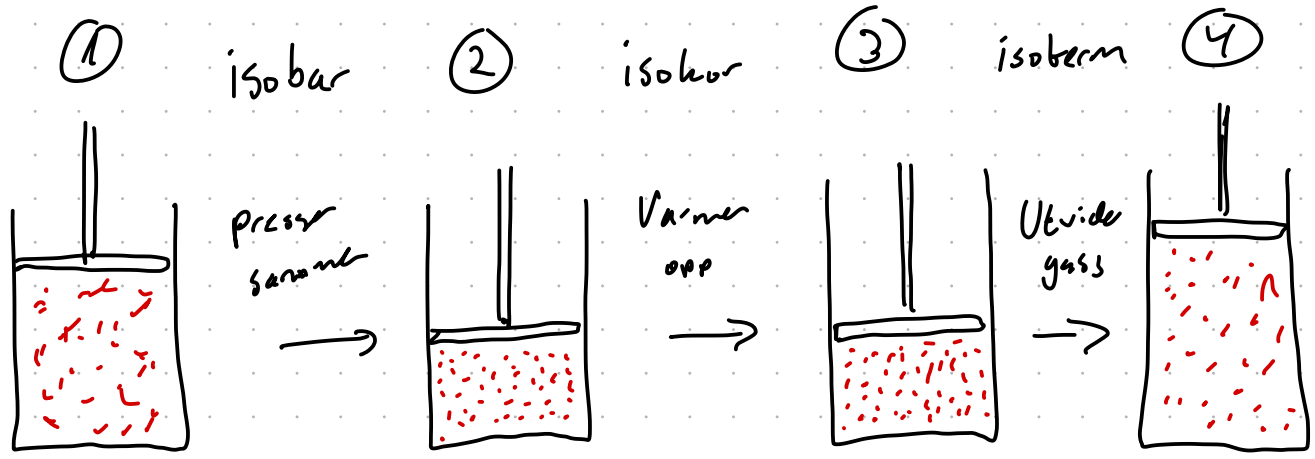
9.1

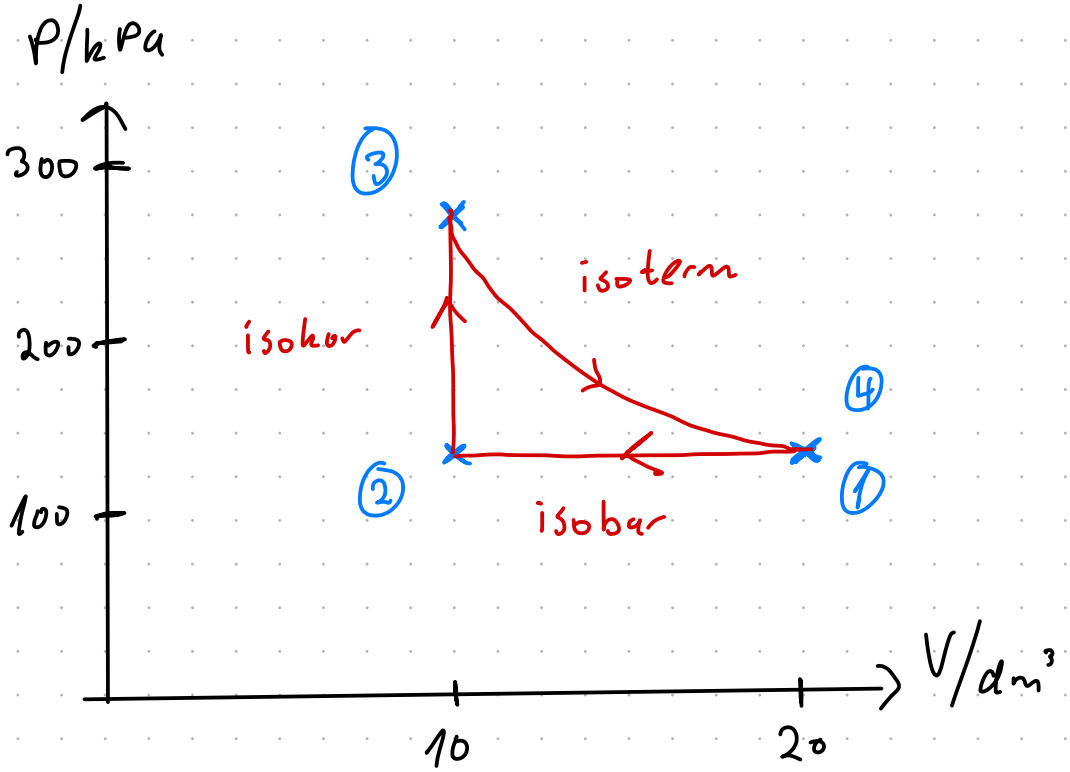


$V_1 = 20\,dm^3$ $\quad V_2 = \frac{V_1}{2}$ $\quad V_3 = V_2$ $\quad V_4 = V_1$

$p_1 = 138\,kPa$ $\quad p_2 = p_1$ $\quad p_3 = ?$ $\quad p_4 = p_1$

$T_1 = 400\,K$ $\quad T_2 = ?$ $\quad T_3 = T_1$ $\quad T_4 = T_1$

a)



