


## ANSWER TO "TRY YOURSELF" PROBLEM FROM STUDY SECTION 5.3

### Try Yourself 5.3

Calculate the total quantity of heat energy (in joule and in kilojoule) that is required to melt 50 g of ice and then transform **all** the formed water to steam at 100 °C. (C for water = 4.184 J/g·K; heat of fusion of ice is 333 J/g, and the heat of vaporization for water at 100 °C is 2256 J/g.) Assume a closed system where no heat is lost or gained to the rest of the surroundings.

Try Yourself 5.3 a



1) Calculate the amount of heat necessary to melt all the ice.

$$q_1 = C \times m \quad (\text{no temp. change during phase transformation})$$
$$= 333 \text{ J/g} \times 50 \text{ g}$$
$$= 16650 \text{ J} \rightarrow$$

2) Calculate the amount of heat necessary to heat all the formed H<sub>2</sub>O to the boiling point of H<sub>2</sub>O.

$$q_2 = C \times m \times \Delta T \quad \Delta T = T_f - T_i$$
$$= (4.184 \text{ J/g} \cdot \text{K}) (50 \text{ g}) (100 \text{ K})$$
$$= 20920 \text{ J} \rightarrow$$

3) Calculate the amount of heat necessary to transform all the water at 100 °C to steam

$$q_3 = C \times m \quad (\text{no temp. change during phase transformation})$$
$$= 2256 \text{ J/g} \times 50 \text{ g}$$
$$= 112800 \text{ J} \rightarrow$$

\* Total heat energy =  $q_1 + q_2 + q_3$

$$= 16650 \text{ J} + 20920 \text{ J} + 112800 \text{ J} = 150370 \text{ J}$$
$$\text{or } 150.37 \text{ kJ}$$