#### Chapter 19 Practice Problem Set

- 1. Determine whether each of the following process is spontaneous or non-spontaneous.
  - a. Spontaneous / nonspontaneous dissolving table salt in hot soup
  - b. Spontaneous / nonspontaneous ball rolling up A Mountain
  - Spontaneous / nonspontaneous opening a perfume bottle to allow the fragrance to spread through the room
  - d. Spontaneous / nonspontaneous separating helium and neon from a mixture of gases
  - e. Spontaneous / nonspontaneous water solidifying to ice at 3 °C
- Which one of the following processes produces a decrease in the entropy of the system?
  - A. boiling water to form steam
  - B. dissolution of solid KCI in water
  - C. mixing of two gases into one container
  - D. freezing water to form ice
  - E. melting ice to form water
- Which of these species has the largest entropy (5") at 25°C?
  - A) CO(g) B) CHa[g] C) NaCl(s) D) H<sub>2</sub>O(l) E) Fe(s)
- 4. For each of the following pairs, identify which one has a greater number of microstates (W):
  - a. CH<sub>4</sub> or C<sub>2</sub>H<sub>4</sub>
  - b. H<sub>2</sub>O<sub>28</sub> or H<sub>2</sub>O<sub>30</sub>
  - c. 1 mol O<sub>2</sub> occupying 1L a 25°C or 1 mol O<sub>2</sub> occupying 2L at 25°C
- Predict whether each of the following reactions would have a positive or negative entropy change:
  - a. Δ5 ≥ 0 S<sub>(0)</sub> + O<sub>2(0)</sub> → SO<sub>2(0)</sub>
  - b.  $\Delta S \leq 0$   $H_2O_{BS} \rightarrow H_2O_{BS}$
  - c. Δ5 < 0 PCl<sub>2 M</sub> + Cl<sub>2 M</sub> → PCl<sub>2 M</sub>
  - d.  $\Delta S > 0$   $2Na_{(0)} + 2H_2O_{(1)} \rightarrow 2NaOH_{(ac)} + H_{2(0)}$
  - e. AS ≥ 0 N<sub>2(g)</sub> → 2N<sub>g</sub>

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**Karin Nielsen-Saines** 

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