class notes:

TEST [illegible] ~~TEST~~ THIS

Topic: Practice with

1) Theoretical Yield This is from your calculation:

$\frac{g}{} \Big| \frac{mol}{g} \Big| \frac{mol}{mol} \Big| \frac{g}{mol} \Big| =$.

2) Percent Yield

READ THE SCALE → ACTUAL YIELD

$\% = \frac{\text{ACTUAL YIELD}}{\text{THEORETICAL YIELD}} \times 100$

3) Limiting Reagent

#1 $\frac{g}{} \Big| \frac{mol}{g} \Big| \frac{mol}{mol} \Big| \frac{g}{mol} \Big| =$ ANSWER

#2 $\frac{g}{} \Big| \frac{mol}{g} \Big| \frac{mol}{mol} \Big| \frac{g}{mol} \Big| =$ ANSWER ☆

Warmup: Calculate the molecular mass (in grams per mole) of ~~$CuCl_2 \cdot 3H_2O$~~

$KAl(SO_4)_2 \cdot 12H_2O$

K: $1 \times (39.10) = 39.10$
Al: $1 \times (26.98) = 26.98$
S: $2 \times (32.06) = 64.12$
O: $20 \times (16.00) = 320.00$
H: $24 \times (1.01) = 24.24$

$= 474.44$ g/mol

"THEORETICAL YIELD" - the amount of product you were "supposed" to get according to your calculator.

TEST FRIDAY over the last two weeks

NEXT LAB DAY: TOMORROW NORMAL CLASS: TODAY

Topic: Practice with

1) Theoretical Yield Your calculated yield in a perfect world

2) Percent Yield

$$\% \text{ yield} = \frac{\text{grams you actually weigh out IN LAB}}{\text{grams theoretical yield}} \times 100$$

3) Limiting Reagent the reactant you ran out of; the reactant that gives the least product.

Warmup: Calculate the molecular mass (in grams per mole) of $CuCl_2 \cdot 3H_2O$ (three waters)

Cu: 1 × (63.55) = 63.55

Cl: 2 × (35.45) = 70.90

H: 6 × (1.01) = 6.06

O: 3 × (16.00) = 48.00

188.51 grams/mole

hints on how to solve the homework tonight:

limiting reactant & percent yield

CλeMis+ry: http://genest.weebly.com

Stop in for help every day at lunch and Tues, Weds., &Thurs after school!

After-hours question? Email me at home: eagenest@madison.k12.wi.us

Name HINTS

Period

1. (Circle answers). You calculate the theoretical yield by converting the amount of *each* of the **(reactants / products)** into the amount of *just one* of the **(reactants / products)**.

2. The reactant that gives the least product is called the ____________________.

3. The formula for finding percent yield is:

> The balanced reaction we used in lab:
>
> $2\ Al_{(s)} + 2\ KOH_{(aq)} + 4\ H_2SO_{4(aq)} + 22\ H_2O_{(l)} \rightarrow 2\ KAl(SO_4)_2{\cdot}12H_2O_{(s)} + 3\ H_{2(g)}$

4. Using a periodic table and ***the information above***, fill in these conversion factors:

use periodic table → 1 mole of potassium hydroxide = _____ grams

USE the BALANCED REACTION → _____ mole of H_2SO_4 = _____ moles of H_2

Use the balanced reaction → _____ mole of Al = _____ moles of $KAl(SO_4)_2{\cdot}12H_2O$

use the periodic table → 1 mole of $KAl(SO_4)_2{\cdot}12H_2O$ = ________ grams $KAl(SO_4)_2{\cdot}12H_2O$

5. In a perfect world, if you react 808 moles of H_2SO_4 in the above reaction how many moles of H_2 will you get?

$808\ mol \times \frac{?\ mol}{?\ mol} = ?\ mol\ H_2$

6. In the real world, Bobby Brown does the above reaction with 808 moles of H_2SO_4 and he only gets 501 moles of H_2. What was Mr. Brown's % yield?

Find theoretical yield first: $808\ mol\ H_2SO_4 \times \left(\frac{mol\ H_2}{mol\ H_2SO_4}\right) =$

THEN USE THE % yield formula from class notes

7. If Mr. Brown tries the experiment again, 123 grams of aluminum and 123 grams of KOH and more than enough of the other reactants,

a. which will be the limiting reactant?

