CHM151 (Quiz5b) **25 Pts Fall 2016 Name:** Key

1. (3 Pts) The reaction that represents the standard enthalpy of formation for acetone (CH_3COCH_3), a common ingredient in nail polish remover is:
   A) $3\ C(graphite) + 3\ H_2(g) + \frac{1}{2}\ O_2(g) \rightarrow CH_3COCH_3(l)$
   B) $6\ C(diamond) + 6\ H_2(g) + O_2(g) \rightarrow 2\ CH_3COCH_3(l)$
   C) $3\ C(diamond) + 3\ H_2(g) + \frac{1}{2}\ O_2(g) \rightarrow CH_3COCH_3(l)$
   D) $CH_3COCH_3(l) \rightarrow 3\ C(graphite) + 3\ H_2(g) + \frac{1}{2}\ O_2(g)$
   E) $CH_3COCH_3(l) + 4\ O_2(g) \rightarrow 3\ CO_2(g) + 3\ H_2O(g)$

2. (2 Pts) An endothermic reaction causes the surroundings to
   A) warm up.
   B) become acidic.
   C) condense.
   D) decrease in temperature.
   E) release CO_2.

3. (2 Pts) Which of the following has a $\Delta H°_f = 0$ kJ/mol?

   A) $CO_2(g)$ B) O_3 C) $Cl^-(aq)$ D) $NH_3(aq)$ E) $I_2(s)$

4. (6 Pts) The value of $\Delta H°_{rxn}$ for the following reaction is –6535 kJ/mol.
   $2C_6H_6(l) + 15O_2(g) \rightarrow 12CO_2(g) + 6H_2O(g)$
   How many kilojoules of heat will be evolved during the combustion of 16.0 g of $C_6H_6(l)$?

   $\frac{16.0\ g\ C_6H_6}{1} \left| \frac{mol\ C_6H_6}{78.11\ g\ C_6H_6} \right| \frac{6535\ kJ}{2\ mol\ C_6H_6} =$ 669 kJ signless since the term evolved is used

5. (6 Pts) Calculate the enthalpy for the reaction: (Show all work)
   $C_2H_2(g) + 2H_2(g) \rightarrow C_2H_6(g)$
   Given:
   (1) $2C_2H_2(g) + 5O_2(g) \rightarrow 4CO_2(g) + 2H_2O(g)$ $\Delta H = -2320$ kJ/mol
   (2) $2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(g)$ $\Delta H = -3040$ kJ/mol
   (3) $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$ $\Delta H = -572$ kJ/mol

   C_2H_2: Eq (1) ÷ 2 $C_2H_2(g) + \frac{5}{2}O_2(g) \rightarrow 2CO_2(g) + H_2O(g)$ -1160 kJ
   H_2: Eq (3) as is $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$ -572 kJ
   C_2H_6: Eq (2) reverse ÷ 2 $2CO_2(g) + 3H_2O(g) \rightarrow C_2H_6(g) + \frac{7}{2}O_2(g)$ $+1520$ kJ
   $C_2H_2(g) + 2H_2(g) \rightarrow C_2H_6(g)$ $\Delta H = -212$ kJ

6. (6 Pts) The enthalpy of combustion of acetylene C_2H_2 is described by
   $C_2H_2(g) + (5/2)O_2(g) \rightarrow 2CO_2(g) + H_2O(l)$ $\Delta H°_{rxn} = ?$
   Calculate the enthalpy of combustion of acetylene, given the following enthalpies of formation
   $\Delta H°_f[CO_2(g)] = -393.5$ kJ/mol $\Delta H°_f[H_2O(l)] = -285.8$ kJ/mol $\Delta H°_f[C_2H_2(g)] = 226$ kJ/mol

   $\Delta H°_{rxn} = \sum \Delta H_{products} - \sum \Delta H_{reactants}$
   $\Delta H°_{rxn} = [2(-393.5) + (-285.8)] - [226] =$ −1298.8 kJ