Name _____ Date _____ Class _____

CHAPTER 17 REVIEW

Reaction Energy and Reaction Kinetics

SECTION 17-2

SHORT ANSWER **Answer the following questions in the space provided.**

1. For the following examples, state whether the change in entropy favors the forward or reverse reaction:

_____ **a.** $HCl(l) \rightleftarrows HCl(g)$

_____ **b.** $C_6H_{12}O_6(aq) \rightleftarrows C_6H_{12}O_6(s)$

_____ **c.** $2NH_3(g) \rightleftarrows N_2(g) + 3H_2(g)$

_____ **d.** $3C_2H_4(g) \rightleftarrows C_6H_{12}(l)$

2. _____ **a.** Write an equation that shows the relationship between enthalpy, entropy, and free energy.

_____ **b.** For a reaction to occur spontaneously, the sign of ΔG should be ____.

3. Consider the following reaction: $NH_3(g) + H_2O(l) \rightleftarrows NH_4^+(aq) + OH^-(aq)$ + heat energy

_____ **a.** The enthalpy factor favors the forward reaction. True or False?

_____ **b.** The sign of $T\Delta S^o$ is negative. This means the entropy factor favors the ____.

c. Given that ΔG^o for the above reaction is positive, which term is greater in magnitude and therefore predominates, $T\Delta S$ or ΔH?

_____

_____

_____

4. Consider the following equation for the vaporization of water:

$$H_2O(l) \rightleftarrows H_2O(g) \qquad \Delta H = +40.65 \text{ kJ/mol at } 100°C$$

_____ **a.** Is the forward reaction exothermic or endothermic?

_____ **b.** Does the enthalpy factor favor the forward or reverse reaction?

_____ **c.** Does the entropy factor favor the forward or reverse reaction?

SECTION 17-2 continued

PROBLEMS **Write the answer on the line to the left. Show all your work in the space provided.**

5. Halogens can combine with other halogens to form several unstable compounds. Consider the following equation: $I_2(s) + Cl_2(g) \rightleftarrows 2ICl(g)$
ΔH_f^o for the formation of ICl = +18.0 kJ/mol and $\Delta G^o = -5.4$ kJ/mol.

_____ **a.** Is the forward or reverse reaction favored by the enthalpy factor?

_____ **b.** Will the forward or reverse reaction occur spontaneously at standard conditions?

_____ **c.** Is the forward or reverse reaction favored by the entropy factor?

_____ **d.** Calculate the value of $T\Delta S$ for this system.

_____ **e.** Calculate the value of ΔS for this system at 25°C.

6. Calculate the free energy change for the reactions below. Determine whether each reaction will be spontaneous or nonspontaneous.

_____ **a.** $C(s) + 2H_2(g) \rightarrow CH_4(g)$

$\Delta S^O = -80.7$ J/(mol•K), $\Delta H^O = -75.0$ kJ/mol, $T = 298$ K

_____ **b.** $3Fe_2O_3(s) \rightarrow 2Fe_3O_4(s) + \frac{1}{2}O_2(g)$

$\Delta S^O = 134.2$ J/(mol•K), $\Delta H^O = 235.8$ kJ/mol, $T = 298$ K