CHM151 Quiz2 Fall 2018 25 Pts Name Key

SHOW ALL WORK TO RECEIVE CREDIT. Atomic masses: H 1.008, N 14.01, O16.00, Mg 24.31, As 74.92

mole = 6.02×10^{23}

1) Calculate the molar mass of $(NH_4)_3AsO_4$.

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

193.05 g/mol

2) Calculate the number of moles in 17.8 g of the antacid magnesium hydroxide, $Mg(OH)_2$.

$$17.8\ g \left| \frac{mol}{58.266\ g} \right. = 0.305\ mol$$

3) Calculate the number of oxygen atoms in 29.34 g of sodium sulfate, Na_2SO_4.

$$29.34\ g\ Na_2SO_4 \left| \frac{1\ mol\ Na_2SO_4}{142.05\ g\ Na_2SO_4} \right| \frac{4\ mol\ O}{1\ mol\ Na_2SO_4} \left| \frac{6.02 \times 10^{23}\ atoms\ O}{mol\ O} \right. = 4.974 \times 10^{23}\ atoms\ O$$

4) Hydroxylamine nitrate contains 29.17 mass % N, 4.20 mass % H, and 66.63 mass % O. Determine its empirical formula.

N: $\frac{29.17\ g}{14.01\ g/mol} = 2.082 \div 2.082 = 1$

H: $\frac{4.20\ g}{1.008\ g/mol} = 4.17 \div 2.082 = 2$

O: $\frac{66.63\ g}{16.00\ g/mol} = 4.16 \div 2.082 = 2$

H_2NO_2

5) Balance the following equation:

$$\_\_\_ C_8H_{18}O_3(l) + \_11\_ O_2(g) \rightarrow \_9\_ H_2O(g) + \_8\_ CO_2(g)$$

9 + 16 = 25

25 − 3 = 22

More questions on the back

Key

6) Sulfur dioxide reacts with chlorine to produce thionyl chloride (used as a drying agent for inorganic halides) and dichlorine oxide (used as a bleach for wood, pulp, and textiles).

$SO_2(g) + 2Cl_2(g) \rightarrow SOCl_2(g) + Cl_2O(g)$

If 0.400 mol of Cl_2 reacts with excess SO_2, how many moles of Cl_2O are formed?

$SO_2 + 2Cl_2 \rightarrow SOCl_2 + Cl_2O$

$0.400\ mol$; $?\ mol$

$$0.400\ \text{mol}\ Cl_2 \left| \frac{1\ \text{mol}\ Cl_2O}{2\ \text{mol}\ Cl_2} \right. = 0.200\ \text{mol}\ Cl_2O$$

7) Ammonia will react with fluorine to produce dinitrogen tetrafluoride and hydrogen fluoride (used ir production of aluminum, in uranium processing, and in frosting of light bulbs).

$2NH_3(g) + 5F_2(g) \rightarrow N_2F_4(g) + 6HF(g)$

How many moles of NH_3 are needed to react completely with 13.6 mol of F_2?

$$13.6\ \text{mol}\ F_2 \left| \frac{2\ \text{mol}\ NH_3}{5\ \text{mol}\ F_2} \right. = 5.44\ \text{mol}\ NH_3$$

8) Ammonia, an important source of fixed nitrogen that can be metabolized by plants, is produced usir the Haber process in which nitrogen and hydrogen combine.

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

How many grams of nitrogen are needed to produce 325 grams of ammonia?

$$325\ \text{g}\ NH_3 \left| \frac{\text{mol}\ NH_3}{17.034\ \text{g}\ NH_3} \right| \frac{1\ \text{mol}\ N_2}{2\ \text{mol}\ NH_3} \left| \frac{28.02\ \text{g}\ N_2}{1\ \text{mol}\ N_2} \right. = 267\ \text{g}\ NH_3$$