Answer on Question #79418, Chemistry / General Chemistry

For the reaction H2(g) + Cl2(g) -> 2HCl(g) deltaG=-190.2 kJ and deltaS=20 J/K at 280 K and 1 atm. The maximum amount of work that could be done be this reaction when 1.98 moles of H2(g) react at standard conditions at this temperature is

Solution

Gases can do work through expansion or compression against a constant external pressure.
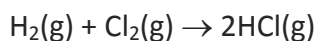
Work done by gases can be calculated as:

$w = -P_{external} \times \Delta V$

where $P_{external}$ is the external pressure

ΔV is the change in the volume of a gas.

We can see from the equation:

$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$

that there is no increase in moles of gas (1 mole of H_2 + 1 mole of Cl_2 = 2 moles of HCl, e.i. 2=2) and the products occupy the same volume as the reactants. Therefore $\Delta V = 0$ and no work is done:

$w = - 1 \text{ atm} \times 0 = 0$.

Answer: w=0