Fundamentals of Nanoelectronics, Basic Concepts Unit 4
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L4.8 Quiz
Answers

4.8. Shannon Entropy

4.8a We have a collection of spins randomly oriented with probability 3/4 of being up and probability 1/4 of being down. The entropy per spin is

(a) $k\,\ell n\,2$

(b) $k\left(\ell n\,4 - \frac{3}{4}\ell n 3\right)$

(a) $k\,\ell n 3$

(a) $k\left(\ell n\,4 + \frac{3}{4}\ell n 3\right)$

(e) None of the above

$$S = -k\left(\frac{3}{4}\ell n\frac{3}{4} + \frac{1}{4}\ell n\frac{1}{4}\right) = k\left(\ell n 4 - \frac{3}{4}\ell n 3\right)$$

4.8b Consider contacts 1 and 2 held at the same temperature T, but at two different electrochemical potentials $\mu_1 > \mu_2$. If a number of electrons ΔN is transferred from 1 to 2, the overall increase in entropy is

(a) $\dfrac{\Delta N}{\frac{T}{m_1} + \frac{T}{m_2}}$

(b) $\Delta N\left(\dfrac{m_1 - m_2}{T}\right)$

(c) $\Delta N\left(\dfrac{m_1 + m_2}{T}\right)$

(d) $\dfrac{\Delta N}{\frac{T}{m_1} - \frac{T}{m_2}}$

(e) None of the above