

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

Fall 2006 Physics 200a

R. Shankar

(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°C is melted and heated to 50°C ?
2. Find the change in entropy if 500 g of water at 80°C is added to 300 g of water at 20°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 .

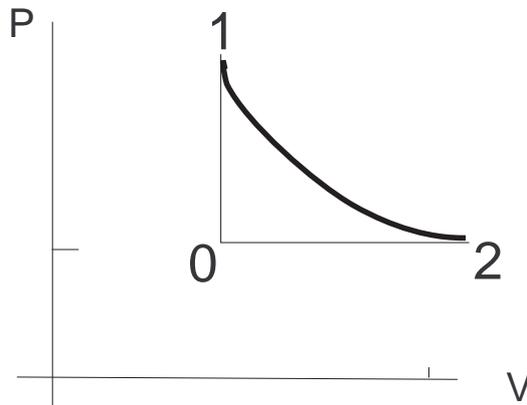


FIG. 1: To compute entropy difference $S_2 - S_1$ go from 1 to 0 at constant volume and then from 0 to 2 at constant pressure.