Stoichiometry Review

1) Balance the equation 1st.

$$3\ Mg(CN)_2 + 2\ H_3PO_4 \rightarrow Mg_3(PO_4)_2 + 6\ HCN$$

a.) How much H_3PO_4 did he start with? This is a tough one because I gave you the excess amount. So start by converting the 32.5g of $Mg(CN)_2$ into H_3PO_4. This will tell you how much you started with.

$$32.5\text{g } Mg(CN)_2 \left| \frac{1\text{ mole}}{76\text{ g}} \right| \frac{2\ H_3PO_4}{3\ Mg(CN)_2} \left| \frac{98\text{ g}}{1\text{ mole}} \right| = 27.9\text{g}$$

so the answer is **27.9g H_3PO_4**

This is how much was used!!

Now add the excess to it:

$27.9 + 12 =$ **39.9g H_3PO_4**

Final answer!!

b) Now just take the original 32.5g $Mg(CN)_2$ and convert it into HCN.

$$\frac{32.5\text{g } Mg(CN)_2}{} \left| \frac{1\text{ mole}}{76\text{g}} \right| \frac{6\text{ HCN}}{3\,Mg(CN)_2} \left| \frac{27\text{ g}}{1\text{ mole}} \right. = 23.1\text{g}$$

oops, calculator error.

Answer: 23.1 g HCN

2.) $$\frac{9.90\text{g CuCl}}{} \left| \frac{1\text{ mole}}{99\text{ g}} \right| \frac{1\,Cu_2S}{2\,CuCl} \left| \frac{160\text{ g}}{1\text{ mole}} \right. = 8\text{g } Cu_2S$$

3.) You need a balanced equation. (Not asked to do that on final)

$$2\,AlBr_3 \rightarrow 2\,Al + 3\,Br_2$$

Theoretical yield:

$$\frac{750\text{g } AlBr_3}{} \left| \frac{1\text{ mole}}{267\text{g}} \right| \frac{3\,Br_2}{2\,AlBr_3} \left| \frac{160\text{g}}{1\text{ mole}} \right. = 674.2\text{g } Br_2$$

$$(.552)(674.2) = 372.1\text{g } Br_2$$

4.) write a balanced equation:

$$NH_4NO_3 \rightarrow N_2O + 2H_2O$$

$$\frac{25.0\text{ g } NH_4NO_3}{} \left| \frac{1\text{ mole}}{80\text{ g}} \right| \frac{2\,H_2O}{1\,NH_4NO_3} \left| \frac{18\text{ g}}{1\text{ mole}} \right. = \boxed{11.25\text{ g } H_2O}$$

5.) $Ca + 2\,HCl \rightarrow CaCl_2 + H_2$

a) Convert both amounts to $CaCl_2$:

$$\frac{17\text{ g Ca}}{} \left| \frac{1\text{ mole}}{40\text{ g}} \right| \frac{1\,CaCl_2}{1\,Ca} \left| \frac{110\text{ g}}{1\text{ mole}} \right. = 46.75\text{ g } CaCl_2$$

$$\frac{50\text{ ml}}{} \left| \frac{0.895\text{ g}}{1\text{ ml}} \right| \frac{1\text{ mole}}{36\text{ g}} \left| \frac{1\,CaCl_2}{2\,HCl} \right| \frac{110\text{ g}}{1\text{ mole}} = 68.4\text{ g } CaCl_2$$

1 extra step

Answer that is largest is excess.

So the **HCl is excess**

b) To find excess, convert limiting into excess:

$$\frac{17\text{g Ca}}{40\text{g}} \left| \frac{1\text{ mole}}{1\text{ Ca}} \right| \frac{2\text{ HCl}}{1\text{ mole}} \left| \frac{36\text{g}}{} \right. = 30.6\text{ g HCl}$$

Now subtract that from amount of HCl you started with:

$(50)(0.895) = 44.75\text{g}$

$$\begin{array}{r} 44.75\text{g} \\ -30.6\text{g} \\ \hline 14.15\text{g} \end{array}$$

c) Already answered in Part A!! ☺

Its the lower value.

46.75g $CaCl_2$