PHYSICS 211
FOUNDATIONS OF PHYSICS III

TEST #1: THERMODYNAMICS
October 25, 2004

Do all the problems. Show your work and circle your answers.

1. According to the kinetic theory, how much energy is contained in 2 m^3 of an ideal monatomic gas at atmospheric pressure and 20°C?

2. A piston contains 3 liters of an ideal diatomic gas at atmospheric pressure and 0°C. An adiabatic process takes the gas to half its original volume, then an isobaric process brings it to 0°C again. What is the total work done by the gas?

3. A 200 g copper container is at a temperature of 20°C. Into the container 20 g of ice at -10°C and 150 g of water at 75°C are placed. What will be the equilibrium temperature of this system ?

4. Estimate the maximum efficiency of an engine that takes heat from your body and releases heat to the outside air on a winter day.

5. Lead has a density of 11.4 g/cm^3. Suppose a cube of lead 5 cm on each side is at atmospheric pressure. Heat is added to the cube until its volume increases by 2 percent. What is the change in its internal energy?

6. An ideal monatomic gas at pressure P_0 is to be reversibly compressed until the pressure is $2P_0$. Determine whether the entropy change of the gas will be greater for an isovolumetric compression or an isothermal compression.