

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:



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 _____.

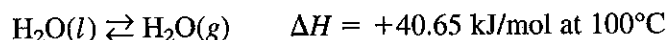
3. Consider the following reaction: $\text{NH}_3(g) + \text{H}_2\text{O}(l) \rightleftharpoons \text{NH}_4^+(aq) + \text{OH}^-(aq) + \text{heat energy}$

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

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

- c. Given that ΔG° 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:



_____ 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: $I_2(s) + Cl_2(g) \rightleftharpoons 2ICl(g)$

ΔH_f° for the formation of ICl = +18.0 kJ/mol and $\Delta G^\circ = -5.4$ 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. $C(s) + 2H_2(g) \rightarrow CH_4(g)$

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

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

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