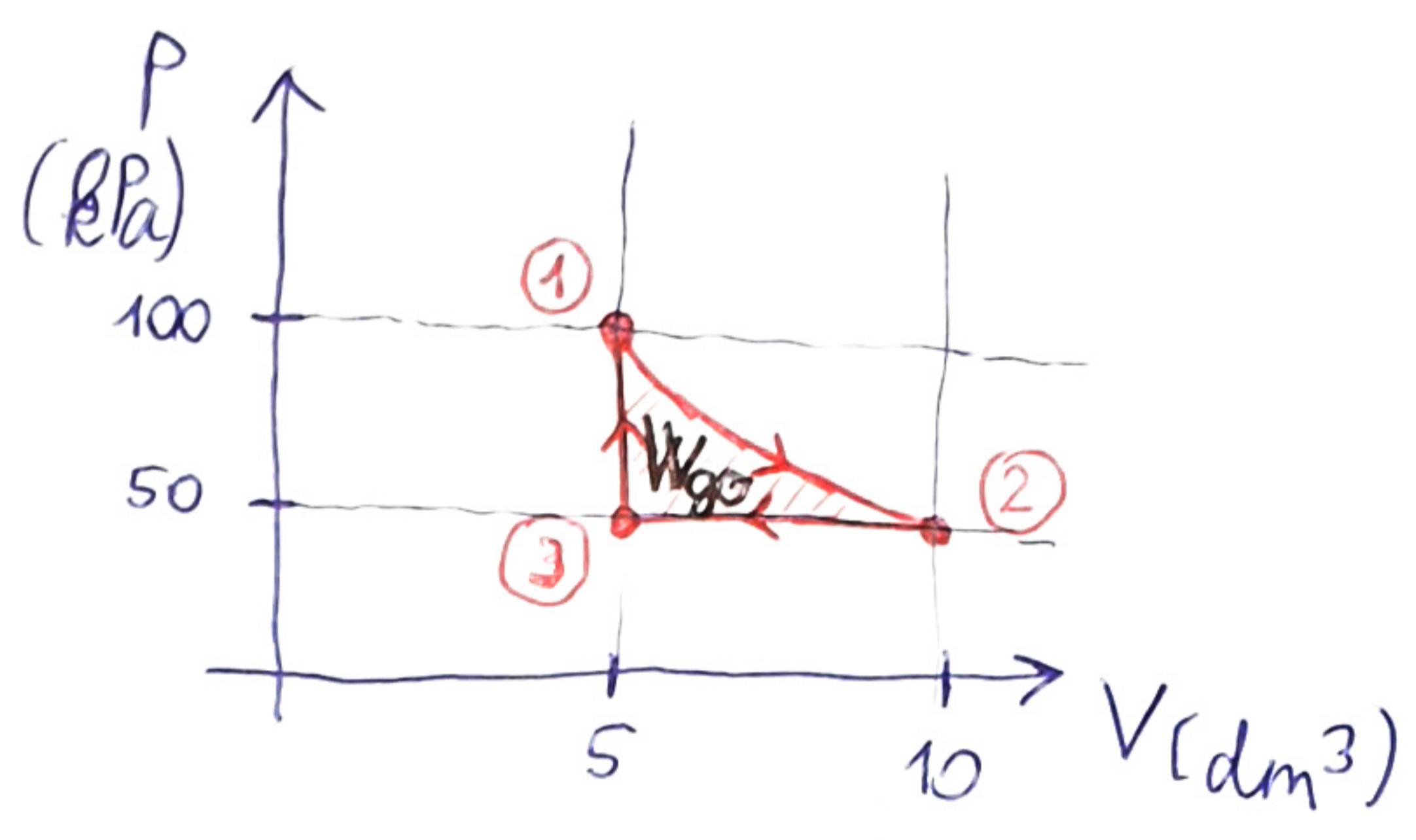
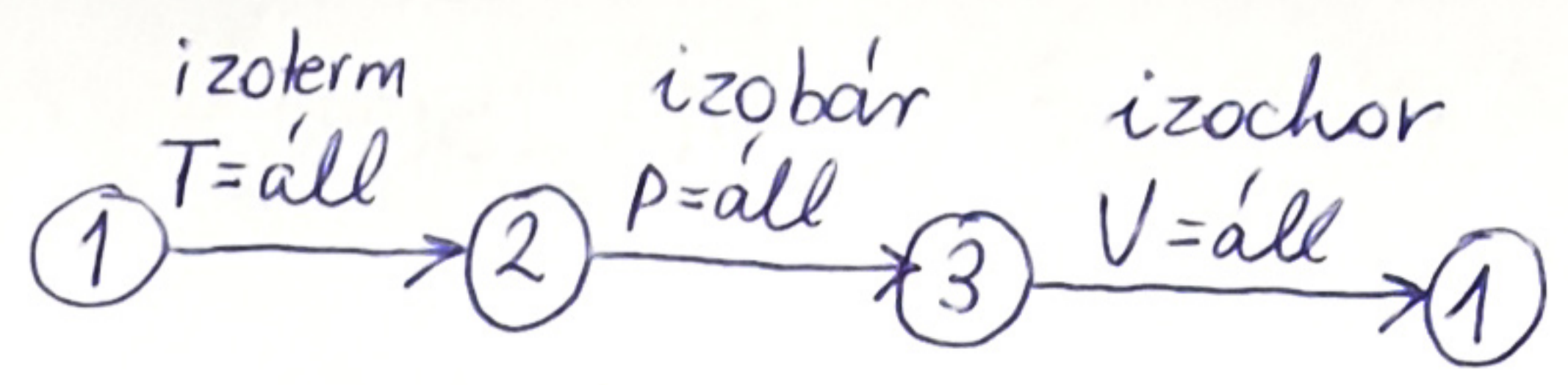


