Summary of lecture 3

The equilibrium macrostate of a system is the macrostate with the largest statistical weight.

In other words: it is the macrostate with the largest number of corresponding microstates. Since we assume all microstates are equally likely it therefore follows that this macrostate is also the most likely macrostate.

e.g. We showed that the statistical weight of two thermally coupled Einstein solids was strongly peaked at the macrostate which shares the energy equally between the two solids.

The equilibrium state is characterised as the state of maximum statistical weight. Hence, for two systems A and B in equilibrium, it follows that

$$\frac{\partial \ln g_A}{\partial U_A} = \frac{\partial \ln g_B}{\partial U_B}$$

i.e. $\boxed{T_A = T_B}$ with $\frac{1}{k_B T} \equiv \frac{\partial \ln g}{\partial U}$