CHM151 Q3 25 Pts Fall 2004 Name: Key (2 versions)

Information: mole = 6.02×10^{23}, molar masses: S = 32.06, Al = 27.0, N = 14.07, C = 12.01, H = 1.01, Si = 28.1, O = 16.00, P = 31.0, Xe = 131.3, F = 19.0, K = 39.1

SHOW ALL WORK FOR CREDIT.

1 . (3) Determine the number of moles of aluminum in 96.7 g of Al.

$$\frac{96.7\ \text{g} \mid \text{mol}}{27.0\ \text{g}} = 3.58\ \text{mol Al}$$

2. (3) What is the molar mass of acetaminophen, $C_8H_9NO_2$?

$2 \times 16.00 = 32.00$
$1 \times 14.07 = 14.07$
$9 \times 1.01 = 9.09$
$8 \times 12.01 = 96.08$

151.24

3. (4) How many sulfur atoms are there in 21.0 g of Al_2S_3?

$$\frac{21.0\ \text{g}\ Al_2S_3 \mid \text{mol} \mid 3\ S \mid 6.02\times10^{23}\ \text{Atoms}}{150.2\ \text{g} \mid 1\ Al_2S_3 \mid \text{mol}} = 2.52\times10^{23}\ \text{S Atoms}$$

151.24

4. (4) The empirical formula of a compound of uranium and fluorine that is composed of 67.6% uranium and 32.4% fluorine is

Assume 100 g

U: $\frac{67.6\ \text{g} \mid \text{mol}}{238.0\ \text{g}} = 0.285 \div 0.285 = 1$

F: $\frac{32.4\ \text{g} \mid \text{mol}}{19.0\ \text{g}} = 1.705 \div 0285 = 6$

UF_6

5. (5) How many grams of Cl_2 can be prepared from the reaction of 15.0 g of MnO_2 and 30.0 g of HCl according to the following chemical equation?

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

15.0 g 30.g ?g

Based on MnO_2: $\frac{15.0\ \text{g}\ MnO_2 \mid \text{mol} \mid 1\ \text{mol}\ Cl_2 \mid 70.9\ \text{g}}{86.94\ \text{g} \mid 1\ \text{mol}\ MnO_2 \mid \text{mol}} = 12.2\ \text{g}\ Cl_2$ ← The Least by L.R.

Based on HCl: $\frac{30.0\ \text{g HCl} \mid \text{mol} \mid 1\ \text{mol}\ Cl_2 \mid 70.9\ \text{g}}{36.46\ \text{g} \mid 4\ \text{mol HCl} \mid \text{mol}} = 14.58\ \text{g}\ Cl_2$

6. (3) How many moles of silver nitrate are necessary to react completely with 7 moles of copper?

$Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$

7 moles ? mol

$$\frac{7\ \text{mol Cu} \mid 2\ \text{mol}\ AgNO_3}{1\ \text{mol Cu}} = 14\ \text{mol}\ AgNO_3$$

7. (3) Calculate the percent oxygen by mass in Na_2CO_3.

$3 \times 16.00 = 48.00$
$1 \times 12.01 = 12.01$
$2 \times 23.00 = 46.00$
106.01 g/mol

$\frac{48.00}{106.01} \times 100 = 45.3\%$