#1 $\frac{123g\ Al}{1} \times (\quad) \times (\quad) \times (\quad) =$

#2 $\frac{123g\ KOH}{1} \times (\quad) \times (\quad) \times (\quad) =$

the smaller one is limiting

b. How many grams of $KAl(SO_4)_2{\cdot}12H_2O$ will be his theoretical yield?

c. If he only gets 208 g of $KAl(SO_4)_2{\cdot}12H_2O$, what was his % yield?

$\frac{208g}{\text{theoretical yield from \#7(B)}} \times 100 = \%\ yield$

8. Calculate the answer writing both number and correct UNIT.

$$\left(\frac{4\ grams\ Zn}{7\ mL\ Zn}\right) x \left(\frac{3\ mL\ H_2\ O}{1\ mL\ Zn}\right) x \left(\frac{5\ mL\ Zn}{2\ mL\ H_2\ O}\right) =$$

The balanced reaction we used in lab: = "ALUM"

$$2\ Al_{(s)} + 2\ KOH_{(aq)} + 4\ H_2SO_{4(aq)} + 22\ H_2O_{(l)} \rightarrow 2\ KAl(SO_4)_2{\cdot}12H_2O_{(s)} + 3\ H_{2(g)}$$

9. In a perfect world, if you react 40.8 grams of Al in the above reaction how many moles of $KAl(SO_4)_2{\cdot}12H_2O$ will you get?

$$40.8 g\ Al \times \left(\frac{mol\ Al}{g\ Al}\right) \times \left(\frac{mol\ ALUM}{mol\ Al}\right) =$$

10. In the real world you attempt the above reaction with 40.8 grams of Al and you only get 680. grams of ~~40.8 grams~~ of $KAl(SO_4)_2{\cdot}12H_2O$.

a. What was your % yield?

FIRST FIND YOUR THEORETICAL YIELD

$$40.8 g\ Al \times \left(\frac{?\ mol\ Al}{?\ g\ Al}\right) \times \left(\frac{?\ mol\ KAl(SO_4)_2 12H_2O}{?\ mol\ Al}\right) \times \left(\frac{?\ g\ KAl(SO_4)_2 12H_2O}{?\ mol\ KAl(SO_4)_2 12H_2O}\right) =$$

then use % YIELD FORMULA

b. List three things that might have caused your yield to be so low:

11. If you try the above reaction again, using 3.00 grams of aluminum and 16.5 grams of KOH and more than enough of the other reactants, ANSWER: ALUMINUM IS THE LIMITING REAGENT

a. which will be the limiting reactant?*

$$\#1 \quad \frac{3.00 g\ Al}{1} \times \left(\frac{1\ mol\ Al}{26.98 g\ Al}\right) \times \left(\frac{3\ mol\ H_2}{2\ mol\ Al}\right) \times \left(\frac{2.02\ grams\ H_2}{1\ mol\ H_2}\right) = 0.337\ grams\ H_2$$

$$\#2 \quad \frac{16.5\ grams\ KOH}{1} \times \left(\frac{1\ mol\ KOH}{56.11 g\ KOH}\right) \times \left(\frac{3\ mol\ H_2}{2\ mol\ KOH}\right) \times \left(\frac{2.02 g\ H_2}{1\ mol\ H_2}\right) = 0.89\ grams\ H_2$$

b. How many grams of $KAl(SO_4)_2{\cdot}12H_2O$ will be your theoretical yield?** (ALUM)

$$3.00\ grams\ Al \times \left(\frac{mol\ Al}{g\ Al}\right) \times \left(\frac{\quad}{\quad}\right) \times \left(\frac{\quad}{\quad}\right) = g\ ALUM$$

c. If you only get 30.6 g of $KAl(SO_4)_2{\cdot}12H_2O$, what was your % yield?

*Strategy: Try converting grams of the first reactant into grams of product, Then do the same for the second reactant. The limiting reactant will be whichever reactant gives the least product

**Strategy: Do a conversion, using the grams of your limiting reactant as the starting point and trying to finish up in grams of your product.