

## ASSIGNMENT 4

### CHEMISTRY 305

Due: 4:30 pm Monday 8 February 2010

1. Derive equation 21.35 from equation 21.29 on page 556 of your text
2. Do question 10 on page 594 of your text.
3. Derive an expression for the fugacity of a van der Waals gas.
4. Show that for a van der Waals gas:

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

and that

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

5. Using the results of the previous question, calculate  $\Delta h$  and  $\Delta s$  for an isothermal pressure increase of  $\text{CO}_2$  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.