

CHAPTER 6 SOLUTIONS

6-1 Density of oxygen

Given: Temperature = 273.0 K, pressure = 98.0 kPa

Solution:

a. Assume 1 gram mole of oxygen

From inside front cover of book GMW of O = 15.9994

For $O_2 = 2(15.999) = 31.9988 \text{ g/M}$

b. Calculate density (Eqn. 6-1)

$$\rho = \left(\frac{1}{8.3143 \text{ J/K-mole}} \right) \left(\frac{(98.0 \text{ kPa})(1 \text{ mole})(31.9988 \text{ g/mole})}{273 \text{ K}} \right) \times (1,000 \text{ Pa/kPa})(10^{-3} \text{ kg/g})$$

$$\rho = 1.382 \text{ kg/m}^3$$

6-2 Density of nitrogen

Given: Temperature = 298.0 K, pressure = 122.8 kPa

Solution:

a. Assume 1 gram mole of nitrogen

From inside front cover of book GMW of N = 14.0067

For $O_2 = 2(14.0067) = 28.0134 \text{ g/M}$

b. Calculate density (Eqn. 6-1)

$$\rho = \left(\frac{1}{8.3143 \text{ J/K-mole}} \right) \left(\frac{(122.8 \text{ kPa})(1 \text{ mole})(28.0134 \text{ g/mole})}{298 \text{ K}} \right) \times (1,000 \text{ Pa/kPa})(10^{-3} \text{ kg/g})$$

$$\rho = 1.388 \text{ kg/m}^3$$