

**Physics 102-Rec**  
**Quiz # 4**  
**Chapter 21**

Date: 31 March 2002

Name:

Key

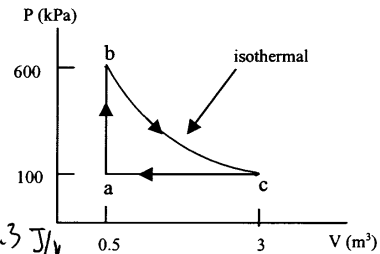
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Sect:

Consider one mole of an ideal monatomic gas taken through the reversible processes shown in the P-V diagram. Calculate the change in entropy for the process:

(a) Process ab.

$$\begin{aligned}\Delta S &= n C_v \ln \left( \frac{T_b}{T_a} \right) \\ &= (1) \left( \frac{3}{2} \times 8.31 \right) \ln \left( \frac{600 \times 0.5}{100 \times 0.5} \right) \\ &= (1) \left( \frac{3}{2} \times 8.31 \right) \ln(6) = 22.3 \text{ J/K}\end{aligned}$$



(b) Process bc.

$$\begin{aligned}\Delta S &= n R \ln \left( \frac{V_c}{V_b} \right) = (1) (8.31) \ln \left( \frac{3}{0.5} \right) = 8.31 \ln(6) \\ &= 14.89 \text{ J/K}\end{aligned}$$

(c) Process ca.

$$\begin{aligned}\Delta S &= n C_p \ln \left( \frac{T_a}{T_c} \right) = (1) \left( \frac{5}{2} \times 8.31 \right) \ln \left( \frac{100 \times 0.5}{600 \times 3} \right) \\ &= -37.2 \text{ J/K}\end{aligned}$$

(d) The entire cycle.

$$\Delta S = 22.3 + 14.89 - 37.2 = 0 \text{ J/K}.$$