

Problem Set XII- Assign December 6, 2006 Due December 8, 2006.

Fall 2006 Physics 200a

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(Turn the problem set into Mara Baraban's box in the SPL mail room by 5pm on 12/8.)

1. What is the increase in entropy if one gram of ice at $0^\circ C$ is melted and heated to $50^\circ C$?
2. Find the change in entropy if 500 g of water at $80^\circ C$ is added to 300 g of water at $20^\circ C$. (None of the heat is lost from the system.)
3. Consider a mole of a gas initially at $1 \equiv (P_1, V_1)$ and finally at $2 \equiv (P_2, V_2)$. Since $S_2 - S_1$ is path independent, choose the simple path shown in Figure (1) by first changing pressure at constant volume and then volume at constant pressure. Let $0 = (P_0, T_0)$ be the intermediate point you go through. Show that

$$S_2 - S_1 = C_P \ln \left(\frac{T_2}{T_1} \right) - R \ln \left(\frac{P_2}{P_1} \right).$$

Show that if 1 and 2 lie on an adiabatic curve, this difference vanishes. Assume $C_p = C_V + R$, but not a particular value to C_V .

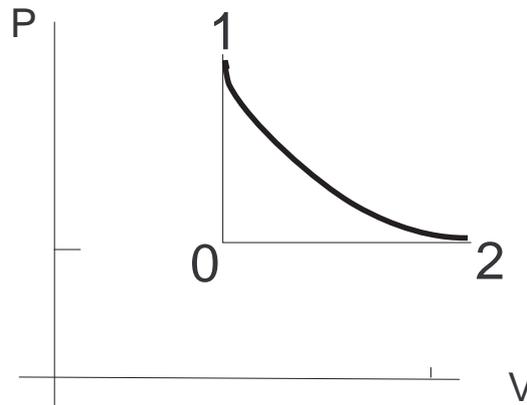


FIG. 1: To compute entropy difference $S_2 - S_1$ go from 1 to 0 at constant volume and then from 0 to 2 at constant pressure.

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