Name:_____ Chem 11 Block _____ March 6, 2017

Stoichiometry Relay Questions

1. What mass of nickel wire reacts with all the silver nitrate in 1.25 L of a 0.15 M solution? Include the balanced chemical equation.

$M = \frac{mol}{L}$

$1\,Ni + 2\,AgNO_3 \rightarrow 1\,Ni(NO_3)_2 + 2\,Ag$

moles = 0.15M x 1.25L

$= 0.1875\ mol\ of\ AgNO_3 \times \frac{1\ mol\ of\ Ni}{2\ mol\ AgNO_3} \times \frac{58.69g}{mol\ Ni} = \boxed{5.5g\ of\ Ni}$

$Zn^{2+}\ As^{3-}$

2. What mass of HCl must be contained in a solution added to an excess of zinc arsenide to Obtain 17.5L of arsine (AsH_3) gas at STP? Include the balanced chemical equation.

$6\,HCl + 1\,Zn_3As_2 \rightarrow 2\,AsH_3 + 3\,ZnCl_2$

$17.5L\ of\ AsH_3 \times \frac{mol\ of\ AsH_3}{22.4L} \times \frac{6\ mol\ HCl}{2\ mol\ AsH_3} \times \frac{36.46g}{mol\ HCl} = \boxed{85.5g\ of\ HCl}$

3. Identify the products and balance the chemical equation. Determine how many grams of water will be produced if 2.0g of C_4H_{10} react?

$2\,C_4H_{10} + 13\,O_2 \rightarrow 8\,CO_2 + 10\,H_2O$

$2.0g\ of\ C_4H_{10} \times \frac{mol\ C_4H_{10}}{58.14g} \times \frac{10\ mol\ H_2O}{2\ mol\ C_4H_{10}} \times \frac{18.02g}{mol\ H_2O} = \boxed{3.1g\ of\ H_2O}$

4. If 0.68g of Cl_2 react with 25mL of KOH, what was the original concentration of the KOH?

$$\underline{8}\ KOH + \underline{3}\ Cl_2 \rightarrow \underline{5}\ KClO_3 + \underline{1}\ KCl + \underline{3}\ H_2O$$

$M = \frac{mol}{L}$

$0.68\,g\ of\ Cl_2 \times \frac{mol\ of\ Cl_2}{70.90\,g} \times \frac{8\ mol\ KOH}{3\ mol\ Cl_2} = 0.0255...\ mol\ of\ KOH$

$25\,mL \times \frac{1\,L}{1000\,mL} = 0.025\,L$

$\frac{0.0255...\ mol\ of\ KOH}{0.025\,L} = 1.023...\,M$

$= 1.0\,M\ of\ KOH$

5. This unbalanced equation shows one possible set of products for the reaction of aluminum and nitric acid:

$$\underline{2}\ Al(s) + \underline{6}\ HNO_3(aq) \rightarrow \underline{2}\ Al(NO_3)_3(aq) + \underline{3}\ H_2$$

Use the balanced version of this equation to determine the mass of nitric acid required to form 145 kg of hydrogen gas.

$145\,kg \times \frac{1000\,g}{1\,kg} = 145\,000\,g\ of\ H_2 \times \frac{mol\ H_2}{2.02\,g} \times \frac{6\ mol\ HNO_3}{3\ mol\ H_2} \times \frac{63.02\,g}{mol\ HNO_3} = 9050000\,g\ of\ HNO_3$

$= 9.05 \times 10^6\,g$

OR $9050\,kg\ of\ HNO_3$

6. If 16.8L of H_2S gas are produced at STP, how many grams of $Al(OH)_3$ are also produced?

$$\_\_\ Al_2S_3 + \underline{6}\ H_2O \rightarrow \underline{2}\ Al(OH)_3 + \underline{3}\ H_2S$$

$16.8\,L\ of\ H_2S \times \frac{mol\ H_2S}{22.4\,L} \times \frac{2\ mol\ Al(OH)_3}{3\ mol\ H_2S} \times \frac{78.01\,g}{mol\ Al(OH)_3} = 390\,g\ of\ Al(OH)_3$