13.)  $P_1 = 100 \text{ kPa}$   $\text{He} \rightarrow f = 3$

$V_1 = 5 \text{ dm}^3 \rightarrow V_1 = 0,005 \text{ m}^3$   
 $V_2 = 2V_1$   
 $E_{b2} = E_{b1} \rightarrow P_3 = P_2$   
 $V_3 = 5 \text{ dm}^3 \rightarrow \text{①}$



- a.)  $W_{g0} = ?$
- b.)  $Q_{12} + Q_{31} = ?$
- c.)  $Q_{le23} = ?$
- d.)  $\eta = ?$

$PV = P_1 V_1 = \text{all (izoterm)}$   
 $P = \frac{P_1 V_1}{V}$

a.)  $W_{g0} = W_{g12} + W_{g23} + W_{g31} = \int_{V_1}^{V_2} P dV + P_2 \Delta V + 0$

$P_1 V_1 = P_2 V_2$  (izoterm)

$W_{g0} = P_1 V_1 \int_{V_1}^{V_2} \frac{dV}{V} + P_2 (V_2 - V_1) = \dots$

$P_2 = P_1 \frac{V_1}{V_2} = 50000 \text{ Pa}$

b.)  $\Delta E_{b12} = 0$

$\Delta E_{b23} = \frac{f}{2} n R \Delta T = \frac{f}{2} P_2 \Delta V$  (izobár) ha izobár:  $n R \Delta T = P \Delta V!$   
 $f = 3$

$\Delta E_{b12} = Q_{12} + W_{12}$   
 $0 = Q_{12} - W_{g12}$   
 $Q_{12} = W_{g12} \checkmark$

$\Delta E_{b23} = Q_{23} + W_{23}$   
 $\frac{3}{2} P_2 \Delta V = Q_{23} - W_{g23}$   
 $Q_{23} = \frac{3}{2} P_2 (V_3 - V_2) - P_2 (V_2 - V_1) \checkmark$   
 $Q_{le23} = -Q_{23}$

$\Delta E_{b31} = Q_{31} + W_{31} \leftarrow 0$   
 $\frac{f}{2} \Delta P \cdot V_3 = Q_{31}$   
 $Q_{31} = \frac{3}{2} (P_1 - P_3) V_3 \checkmark$

c.)  $Q_{le23} = \dots$

d.)  $\eta = \frac{W_{hasz}}{Q_{fel}} = \frac{W_{g0}}{Q_{12} + Q_{31}} = \dots$