

Name _____

Physics 4B

Final Exam

*Carefully read and solve the following problems. Clearly indicate which part of the problem you are solving in each area. Solve all problems algebraically first, **the algebraic solution is much more important than the numeric solution**. Write out the equations that you are using and show all work to get your answer. You will be graded on how you solve the problems, not just the final answer. You may assume an answer and go on, but clearly state and circle this assumption. Your answers may be in any units, but if no units are given then your value must match the correct value in SI units. Give numeric answers to three significant figures, and clearly **box the final answer!***

1. A container is filled with diatomic oxygen gas (O_2 , $M=32g/mol$).

At point 1, this gas initially fills a volume of $0.0500 m^3$ at a pressure of $1.25 atm$ and a temperature of $89.3^\circ F$.

This gas undergoes an adiabatic expansion to point 2, to fill $75.0 L$.

Then, it goes through an isothermal expansion to point 3 so it fills $100.0 L$.

Then, the gas is isobarically compressed back to point 4 with its initial volume of $0.0500 m^3$.

Finally, the gas is isochorically heated back to its original temperature of $89.3^\circ F$.

- a. Find the translational kinetic energy of one molecule, the total kinetic energy of all molecules, and the root mean square speed of a single molecule in the container at point 1.
- b. Draw a detailed pV diagram showing the process the gas goes through.
- c. Find the total heat that enters the gas, total heat that leaves the gas, and total work done by the gas for the entire cycle.