

Lösungshinweise Blatt 12

44 a) $Q_1 = \varepsilon A = \varepsilon \eta Q_0$, mit

$$\varepsilon = \frac{T_H}{T_H - T_R} = \frac{308 \text{ K}}{35 \text{ K}} = 8,8,$$

$$\eta = \frac{T_B - T_A}{T_B} = \frac{580 \text{ K}}{873 \text{ K}} = 0,66$$

$$\rightarrow Q_1/Q_0 = \varepsilon \eta = 5,8.$$

b) $Q_1/Q_0 = 2,7.$

45 a)

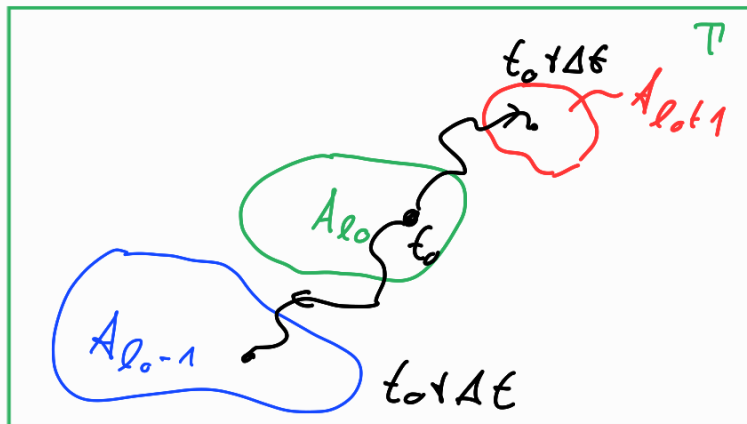
$$\ln W(A_e) \approx \ln \frac{N}{r} \left(\left(\frac{1}{2} + \frac{\ell}{2r} \right) N \right)$$

$$= \ln \left(\frac{N}{(\frac{1}{2} + \frac{\ell}{2r}) N} \right) + \cancel{\sigma(\ln N)}$$

$$= N \ln \left(\frac{1}{2} + \frac{\ell}{2r} \right) \quad (\text{vgl. Uls. 26})$$

$$\rightarrow S(A_e) = k \ln W(A_e) = N k \ln \left(\frac{1}{2} + \frac{\ell}{2r} \right)$$

45 b) Schematisch:



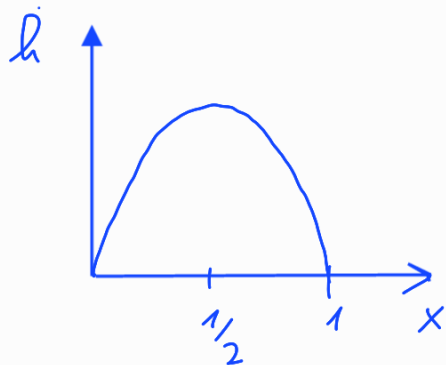
$$\begin{aligned} \rightarrow \quad \frac{P_-}{P_+} &= \frac{W(A_{l_0-1})}{W(A_{l_0+1})} \rightarrow \frac{P_-}{P_+} = \frac{W(A_{l_0-1})}{W(A_{l_0+1})} \end{aligned}$$

1)

$$\frac{P_-}{P_+} = e^{\frac{1}{k} (S(A_{l_0-1}) - S(A_{l_0+1}))}$$

$$W(A) = \exp(S(A)/k)$$

$$\begin{aligned} &= \exp \left\{ N \left(h\left(\frac{1}{2} + \frac{l_0-1}{2N}\right) - h\left(\frac{1}{2} + \frac{l_0+1}{2N}\right) \right) \right\} \\ &\quad \underbrace{\quad \quad \quad}_{< 0} \\ &\quad \underbrace{h'\left(\frac{1}{2} + \frac{l_0}{2N}\right)}_{< 0} \cdot \left(-\frac{1}{N}\right) \end{aligned}$$



solange $\frac{N}{\tau} \gg 1$

$$\rightarrow \frac{P_-}{P_+} = e^{\left| h'\left(\frac{1}{2} + \frac{l_0}{2N}\right) \right| \frac{N}{\tau}} \gg 1$$