

### Answer on Question #67209-Physics-Molecular Physics-Thermodynamics

One mole of an ideal gas expands isothermally to five times its initial volume.

Calculate the entropy change in terms of R, the gas constant.

#### Solution

The entropy change is

$$\Delta S = S_2 - S_1 = \int_{V_1}^{V_2} \frac{\delta Q}{T}$$

$$\delta Q = pdV + dU.$$

For one mole of an ideal gas:

$$p = \frac{RT}{V}.$$

$dU = 0$  for isothermal process.

Thus,

$$\Delta S = \frac{1}{T} \int_{V_1}^{V_2} pdV = \frac{1}{T} \int_{V_1}^{V_2} \frac{RT}{V} dV = R \int_{V_1}^{V_2} \frac{1}{V} dV = R \ln \frac{V_2}{V_1}$$

The entropy change in terms of R is

$$\Delta S = R \ln 5$$

Answer provided by <https://www.AssignmentExpert.com>