

CHM151 Quiz 2a 25 Pts Fall 2019 Name: Key

SHOW ALL WORK TO RECEIVE CREDIT. Use of a cell phone will result in a zero.

Atomic masses: H 1.008, N 14.01, O 16.00, F 19.00, Al 26.98, S 32.07, Cl 35.45, As 74.92, Br 79.90, Mn 54.94.

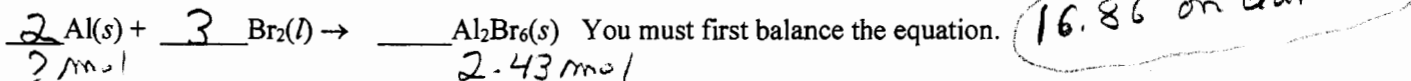
1. (4 Pts) Calculate the molecular or formula mass of $(\text{NH}_4)_3\text{AsO}_4$.

$$\begin{array}{l} 4 \times 16.00 \\ 1 \times 74.92 \\ 12 \times 1.008 \\ 3 \times 14.01 \end{array} \quad \boxed{193 \text{ g/mol}}$$

2. (5 Pts) Hydroxylamine nitrate contains 29.17 mass % N, 4.20 mass % H, and 66.63 mass % O. Determine its empirical formula.

$$\begin{array}{l} \text{N: } \frac{29.17 \text{ g/mol}}{14.01 \text{ g}} = 2.08 \div 2.08 = 1 \\ \text{H: } \frac{4.20 \text{ g/mol}}{1.008 \text{ g}} = 4.17 \div 2.08 = 2 \\ \text{O: } \frac{66.63 \text{ g/mol}}{16.00 \text{ g}} = 4.17 \div 2.08 = 2 \end{array} \quad \boxed{\text{H}_2 \text{NO}_2}$$

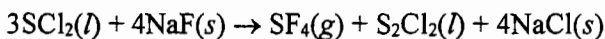
3. (4 Pts) Aluminum will react with bromine to form aluminum bromide (used as an acid catalyst in organic synthesis).



How many moles of Al are needed to form 2.43 mol of Al_2Br_6 ?

$$\frac{2.43 \text{ mol Al}_2\text{Br}_6}{1 \text{ mol Al}_2\text{Br}_6} \times \frac{2 \text{ mol Al}}{1 \text{ mol Al}_2\text{Br}_6} = \boxed{4.86 \text{ mol Al}}$$

4. (6 Pts) How many grams of sodium fluoride (used in water fluoridation and manufacture of insecticides) are needed to form 485 g of sulfur tetrafluoride?



$$\frac{485 \text{ g SF}_4}{108.07 \text{ g SF}_4} \times \frac{4 \text{ mol NaF}}{1 \text{ mol SF}_4} \times \frac{42.0 \text{ g NaF}}{1 \text{ mol NaF}} = \boxed{753.7 \text{ g NaF}}$$

5. (6 Pts) How many grams of Cl_2 can be prepared from the reaction of 16.0 g of MnO_2 and 30.0 g of HCl according to the following chemical equation?



Based on MnO_2 : $\frac{16.0 \text{ g MnO}_2}{86.94 \text{ g MnO}_2} \times \frac{1 \text{ mol Cl}_2}{1 \text{ mol MnO}_2} \times \frac{70.9 \text{ g Cl}_2}{1 \text{ mol Cl}_2} = \boxed{13.048 \text{ g Cl}_2}$ Based on Limiting Reactant MnO_2

Based on HCl : $\frac{30.0 \text{ g HCl}}{36.458 \text{ g HCl}} \times \frac{1 \text{ mol Cl}_2}{4 \text{ mol HCl}} \times \frac{70.9 \text{ g Cl}_2}{1 \text{ mol Cl}_2} = \boxed{14.59 \text{ g Cl}_2}$