The Laws of Thermodynamics

(& thermal expansion)

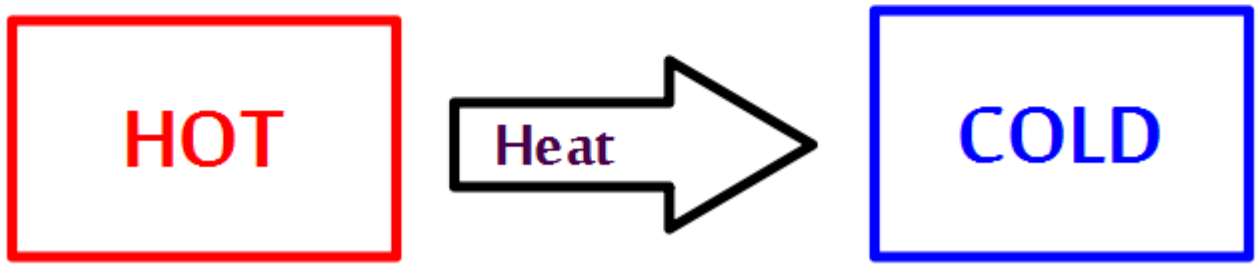
1st Law

The change in internal heat of a system is equal to the heat added to the system minus the work done by the system.

$$\Delta U = Q - W$$

2nd Law

Heat can flow spontaneously from a hot object to a cold object; heat will NOT flow spontaneously from a cold object to a hot object.



3rd Law

Entropy is a measure of disorder in a system. The entropy of the universe will always increase.

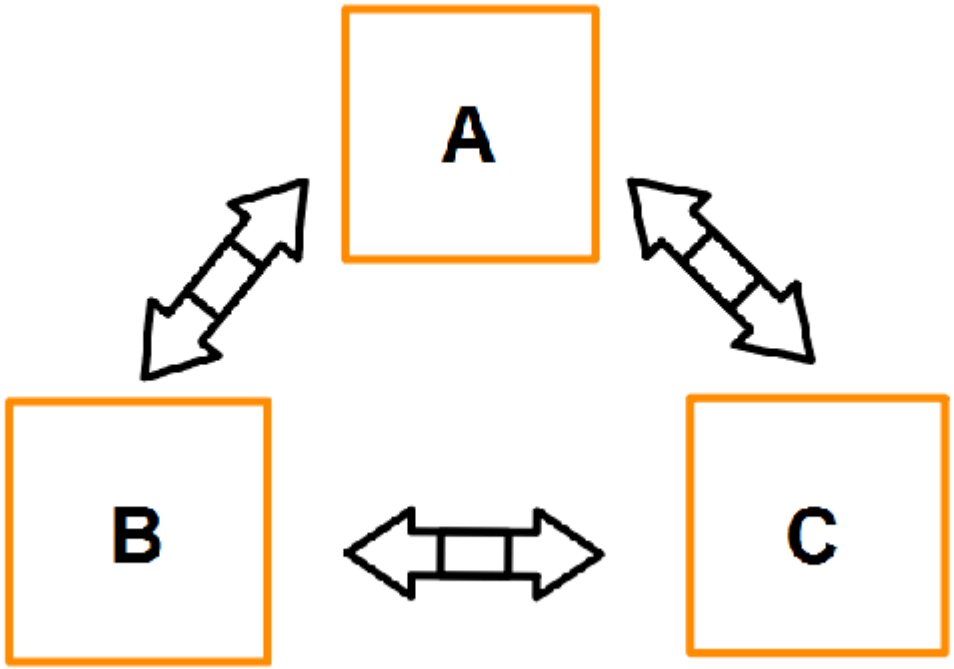
Natural processes tend to move toward a state of disorder.

The 3rd law says that zero entropy is impossible, so you can never reach absolute zero.

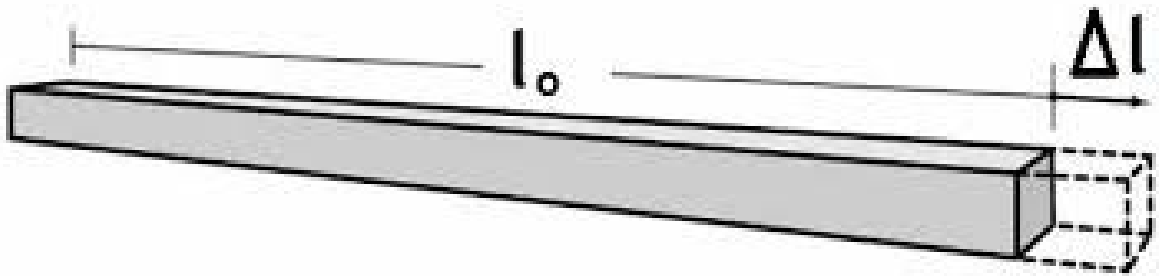
0th Law

If object A is in thermal equilibrium with object B, and also with object C, then objects B and C are in thermal equilibrium with each other.

0th Law



$$\Delta l = \alpha\, l_0\, \Delta T$$



L = final length

α = coefficient of thermal expansion (depends on the material, ie aluminum vs steel vs concrete)

L_0 = original length

ΔT = change in temperature in C or K