If you are a student that **HAS** access to technology, this is not the packet for you. This packet is for students who pick up and drop off their work at the front office every week. If you have access to technology, please go back to your teacher's website and complete the correct assignment.

Name: _____ Period: _____ Teacher: _____

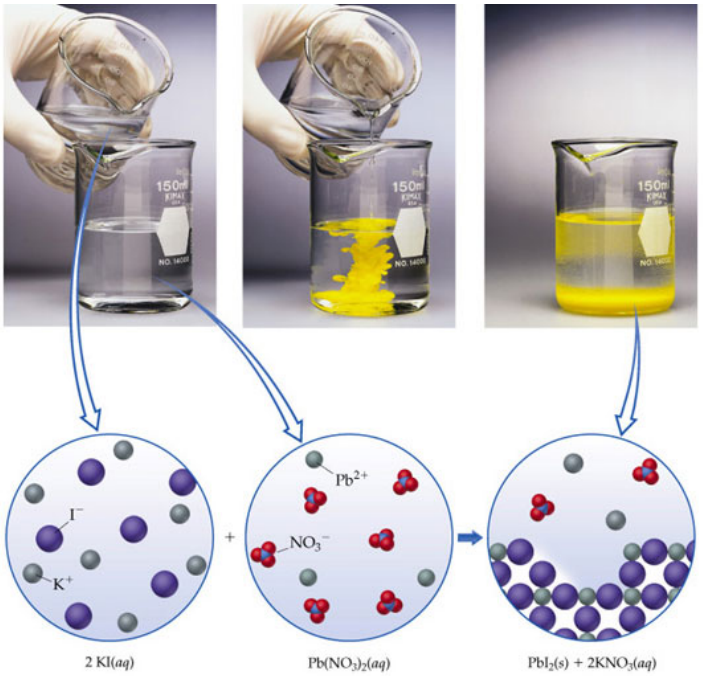
Distance Learning Week 8 Paper Packet
5/25-5/31

8.1 Stoichiometry: Calculating Chemical Amounts

(notes, 3 examples, and 3 practice problems)

If you have internet access, there is a video on my website explaining these notes!

When potassium iodide (KI) is mixed with lead nitrate ($Pb(NO_3)_2$), a yellow solid is formed. This yellow solid is lead iodide, PbI_2. Lead iodide used to be used as a pigment in yellow paint, but is now used to detect gamma and x-rays.



$2\ KI + Pb(NO_3)_2 \rightarrow PbI_2 + 2\ KNO_3$

Molar Mass KI: 166.0 grams = 1 mol

Molar Mass $Pb(NO_3)_2$: 331.22 grams = 1 mol

Molar Mass PbI_2: 461.0 grams = 1 mole

Molar Mass KNO_3: 101.11 grams = 1 mole

1. I need 15.5 grams of PbI_2. How many moles of KI do I need to use to make it?

   Given (with units!): 15.5 grams of PbI_2

   Desired units: moles of KI

   Calculation:

15.5 grams PbI_2	1 mol PbI_2	2 mol KI	= 0.0672 mol KI
(remember: nothing goes here!)	461.0 g PbI_2	1 mol PbI_2	*(remember: nothing goes here!)*

Explanation for each step:	Use molar mass to convert grams of PbI_2 to moles of PbI_2	Use mole ratio to convert moles of PbI_2 to moles of KI	Calculate by multiplying by the top/dividing by the bottom (15.5 ÷ 461.0 x 2)

2. If I want to make 15.5 grams of PbI_2, how many grams of $Pb(NO_3)_2$ will I need to use?

Given (with units!): 15.5 grams of PbI_2 Desired units: grams $Pb(NO_3)_2$

Calculation:

15.5 grams PbI_2	1 mol PbI_2	1 mol $Pb(NO_3)_2$	331.22 g $Pb(NO_3)_2$	= 11.1 g $Pb(NO_3)_2$
(remember: nothing goes here!)	461.0 g PbI_2	1 mol PbI_2	1 mol $Pb(NO_3)_2$	*(remember: nothing goes here!)*

Explanation for each step:	Use molar mass to convert grams of PbI_2 to moles of PbI_2	Use mole ratio to convert moles of PbI_2 to moles of $Pb(NO_3)_2$	Use molar mass to convert moles of $Pb(NO_3)_2$ to grams of $Pb(NO_3)_2$	Calculate by multiplying by the top/dividing by the bottom (15.5 ÷ 461.0 x 331.22)

3. If I use 4.8×10^{23} particles of KI, how many grams of PbI_2 can be made?

Given (with units!): 4.8×10^{23} particles of KI Desired units: grams of PbI_2

Calculation:

4.8×10^{23} particles KI	1 mol KI	1 mol PbI_2	461.0 g PbI_2	= 180 g PbI_2
(remember: nothing goes here!)	6.02×10^{23} particles KI	2 mol KI	1 mol PbI_2	*(remember: nothing goes here!)*

Explanation for each step:	Use Avogadro's number to convert particles of KI to moles of KI	Use mole ratio to convert moles of KI to moles of PbI_2	Use molar mass to convert moles of PbI_2 to grams of PbI_2	Calculate by multiplying by the top/dividing by the bottom (remember to put Avogadro's number in parentheses!)

