Put the first three letters of your LAST NAME in the boxes:

Full Name: Elizabeth Wu (S), Joanna Huang (B), Camille Diaz (C), Kristine Hernandez (S) Elizabeth Wilcenski (B) UTEID: _____

Unit 1: Gases Discussion Worksheet #1, Stoichiometry and Pressure

Show all work for credit. Your work and answers must fit in the boxes or diagrams provided for each question.

Part I:

1. 40.0 grams of A (60.0 g/mol) react with 35.0 grams of B (40.0 g/mol) to form C (37.0 g/mol) and D (75.0 g/mol) according to the following equation:

$$3\ A + 2\ B \rightarrow 5\ C + 1\ D$$

Which reactant is the limiting reactant? (Show the work used to make this determination in the box and then circle your answer.)

$3A + 2B \rightarrow 5C + D$

$\frac{40\text{ g A}}{60\text{ g A}} \left| \frac{1\text{ mol A}}{3\text{ mol A}} \right| \frac{1\text{ mol D}}{} = 0.22$

Limiting Reactant is A

$\frac{35\text{ g B}}{40\text{ g B}} \left| \frac{1\text{ mol B}}{2\text{ mol B}} \right| \frac{1\text{ mol D}}{} = 0.4375$

The limiting reactant is (circle one): (A) B C D

2. For the reaction in #1, what is the maximum number of grams of D that can be produced? Again, show your work and put your final answer in the spaces in the lower right corner.

$0.67\text{ mol A} \cdot \frac{1\text{ mol D}}{3\text{ mol A}} \cdot \frac{75\text{ g D}}{1\text{ mol D}} = 16.7\text{ g D}$

Answer: 16.7 g D

3. For the reaction in #1, how many grams of excess reactant are left over at the completion of the reaction? Again, show your work and put your final answer in the spaces in the lower corner.

$0.67\text{ mol A} \cdot \frac{2\text{ mol B}}{3\text{ mol A}} \cdot \frac{40\text{ g B}}{1\text{ mol B}} = 17.8\text{ g B}$

$35.0\text{ g B} - 17.8\text{ g B} = 17.2\text{ g B}$

Answer: 17.2 g of B

Part II:

On a table in front of you are two beakers, each containing 100.0 mL of a clear, colorless liquid. One beaker is labeled lead(II) nitrate and the other is labeled potassium iodide. You pour the contents of one beaker into the other, and immediately a solid yellow precipitate, PbI_2 forms. The other product is the soluble compound KNO_3.

1. Write the chemical formulas for the reactants, lead (II) nitrate and potassium iodide, in the scenario above.

   $Pb(NO_3)_2$

   KI

2. Write names for the products, PbI_2 and KNO_3, in the scenario above.

   lead (II) iodide

   potassium nitrate

3. Write a balanced chemical equation for this reaction.

   $Pb(NO_3)_{2\,(aq)} + 2KI_{(aq)} \rightarrow PbI_{2\,(s)} + 2KNO_{3\,(aq)}$

4. You separate the precipitate from the liquid. You dry the yellow precipitate and weigh it, and find that you have 9.22 grams of PbI_2. How many moles of PbI_2 is this?

   $9.22\text{g } PbI_2 \cdot \frac{1\text{ mol } PbI_2}{461\text{g } PbI_2} = \boxed{0.02\text{ mol } PbI_2}$

0.22 mol/L 0.56 mol/L

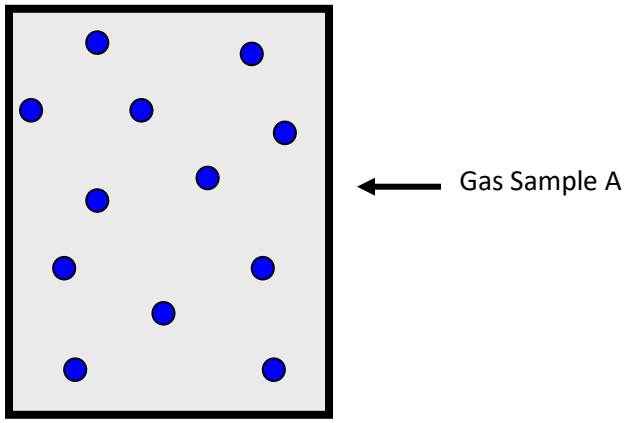
5. If the starting concentrations of your solutions were 0.22 M lead (II) nitrate and 0.56 M potassium iodide, what is the percent yield for the reaction, given the final mass of 9.22 PbI_2?

$100\text{mL} \cdot \frac{1\text{ L}}{1000\text{mL}} \cdot \frac{0.22\text{mol } Pb(NO_3)_2}{1\text{L}} \cdot \frac{1\text{ mol } PbI_2}{1\text{ mol } Pb(NO_3)_2} \cdot \frac{461\text{g } PbI_2}{1\text{ mol } PbI_2} = 10.142\text{g}$

$\frac{9.22\text{g}}{10.142\text{g}} = \boxed{91\%}$

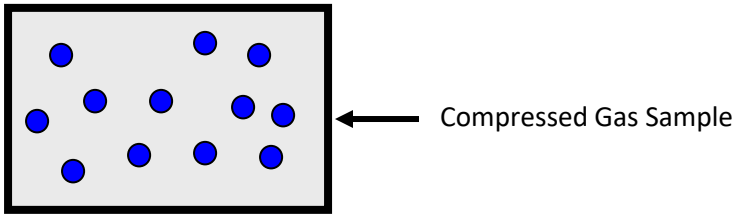
Part III:

Gas Sample A has a pressure of 735 torr at a temperature of 300 K:



1. What is the pressure of gas sample A as measured in bar?

2. If gas sample A is compressed at constant temperature, would the pressure increase or decrease? Why?



3. Which contains more moles of gas: the original sample or the compressed sample?

4. Which has a greater density (g/L): the original sample or the compressed sample?