Answer on Question #70209, Physics / Molecular Physics / Thermodynamics

Question Suppose 2.84 moles of a monatomic ideal gas expand adiabatically, and its temperature decreases from 384 to 266 K. Determine (a) the work done (including the algebraic sign) by the gas, and (b) the change in its internal energy.

Solution In the adiabatic process all the change in internal energy is in the form of work done. In our case work done by gas is positive. The expression for work is:

$$W = \int_{V_i}^{V_f} PdV$$

$$PV^{\gamma} = const = K$$

$$W = K\frac{V_f^{1-\gamma} - V_i^{1-\gamma}}{1-\gamma}$$

But here is the problem: this work can not be found as we don't have initial volume nor initial pressure. Indeed, having two equation

$$PV = \nu RT$$

$$PV^{\gamma} = K$$

we have three unknown: V, P, K. Therefore, this problem can not be solved.