Try these problems on your own, then check your answers. The answers are at the bottom of the page. If you have internet access, there is also a video showing how to do the problems on my website.

The reaction below is called the Haber process. It was developed by Fritz Haber in the early 1900s. Ammonia, NH_3, is the main component in fertilizer; this is the main use of the Haber process today. However, ammonia is also used in many cleaning products such as Windex.

Balance: _____ H_2 + _____ N_2 → _____ NH_3

MM H_2: 2.016 grams = 1 mol *MM N_2: 28.02 grams = 1 mol* *MM NH_3: 17.034 grams = 1 mol*

1. If I start with 6.8×10^{23} particles of H_2, how many particles of N_2 will I need to use?

Given (with units!): _____ Desired units: _____

Calculation:

2. If I start with 3.78 grams of N_2, how many molecules of NH_3 can I make?

Given (with units!): _____ Desired units: _____

Calculation:

Ammonia should *never* be mixed with chlorine bleach when cleaning. When mixed, the following reaction happens:

NaOCl (bleach) + NH_3 (ammonia) → NaOH + NH_2Cl

NH_2Cl is a substance that is used to treat water in *very* small amounts, but it's fumes can be poisonous or even fatal if inhaled.

3. A lethal dose of NH_2Cl is approximately 65 grams for the average adult. How many grams of bleach (NaOCl) would be needed to generate this amount of NH_2Cl?

Given (with units!): _____ Desired units: _____

Molar Mass NH_2Cl: *Molar Mass NaOCl:*

Calculation:

Answers (problems 2 and 3 only): 2.3 x 10^{23} particles N_2, 1.62 x 10^{23} molecules NH_3, 94 grams NaOCl

Assignment 8.2 Stoichiometry Practice

Before you begin, make sure you have completed assignment 8.1. Please show your work. **You must show your work in order to receive full credit. Use the mole Island Graphic Organizer (Page) to guide you. A partial answer key is also included for you. YOU MUST SHOW YOUR WORK TO RECEIVE FULL CREDIT!!!**

Use the following balanced chemical equation to answer questions 1-4:

$$C_3H_8 + 5O_2 \rightarrow 4H_2O + 3CO_2$$

1. If I want to make 3.00 moles of H_2O, how many grams of C_3H_8 do I need?

Given/**start** with units (X): 3 moles of H_2O
Desired/**end** with units (Y) : grams of C_3H_8

Step 1. Write what you **start** with in the top left, what you **end with** goes in the top right.
Step 2. Make plan from start → end using mole island island
moles of (X) → moles of (Y) → grams of (Y)
Step 3. Using dimensional analysis and mole island, convert from X → Y
Each mole island **arrow** will be one **column** of dimensional analysis
You will have to calculate molar mass in some problems
The **molar ratio** of C_3H_8 : H_2O is **1 mol of C_3H_8 : 4 mol of H_2O**

3 moles of H_2O (start)	**1 mol of C_3H_8**	**44.097 grams of C_3H_8**	**= 33.1 grams of C_3H_8 (end)**
(This area remaines blank)	**4 mol of H_2O**	**1 mol of C_3H_8**	**(This area remaines blank)**

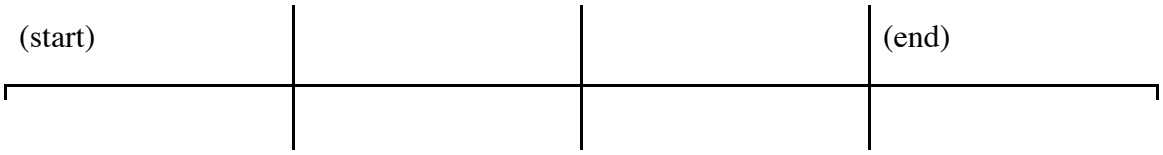
2. If I use 50.0 grams of O_2 , how many grams of C_3H_8 will I use?

