

Physics 102  
Quiz # 4  
Chapter 20

Name: Solution

Id: \_\_\_\_\_

Sec. #: \_\_\_\_\_

One mole of oxygen molecules at an initial temperature of 310 K expands adiabatically from an initial volume of 12 L to a final volume of 19 L. What is the final temperature of the gas? Assume that the gas is ideal.

Since the process is adiabatic

$$T_i V_i^{\gamma-1} = T_f V_f^{\gamma-1}$$

$O_2$  is a diatomic gas  $\Rightarrow \gamma = \frac{7}{5} = 1.4$

$$\begin{aligned} T_f &= T_i \left( \frac{V_i}{V_f} \right)^{\gamma-1} \\ &= 310 \left( \frac{12}{19} \right)^{1.4-1} \end{aligned}$$

$$\Rightarrow \boxed{T_f = 258 \text{ K}}$$