Kittel TP

5.4. $\mu_{IN} = \tau \ln\left[\frac{n_{In}}{n_Q}\right]$, $\mu_{OUT} = \tau \ln\left[\frac{n_{OUT}}{n_Q}\right]$.

$$\mu_{IN} - \mu_{OUT} = \Delta\mu = \tau \ln[10^4]$$

$$= k_B T (4) \ln 10 \quad J$$

$$\approx 1.38 \times 10^{-23} \times 4 \times 300 \times 3 \quad J.$$

$$\approx 50 \times 10^{-21} \quad J.$$

$1\,J = 1.6 \times 10^{19}$ eV.

$$\Rightarrow \quad 50 \times 10^{-21} J \approx 31 \times 10^{-2} eV$$

$$\approx \boxed{0.3 eV}$$

what we have computed is the chemical potential difference per atom of K^+, using the fact that the charge of each K^+ is e. Thus the equivalent potential $\approx 0.3 V$.

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