8)

$\lambda(O_2) = 1 \cdot 10^{-15}$ $\qquad$ $\lambda(CO) = 1 \cdot 10^{-7}$

$T = 37°C = 310°K.$

a) $\mathcal{Z}_1 = 1 + \lambda_A e^{-\varepsilon_A/\tau} + \lambda_B e^{-\varepsilon_B/\tau}$

$\langle N_A \rangle = \lambda_A \frac{\partial}{\partial \lambda_A} \ln z \quad \Big| \quad \mathcal{Z}_N = \frac{\mathcal{Z}_1^N}{N!}$

$\langle N_A \rangle = N \lambda_A e^{-\varepsilon_A/\tau} / \mathcal{Z}$

$\langle N_A \rangle / N \doteq 0.9 = \frac{\lambda_A e^{-\varepsilon_A/\tau}}{\mathcal{Z}}$

Absence of CO

$$0.9 = \frac{\lambda_A e^{-\varepsilon_A/\tau}}{1 + \lambda_A e^{-\varepsilon_A/\tau}}$$

$0.9 + 0.9 \lambda_A e^{-\varepsilon_A/\tau} = \lambda_A e^{-\varepsilon_A/\tau}$

$0.9 = \lambda_A e^{-\varepsilon_A/\tau} \iff \frac{\varepsilon_A}{\tau} = -\log \frac{0.9}{\lambda_A}$

$\frac{\varepsilon_A}{\tau} = -\log 9 \cdot 10^5 = \frac{\varepsilon_A}{\tau} = -13.7$

$\tau \simeq \frac{1}{40}\, eV = 0.025\, eV$

$\Rightarrow \underline{\underline{\varepsilon_A = -0.38\, eV.}}$