Q1)

Given that: kPa, , K, and

a) The equation of ideal gives us

b) For the isochoric baric, we have

Then, the final temperature is

The heat transfer for isochoric baric is given by

For monatomic gas J release J

For diatomic gas J release J

For polyatomic gas J release J

Q2)

Given that: g, , J, and .

a) Since, we have

The mean free path of molecules is given by

b) The translational kinetic energy of a nitrogen molecule is given by

Then the average speed for the molecules is

Thus, the frequency of collisions is

Q3)

Given that: mole, m/s.

a) The average speed of the nitrogen molecules is given by

Solve for temperature , we get

The total translational kinetic energy for the gas is

b) The problem gives us

Simplify the above equation gives us

The total translational kinetic energy for the gas when temperature increased is

Thus, the energy has to provide is

Q4)

Since, for water , then, 200 and 44 water equivalent with 200 g and 44 g, respectively. Assume that the specific heat capacity for water and ice and heat fusion are , respectively.

From the given conditions, we have the following heat transfer diagram

Ice:

Water:

a) The increased volume of water is the amount of ice melted. Therefore, g.

The equation of thermal equilibrium gives us

b)

We have

Thus, the change in entropy of system is

The physical meaning of this result is that the process of ice block melts in water is irreversible process due to via second law of thermodynamics.

Q5)

Given that: K and K. For the diatomic ideal gas .

a) For the isochoric process from a to b :

For the isothermal process from b to c :

For the isobaric process from c to a:

K.

Thus, the net energy providing the gas as heat is

b) For a close cycle: