

This print-out should have 14 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Please notice that for your homework to be considered towards your grade, it needs to be submitted one hour before the corresponding recitation starts.

PLEASE REMEMBER THAT YOU MUST CARRY OUT YOUR CALCULATIONS TO AT LEAST THREE SIGNIFICANT FIGURES. YOUR ANSWER MUST BE WITHIN ONE PERCENT OF THE CORRECT RESULT TO BE MARKED AS CORRECT BY THE SERVER.

001 (part 1 of 2) 4 points

Air in the cylinder of a diesel engine at 18.5°C is compressed from an initial pressure of 0.809 atm and of volume of 792 cm^3 to a volume of 79.5 cm^3 .

Assuming that air behaves as an ideal gas ($\gamma = 1.40$) and that the compression is adiabatic and reversible, find the final pressure. Answer in units of atm.

002 (part 2 of 2) 3 points

Find the final temperature under the same assumptions as above. Answer in units of $^\circ\text{C}$.

003 (part 1 of 2) 4 points

Helium gas at $T_i = 15^\circ\text{C}$ is compressed reversibly without heat loss to one-fifth its initial volume. $\gamma_1 = 1.67$.

What is its temperature after compression? Answer in units of K.

004 (part 2 of 2) 3 points

What if the gas is dry air (23 percent O_2 , 77 per N_2)? $\gamma_2 = 1.4$. Answer in units of K.

005 (part 1 of 4) 4 points

5.5 L of diatomic gas ($\gamma = 1.4$) confined to a cylinder are put through a closed cycle. The gas is initially at 1.1 atm and at 310 K. First, its pressure is tripled under constant volume. Then it expands adiabatically to its original pressure and finally is compressed isobarically

to its original volume.

Determine the volume at the end of the adiabatic expansion. Answer in units of L.

006 (part 2 of 4) 4 points

Find the temperature of the gas at the start of the adiabatic expansion. Answer in units of K.

007 (part 3 of 4) 3 points

Find the temperature at the end of the adiabatic expansion. Answer in units of K.

008 (part 4 of 4) 3 points

What is the net work done for this cycle? Answer in units of J.

009 (part 1 of 3) 4 points

Five moles of a certain diatomic molecular gas are heated at constant pressure from 310 K to 427 K.

The heat capacity of this gas under constant pressure is $28.8\text{ J/mol}\cdot\text{K}$. The universal gas constant is $8.31451\text{ J/mol}\cdot\text{K}$.

Calculate the heat transferred to the gas. Answer in units of J.

010 (part 2 of 3) 4 points

Calculate the increase in its internal energy. Answer in units of J.

011 (part 3 of 3) 3 points

Calculate the work done by the gas. Answer in units of J.

012 (part 1 of 3) 4 points

2 mol of an idea gas ($\gamma = 1.4$) expands slowly and adiabatically from a pressure of 7 atm and a volume of 15 L to a final volume of 31 L.

The universal gas constant is $8.31451\text{ J/K}\cdot\text{mol}$.

What is the final pressure? Answer in units of atm.

013 (part 2 of 3) 4 points

What is the initial temperature? Answer in units of K.

014 (part 3 of 3) 3 points

What is the final temperature? Answer in units of K.