Worksheet 2.3: Mole and Avogadro Problems KEY

1- ? g SiF_4 = (104.1 g / mole)(1 mole / 22.4 L)(245 L) = 1.14 x 10^3 g SiF_4

2- Mass of $C_2H_{4(g)}$ = 771 g $C_2H_{4(g)}$

3- ? g $C_5H_{10(g)}$ = (70.1 g / mole)(1 mole / 6.02 x 10^{23} molecules)(7.55 x 10^{25} molecules) =

8.79 x 10^3 g $C_5H_{10(g)}$

4- $(V, T, P)_{F_2}$ = $(V, T, P)_{CS_2}$ \ moles $F_{2(g)}$ = moles $CS_{2(g)}$ (Avogadro's hypothesis)

? moles $F_{2(g)}$ = (1 mole / 38.0 g)(1055 g) = 27.8 moles

? g $CS_{2(g)}$ = (76.2 g / mole)(27.8 moles) = 2.12 x 10^3 g $CS_{2(g)}$

5- Balloon volume = 301 L and mass of $CH_{4(g)}$ = 197 g.

6- Since (V, T ,P) are the same, the moles will be equivalent, according to Avogadro's
hypothesis.

Mass H_2 = (2.02 g / mole)(45.6 moles) = 92.1 g

Mass HCN = (27.0 g / mole)(45.6 moles) = 1230 g

The second container must hold $HCN_{(g)}$.

7- Mass of $Ar_{(g)}$ = 7.98 x 10^5 g

Mass of $O_{2(g)}$ = 6.40x 10^5 g

Mass of $CO_{(g)}$ = 5.60 x 10^5 g

8- A molecule of A has 1.55 times the mass of a molecule of B.

9- $(V, T, P)_{HI}$ = $(V, T, P)_{Xe}$ = $(V, T, P)_{C_3H_8}$ \ moles HI = moles Xe = moles C_3H_8

Ratio Xe/HI = (131.3 g / mole) / (127.9 g / mole) = 1.027

Ratio C_3H_8/HI = (44.1 g / mole) / (127.9 g / mole) = 0.335

10- Mass of $H_{2(g)}$ = 0.59 g, mass of $NF_{3(g)}$ = 21 g, mass of Kr = 24 g.

11- The unknown gas is fluorine.

12- $(V, T, P)_{C_4H_{10}}$ = $(V, T, P)_{X_aY_b}$ \ moles C_4H_{10} = moles X_aY_b

Moles C_4H_{10} = (1 mole / 58.1 g)(1740 g) = 29.9 moles

Molar mass of X_aY_b = 2700 g / 29.0 moles = 90. g / mole

For X = 15 g/mole and Y = 60 g/mole, the formula must be X_2Y.