

Answer on Question#41108-Chemistry-Physical Chemistry

Question:

The standard enthalpy change for this process is 6.01 kJ/mol. What is the minimum value for the standard entropy change, on the basis of your conclusions about the spontaneity?

Solution.

For a process at constant temperature and pressure, ΔG in the Gibbs free energy is:

$$\Delta G = \Delta H - T\Delta S$$

When ΔG is negative, a process proceeds spontaneously in the forward direction. So, we can calculate the minimum value for the standard entropy change:

$$\Delta G = 0$$

$$\Delta H = T\Delta S_{\min}$$

$$\Delta S_{\min} = \frac{\Delta H}{T}$$

According to the task, the conditions are standard. It means that the temperature is 298.15 K.

$$\Delta S_{\min} = \frac{6010}{298.15} = 20.16 \text{ J/K}$$

Answer: $\Delta S_{\min} = 20.16 \text{ J/K}$