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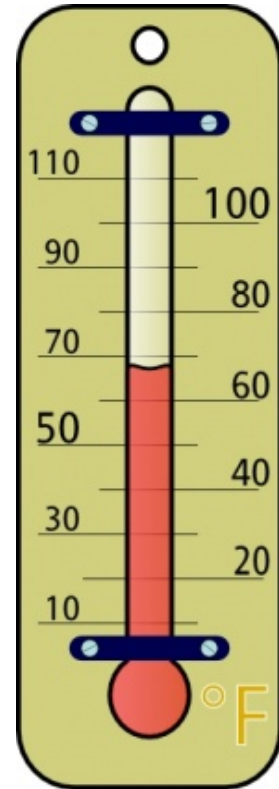
# Heat Transfer

Geophysical Science



# Heat vs. Temperature

- **Heat** = energy
- **Temperature** = the measure of how much heat there is



# Temperature Scales

## ○ Kelvin

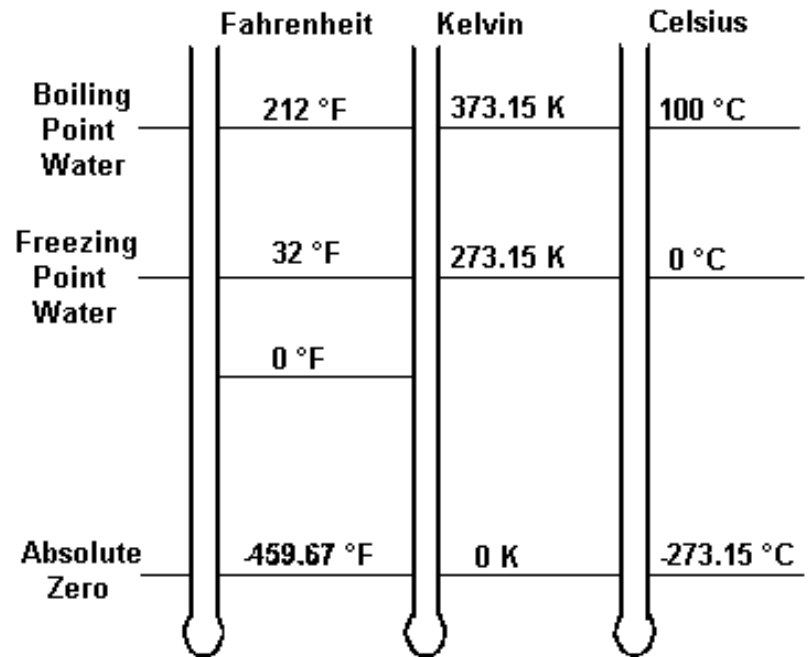
- Absolute zero = 0 Kelvin
- 1 Kelvin is =  $1^{\circ}\text{C}$
- Water freezes at 273 Kelvin

## ○ Celsius

- Water freezes at  $0^{\circ}\text{C}$
- Water boils at  $100^{\circ}\text{C}$

## ○ Fahrenheit

- Water freezes at  $32^{\circ}\text{F}$
- Water boils at  $212^{\circ}\text{F}$



# Movement of Heat

- Heat always moves from **warm to cold**
- Cold is the lack of heat
- When something cools off it is losing energy



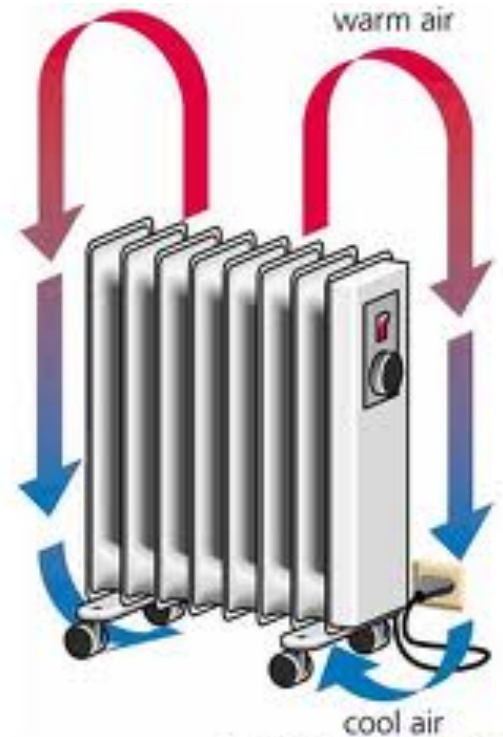
# Conduction

- The transfer of heat between substances in direct contact with each other
- **Good conductors = metals**
  - Copper, silver, iron, steel
- Bad conductors are **insulators = non-metals**
  - Wood, Styrofoam, paper, air, waffles



# Convection

- The up and down movement of liquids and gasses due to heat transfer
- As air **heats up** it expands, making it less dense and **causing it to rise**
- As air **cools**, it becomes more dense **causing it to fall**

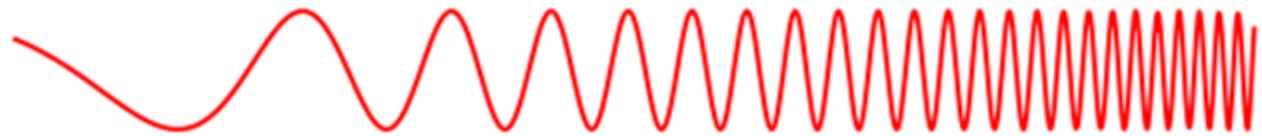




# Radiation

- Electromagnetic waves carrying energy

- When the waves hit an object they transfer their energy



Radiation Type	Radio	Microwave	Infrared	Visible	Ultraviolet	X-ray	Gamma ray
Wavelength (m)	$10^3$	$10^{-2}$	$10^{-5}$	$0.5 \times 10^{-6}$	$10^{-8}$	$10^{-10}$	$10^{-12}$

