CHAPTER 16:

Temperature is a measure of the average kinetic energy of a single constituent of a system, when the correct unit (Kelvin) is used.

Heat is the flow of internal energy from one system to another across a temperature difference.

Heat Capacity or Specific Heat:

c is the heat input required per unit mass to produce a unit change in temperature, for any given substance:

$$Q = mc\Delta T.$$

For solids, c could be anywhere from 100 to 1000 J/kg-K. Note that since a degree Centigrade is the same size as a K, ΔT can be calculated using either Kelvin or Centigrade temperatures.

Reaching Equilibrium:

$$m_1 c_1 |\Delta T_1| = m_2 c_2 |\Delta T_2|,$$

in other words, any heat lost by part of the isolated system must be absorbed by the other part.

Heat Transfer:

- ***Conduction:*** heat flows by direct molecular or atomic collision.
- ***Convection:*** heat flows due to the fact that regions of different temperature have different density, so buoyant forces mix the regions.
- ***Radiation:*** Any object not at zero K emits electromagnetic radiation.

$$\text{Conduction} : \mathcal{P} = kA\frac{\Delta T}{\Delta x}.$$

$$\text{Thermal Resistance} : R = \frac{\Delta x}{kA}.$$

$$\text{Radiation} : \mathcal{P} = \epsilon\sigma A T^4.$$

The fundamental constant σ is about 5.67×10^{-8} $\mathrm{W/m^2K^4}$.