0 (1 + \beta \cdot \Delta T_1)$

$V_2 = V_0 (1 + \beta \cdot \Delta T_2)$

$W = ?$

$W = p \cdot (V_0 + \beta \cdot V_0 \cdot \Delta T_2 - V_0 - \beta \cdot V_0 \cdot \Delta T_1)$
 $= p V_0 \beta (T_2 - T_1) =$

$= 1,01 \cdot 10^5 \cdot 1,4 \cdot 10^{-3} \cdot 69 \cdot 10^{-6} \cdot 300$
 $= 2,93 \text{ J}$

14.] $u = 5 \text{ mol}$

$\gamma =$

$T_1 = 320 \text{ K}$

$T_2 = 290 \text{ K}$

$W, \Delta U = ?$

a) $W = \frac{3}{2} u R (T_1 - T_2) = +5,0 \cdot 10^3 \text{ J}$

b) $\Delta Q = 0$

$\Delta U = -W = -5,0 \cdot 10^3 \text{ J}$

15.] $u = 2,5 \text{ mol}$

$T = 430 \text{ K} = \text{const.} : \Delta U = 0$

$V_2 = 2V_1$

$\Delta Q = ?$

$\Delta Q = W = u R T \ln\left(\frac{V_2}{V_1}\right) = 2,5 \cdot 8,314 \cdot 430 \cdot \ln 2$

$= 2002,9$

18.] $w = fg$
 $\Delta T = 75 \text{ K}$
 $p = \text{const.}$

 $\Delta Q = ?$

$$\Delta Q = C_p u \Delta T$$

$$C_p = \frac{5}{2} R$$

$$u = \frac{w}{\mu} = \frac{8}{39,9} = 0,2 \text{ mol}$$

$$\mu = 39,9 \text{ g/mol}$$

$$\Delta Q = \frac{5}{2} R \cdot 0,2 \cdot 75 = \underline{\underline{310 \text{ J}}}$$

19.] $\Delta T_v = 75 \text{ K}$
 $\Delta Q_v = \Delta Q_p$

 $\Delta T_p = ?$

$$\Delta Q_v = \Delta Q_p$$

$$C_v u \Delta T_v = C_p u \Delta T_p$$

$$\Delta T_p = \left(\frac{C_v}{C_p} \right) \Delta T_v = \left(\frac{\frac{3}{2} R}{\frac{5}{2} R} \right) \cdot 75$$

$$\Delta T_p = 45 \text{ K}$$

20.] $V = 1,00 \text{ L} = 1 \cdot 10^{-3} \text{ m}^3 = \text{const.}$

$$P = 10 \text{ W}$$

$$\Delta p = 0,5 \cdot 10^5 \text{ Pa}$$

$$\Delta Q = ?$$

$$P = \frac{\Delta Q}{t} \Rightarrow \Delta Q = P \cdot t$$

$$P \cdot t = C_v \cdot u \cdot \Delta T$$

$$t = \frac{C_v \cdot u \cdot \frac{\Delta p \cdot V}{p R}}{P}$$

$$t = \frac{\frac{3}{2} R \cdot \Delta p \cdot V}{P \cdot R} = \frac{3 \Delta p \cdot V}{2 P} =$$

$$t = 7,5 \text{ s}$$

$$\Delta p \cdot V = \mu R \Delta T$$

$$\Delta T = \frac{\Delta p \cdot V}{\mu R}$$

$$\underline{\underline{C_v = \frac{3}{2} R}}$$