Given/**start** with units (X): 50.0 grams of O_2
Desired/**end** with units (Y): grams of C_3H_8
Mole island pathway: grams of (X) → moles of (X) → moles of (Y) → grams of (Y)

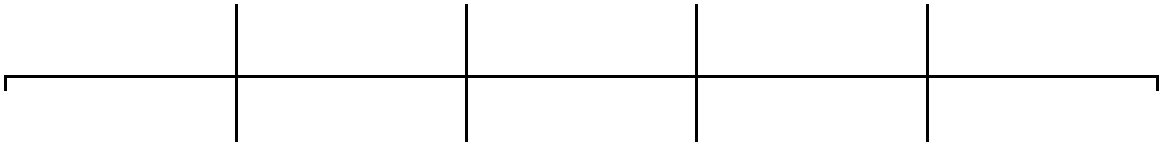
50.0 grams of O_2				= grams of C_3H_8
(This area remaines blank)				**(This area remaines blank)**

3. If I want to make 12 moles of CO_2, how many particles of C_3H_8 will I use?

a. Given/**start** with units (X): _____
b. Desired/**end** with units (Y): _____
c. Mole island map: Moles of (X) → moles of (Y) → particles of (Y)



4. If I use 8.65×10^{23} particles of C_3H_8, how many grams of CO_2 will I use?



Use the following balanced chemical equation to answer questions 5-8:

$$2\ Al + Fe_2O_3 \rightarrow Al_2O_3 + 2\ Fe$$

5. Mr. Lim is going to perform a thermite reaction. How many moles of Al should he use if he wants to make 123 grams Fe?

6. If Mrs. Macedo produces 1.01×10^{23} particles of Al_2O_3, how many particles of Fe_2O_3 were used?

7. How many grams of Al will Mrs. Meemari needs to make 4.80 moles of Al_2O_3?

8. If Mrs. Richardson produce 92 grams of Al_2O_3, how many grams of Fe_2O_3 did she use?

9. (Super) Challenge (Optional): $2\ Al + Fe_2O_3 \rightarrow Al_2O_3 + 2\ Fe$

I have 2.000 pounds of Al and 5.000 pounds of Fe_2O_3, how many moles of Fe can I make? How many grams? (hint: 453.6 grams = 1 lb, there is a *limiting reactant* as well)

8.3 End of Year Survey Please answer the following questions:

1. If we could travel back in time and redo semester 2 (specifically the 4th quarter with distance learning) what should we add/change to make the experience better or more successful for you?

2. How "hard" was the workload this quarter on Distance Learning? Did you feel you had enough support and could successfully complete the assignments if you were actually trying?

3. On a scale of 1-5 (1 being the easiest and 5 being the hardest) - how hard was it to do the following:
    a. Access assignments? _____
    b. Complete assignments? _____
    c. Submit the distance learning assignments? _____

4. How did the rest of this quarter end for you? A lot of news reports discussed "Distance Learning Fatigue" - did you feel that way? Anything else you would like me to know about how you're doing right now?

