Entropy Change in an isothermal expansion of ideal gas

$$q_{rev} = -w$$

$$-w = nRT \ln (V_2/V_1)$$

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$$\Delta S = q_{rev}/T = 1/T \times nRT \ln V_2/V_1 = nR \ln (V_2/V_1)$$

Example 3. 5 moles of an ideal gas expand reversibly from a volume of 8 dm^3 to 80 dm^3 at a temperature of 27°C. Calculate the change in entropy.

Entropy Changes in Reversible and Irreversible Process

Isothermal Reversible Expansion in vacuum

For Surrounding

Since there is no opposing force, the work done (w) by the system will be *zero*. Further, since there is no change in temperature during the process, there will be no change in the internal energy of the system, *i.e.*, $\Delta U=0$. Hence, from the First law equation, $q=0$, *i.e.*, no heat is absorbed or evolved in the process. In other words, no heat is supplied to or removed from the surroundings. The entropy of the surroundings, therefore, remains unchanged.

For System

$$\Delta S = R \ln (V_2/V_1)$$

Total Increase in Entropy

$$\Delta S = R \ln (V_2/V_1)$$