15-7 Entropy and the Second Law of Thermodynamics

Definition of the change in entropy $S$ when an amount of heat $Q$ is added:

$$\Delta S = \frac{Q}{T}$$  \hspace{1cm} (15-8)

Another statement of the second law of thermodynamics:
The total entropy of an isolated system never decreases.

15-8 Order to Disorder

Entropy is a measure of the disorder of a system. This gives us yet another statement of the second law:

Natural processes tend to move toward a state of greater disorder.

Thermal equilibrium is a similar process – the uniform final state has more disorder than the separate temperatures in the initial state.

15-9 Unavailability of Energy; Heat Death

Another consequence of the second law:
In any natural process, some energy becomes unavailable to do useful work.

Heat death: If we look at the universe as a whole, it seems inevitable that, as more and more energy is converted to unavailable forms, the ability to do work anywhere will gradually vanish.

The Fate of the Universe

http://www.pbs.org/wgbh/nova/origins/universe.html