Answer on the question #41911, Chemistry, Physical Chemistry

Question

Calculate the change in Gibbs Free energy of 1 mol N2 when its temperature is raised from 298 K to 348 K at 2 atm pressure. Given that the molar entropy of N2, measured in J/K.mol is given by S=A+BlnT, with A=25.1 and B=29.3 in SI unit

Solution

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

$$\frac{\partial \Delta G}{\partial T} = -\Delta S$$

$$\Delta S = S2 - S1 = Bln\frac{T_2}{T_1} = 29.3 * \ln\left(\frac{348}{298}\right) = 4.545 \ \frac{J}{K * mol}$$

$$\Delta G = -T * \Delta S = -348 * 4.545 = -1581.55 \ \frac{J}{mol}$$

Answer: -1581.55 J/mol