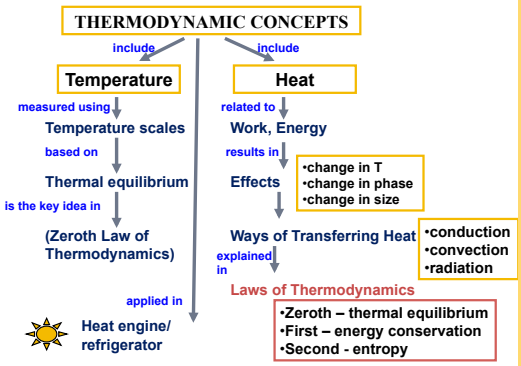
Physics in the Home

Our instructional objectives:
Define the various CONCEPTS related to the Theory of Heat and Thermodynamics
Compare these CONCEPTS with each other
Differentiate CONCEPTS that are quite similar to each other
Use these CONCEPTS to explain occurrences/ mysteries in daily life



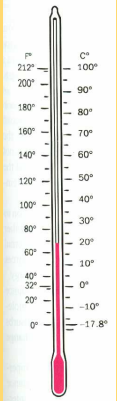
Temperature

- Measure of how HOT or COLD a body is
- Determines the direction of heat flow
- Measure of **random average translational KE** of molecules of the body

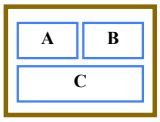
Temperature Scales

- Celsius : T_C
- Kelvin: $T_k = T_C + 273$
- Fahrenheit:

$T_C = (5/9)(T_F - 32)$



Zeroth Law of Thermodynamics



If $T_A = T_B$ and $T_B = T_C$,

then $T_A = T_C$

"If body A is in thermal equilibrium with body B,

and B is in thermal equilibrium with C,

then A is in thermal equilibrium with C."

Change in Temperature

$$Q = m\,c\,\Delta T$$

specific heat of the substance

$$c = \frac{\Delta Q}{m\Delta T} \qquad \frac{\text{joules}}{\text{kg}^0\text{C}}$$

Change in Size

Linear Expansion

$\Delta L \propto L_o$

$\Delta L \propto \Delta T$

$\Delta L = \alpha L_o \Delta T$

Coefficient of linear expansion

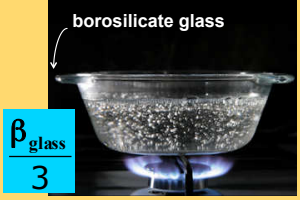
Change in Size

Volume Expansion

$\Delta V \propto V_o$

$\Delta V \propto \Delta T$

$\Delta V = \beta V_o \Delta T$



$\frac{\beta_{glass}}{3}$

Coefficient of volume expansion

Problem

$$W = J\,Q$$

mgh

[total kcal]

$$J = \frac{4.184\,\text{Joules}}{1\,\text{calorie}}$$

Mechanical Equivalent of Heat