DAY 2 | OVERHEAD NOTES | FEB 28, 2014

(FROM "LIMITING REACTANT AND THEORETICAL YIELD PRACTICE" WORKSHEET)

REMEMBER OUR PROCEDURE FROM YESTERDAY:

1. WRITE OUT GIVEN/FIND
2. IDENTIFY RELEVENT MOLAR RATIOS
3. SET UP A PICKET FENCE FOR EACH REACTANT IN THE CHEMICAL RXN.
4. CIRCLE THE SMALLEST YIELD: THIS IS THE THEORETICAL YIELD
5. WHATEVER REACTANT PRODUCES THE THEORETICAL YIELD (THE GIVEN) IS THE LIMITING REACTANT.

LET'S LOOK AT #1 ON WORKSHEET:

#1) $2Na(s) + Cl_2 \rightarrow 2NaCl(g)$

STEP 1

GIVEN
7.25 mol Na
4.25 mol Cl_2

FIND
THEORETICAL YIELD: ___ mol NaCl
LIMITING REACTANT ____

STEP 2

2 mol Na : 2 mol NaCl
1 mol Cl_2 : 2 mol NaCl
MOLAR RATIO

STEP 3

$$\frac{7.25\ \text{mol Na}}{1}\left(\frac{2\ \text{mol NaCl}}{2\ \text{mol Na}}\right) = \boxed{7.25\ \text{mol NaCl}}\ \bigstar$$

STEP 4, SMALLEST AMOUNT PRODUCED IS THEORETICAL YIELD

$$\frac{4.25\ \text{mol } Cl_2}{1}\left(\frac{2\ \text{mol NaCl}}{1\ \text{mol } Cl_2}\right) = 8.5\ \text{mol NaCl}$$

MOLAR RATIO

STEP 5: 7.25 mol OF Na PRODUCED THE SMALLEST THEORETICAL YIELD SO Na IS THE LIMITING REACTANT

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

STEP 1

GIVEN
100 g Cu
100 g $AgNO_3$
63.5 g Cu : 1 mol Cu
169.91 g $AgNO_3$: 1 mol $AgNO_3$
107.9 g Ag : 1 mol Ag
I'M INCLUDING THE MOLAR MASSES OF BOTH THE REACTANTS AND PRODUCTS BECAUSE I WILL

FIND
THEORETICAL YIELD:
___ g Ag
LIMITING REACTANT:

NEED THEM IN ORDER TO REPORT THE MASSES IN THE UNITS OF MOLES. THAT ALLOWS ME TO COMPARE MOLE RATIO.

STEP 3

$$\frac{100\text{g Cu}}{1}\left(\frac{1\text{mol Cu}}{63.5\text{g Cu}}\right)\left(\frac{2\text{mol Ag}}{1\text{mol Cu}}\right)\left(\frac{107.9\text{g Ag}}{1\text{mol Ag}}\right) = 339.84\text{g Ag}$$

↑ MOLAR MASS OF Cu ↑ MOLAR RATIO ↑ MOLAR MASS OF Ag

STEP 4

$$\frac{100\text{g AgNO}_3}{1}\left(\frac{1\text{mol AgNO}_3}{169.9\text{g AgNO}_3}\right)\left(\frac{2\text{mol Ag}}{2\text{mol AgNO}_3}\right)\left(\frac{107.9\text{g Ag}}{1\text{mol Ag}}\right) = \boxed{63.50\text{g Ag}}$$

* THEORETICAL YIELD

STEP 5

$AgNO_3$ IS LIMITING REACTANT

#5) $O_2(g) + 2H_2(g) \rightarrow 2H_2O(l)$

GIVEN
1.22g O_2
1.05g H_2
1mol O_2 : 2mol H_2O
2mol H_2 : 2mol H_2O
32.0g O_2 : 1mol O_2
2.02g H_2 : 1mol H_2
18.02g H_2O : 1mol H_2O

FIND:
THEORETICAL YIELD: ____ g H_2O
LIMITING REACTANT:

$$\frac{1.22\text{g O}_2}{1}\left(\frac{1\text{mol O}_2}{32.0\text{g O}_2}\right)\left(\frac{2\text{mol H}_2\text{O}}{1\text{mol O}_2}\right)\left(\frac{18.02\text{g H}_2\text{O}}{1\text{mol H}_2\text{O}}\right) = \boxed{1.37\text{g H}_2\text{O}}$$

$$\frac{1.05\text{g H}_2}{1}\left(\frac{1\text{mol H}_2}{2.02\text{g H}_2}\right)\left(\frac{2\text{mol H}_2\text{O}}{2\text{mol H}_2}\right)\left(\frac{18.02\text{g H}_2\text{O}}{1\text{mol H}_2\text{O}}\right) = 9.37\text{g H}_2\text{O}$$

1.37g H_2O IS THEORETICAL YIELD
O_2 IS LIMITING REACTANT.