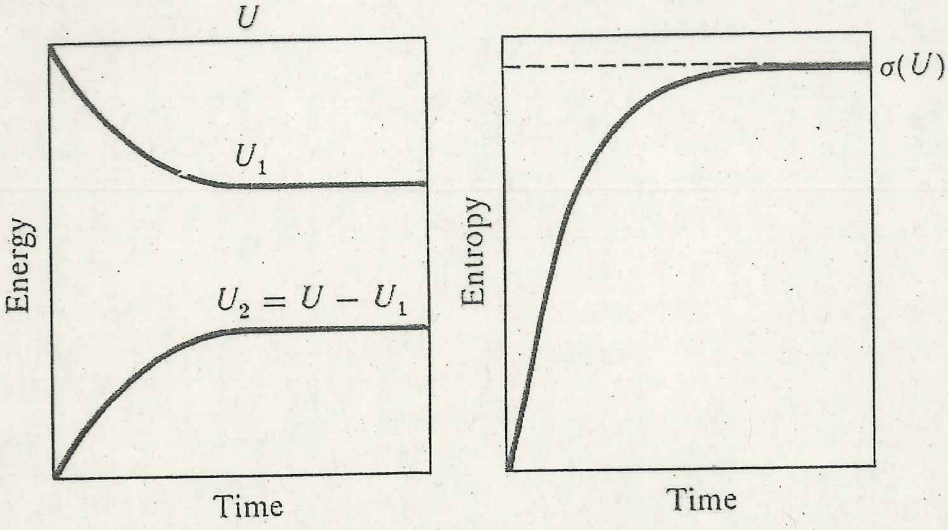

Figure 2.8 A system with two parts, 1 and 2, is prepared at zero time with $U_2 = 0$ and $U_1 = U$. Exchange of energy takes place between two parts and presently the system will be found in or close to the most probable configuration. The entropy increases as the system attains configurations of increasing multiplicity or probability. The entropy eventually reaches the entropy $\sigma(U)$ of the most probable configuration.

may be very, very much larger than the initial term

$$g_1(U_{10})g_2(U - U_{10}). \tag{35}$$

Here $\hat{U}_1$ denotes the value of U_1 for which the product g_1g_2 is a maximum. The essential effect is that the systems after contact evolve from their initial configurations to their final configurations. The fundamental assumption implies that evolution in this operation will always take place, with all accessible final states equally probable.

The statement

$$\sigma_{\text{final}} \simeq \log(g_1g_2)_{\text{max}} \geq \sigma_{\text{initial}} = \log(g_1g_2)_0 \tag{36}$$

is a statement of the **law of increase of entropy**: the entropy of a closed system tends to remain constant or to increase when a constraint internal to the system is removed. The operation of establishing thermal contact is equivalent to the removal of the constraint that U_1, U_2 each be constant; after contact only $U_1 + U_2$ need be constant.

The evolution of the combined system towards the final thermal equilibrium configuration takes a certain time. If we separate the two systems before they