Heat Capacity

- Objects undergoing identical temperature changes will absorb (store) or release different quantities of thermal energy
- **High Heat Capacity** means that an object will absorb or release thermal energy at a slower rate
- Objects with a **Low Heat Capacity** will absorb or release thermal energy more quickly

Heat Capacity

$$\text{Heat Capacity} = \frac{\Delta Q}{\Delta T}$$

ΔQ = change in thermal energy; measured in Joules (J)

ΔT = change in temperature; measured in Kelvin (K)

Examples:

WATER—used in cooling systems (cars) because of its HIGH heat capacity

METALS—used as “heat sink” on the back of refrigerators because of its LOW heat capacity

Specific Heat Capacity

- Takes into consideration the MASS of a substance as well
- Specific Heat Capacity (c), is defined as that heat capacity per unit mass of a substance

$$c = \frac{\Delta Q}{m \cdot \Delta T} \quad \Leftrightarrow \quad \Delta Q = m \cdot c \cdot \Delta T$$

Q = thermal energy added/released (J)

C = specific heat capacity ($J \cdot kg^{-1} \cdot K^{-1}$)

ΔT = Change in temperature (K) **Note: always positive!*

m = Mass (kg)

Specific Heat Capacity

- The heat capacity per unit mass
  $\Delta Q = mc\Delta T$
- Definition: The quantity of thermal energy required to raise the temperature of one kilogram of a substance by one Kelvin degree
- *note:* ΔT will always be positive—thermal energy will always flow from hotter region to colder region
- For gases: Molar heat capacity = quantity of heat required to raise the temperature of one mole of a gas by one kelvin degree.
- c_v → under constant volume; c_p → under constant pressure