••13. Air that initially occupies 0.140 m^3 at a gauge pressure of 103.0 kPa is expanded isothermally to a pressure of 101.3 kPa and then cooled at constant pressure until it reaches its initial volume. Compute the work done by the air. (Gauge pressure is the difference between the actual pressure and atmospheric pressure.)

••44. Under constant pressure, the temperature of 2.00 mol of an ideal monatomic gas is raised 15.0 K. What are (a) the work *W* done by the gas, (b) the energy transferred as heat *Q*, (c) the change ΔE_{int} in the internal energy of the gas, and (d) the change ΔK in the average kinetic energy per atom?

••46. One mole of an ideal diatomic gas goes from *a* to *c* along the diagonal path in Fig. 19-25. The scale of the vertical axis is set by p_{ab} = 5.0 kPa and p_c = 2.0 kPa, and the scale of the horizontal axis is set by V_{bc}=4.0 m^3 and V_a = 2.0 m^3. During the transition, (a) what is the change in internal energy of the gas, and (b) how much energy is added to the gas as heat? (c) How much heat is required if the gas goes from *a* to *c* along the indirect path *abc*?

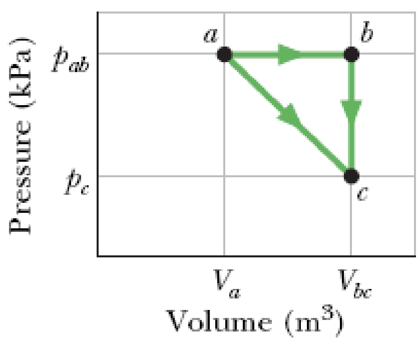

FIGURE 19-25 Problem 46.

••48. When 20.9 J was added as heat to a particular ideal gas, the volume of the gas changed from 50.0 cm^3 to 100 cm^3 while the pressure remained at 1.00 atm. (a) By how much did the internal energy of the gas change? If the quantity of gas present was 2.0 x 10^{-3} mol, find (b) C_p and (c) C_V.

••53. Suppose 4.00 mol of an ideal diatomic gas, with molecular rotation but not oscillation, experienced a temperature increase of 60.0 K under constant-pressure conditions. What are (a) the energy transferred as heat Q, (b) the change ΔE_{int} in internal energy of the gas, (c) the work W done by the gas, and (d) the change ΔK in the total translational kinetic energy of the gas?

•54. Suppose 1.00 L of a gas with γ = 1.30, initially at 273 K and 1.00 atm, is suddenly compressed adiabatically to half its initial volume. Find its final (a) pressure and (b) temperature. (c) If the gas is then cooled to 273 K at constant pressure, what is its final volume?

••61. The volume of an ideal gas is adiabatically reduced from 200 L to 74.3 L. The initial pressure and temperature are 1.00 atm and 300 K. The final pressure is 4.00 atm. (a) Is the gas monatomic, diatomic, or polyatomic? (b) What is the final temperature? (c) How many moles are in the gas?

•••63. Figure 19-27 shows a cycle undergone by 1.00 mol of an ideal monatomic gas. The temperatures are T1 = 300 K, T2 = 600 K, and T3 = 455 K. For $1 \longrightarrow 2$, what are (a) heat *Q*, (b) the change in internal energyΔEint, and (c) the work done *W*? For $2 \longrightarrow 3$, what are (d) *Q*, (e) ΔEint, and (f) *W*? For $3 \longrightarrow 1$, what are (g) *Q*, (h) ΔEint, and (i) *W*? For the full cycle, what are (j) *Q*, (k) ΔEint, and (l) *W*? The initial pressure at point 1 is 1.00 atm. What are the (m) volume and (n) pressure at point 2 and the (o) volume and (p) pressure at point 3?

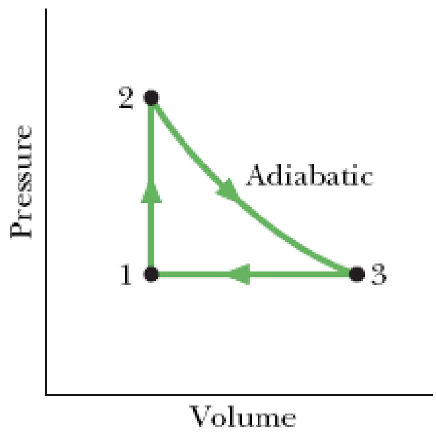

FIGURE 19-27 Problem 63.

76. An ideal gas, at initial temperature T_1 and initial volume 2.0 m^3, is expanded adiabatically to a volume of 4.0 m^3, then expanded isothermally to a volume of 10 m^3, and then compressed adiabatically back to T_1. What is its final volume?