Quiz 18.1 – Entropy

Name: _____

Question 1

For each process, indicate whether the entropy change for the system is positive or negative:

- $H_2O(g) \longrightarrow H_2O(l)$

- $CO_2(s) \longrightarrow CO_2(g)$

- $N_2(g) + 3\,H_2(g) \longrightarrow 2\,NH_3(g)$

- $Na_2CO_3(aq) + H_2SO_4(aq) \longrightarrow Na_2SO_4(aq) + 2\,H_2O(l) + CO_2(g)$

- $NaC_2H_3O_2(aq) \longrightarrow NaC_2H_3O_2(s)$

- The valve on a pressurized gas tank is opened, and gas comes streaming out

- A sample is taken out of the freezer and left on the counter for twenty minutes

Question 2

Use the Boltzmann definition of entropy to find the entropy of each system:

- Tossing a single six-sided die

- Tossing two six-sided dice (consider the dice to be distinguishable)

- A $0.0100\,g$ diamond is cooled to near absolute zero. The only excited state accessible at this temperature is a nuclear spin state, which each carbon atom having an equal probability of being in the excited or ground state (consider the carbon atoms to be distinguishable)

- 4 He atoms are placed in a chamber with two halves. Each atom has equal probability to be in either half of the chamber (consider the He atoms to be indistinguishable)

- 4 different gas particles are placed in a chamber with two halves. Each atom has equal probability to be in either half of the chamber (consider the particles to be distinguishable)

오늘 (*Today*)

By 구상 (Ku Sang)

오늘도 신비의 샘인 하루를 맞는다.

이 하루는 저 강물의 한 방울이
어느 산골짝 옹달샘에 이어져 있고
아득한 푸른 바다에 이어져 있듯
과거와 미래와 현재가 하나다.

이렇듯 나의 오늘은 영원 속에 이어져
바로 시방 나는 그 영원을 살고 있다.

그래서 나는 죽고 나서부터가 아니라
오늘서부터 영원을 살아야 하고
영원에 합당한 삶을 살아야 한다.

마음이 가난한 삶을 살아야 한다.
마음을 비운 삶을 살아야 한다.

Today again I meet a day, a well of mystery.

Like a drop of that river extends to
a spring of a valley and then to
the faraway blue sea, for this day
the past, the future, and the present are one.

So does my today extend to eternity,
and right now I am living the eternity.

So, starting from today, I should live
eternity, not after I die,
and should live a life that deserves eternity.

I should live the life of a poor heart.
I should live the life of an empty heart.