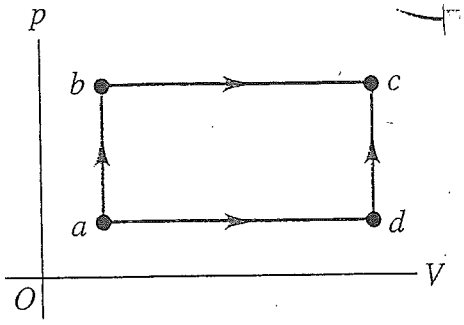
19.28. Three moles of an ideal monatomic gas expands at a constant pressure of 2.50 atm; the volume of the gas changes from $3.20 \times 10^{-2}\ \text{m}^3$ to $4.50 \times 10^{-2}\ \text{m}^3$. (a) Calculate the initial and final temperatures of the gas. (b) Calculate the amount of work the gas does in expanding. (c) Calculate the amount of heat added to the gas. (d) Calculate the change in internal energy of the gas.

19.44. A thermodynamic system is taken from state a to state c in Fig. 19.29 along either path abc or path adc. Along path abc, the work W done by the system is 450 J. Along path adc, W is 120 J. The internal energies of each of the four states shown in the figure are $U_a = 150$ J, $U_b = 240$ J, $U_c = 680$ J, and $U_d = 330$ J. Calculate the heat flow Q for each of the four processes ab, bc, ad, and dc. In each process, does the system absorb or liberate heat?

Figure **19.29** Problem 19.44.



19.48. Three moles of an ideal gas are taken around the cycle abc shown in Fig. 19.31. For this gas, $C_p = 29.1\ \text{J/mol} \cdot \text{K}$. Process ac is at constant pressure, process ba is at constant volume, and process cb is adiabatic. The temperatures of the gas in states a, c, and b are $T_a = 300$ K, $T_c = 492$ K, and $T_b = 600$ K. Calculate the total work W for the cycle.

Figure **19.31** Problem 19.48.