CHAPTER 8	**Thought Lab 8.1: The Limiting Item**	**BLM 8.1.1**
HANDOUT		

Suppose that you are in charge of a company that is manufacturing widgets. A widget is a contraption that, in this case, consists of two nuts, a washer, and a bolt. The word equation for making one widget is:
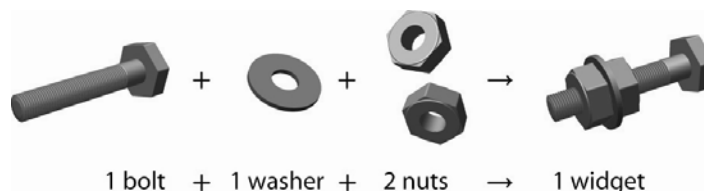
one bolt + one washer + two nuts → one widget
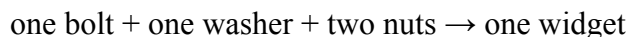
• a bolt has the symbol Bt
• a washer has the symbol Wa
• a nut has the symbol Nu

Using the above symbols, we can write a "chemical equation" for the formation of one widget:

$$Bt + Wa + 2Nu \rightarrow BtWaNu_2$$

$BtWaNu_2$ is the "formula" for a widget.

1 bolt + 1 washer + 2 nuts → 1 widget

Analysis

1. If you are given 75 bolts (75 Bt), 100 washers (100 Wa), and 100 nuts (100 Nu), how many widgets can you make if they must all have the formula $BtWaNu_2$?

    (a) Which "reactant" limits the number of widgets you can make?

    (b) Which "reactants" were present in excess?

    (c) How much of each excess reactant remains?

    (d) What is the "mole ratio" of Nu to Bt?

    (e) What is the "mole ratio" of Nu to Wa?

Thought Lab 8.1: The Limiting Item (continued)

2. How does the amount of a reactant that is present in excess affect the quantity of product that is obtained?

3. In this case, there were fewer Bt than Nu or Wa. Explain why the bolts are not the limiting reactant, despite being present in the least number of the three reactants.

Extension

1. Can you generate a general mathematical rule to be used in determining the limiting reactant?

2. (a) Create another example of limiting and excess reactants in everyday life.

(b) Assign quantities to this example, and have a classmate solve for the limiting and excess reactant.