Chapter 5 – Problem Set 1

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1. How many grams of hydrogen is needed to fill a 80[L] tank to a pressure of 150[ATM] at 27[°C]? (1)

$$\begin{aligned} n &= \frac{PV}{RT} \\ \frac{150 \cdot 80}{.0821 \cdot 300} &= 487.211[\text{mol}] \\ 2 \cdot 487 &= 974[\text{g}_\text{H}] \end{aligned} \tag{1}$$

2. At what temperature does 16.3[g] of nitrogen have a pressure of 725[TORR] in a 25[L] tank? (2)

$$\begin{aligned} 725[\text{TORR}] &= .954[\text{ATM}] \\ \frac{16.3}{28} &= .582[\text{mol}_\text{N}] \\ T &= \frac{25 \cdot .954}{.582 \cdot .0821} \\ &= 499[^\circ\text{K}] \end{aligned} \tag{2}$$

3. What is the volume, in [mL], of 837[mg] of xenon gas at STP? (**??**)

$$\begin{aligned} 837[\text{mg}] &= .837[\text{g}] \\ V_\text{mL} &= \frac{1}{1000}\cdot \end{aligned} \tag{3}$$

4. A gas at STP is in a 25[L] container. The volume is increased to 50[L] and pressure is increased to 1.5[ATM]. What is new temperature?

5. A balloon is filled with 1.0[L] of helium at 1.0[ATM] and a starting temp. The balloon rises to a point where the pressure is 220[TORR], temp is -31[°C], and the volume increases to 2.8[L]. What is the starting temp of the balloon?

6. How many grams of gas must be released from a 45.2[L] sample of nitrogen at STP to reduce the volume to 45[L] at STP?

7. A neon sign is made of glass tubing whose inside diameter is 2.0[cm] and whose length is 4.0[cm]. If the sign contains neon at a pressure of 1.5[TORR] at 35[°C], how many grams of neon are in the sign? ($V = \pi r^2 h$)

8. Calculate the number of molecules in a deep breath of air whose volume is 2.55[L] at body temp of 37[°C], and a pressure of 740[TORR].