PURPOSE How Do We SAY
How WELL OUR LAB WENT?

#1) "THEORETICAL YIELD"
is how much we predict
we will get

#2) "ACTUAL YIELD"
How MUCH WE ACTUALLY
GET.

#3) "Percent Yield"

$$\% \text{ yield} = \frac{\text{Actual Yield}}{\text{Theoretical Yield}} \times 100$$

BEFORE YOU SIT, GO FIX YOUR LAB

1) GRAB A WIRE
2) SAND OFF THE VARNISH
3) WEIGH IT (CRUCIAL!!)
4) ~~Do~~ ADD THE WIRE TO
   YESTERDAY'S TEST TUBE

Name _____ Hr ___

HW 8.1 Mole relationships

For each of the problems below:
a. Write the underlined balanced chemical equation.
b. Identify what is given (with units) and what you want to find (with units).
c. Use coefficients from balanced equation to determine mole ratio.
d. Show set up (organize it!).

1. Hydrogen sulfide gas, which smells like rotten eggs, burns in air to produce sulfur dioxide and water. How many moles of oxygen gas would be needed to completely burn 8 moles of hydrogen sulfide?

Equation: $\underline{2}\ H_2S_{(g)} + \underline{3}\ O_{2\ (g)} \rightarrow \underline{2}\ SO_{2(g)} + \underline{2}\ H_2O_{(g)}$
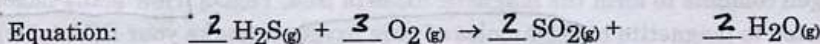
Before	8 mol	xs mol	0 mol	0 mol
Change	-8 mol	-12 mol	+8 mol	+8 mol
After	0 mol	xs mol	+8 mol	+8 mol

12 mol of O_2

2. Propane, C_3H_8, burns in air to form carbon dioxide and water. If 12 moles of carbon dioxide are formed, how many moles of propane were burned?
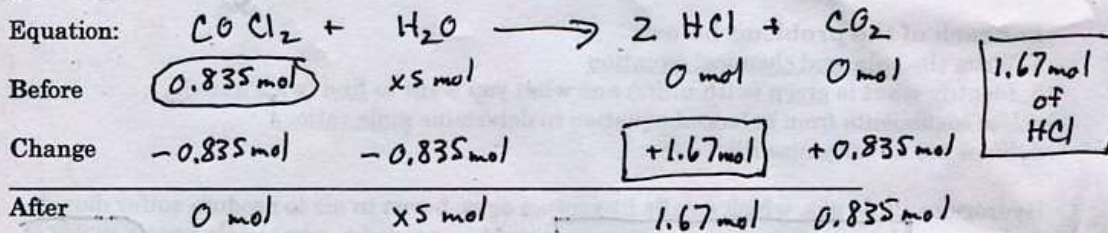
Equation: $C_3H_8 + 5 O_2 \longrightarrow 3 CO_2 + 4 H_2O$
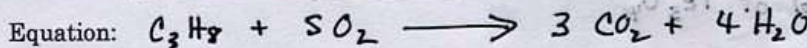
Before	xs mol	xs mol	0 mol	0 mol
Change	-4 mol	-20 mol	+12 mol	+16 mol
After	xs mol	xs mol	12 mol	16 mol

4 mol of C_3H_8

3. Ammonia, NH_3, for fertilizer is made by causing hydrogen and nitrogen to react at high temperature and pressure. How many moles of ammonia can be made from 0.15 moles of nitrogen gas?
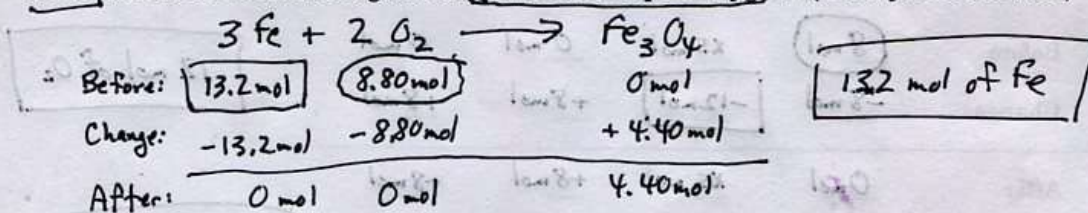
Equation: $N_2 + 3 H_2 \longrightarrow 2 NH_3$
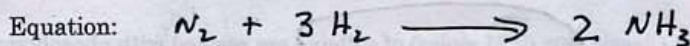
Before	0.15mol	xs mol	0 mol
Change	-0.15mol	-0.45 mol	+0.30 mol
After	0	xs mol	0.30 mol

0.30 mol of NH_3

4. The poison gas phosgene, $COCl_2$, reacts with water in the lungs to form hydrochloric acid and carbon dioxide. How many moles of hydrochloric acid would be formed by 0.835 moles of phosgene?

Equation: $CO\,Cl_2$ + H_2O ⟶ $2\,HCl$ + CO_2

	$CO\,Cl_2$	H_2O	HCl	CO_2	
Before	0.835 mol	x5 mol	0 mol	0 mol	1.67 mol of HCl
Change	−0.835 mol	−0.835 mol	+1.67 mol	+0.835 mol	
After	0 mol	x5 mol	1.67 mol	0.835 mol	

5. Iron metal and oxygen combine to form the magnetic oxide of iron, Fe_3O_4. How many moles of iron can be converted to magnetite by 8.80 moles of pure oxygen? (make your BCA table)

$3\,Fe$ + $2\,O_2$ ⟶ Fe_3O_4

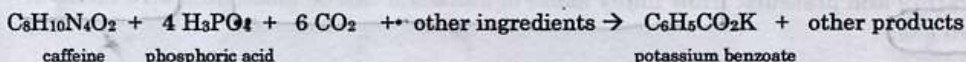|	$3\,Fe$	$2\,O_2$	Fe_3O_4	
Before:	13.2 mol	8.80 mol	0 mol	13.2 mol of Fe
Change:	−13.2 mol	−8.80 mol	+4.40 mol	
After:	0 mol	0 mol	4.40 mol	

How many moles of iron oxide would be produced?

4.40 mol of Fe_3O_4

6. The recipe for Coca-Cola Classic is a closely guarded secret. Researchers outside the company believe the flavoring mixture, known as "7X", contains oils of orange, lemon, nutmeg, cinnamon, and coriander. The original mixture also contained caffeine, vanilla, caramel, lime juice, sugar or artificial sweetener, and citric acid.

Over the years, the recipe has changed. For example, the original recipe contained citric acid but this was combined with phosphoric acid to cut production costs. Corn syrup replaced sugar for the same reason.

$C_8H_{10}N_4O_2$ + $4\,H_3PO_4$ + $6\,CO_2$ + other ingredients → $C_6H_5CO_2K$ + other products

caffeine   phosphoric acid   potassium benzoate

To produce 1000 cans of Coca-Cola Classic, 40g (0.21 moles) of caffeine are reacted with phosphoric acid and other ingredients. How many moles of phosphoric acid are required? How many moles of carbon dioxide are required?

B:	0.21 mol	0.84 mol	1.26 mol	0.84 mol of phosphoric acid
C:	−0.21 mol	−0.84 mol	−1.26 mol	
A:	0 mol	0 mol	0 mol	1.26 mol of CO_2