

Now, in the study of the second law of thermodynamics we are told that the law of increase of entropy is related to the fact that the energy content of the universe, in its natural course, is becoming less and less available for conversion into work; accordingly, the entropy of a given system may be regarded as a measure of the so-called disorder or chaos prevailing in the system.

Formula $S = k_B \ln \Omega$ tells us how disorder arises microscopically.

Clearly, disorder is a manifestation of the largeness of the number of microstates the system can have. The larger the choice of microstates, the lesser the degree of predictability and hence the increased level of disorder in the system. Complete order prevails when and only when the system has no other choice but to be in a unique state ($\Omega = 1$); this, in turn, corresponds to a state of vanishing entropy.