Worksheet For Class 09/08 (Interacting Einstein Solids)

1. Binomial Coefficient
In the following we will use EXCEL to determine multiplicities and therefore we will need the EXCEL command for $\begin{pmatrix} a \\ b \end{pmatrix}$, so "$a$ choose b", or the binomial coefficient. Use the command `COMBIN(a,b)` in EXCEL for $\Omega(N=3, q=6) = \begin{pmatrix} 8 \\ 6 \end{pmatrix}$ and check if you get the expected result (see solutions to today's homework #6).

2. Einstein Solids $N_A = N_B = 3 \quad q_{\text{tot}} = q_A + q_B = 6$
(Problem 2.9) Use EXCEL to reproduce Fig. 2.4 (table & graph) on page 57, so for two Einstein solids with $N_A = N_B = 3 \quad q_{\text{tot}} = q_A + q_B = 6$. At the beginning of your table set the parameters N_A, N_B, and q_{tot} and refer to these parameters with absolute references in your table.

3. Einstein Solids $N_A = 6 \quad N_B = 4 \quad q_{\text{tot}} = q_A + q_B = 6$
(Problem 2.9 continued) Modify your table and graph to show the case $N_A = 6 \quad N_B = 4 \quad q_{\text{tot}} = q_A + q_B = 6$. Assuming that all microstates are equally likely, what is the most probable macrostate, and what is its probability? What is the least probable macrostate, and what is its probability?

4. Einstein Solids $N_A = 60 \quad N_B = 40 \quad q_{\text{tot}} = q_A + q_B = 60$
Now let's just scale up our system size. Modify your table and graph to show the case $N_A = 60 \quad N_B = 40 \quad q_{\text{tot}} = q_A + q_B = 60$. Compare the resulting graph with your result in 3.

5. (if time)
Try to increase the size even more, so $N_A = 300 \quad N_B = 200 \quad q_{\text{tot}} = q_A + q_B = 300$ and also $N_A = 600 \quad N_B = 400 \quad q_{\text{tot}} = q_A + q_B = 600$.

Read: §2.4 Homework #7: 2.10 & 2.11