Homework 13

December 3, 2022

Weekly homework assignments are posted approximately one week prior to the due date. Collaborations are encouraged and students must report all collaborators in writing on each assignment. All external sources (websites, books) must be properly cited. Additional problems are listed at the end of each assignment. This week's assignment is due *Fri, Dec 9th at 11:59pm.*

1) A sample of helium gas at 298.15K and 1.03atm occupies a volume of 5.00L. How many moles of helium gas are there? (1 pt)

2) A scientist collect CO_2(g) into a tank that contains a mixture of N_2(g) and He(g). The total pressure is 5.45atm. Vapor pressures of N_2(g) and He(g) are 1.20atm and 2.72atm, respectively. What is the partial pressure of CO_2(g)? (1 pt)

3) N_2(g) is collected over H_2O(g) at 40.0°C. What is the partial pressure of nitrogen if the total pressure is 99.42 kPa? The vapor pressure of H_2O(g) at 40°C is 7.38kPa. (1 pt)

4) A tank contains 78.0g N_2(g) and 42.0g Ne at a total pressure of 4.00atm. What is the partial pressures of N_2 and Ne in atm? (1 pt)

5) What volume does 5.50mol Ar have at STP? (1 pt)

6) What is the density of water vapor 425.15K and 1.50atm? (1 pt)

7) Determine the intermolecular forces for the following compounds: CH_4, H_2O, CO_2, $C_{12}H_{26}$, NH_3, SO_2. (1 pt)

8) Rank the boiling point (highest to lowest) of the following compounds: CH_4, H_2O, CO_2, $C_{12}H_{26}$, NH_3, SO_2. (1 pt)

9) Calculate the heat absorbed when 46.0g of ice at $-10.0°C$ is converted to liquid water at 85.0°C. The specific heat of ice is 2.03 J/(g °C), the molar heat of fusion of ice is 6,010 J/mol, and the specific heat of water is 4.18 J/(g °C). (1 pt)

10) Car air bags inflate based on the decomposition of sodium azide, $NaN_3(s)$:

$2\ NaN_3(s) \rightarrow 2\ Na(s) + 3\ N_2(g)$

What mass of NaN_3 is needed to fill a 3.50L air bag with nitrogen gas at a pressure of 1.50atm and 300.K?

Optional Textbook Problems: Ch. 9- 9.15 – 9.101 odd; Ch. 10- 10.31 – 10.79 odd