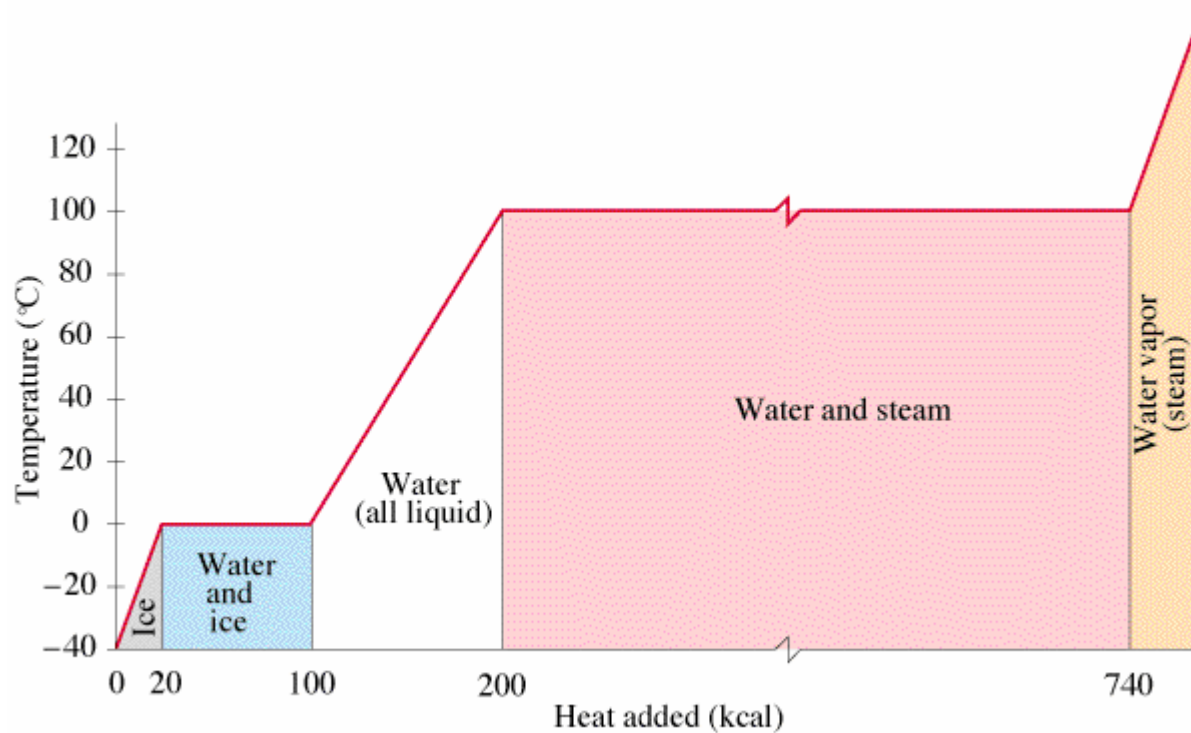


# III. Latent Heat



Phase change:  $Solid \xrightarrow{Fusion} Liquid \xrightarrow{Vaporization} Gas$   
Temperature: no change

# Latent Heats

Solid  $\xrightleftharpoons[\text{Releases}]{\text{Absorbs}}$  Liquid      heat of fusion  $L_F$

Liquid  $\xrightleftharpoons[\text{Releases}]{\text{Absorbs}}$  Gas      heat of vaporization  $L_V$

