

# AP Physics - Temperature - Temperature

Note Title

11/29/2007

## Thermodynamics

Study of physical and chemical transformations of matter in all its forms: solids, liquids, gases

## Heat (Q)

Energy exchanged between objects because of temperature differences.

## Thermal Contact

Two things are in thermal contact if heat can be exchanged between them.

## Thermal Equilibrium

Situation in which 2 objects in thermal contact with each other cease to have net exchanges of heat.

## “Zeroth Law of Thermodynamics”

If A&B are in thermal equilibrium with C, then A&B will be in thermal equilibrium with each other if placed in thermal contact.

## Temperature

Property that determines whether or not two objects will be in thermal equilibrium with each other. Tells you how hot or cold something is relative to some standard.

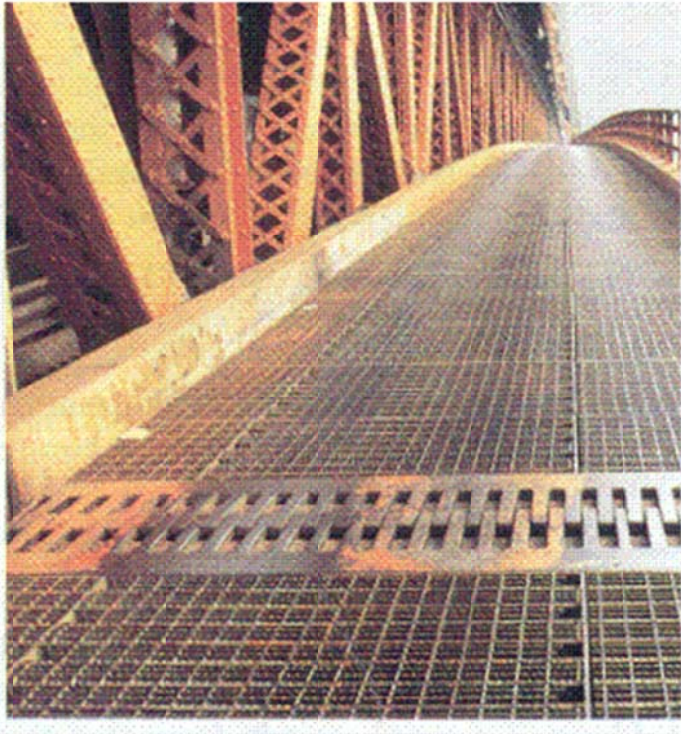
If two objects are in thermal equilibrium, then they are at the same temperature.

HEAT ONLY FLOWS IF THERE IS A DIFFERENCE IN TEMPERATURE.  
HEAT FLOWS FROM HOT TO COLD.

## Thermal Expansion

As temperature increases, volume increases. (usually true--water is a notable exception, when it shrinks going from ice to water at 4 degrees celcius)

Thermal Expansion Joints – Between bridge and road



A steel bar of length  $L_0$  will expand when heated according to the following equation:

$$\Delta L = \alpha L_0 \Delta T$$

$\Delta L$  - change in length

$\Delta T$  - change in temperature

$\alpha$  - linear coefficient of thermal expansion of the

material - units of  $[\frac{1}{^\circ\text{C}}]$  or  $[(^{\circ}\text{C})^{-1}]$

Solids and liquids also tend to expand in volume according to the equation

$$\Delta V = \beta V_0 \Delta T$$

$\beta$  - Volumetric coefficient of thermal expansion [ $\frac{1}{^\circ\text{C}}$ ]