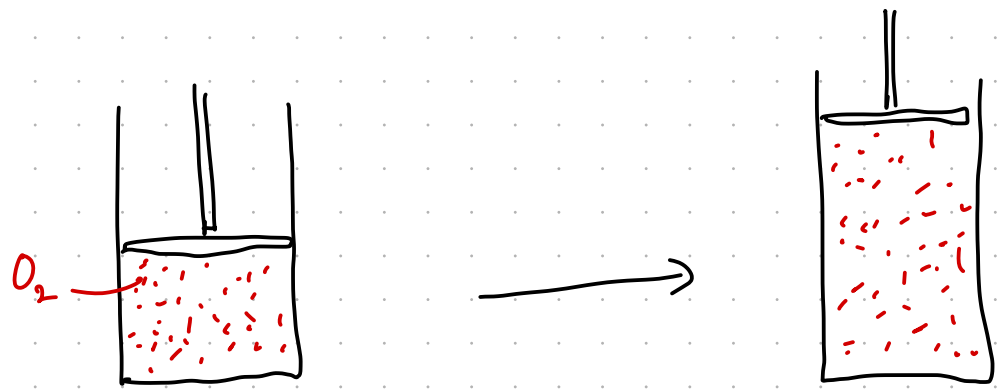
b) $\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2} \Rightarrow T_2 = T_1 \frac{V_2}{V_1} \Rightarrow \underline{T_2 = \frac{T_1}{2} = 200\,K}$

$(p_1 = p_2)$ $\quad (V_2 = \frac{V_1}{2})$

$\frac{p_2 V_2}{T_2} = \frac{p_3 V_3}{T_3} \Rightarrow \underline{p_3 = p_2 \frac{T_3}{T_2} = p_2 \frac{T_1}{\frac{T_1}{2}} = 2p_2 = 276\,kPa}$

$V_2 = V_3$ $\quad \underline{T_3 = T_1}$ $\quad \underline{T_2 = \frac{T_1}{2}}$

9.2



$V_1 = 200\,dm^3$

$T_1 = 40°C = 273K + 40°C$

$T_1 = 313\,K$

$p_1 = 101\,kPa$

$V_2 = 300\,dm^3$

$T_2 = ?$

$p_2 = 106\,kPa$

a) $p_1 V_1 = N k T_1$

$N = \frac{pV}{kT} = \frac{101 \cdot 10^3\,Pa \cdot 200\,(10^{-1}\,m)^3}{1{,}38 \cdot 10^{-23}\,\frac{J}{K} \cdot 313\,K}$

Enhet: $\frac{Pa \cdot m^3}{\frac{J}{K} \cdot K} = \frac{Pa \cdot m^2 \cdot m}{J} = \frac{N \cdot m}{J} = \frac{J}{J} = \ldots$

$N = \frac{101 \cdot 200}{1{,}38 \cdot 313} \cdot 10^{23} = 46{,}766 \cdot 10^{23} = 4{,}68 \cdot 10^{24}$

b) $p_2 V_2 = N \cdot k \cdot T_2$

$T_2 = \frac{p_2 V_2}{N \cdot k} = \frac{106 \cdot 10^3\,Pa \cdot 300\,(10^{-1}\,m)^3}{4{,}6766 \cdot 10^{24} \cdot 1{,}38 \cdot 10^{-23}\,\frac{J}{K}} = \frac{106 \cdot 300}{46{,}766 \cdot 1{,}38}\,K$

$T_2 = 493K = 220°C$

9.3

a) Vi har rystet termosflasken, ikke tilført noe varme. Dette er en adiabatisk prosess.

b) Arbeidet W er lik økningen i indre energi, ΔU.

$$\Delta U = c_v m_v \Delta t$$

$$c_v = 4{,}2 \frac{kJ}{kg\,K}$$

$$m_v = 50\,g = 0{,}050\,kg$$

$$\Delta t = 3{,}0\,K$$

$$\Delta U = 4{,}2 \frac{kJ}{kg\,K} \cdot 0{,}050\,kg \cdot 3{,}0\,K = 0{,}63\,kJ$$

$$\underline{W = 0{,}63\,kJ}$$

c) $\underline{\Delta U = 0{,}63\,kJ}$