Thermochemical Equations- Practice Problems

1. Calcium oxide reacts with water to produce calcium hydroxide and 65.2 kJ of heat in the following reaction. Remember the self-heating coffee cup?

   $CaO\ (s) + H_2O\ (l) \rightarrow Ca(OH)_2\ (s) \qquad \Delta H = -65.2\ kJ$

   How much heat is released when 100.0 g of calcium oxide reacts with excess water?

2. The decomposition of baking soda is represented by the following thermochemical equation:

   $2NaHCO_3\ (s) + 129\ kJ \rightarrow Na_2CO_3\ (s) + H_2O\ (l) + CO_2\ (g)$

   Is this reaction exothermic or endothermic?
   What is the heat of reaction (ΔH) value for this reaction?

   Calculate the amount of heat required to decompose 2.24 mol of baking soda.

3. Gasohol contains ethanol (C_2H_5OH), which when burned reacts with oxygen to produce water and carbon dioxide. How much heat is released when 12.5 g of ethanol burns?

   $C_2H_5OH\ (l) + 3O_2 \rightarrow 2CO_2\ (g) + H_2O\ (g) \qquad \Delta H = -1235\ kJ$

4. Distinguish between heat of reaction and heat of solution.

5. How much heat is released when 2.500 mol of NaOH (s) is dissolved in water?
   The $\Delta H_{solution}$ for NaOH is –445.1 kJ/mol

   The thermochemical equation for this reaction is…

   $NaOH\ (s) + H_2O\ (l) \rightarrow Na^+\ (aq) + OH^-\ (aq) + 445.1\ kJ$

6. What kind of information is given in a thermochemical equation?

7. Sodium acetate dissolves in water according to the following equation

   $NaC_2H_3O_2\ (s) \rightarrow Na^+\ (aq) + C_2H_3O_2^-\ (aq) \qquad \Delta H = -17.3\ kJ$

   Would this process increase or decrease the temperature of the water? Explain.

8. The combustion of ethane (C_2H_4) is an exothermic reaction

   $C_2H_4\ (g) + 3O_2\ (g) \rightarrow 2CO_2\ (g) + 2H_2O\ (l) \qquad \Delta H = -1.39 \times 10^3\ kJ$

   Calculate the amount of heat released when 4.79 g of C_2H_4 reacts with excess oxygen. The molar mass of ethane is 28.0 g/mol.