

ASSIGNMENT 2

CHEMISTRY 200

Due: 4:30 pm Monday 17 September 2006

1. At 200°C, when the pressure is 41.9 atm, the molar volume of ammonia is observed to be 0.851 L. What pressure would have been calculated on the basis of:
 - (a) ideal gas behaviour
 - (b) the van der Waals equation? [$a = 4.170 \text{ dm}^6 \text{ atm mol}^{-2}$; $b = 37.07 \text{ cm}^3 \text{ mol}^{-1}$]
 - (c) Which equation of state best describes the behaviour of the gas? Why?
2.
 - (a) Surface science experiments are often carried out in ultra-high vacuum apparatus that can attain pressures of 10^{-14} atm. How many gas molecules are there in each cubic centimeter in such an apparatus at room temperature? What is the molar volume?
 - (b) The average density of interstellar space is about 1 H atom per cm^3 and the temperature is about 10 K. What is the pressure of this interstellar medium? What is the molar volume?
3. It is found that the molar volume of a gaseous saturated hydrocarbon C_nH_{2n+2} is 30.61 L mol^{-1} if 0.432 g of the hydrocarbon fills a 300.0 mL container at constant temperature and pressure.
 - (a) What is the hydrocarbon?
 - (b) What can you say about the temperature and pressure of the experiment?