Chapter 21   Entropy and the Second Law of Thermodynamics

21-2   Change In Entropy

21-02

Question 364
One mole of an ideal monatomic gas is heated quasi-statically at constant volume from 100 K to 105 K. What is the change in entropy of the gas?
(a)   0.18 J/K.
(b)   0.26 J/K.
(c)   0.61 J/K.
(d)   1.03 J/K.
(e)   1.39 J/K.

21-02
0.47-52%

Question 365
Suppose that 10 kg of water at 50 degree-C is mixed with an equal amount of water at 10 degree-C. When thermal equilibrium is reached, what is the change in entropy of the mixture? The specific heat of water is 4186 J/kg*K.
(a)   250 J/K
(b)   130 J/K
(c)   246 J/K
(d)   551 J/K
(e)   183 J/K

21-02
0.41-53%

Question 366
Five moles of an ideal diatomic gas (Cp = 7R/2) is taken through an isovolumetric process. If the final pressure is five times the initial pressure, what is the change in entropy of the gas?
(a)   234 J/K
(b)   -234 J/K
(c)   -167 J/K
(d)   167 J/K
(e)   -151 J/K

21-02
0.51-45%

Question 367
Find the change in entropy when 100 g of ice at 0 degree-C is heated slowly to 80 degrees-C. (C(water) = 1.0 cal/g*degree-C, L(f) = 80 cal/g).
(a)   85 cal/K
(b)   25 cal/K
(c)   62 cal/K
(d)   12 cal/K
(e)   55 cal/K

21-02

Question 368
The left-hand side of the container shown in Figure 2 contains 5 moles of nitrogen gas, in thermal equilibrium with the right hand side, which contains 3 moles of hydrogen gas. The two sides are separated by a partition, and the container is insulated. After the partition is broken, what is the change in entropy of the system?
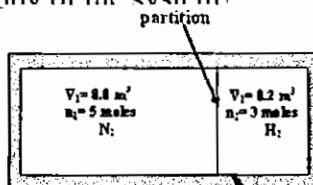

Figure 2

(a)   34 J/K
(b)   58 J/K
(c)   zero
(d)   12 J/K
(e)   49 J/K

21-02
Question 369
A container holds 240 g of water at 8 degrees-C. The container is placed in a refrigerator maintained at - 5 degrees-C. Calculate the change in entropy of the water after it is in thermal equilibrium with the refrigerator. C(ice)=2090 J/kg*K,C(water)=4186 J/kg*K, Lf=3.33*10**(5) J/Kg.
(a)   331 J/K
(b)   -331 J/K
(c)   -254 J/K
(d)   -172 J/K
(e)   254 J/K

21-02
Question 370   0.24-43%
Consider 5 moles of a isolated ideal gas initially at a pressure P1 and volume V1. The gas expands freely to a final pressure P2 and volume V2. If the entropy change during this process is 16.6 J/K, then the ratio of the final pressure to the initial pressure is:
(a)   0.67
(b)   3.0
(c)   0.33
(d)   0.50
(e)   1.5

21-02
Question 371   0.29-30%
When an ideal gas is subjected to a reversible adiabatic compression process, which one of the following statements is TRUE:
(a)   The gas rejects heat.
(b)   No work is done on the gas.
(c)   The entropy of the gas does not change.
(d)   The gas absorbs heat.
(e)   The internal energy of the gas does not change.

21-02
Question 372
A 10 kg piece of ice at 0 degree Celsius is changed slowly and reversibly to water at 70 degrees Celsius. What is the change in entropy of the Ice?
(a)   -2.2*10**4 J/K.
(b)   6.5*10**4 J/K.
(c)   2.2*10**4 J/K.
(d)   -6.5*10**4 J/K.
(e)   -3.4*10**4 J/K.

21-02
Question 373
What is the change in entropy of 200-g of water as its temperature increases from 0 degrees Celsius to 50 degrees Celsius. [For water: the specific heat = 4.19 kJ/(kg.K) and the latent heat of fusion = 333 kJ/kg.]
(a)   2.55*10**3 J/K.
(b)   1.41*10**2 J/K.
(c)   4.19*10**3 J/K.
(d)   0.35*10**3 J/K.
(e)   3.35*10**3 J/K.

Question 374
An ideal monatomic gas is confined to a cylinder by a piston. The piston is slowly pushed in so that the gas temperature remains at 27 degree C. During the compression, 750 J of work is done on the gas. The change in the entropy of the gas is:
(a)   3.0 J/K.
(b)   - 2.5 J/K.
(c)   2.5 J/K.
(d)   Zero.
(e)   - 3.0 J/K.

Question 375
240 grams of water at 8 degrees-C are cooled to ice at at - 5 degrees-C. Calculate the change in entropy of the water. c(ice)=2090 J/kg*K, c(water)=4186 J/kg*K, Lf=3.33*10**(5) J/Kg.
(a)   -254 J/K.
(b)   -172 J/K.
(c)   254 J/K.
(d)   331 J/K.
(e)   -331 J/K.

