Chapter 8: Hints

8h-1 The heat absorbed during an infinitesimal process is T dS. The total heat absorbed, which is the sum of all the successive infinitesimal heats, is then simply related to the area under the curve.

8h-2 The change of entropy between two macrostates depends only on the inital and final states. This change of entropy must, therefore, be the same as if one went from one state to the other by means of a *quasi-static* process. What then is this change of entropy, and how does it differ from the change of entropy calculated in the preceding problem?

8h-3 Is the situation where the polumer chains are nearly aligned more or less random than the original situ3ation where they are coiled up? Which situation corresponds then to the larger entropy?

Chapter 8: Answers

8a-1 (a) 0. (b) 0. (c) 0. (d) R ln2. Same. (e) R ln2. (f) Irreversible.

8a-2 (a) Larger. (b) Larger. (c) Would increase, must decrease.
(d) Decrease, increase.

8a-3 (a) 0. (b) $T_B\,(S_C - S_A)$. (c) $-\frac{1}{2}(T_B + T_A)\,(S_C - S_A)$.
(d) Positive, negative. (e) $-\frac{1}{2}(T_B - T_A)\,(S_C - S_A)$.

8a-4 (a) $-RT \ln(V_B/V_A)$. (b) 0. (c) $RT \ln(V_B/V_A)$. (d) $R \ln(V_B/V_A)$.
(e) $R \ln(V_B/V_A)$. Yes.

8a-5 (a) Yes, no, $C_V \ln(T_B/T_A)$. (b) Yes, yes, $C_p \ln(T_B/T_A)$.

8a-6 (a) Yes (e.g., adiabatic compression of an ideal gas).
(b) Yes (e.g., free expansion of a thermally insulated non-ideal gas so that its volume increases without any work being done on it).
(c) Yes (e.g., adiabatic quasi-static expansion of an ideal gas).

8a-7 (a) Larger. (b) Smaller. (c) Would decrease, must increase.
(d) Increase, decrease.

8a-9 (a) $S = \text{constant} + kN\,[\ln V + \frac{3}{2}\ln E)$.
(b) $S = \text{constant} + kN\,[\ln V + \frac{3}{2}\ln T)$. (c) $T\,V^{3/2} = \text{constant}$. Yes.

8a-10 (a) $-RT \ln 2$. (b) 0. (c) $RT \ln 2$. (d) $R \ln 2$. (e) $-R \ln 2$. (f) 0.
(g) Reversible.

8a-12 See Fig. 8a-12.

	ΔT	Δp	ΔE	ΔS
slow, isothermal	0	0	+	−
slow, adiabatic	−	−	0	−
fast, adiabatic	0	0	+	−

Fig. 8a-12.