5. What was your favorite memory from class this year?

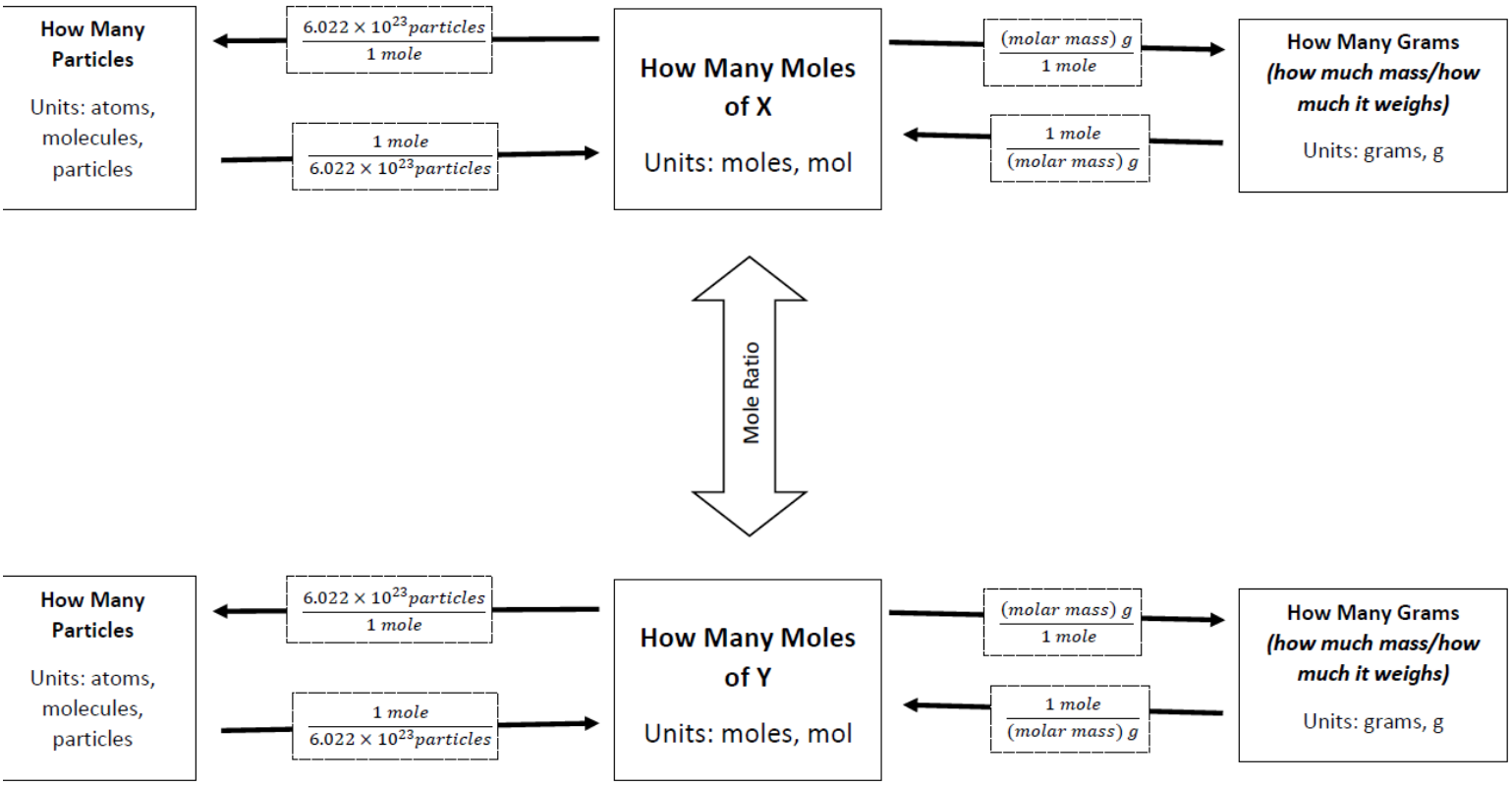
6. If you had to describe your Chem Class in a tweet - what would the tweet say?

7. Which topic do you feel you never fully understood/still have questions about?

8. Which topic was your favorite to learn about this year? Why?

9. Anything else you would like to share with me or think would be helpful for me to change going forward? Please be honest (but make it Constructive Criticism). I would like to make this the best class possible and your feedback is super important to me.

Mole Island



Assignment 8.2 Stoichiometry Practice Key

1.

3 ~~moles of H_2O~~ (start)	1 ~~mol of C_3H_8~~	44.097 grams of C_3H_8	= 33.1 grams of C_3H_8 (end)
	4 ~~mol of H_2O~~	1 ~~mol of C_3H_8~~	

2.

50.0 ~~grams of O_2~~	1 ~~mole of O_2~~	1 ~~mole of C_3H_8~~	44.097 grams of C_3H_8	= 61.2 grams of C_3H_8
	35.998 ~~grams of O_2~~	1 ~~mole of O_2~~	1 ~~mole of C_3H_8~~	

3.

12 ~~moles of CO_2~~	1 ~~mol of C_3H_8~~	44.097 grams of C_3H_8	= 176.388 → 180 grams of C_3H_8
	3 ~~moles of CO_2~~	1 ~~mol of C_3H_8~~	

4.

8.65 x 10^{23} ~~particles of C_3H_8~~	1 ~~mol of C_3H_8~~	3 ~~mol of CO_2~~	44.009 grams of CO_2	= 189.653 → 190. grams of CO_2
	6.022 x 10^{23} ~~particles of C_3H_8~~	1 ~~mol of C_3H_8~~	1 ~~mol of CO_2~~	

5. 2.2052 → 2.21 moles of Al
6. 1.01 x 10^{23} particles of Fe_2O_3 (Al_2O_3 and Fe_2O_3 have a 1:1 ratio)
7. 259.0272 → 260 grams of Al
8.

92 ~~grams of Al_2O_3~~	1 ~~mol of Al_2O_3~~	1 ~~mol of Fe_2O_3~~	159.687 grams of Fe_2O_3	= 144.086 → 140 grams of Fe_2O_3
	101.961 ~~grams of Al_2O_3~~	1 ~~mol of Al_2O_3~~	1 ~~mol of Fe_2O_3~~	

9. (Super) Challenge (Optional)

Fe_2O_3 is the limiting reactant (You have 33.622 mol of Al and 14.202 mol of Fe_2O_3. you'll run out of Fe_2O_3 before you run out of Al because you're using Al at twice the rate of Fe_2O_3)

You can make 28.404 moles of Fe → 1590 grams of Fe. ***Good job if you got this problem! Get ready for AP Chem!***