

ASSIGNMENT 3

CHEMISTRY 200

Due: 4:30 pm Monday 24 September 2006

- Using the scaled dimensionless form of the van der Waals equation, plot $(\mathcal{P}, \mathcal{V})$ isotherms at the following scaled temperatures:

(a) 0.1 (b) 0.2 (c) 8/27 (d) 0.5 (e) 1.0

Show a sample calculation for $\mathcal{V} = 2.0$ on each isotherm.

- Derive an expression for the Boyle temperature for the Berthelot equation of state.

- Consider the critical point data given in the table below:

	p_c (atm)	T_c (K)	\bar{V}_c (cm ³ mol ⁻¹)
Xe	57.6	289.7	119
NH ₃	111.5	405.4	72.5
CO ₂	72.7	304.2	94
O ₂	49.7	154.6	73.4

At what (p, \bar{V}, T) are each of Xe, NH₃ and CO₂ in a state corresponding to that of O₂ at $(p, \bar{V}, T) = (4.5 \times 10^4 \text{ Pa}, 1.0 \times 10^5 \text{ cm}^3 \text{ mol}^{-1}, 580 \text{ K})$?