Week 6 Worksheet

Chem 11100-2: Section 33

Nov. 2, 2021

Remarks: The following information might be useful

1. $R = 8.314 \frac{J}{\text{mol} \cdot K} = 0.08206 \frac{L \cdot \text{atm}}{\text{mol} \cdot K}$
2. 1 atm = 101.325 kPa = 760 mm Hg
3. The vapor pressure of water at 30.0°C is 31.86 mm Hg

***Problem* 1:** A vessel at 25°C contains 24.5 g of N_2 (g) and 28.0 g of O_2 (g). If the cylinder developed a pinhole-sized leak and some of the gaseous mixture escaped, what would soon happen to the ratio of moles of N_2 (g) / moles of O_2 (g) in the cylinder?

***Problem* 2:** When 3.00 moles of HCl (g) is collected over water at 30.0°C, the total pressure in the container is 1.10 atm. What volume of HCl (g) is collected under these conditions?

***Problem* 3:** Determine how much greater the velocity is for a neon atom than a xenon atom where both are at the same temperature. Of these two gases, which should effuse from a closed container more rapidly? Why?

***Problem* 4:** Determine the strongest type of intermolecular force available among each of the following molecules.

a) NH_3

b) CH_3Cl

c) CBr_4

d) BF_3

***Problem* 5:** Which of the following compounds should have the highest boiling point: H_2O or H_2S? Why?

***Problem* 6:**

a) How does the behavior of molecules change as they go from the liquid to the gas phase?

b) To convert a liquid into a gas, the IMFs between the individual molecules must be completely disrupted. Which type of IMF would require the most (heat) energy input

to disrupt? Why?

The following is a good problem to know how to do:

***Problem* 7:** A sample of a pure, gaseous hydrocarbon is introduced into an empty, fixed-volume 1.00 L container. At 127°C, the pressure of the hydrocarbon in the container is 0.200 atm. Oxygen gas is then added to the same vessel at 127°C , after which the total pressure of the gas mixture in the container is 1.40 atm. The gaseous mixture is then sparked so that a complete combustion reaction occurs. After the reaction, the partial pressures of the product gases at 127°C are 0.600 atm for CO_2 (g) and 0.800 atm for H_2O (g). (The hydrocabon is the limiting reactant. For this problem, assume no temperature change in the container as a result of the combustion reaction.)

a) Write a balanced chemical equation for this combustion reaction. (Assume that the hydrocarbon's molecular formula is the same as its empirical formula.)

b) Calculate the total pressure in the vessel once the reaction is complete.