

Warm Up

Calculate the amount of heat released when a 375 g piece of aluminum is cooled from 24.3°C to 15.6°C.

$$q = ?$$

$$m = 375 \text{ g}$$

$$C = 0.900 \frac{\text{J}}{\text{g} \cdot ^\circ\text{C}}$$

$$T_i = 24.3^\circ\text{C}$$

$$T_f = 15.6^\circ\text{C}$$

$$q = mC\Delta T$$

$$q = (375 \text{ g})(0.900 \frac{\text{J}}{\text{g} \cdot ^\circ\text{C}})(-8.7^\circ\text{C})$$

$$q = -2940 \text{ J}$$

$$= -2.94 \text{ kJ}$$

Homework - Worksheet #1-7

$$\textcircled{I} m = 550\text{g}$$

$$T_i = 95.0^\circ\text{C}$$

$$T_f = 30.0^\circ\text{C}$$

$$q = -1.63 \times 10^3 \text{J}$$

$$C = ?$$

$$q = mC\Delta T$$

$$-1.63 \times 10^3 \text{J} = (550\text{g})C(-65.0^\circ\text{C})$$

$$C = \frac{-1630 \text{J}}{(550\text{g})(-65.0^\circ\text{C})}$$

$$C = 0.046 \frac{\text{J}}{\text{g}\cdot^\circ\text{C}}$$

$$\textcircled{II} v = ?$$

$$C = 0.0012 \frac{\text{kJ}}{\text{L}\cdot^\circ\text{C}}$$

$$T_i = 75.0^\circ\text{C}$$

$$T_f = 10.0^\circ\text{C}$$

$$q = -3.32 \text{kJ}$$

$$q = vC\Delta T$$

$$-3.32 \text{kJ} = v(0.0012 \frac{\text{kJ}}{\text{L}\cdot^\circ\text{C}})(-65.0^\circ\text{C})$$

$$v = \frac{-3.32 \cancel{\text{kJ}}}{(0.0012 \cancel{\frac{\text{kJ}}{\text{L}\cdot^\circ\text{C}}})(-65.0 \cancel{^\circ\text{C}})}$$

$$v = 42.6 \text{L}$$

1) 31 200 J

7) 0.0456 J/g °C

2) -31 700 J

8) 424 g

3) 120°C

9) 2.60 J/g °C

4) 28°C

10) 6.21 J

5) 1100 J

11) 42.6 L

6) 14 900 J

PHASE CHANGE AND ENTHALPY

Classifying types of systems:

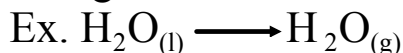
1. Open system - a system where both matter and energy can flow into or out of the system.
2. Closed system - a system where energy is allowed to be transferred into and out but matter cannot be transferred.
3. Isolated system - a system where neither matter nor energy is allowed to enter or leave the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



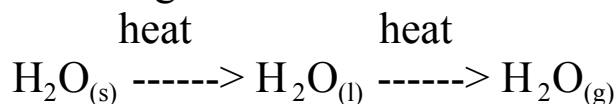
⇒ **always involve a change in energy but never involve a change in temperature.**

Question:

- (i) What is the temperature where water just starts boiling?
- (ii) What is the temperature when water is boiling violently?
- (iii) If energy is still going into the water and the temperature is not increasing, where is the energy going?



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



MOLAR ENTHALPY

For any system:

- an exothermic change involves a decrease in enthalpy
⇒ gives off energy to the surroundings

⇒ H (and ΔH) is negative.

- an endothermic change involves an increase in enthalpy.
⇒ takes in energy from the surroundings

⇒ H (and 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.