Specific Heat Capacity

- This is the amount of heat energy required to raise the temperature of 1g of water by 1^0 C.

$$C = \frac{q}{m \times \Delta T}$$

C – specific heat q – heat (joules or calories
m – mass (g) ΔT – change in temp.

$$q = \Delta H = m\,C\,\Delta T$$

- Because of hydrogen bonding the specific heat of water [4.18 J / (g x ^{0}C) or 1 calorie] is higher than that of most substances eg iron [0.447 J / (g x ^{0}C)] In other words iron needs about one tenth of the heat to raise its temperatureby 1^0C.
- 1J = 0.239 cal or 4.18J = 1cal.
- Water's high specific heat capacity helps moderate air temperatures around large water bodies. It also accounts for sea and land breezes.
- Water is a good storage medium for solar energy.

Evaporation and Condensation

- Because of the hydrogen bonds water absorbs a large amount of heat as it evaporates.
- The heat of vaporization is the amount of energy need to convert 1g of a substance from a liquid to a gas at boiling point.
- The heat of vaporization of water is the amount of energy needed to convert 1g of water at 100^0C to 1g of steam at 100^0C (ΔH_{vap} = 2.26 kJ).
- This is the energy required to break the hydrogen bonds allowing the water molecules to escape.
- The heat of condensation is equal to the heat of vaporization.
- Evaporation and condensation are important in terms of rainfall, cooling etc.

Molar Heat of Vaporisation and Condensation

Molar heat of vaporization (ΔH_{vap}) is the heat, in kJ, required to vaporize one mole of a liquid at a constant temperature.

Molar heat of condensation (ΔH_{cond}) is the heat released when one mole of a gas changes to a liquid at a constant temperature.

$$H_2O_{(l)} \longrightarrow H_2O_{(g)}$$

$\Delta H_{vap} = -\Delta H_{cond}$

water (ΔH_{vap}) = 40.7 kJ/mol
water (ΔH_{cond}) = -40.7 kJ/mol

You get a bad burn from steam when the heat of condensation is released.

Molar Heat of Fusion and Solidification

Molar heat of fusion (ΔH_{fus}) is the heat absorbed by one mole of a substance in changing from a solid to a liquid at a constant temperature.

Molar heat of solidification (ΔH_{sol}) is the heat lost when a liquid changes to a solid at a constant temperature.

$$H_2O_{(s)} \longrightarrow H_2O_{(l)}$$

$\Delta H_{fus} = -\Delta H_{solid}$

(ΔH_{fus}) = 6.01 kJ/mol
(ΔH_{sol}) = -6.01 kJ/mol