Question 376
50.0 g of water at 15.0 degrees-C are converted slowly into ice at - 15.0 degrees-C. What is the change of entropy of water ? specific heat of water = 4190 J/kg.K., specific heat of ice = 2220 J/kg.K., Lf = 333kJ/kg, Lv = 2256kJ/kg
(a)   - 17.5 J/K
(b)   + 83.4 J/K
(c)   - 78.5 J/K
(d)   + 78.5 J/K
(e)   - 83.4 J/K

Question 377
One mole of an ideal monatomic gas expands at constant pressure to three times its initial volume What is the change of entropy of the gas in this process ?
(a)   + 22.8 J/K
(b)   + 9.13 J/K
(c)   - 22.8 J/K
(d)   - 13.7 J/K
(e)   + 13.7 J/K

Question 378
A 4.0-kg piece of iron at 800 K is dropped into a lake whose temperature is 280 K. Assume that the lake is so large that its temperature rise is negligible. Find the change in the entropy of the lake. [specific heat of iron = 0.11 kcal/kg.K].
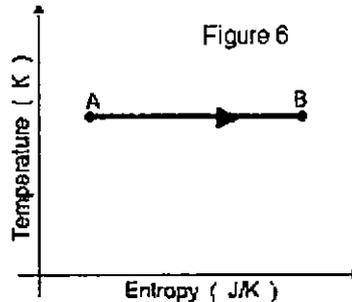(a)   - 0.20 kcal/K
(b)   + 0.20 kcal/K
(c)   + 0.82 kcal/K
(d)   zero
(e)   - 0.82 kcal/K

21-02
Question 379   (.27-47%
A sample of an ideal monatomic gas undergoes the reversible process A to B displayed in the
T-S diagram shown in figure 6. The process is :

Figure 6

(a)   a change of phase.
(b)   an isothermal compression.
(c)   a constant-volume process.
(d)   an isothermal expansion.
(e)   a free expansion.

21-02
Question 380   (.21-74%
The change in entropy is zero for
(a)   reversible processes during which no work is done.
(b)   reversible isothermal processes.
(c)   reversible isobaric processes.
(d)   all adiabatic processes.
(e)   reversible adiabatic processes.

21-02
Question 381   (.44-45%
Five moles of an ideal gas undergo a reversible isothermal compression from volume V to
volume V/2 at temperature 30 degrees C. What is the change in the entropy of the gas?
(a)   29 J/K.
(b)   -81 J/K.
(c)   -29 J/K.
(d)   -18 J/K.
(e)   18 J/K.

21-02
Question 382   ₦.26-83%
One mole of a monatomic ideal gas is taken from an initial state (i) to a final state (f) as
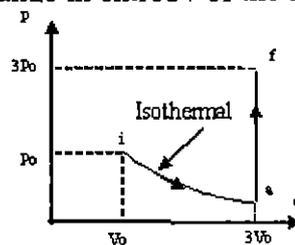shown in figure 1. Calculate the change in entropy of the gas for this process.

Figure 1

(a)   1.25 J/K.
(b)   36.5 J/K.
(c)   11.2 J/K.
(d)   22.5 J/K.
(e)   25.0 J/K.

21-02
Question 383
0.44-62%
You mix two samples of water, A and B. Sample A is 100 g at 20 degree-C and sample B is also 100 g but at 80 degree-C. Calculate the change in the entropy of sample B.
(a)   8.9 cal/K.
(b)   9.7 cal/K.
(c)   - 9.7 cal/K.
(d)   zero.
(e)   - 8.9 cal/K.

21-02
Question 384
0.26-45%
Which of the following statements is correct?
(a)   For an adiabatic process the change in entropy is negative if it is done irreversibly.
(b)   The efficiency of a Carnot engine is 100%.
(c)   For an isothermal expansion the change in entropy of an ideal gas is zero.
(d)   A Carnot engine does not reject any heat as waste.
(e)   For an adiabatic process the change in entropy is zero if it is done reversibly.

21-02
Question 385
0.55-58%
Five moles of an ideal monatomic gas are allowed to expand isobarically. The initial volume is 20.0 cm**3 and the final volume is 100 cm**3. Find the change in entropy of the gas.
(a)   67.0 J/K
(b)   100 J/K
(c)   152 J/K
(d)   52.0 J/K
(e)   167 J/K

21-02
Quest on 386
0.42-66%
10.0 kg of water at zero degrees-C are mixed with 10.0 kg of water at 100 degrees-C. The specific heat of water is 4.19 kJ/kg.K. The change in entropy of the system is
(a)   1.02 kJ/K
(b)   6.03 kJ/K
(c)   7.05 kJ/K
(d)   13.1 kJ/K
(e)   zero

21-02
Quest on 387
0.41-29%
One mole of an ideal gas undergoes an isothermal expansion in which its volume increases to five times its initial value. What is the change of entropy of the gas in this process?
(a)   12.5 J/K
(b)   4010 J/K
(c)   20.1 J/K
(d)   13.4 J/K
(e)   zero

21-02
Quest on 388
0.28-60%
Two moles of an ideal gas undergo an adiabatic free expansion from an initial volume of 0.6 L to 1 3 L. Calculate the change in entropy of gas.
(a)   -12.9 J/K.
(b)   -5.3 J/K.
(c)   16.6 J/K.
(d)   12.9 J/K.
(e)   zero.