

Warm-Up!

Manipulate the equation $q = mc \Delta T$ to solve for the initial temperature of the substance.

$$-T_i = \frac{q}{mc} - T_f \quad \Delta T = T_f - T_i$$
$$T_i = -\frac{q}{mc} + T_f$$

$$3) m = 50.0 \text{ g}$$

$$T_i = 140^\circ \text{C}$$

$$q = -2.5 \text{ kJ}$$

$$q = m(\Delta T)$$

$$-2,500 \text{ J} = (50.0 \text{ g})(2.01)$$

$$-2,500 = (100.5) \left(T_f - 140 \right)$$

$$-24.876 = T_f - 140$$

$$120^\circ \text{C} = T_f$$

$$\begin{aligned} 11) T_i &= 75.0^\circ\text{C} \\ T_f &= 10.0^\circ\text{C} \\ q &= -3.32\text{kJ} \end{aligned}$$

$$\begin{aligned} q &= v(\Delta T) \\ -3.32\text{kJ} &= v(0.0012) \frac{\text{kJ}}{\text{L}\cdot^\circ\text{C}} (-65.0^\circ) \\ -3.32\text{kJ} &= (-0.078 \frac{\text{kJ}}{\text{L}}) v \\ 42.6\text{L} &= v \end{aligned}$$

PHASE CHANGE AND ENTHALPY

Classifying types of systems:

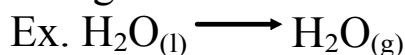
1. Open system - a system where both matter and energy can flow into or out of the system.
2. Closed system - a system where energy is allowed to be transferred into and out but matter cannot be transferred.
3. Isolated system - a system where neither matter nor energy is allowed to enter or leave the system.

ENTHALPY (H) - The total internal (potential) energy and kinetic energy of a system under constant pressure.

⇒ Enthalpy is usually expressed in kJ.



ENTHALPY CHANGE (ΔH) - A change under constant pressure where the surroundings of a system absorb energy or release it to the system.

PHASE CHANGE - is a change in the state of matter without a change in the chemical composition of the system.



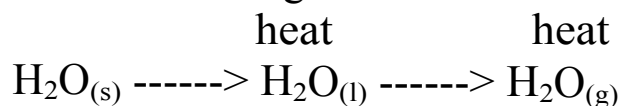
⇒ **always involve a change in energy but never involve a change in temperature.**

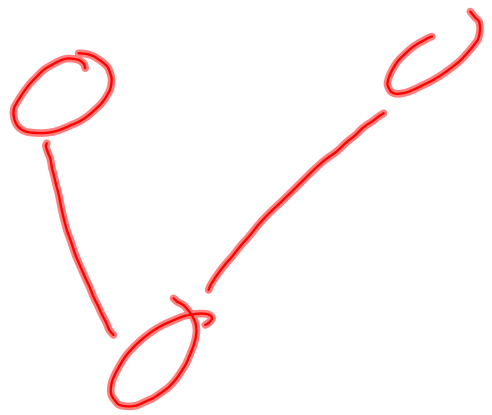
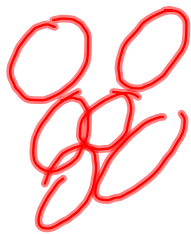
Question:

- (i) Wh 
- (ii) Wh 
- (iii) If energy is still going into the water and the temperature is not increasing, where is the energy going?

The energy is being used to break intermolecular bonds between molecules. This represents a change in phase.

Consider melting ice to water and then boiling water to steam:





MOLAR ENTHALPY ← Title

For any system:

- an exothermic change involves a decrease in enthalpy

⇒ gives off energy to the surroundings

⇒ ΔH is negative.

- an endothermic change involves an increase in enthalpy.

⇒ takes in energy from the surroundings

⇒ ΔH is positive.

The enthalpies for substances undergoing phase changes have been measured experimentally. (TABLE 17.3 p. 522)

- enthalpies are reported as molar enthalpies and are expressed as kJ/mol.