Chapter 16 Mastery

Read each questions carefully, Show all your work including any equations you may use. Remember to label all answers with units and rounded to proper sig figs.

1. The temperature of a piece of metal with a mass of 952.4 g changes from 25.0°C to 99.5°C when the metal absorbs 12,999 J of heat. What is the specific heat of this metal?

2. Will the specific heat of a 50.0 g substance be the same as or greater than the specific heat of 10.0 g of the same substance? Why?   (6 points)

3. When two substances, water and copper (III) chloride, are mixed together, the glass beaker becomes warm to the touch. (4 pts)
   a. Is this an endothermic or exothermic reaction? _____

   b. Is the surrounding water experiencing an endothermic or exothermic process?

   _____

4. $2NaHCO_{3(s)} + O_{2\,(g)} \longrightarrow Na_2CO_{3(s)} + H_2O_{(g)} + CO_{2(g)}$ ΔH = -220.2 kJ
Using the above equation calculate the kJ of heat required to decompose 5.4g of $NaHCO_{3(s)}$. (8 points)

5. When ammonia reacts with oxygen gas, nitrogen dioxide and water vapor are produced.

$$\_\_NH_{3(g)} + \_\_O_{2(g)} \longrightarrow \_\_NO_{2(g)} + \_\_H_2O_{(g)} \qquad \Delta H^0 = ?$$

   a. Balance the equation. (2 points)
   b. Find the change in enthalpy (ΔH°_f) for the above equation using the standard heats of formation (6 points)

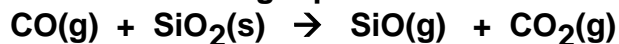 $\Delta H^\circ_f\ NH_{3(g)} = -99.19$ kJ/mol

   $\Delta H^\circ_f\ NO_{2(g)} = 78.85$ kJ/mol

   $\Delta H^\circ_f\ H_2O_{(g)} = -24.88$ kJ/mol

6. What mass of water was heated to a change of 35°C when 56990 J of energy is absorbed by the water? (6 points) specific heat of water = 4.18 J/(g x °C)

7. **Calculate the reaction Enthalpy for the following reaction**
$5CO_2(g) + Si_3N_4 \rightarrow 3SiO(s) + 2N_2O(g) + 5CO(g)$

Use the following equations
$CO(g) + SiO_2(s) \rightarrow SiO(g) + CO_2(g)$ **$\Delta H = +520.9kJ$**

$8CO_2(g) + Si_3N_4(s) \rightarrow 3SiO_2(s) + 2N_2O(g) + 8CO(g)$ **$\Delta H = +461.05kJ$**

8. What is the molar heat of vaporization ($\blacktriangle H_{vap}$) of water if 35.0 g of boiling water require 79 kJ to vaporize?