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 $(NH_4)_3AsO_4$.

4 × 16.00
1 × 74.92
12 × 1.008
3 × 14.01

193 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.

N: $\frac{29.17\text{ g}}{14.01\text{ g/mol}} = 2.08 \div 2.08 = 1$

H: $\frac{4.20\text{ g}}{1.008\text{ g/mol}} = 4.17 \div 2.08 = 2$

O: $\frac{66.63\text{ g}}{16.00\text{ g/mol}} = 4.17 \div 2.08 = 2$

H_2NO_2

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

$2\,Al(s) + 3\,Br_2(l) \rightarrow \_\_\_\_Al_2Br_6(s)$ You must first balance the equation.

? mol Al → 2.43 mol Al_2Br_6

16.86 on Quiz 2b

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

$2.43\text{ mol } Al_2Br_6 \left| \frac{2\text{ mol Al}}{1\text{ mol } Al_2Br_6} \right. = 4.86\text{ mol Al}$

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?

$3SCl_2(l) + 4NaF(s) \rightarrow SF_4(g) + S_2Cl_2(l) + 4NaCl(s)$

? g NaF ← 485 g SF_4

$485\text{ g } SF_4 \left| \frac{\text{mol } SF_4}{108.1\text{ g } SF_4} \right| \frac{4\text{ mol NaF}}{1\text{ mol } SF_4} \left| \frac{42.0\text{ g NaF}}{\text{mole NaF}} \right. = 753.7\text{ g NaF}$

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?

$MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$

16.0 g 30.0 g ? g

Based on Limiting Reactant MnO_2

Based on MnO_2:

$16.0\text{ g } MnO_2 \left| \frac{\text{mol } MnO_2}{86.94\text{ g } MnO_2} \right| \frac{1\text{ mol } Cl_2}{1\text{ mol } MnO_2} \left| \frac{70.9\text{ g } Cl_2}{\text{mol } Cl_2} \right. = 13.048\text{ g } Cl_2$

Based on HCl:

$30.0\text{ g HCl} \left| \frac{\text{mole HCl}}{36.458\text{ g HCl}} \right| \frac{1\text{ mol } Cl_2}{4\text{ mol HCl}} \left| \frac{70.9\text{ g } Cl_2}{\text{mol } Cl_2} \right. = 14.59\text{ g } Cl_2$