Latent heat

$$Q = mL$$

$L$  -kcal/kg or J/kg

## IV. Types of Heat Transfer

Only when there is a temperature difference

Conduction: medium

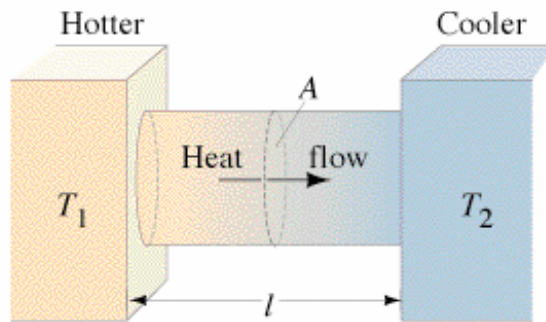
Convection: medium

Radiation: No medium

Heat may be transferred by more than one way at the same time

# Conduction

## Molecular collision



$$\frac{\Delta Q}{\Delta t} = kA \frac{T_1 - T_2}{l}$$

$k$ : thermal conductivity

$$J / s \cdot m \cdot C^{\circ}$$

### Conductors:

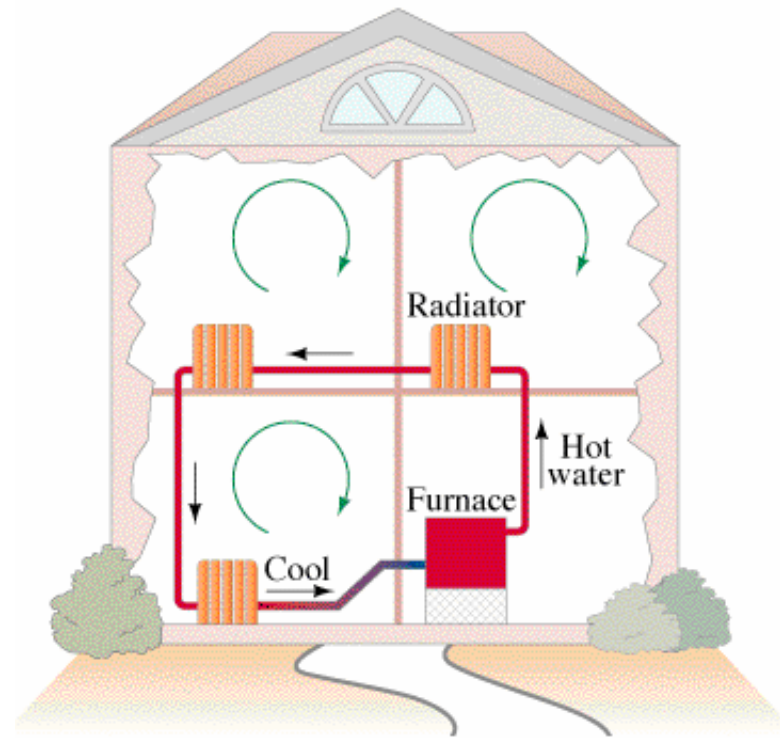
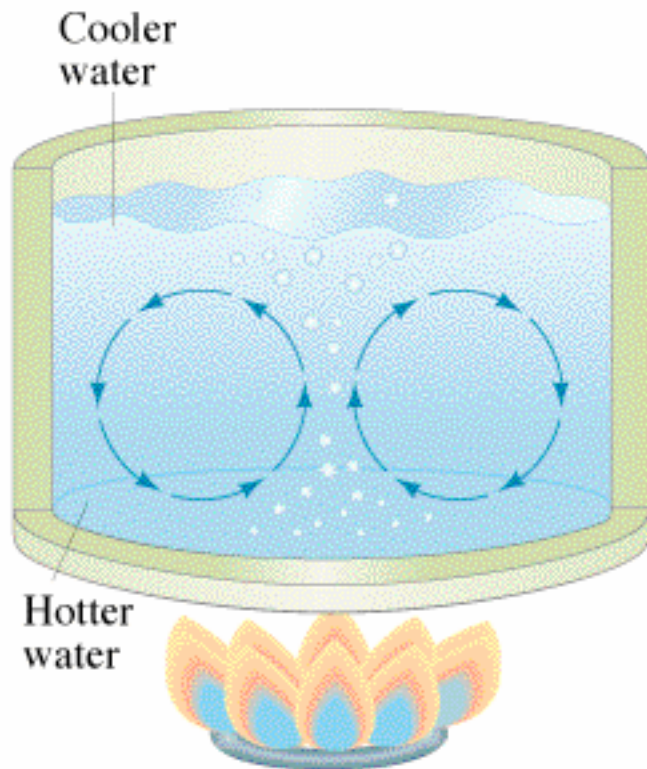
Silver	420
Copper	380
Aluminum	200
Steel	40

### Insulators:

Fiberglass	0.048
Wool	0.040
Goose down	0.025
Air	0.023

# Convection

Mass movements of molecules from one place to another.



# Radiation

Stefan-Boltzmann Equation

$$\frac{\Delta Q}{\Delta t} = e\sigma AT^4$$

Stefan-Boltzmann constant  $\sigma = 5.67 \times 10^{-8} \text{ W/m}^2\text{-K}^4$

Emissivity  $e$ : 0 (shiny surfaces)  $\sim$  1 (black)

Net flow rate of heat radiation  $\frac{\Delta Q}{\Delta t} = e\sigma A(T_1^4 - T_2^4)$

**A good absorber is also a good emitter**