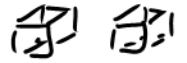


b)  $\Delta H_R^\circ = -396 - (-297 + \frac{1}{2} \cdot 0) = -99 \text{ kJ/mol}$

$\Delta S_R^\circ = 0.256 - (0.248 + \frac{1}{2} \cdot 0.205) = -0.0945 \frac{\text{kJ}}{\text{mol}\cdot\text{K}}$

(c:  $\Delta H_R^\circ < 0$  exotherm

$\Delta S_R^\circ$



3

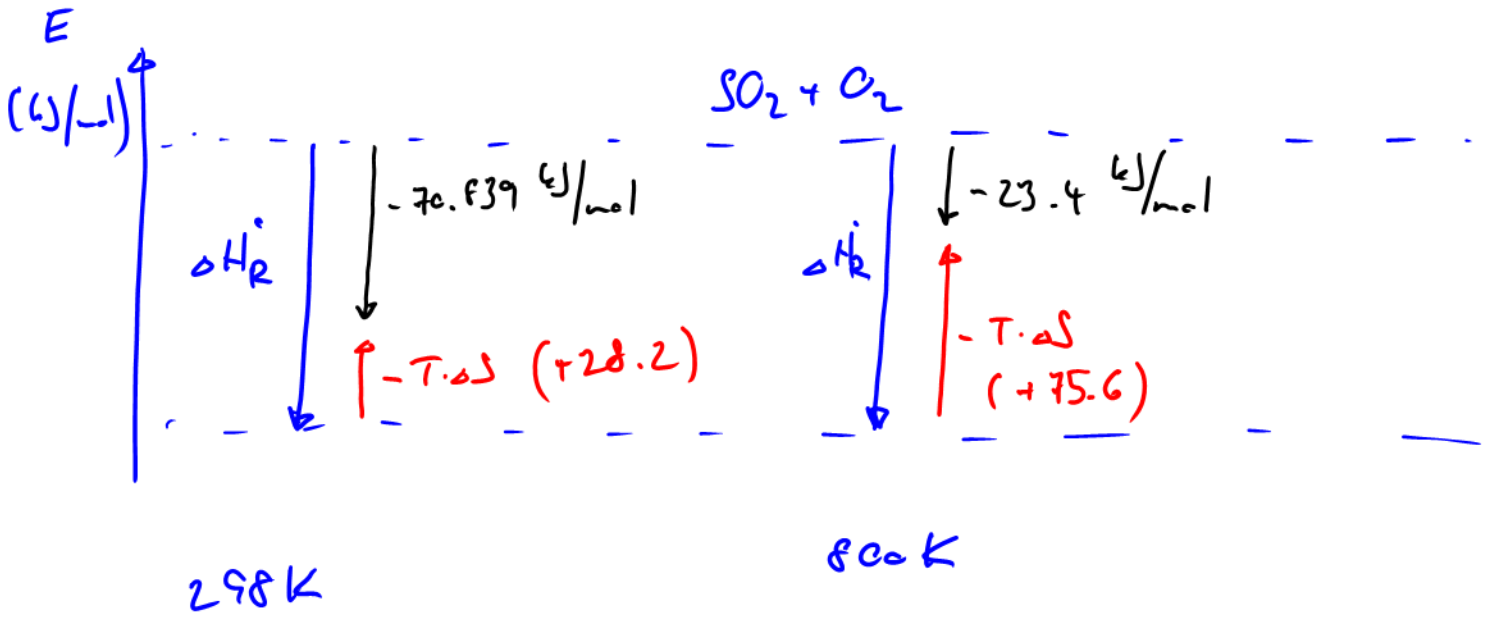
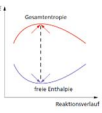
2

$\Delta S_R^\circ < 0$

d)  $\Delta G^\circ = \Delta H_R^\circ - T \cdot \Delta S_R^\circ$

298 K  $\Delta G_R^\circ = -99 - 298 \cdot 0.0945$   
 $= -99 + 28.161 = -70.839 \text{ kJ/mol}$

800 K  $\Delta G_R^\circ = -99 - 800 \cdot 0.0945$   
 $= -99 + 75.6 = -23.4 \text{ kJ/mol}$



• Wann (bei welcher Temp) sind der Beitrag der Reaktionsenthalpie gleich dem Beitrag der Reaktionsenthalpie?

$$\Delta G_R^\circ = 0 = \Delta H - T \cdot \Delta S$$

$$\Rightarrow T = \frac{\Delta H}{\Delta S} = \frac{-89}{-0.0945} = \underline{\underline{1047 \text{ K}}}$$

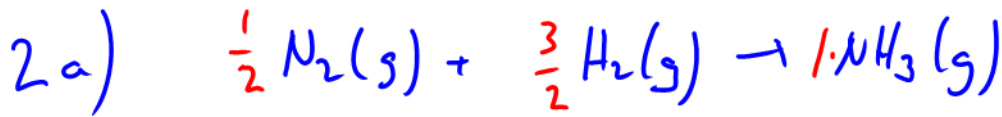
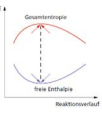
e)  $\Delta G = \Delta H - T \cdot \Delta S$

$$\Delta G = -R \cdot T \cdot \ln K$$

$$\Rightarrow K = e^{-\Delta G / RT}$$

$$= e^{-\frac{70.839 \text{ J/mol}}{8.314 \text{ J/mol} \cdot \text{K} \cdot 298 \text{ K}}} = 2.6 \cdot 10^{12} \gg 0$$

$$K = \frac{p_{\text{Produkt}}}{p_{\text{Edukt}}}$$



$$\begin{array}{cccc} \Delta H_f^\circ & 0 & 0 & -46.11 \text{ kJ/mol} \\ \Delta S_f^\circ & 0.19161 & 0.13068 & 0.1925 \frac{\text{kJ}}{\text{mol} \cdot \text{K}} \end{array}$$

$$b) \quad \Delta H_R^\circ = -46.11 \text{ kJ/mol}$$

$$\begin{aligned} \Delta S_R^\circ &= (0.1925) - \left( \frac{1}{2} \cdot 0.19161 + \frac{3}{2} \cdot 0.13068 \right) \\ &= -0.099325 \frac{\text{kJ}}{\text{mol} \cdot \text{K}} \end{aligned}$$

$$\begin{aligned} \Delta G_R^\circ(298) &= -46.11 - 298 \cdot -0.099 \\ &= -16.51 \text{ kJ/mol} \quad (\text{kleiner als Null: exergonisch}) \end{aligned}$$

$$\Delta G_R^\circ(450^\circ\text{C}) = +25.702 \text{ kJ/mol}$$

↓  
723K

$$c) \quad K(T=298\text{K}) = e^{-\frac{\Delta G}{RT}} = e^{-\frac{-16.510}{8.314 \cdot 298}} = 783.51$$

$$K(T=723\text{K}) = e^{-\left(\frac{+25.702}{8.314 \cdot 723}\right)} = 0.013$$

$$K = \frac{P_{\text{Produkt}}}{E_{\text{Edukt}}}$$



