

ASSIGNMENT 4

CHEMISTRY 305

Due: 4:30 pm Tuesday 6 February 2007

1. Do question 10 on page 594 of your text.
2. Derive an expression for the fugacity of a van der Waals gas.
3. Show that for a van der Waals gas:

$$\left(\frac{\partial h}{\partial p}\right)_T = b - \frac{2a}{RT}$$

and that

$$\left(\frac{\partial s}{\partial p}\right)_T = -\left[\frac{R}{p} + \frac{Ra}{(RT)^2}\right]$$

4. Using the results of the previous question, calculate Δh and Δs for an isothermal pressure increase of CO_2 from 0.100 MPa to 10.0 MPa for a van der Waals gas at 300 K and at 400 K. The van der Waals parameters are: $a = 3.592 \text{ dm}^6 \text{ atm mol}^{-2}$ and $b = 42.67 \text{ cm}^3 \text{ mol}^{-1}$. Compare with the values for an ideal gas.