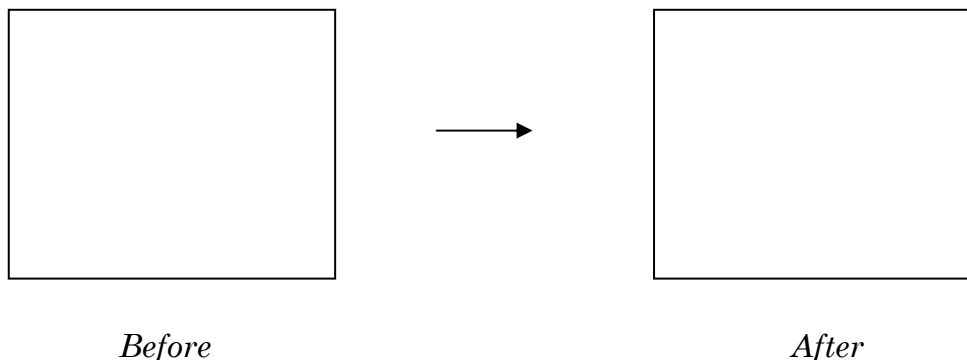# Chemistry Unit 7
Worksheet 3: Adjusting to Reality - Limiting Reactant

1. Given 4 molecules of hydrogen gas and 4 molecules of oxygen gas to form water. Write the <u>balanced</u> equation for the reaction between hydrogen and oxygen.

Balanced Equation: _____

Make a drawing that represents the reaction container before and after the reaction.

Before   *After*

_____ How many molecules of water can be produced?
_____ Which reactant is in excess? Why?
_____ How many molecules of excess reactant are there?

Construct a Before-Change-After Table for this reactant mixture:

Bal. Equation: _____
    Before: _____
    Change: _____
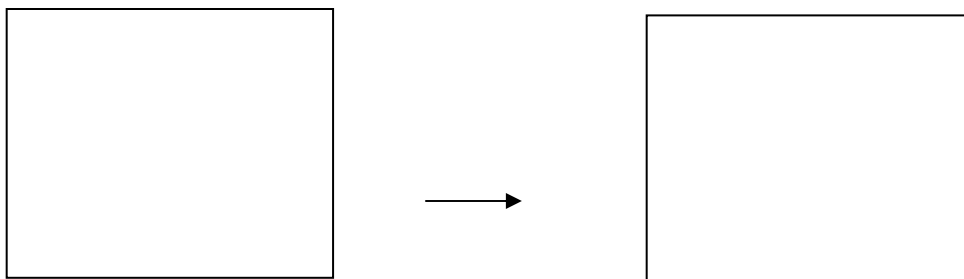   **After:** _____

According to the table you just made,

_____ How many molecules of water can be produced?
_____ Which reactant is in excess? Why?
_____ How many molecules of excess reactant are there?

Based on your two methods of analysis above, what determines how much product can be made from a particular reactant mix?

2. Write the equation for the formation of ammonia from nitrogen gas and hydrogen gas.

   Balanced Equation: _____

Given 6 molecules of nitrogen and 12 molecules of hydrogen, make a drawing that represents the reaction container before and after the reaction.

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┌──────────────┐              ┌──────────────┐
│              │              │              │
│              │      ──────▶ │              │
│              │              │              │
│              │              │              │
└──────────────┘              └──────────────┘
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         Before   After

_____ How many molecules of ammonia can be produced?

_____ Which reactant is in excess? Why?

_____ How many molecules of excess reactant are there?

Construct a Before-Change-After Table for this reactant mixture:

Bal. Equation: _____
   Before: _____
   Change: _____
   After: _____

According to the table you just made,

_____ How many molecules of ammonia can be produced?
_____ Which reactant is in excess? Why?
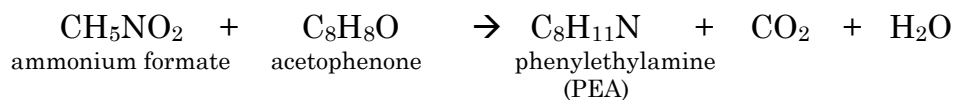_____ How many molecules of excess reactant are there?

Describe what you must look for in a particular reactant mixture to decide which reactant will be in excess (have some left over after the reaction):

3. When 0.50 mole of aluminum reacts with 0.72 mole of iodine to form aluminum iodide, how many moles of the excess reactant will remain? _____
How many moles of aluminum iodide will be formed? _____

Bal. Equation: _____

      Before: _____

      Change: _____

      After: _____

4. When sodium hydroxide reacts with sulfuric acid (H_2SO_4), water and sodium sulfate are the products. Calculate the <u>mass</u> of sodium sulfate produced when 15.5 g of sodium hydroxide are reacted with 46.7 g of sulfuric acid. [Hint: which unit is used in all stoichiometry reasoning?]

5. A 14.6 g sample of oxygen gas is placed in a sealed container with 2.5 g of hydrogen gas. The mixture is sparked, producing water vapor. Calculate the mass of water formed. Calculate the number of moles of the excess reactant remaining.

6. Neuroscientists believe that the only chemical in chocolate that may have a feel-good effect on the human brain is phenylethylamine (PEA). Although the PEA in chocolate occurs naturally, PEA can be made in the laboratory by the following reaction:

phenylethylamine

$$CH_5NO_2 \quad + \quad C_8H_8O \quad \rightarrow \quad C_8H_{11}N \quad + \quad CO_2 \quad + \quad H_2O$$
ammonium formate   acetophenone   phenylethylamine
                                     (PEA)

How much PEA can be made from 75.0g of ammonium formate and 125g of acetophenone What mass of the excess reactant remains?

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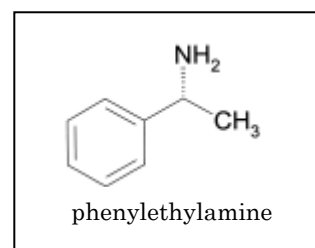
4. 27.5 g   5. 16.4 g, 0.34 moles xs   6. 126 g, 9.45g xs