2.70
7.53
10.3
43.7
85.8
111

Honors/CT Chemistry Unit 8
Chapter 9 Stoichiometry Review

Directions: Honors round to 100ths, CT use you're the PT provided. The answers in the box are scrambled and are for CT. Honors will have slight differences because of sig figs.

Sections 9.1 – 9.2 Moles and Balanced Equations

1. How many moles of ammonia can be formed from 15.5 moles of hydrogen gas?

$N_2 + 3H_2 \rightarrow 2NH_3$

$$15.5 \text{ mol } H_2 \left/ \frac{3 \text{ mol } H_2}{2 \text{ mol } NH_3} \right. = 10.3 \text{ mol } NH_3$$

Sections 9.3 -9.4 Stoichiometry (Mass – mass) calculations

2. What is the definition of "stoichiometry"? - using a equation to obtain mole ratios
3. How many grams of $CaCl_2$ can be formed by 72.75 g of HCl reacting with calcium hydroxide?

$2HCl + Ca(OH)_2 \rightarrow CaCl_2 + 2H_2O$

g ?

$$72.75 \text{ g HCl} \left/ \frac{36.5 \text{ g}}{1 \text{ mol HCl}} \right. \left/ \frac{2 \text{ mol HCl}}{1 \text{ mol } CaCl_2} \right. \left/ \frac{111.1 \text{ g}}{\text{mol}} \right. = 111 \text{ g } CaCl_2$$

Sections 9.5 – 9.7 Limiting Reactants

4. If 31.00 g of HCl is mixed with 15.50 g of calcium hydroxide, what is the maximum amount of water (in grams) that can be produced? $2HCl + Ca(OH)_2 \rightarrow CaCl_2 + 2H_2O$

$$31.00 \text{ g HCl} \left/ \frac{36.5 \text{ g}}{2 \text{ mol HCl}} \right. \left/ \frac{2 \text{ mol } H_2O}{\text{mol}} \right. \left/ \frac{18.0 \text{ g}}{\text{mol}} \right. = 15.3 \text{ g } H_2O$$

$$15.5 \text{ g } Ca(OH)_2 \left/ \frac{74.1 \text{ g}}{1 \text{ mol } Ca(OH)_2} \right. \left/ \frac{2 \text{ mol } H_2O}{\text{mol}} \right. \left/ \frac{18.0 \text{ g}}{\text{mol}} \right. = 7.53 \text{ g } H_2O$$

5. If 11.90 g of chlorine is reacted with 12.00 g of sodium hydroxide, how many grams of water form? The balanced reactions is as follows …

$$2Cl_2 + 4NaOH \rightarrow 3NaCl + NaClO_2 + 2H_2O$$

$$11.90 \text{ g } Cl_2 \left/ \frac{71.0 \text{ g}}{2 \text{ mol } Cl_2} \right. \left/ \frac{2 \text{ mol } H_2O}{\text{mol}} \right. \left/ \frac{18.0 \text{ g}}{\text{mol}} \right. = 3.02 \text{ g } H_2O$$

$$12.00 \text{ g NaOH} \left/ \frac{40.0 \text{ g}}{4 \text{ mol NaOH}} \right. \left/ \frac{2 \text{ mol } H_2O}{\text{mol}} \right. \left/ \frac{18.0 \text{ g}}{\text{mol}} \right. = 2.70 \text{ g } H_2O$$

Section 9.8 Percent Yield

6. When a 5.00 g lump of phosphorus is added to 40.5 g of liquid bromine, the reaction is spontaneous and liberates heat. What is the theoretical yield of PBr_3?

$$2P + 3Br_2 \rightarrow 2PBr_3$$

$$\frac{5.00\ g\ P}{31.0\ g} \left/ \frac{}{1\ mol\ P} \right. \left/ \frac{2\ PBr_3}{2\ mol\ P} \right. \left/ \frac{270.7\ g}{mol} \right. = \boxed{43.7\ g\ PBr_3}$$

$$\frac{40.5\ g\ Br_2}{159.8\ g} \left/ \frac{1\ mol}{3\ mol\ Br_2} \right. \left/ \frac{2\ mol\ PBr_3}{mol} \right. \left/ \frac{270.7\ g}{mol} \right. = \boxed{45.7\ g\ PBr_3}$$

For an actual yield of 37.5 g of PBr_3, what is the percent yield?

$$\frac{37.5\ g}{43.7\ g} \times 100 = \boxed{85.8\%\ PBr_3}$$