

STATISTICAL MOLECULAR THERMODYNAMICS

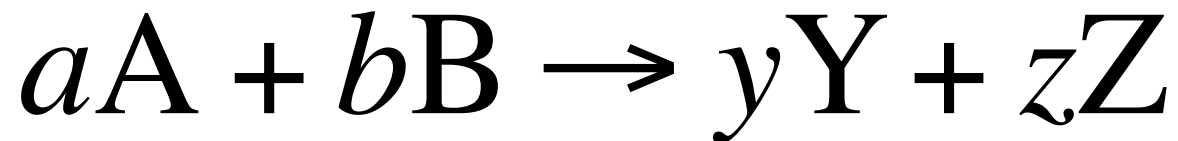
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Video 7.6

Additivity of Entropies

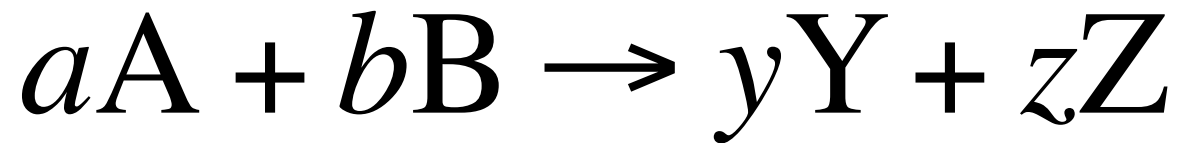
ENTROPY IS ADDITIVE FOR REACTIONS

Just as was true for enthalpy, one may define the entropy of reaction to be

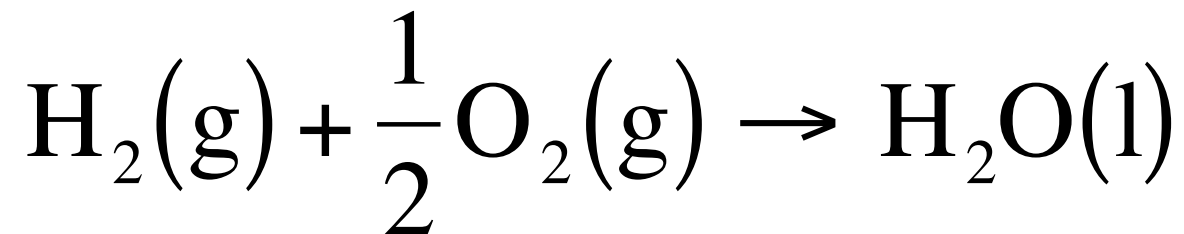


$$\Delta_r S^\circ = yS^\circ[Y] + zS^\circ[Z] - aS^\circ[A] - bS^\circ[B]$$

HYDROGEN COMBUSTION EXAMPLE



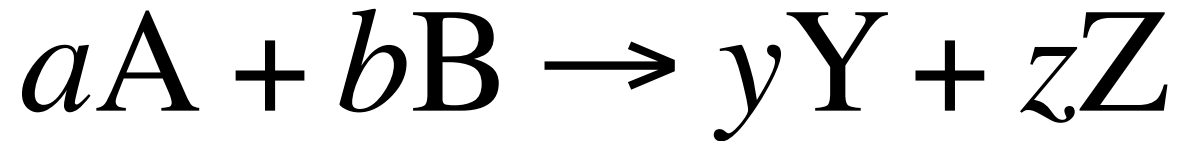
$$\Delta_r S^\circ = yS^\circ[Y] + zS^\circ[Z] - aS^\circ[A] - bS^\circ[B]$$



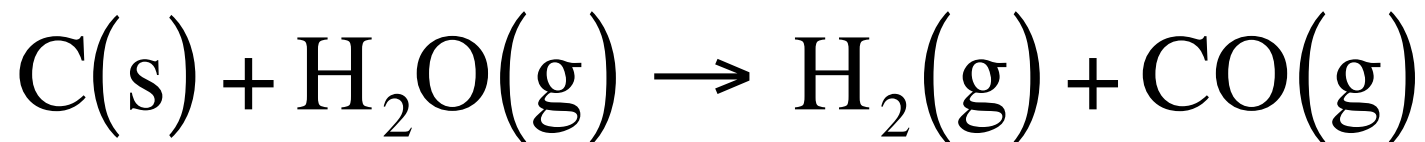
$$\Delta_r S^\circ = 70.0 - 130.7 - \frac{1}{2} \cdot 205.2 = -163.3 \text{ J} \cdot \text{K}^{-1} \cdot \text{mol}^{-1}$$

very negative because the reaction converts 1.5 moles of “very disordered” gas into 1 mole of “less disordered” liquid

WATER SHIFT REACTION EXAMPLE



$$\Delta_r S^\circ = yS^\circ[Y] + zS^\circ[Z] - aS^\circ[A] - bS^\circ[B]$$



$$\Delta_r S^\circ = 130.7 + 197.7 - 5.7 - 188.8 = 133.9 \text{ J} \cdot \text{K}^{-1} \cdot \text{mol}^{-1}$$

very positive because the reaction converts 1 mole of “very ordered” solid into 1 mole of “very disordered” gas