

Entropy and Phase Transitions

Necessarily reversible: process follows a path of successive equilibrium states at normal phase transition temperature

$$\Delta_t S = \frac{q_{\text{rev}}}{T_t}$$

$$\Delta_t S = \frac{\Delta_t H}{T_t} \quad \text{ONLY FOR PHASE TRANSITIONS}$$

$$\Delta_f H_m^\circ = 6.00 \text{ kJ/mol} \quad \Delta_f S_m^\circ = \frac{6.00 \times 10^3 \text{ J/mol}}{273.15 \text{ K}} = 22.0 \text{ J mol}^{-1} \text{ K}^{-1}$$

Entropy of Fusion vs. Entropy of Vaporization

	$\Delta_f S$ (J mol ⁻¹ K ⁻¹)	$\Delta_v S$ (J mol ⁻¹ K ⁻¹)
He	6.0	19.9
O ₂	8.17	75.63
H ₂ O	22.0	108.95
C ₆ H ₆	38.0	87.19

Entropy of Vaporization vs. Size

	$\Delta_v S$ (J mol ⁻¹ K ⁻¹)	M (g mol ⁻¹)
Cyclohexane	85.1	84.16
C ₆ H ₆	87.19	78.08
CCl ₄	85.8	153.82
H ₂ S	87.9	33.08
HF	66.94	20.0
HCl	78.32	36.5
HBr	84.64	80.9
HI	87.19	127.9
H ₂ O	108.95	18.02
H ₂ S	87.9	33.08
NH ₃	97.40	17.00
PH ₃	78.20	32.0