

Stoichiometry IRL

MISS CHATRATH

CHEM 11

Overview

- ❑ Return quizzes
- ❑ Excess/limiting
 - ❑ Balloon races
 - ❑ Whiteboards
 - ❑ Brain breaks in between problems
- ❑ Homework check for page 217 #1-3

Assumptions made so far

- Reactant(s) are completely pure
- Reactant(s) will be totally consumed
- Reaction proceeds entirely to completion
- No alternate or side reactions occur

Assumptions made so far

- All reactants are consumed completely in stoichiometric quantities
 - Molar ratio is identical to that predicted by the balanced equation

You must be able to determine

REACTANTS:

- Which are in excess (excess reactant or reagent)
 - Left overs, there will be more than enough of one reactant to completely react with the other
 - How much is left over once the reaction is complete

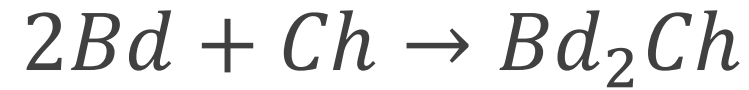
You must be able to determine

REACTANTS:

- Which are in excess (excess reactant or reagent)
 - Left overs, there will be more than enough of one reactant to completely react with the other
 - How much is left over once the reaction is complete
- Which are limiting (limiting reactant or reagent)
 - Reactant that is totally consumed when a reaction is completed

Bread and Cheese analogy
extra notes to help you

Remember:



2 pieces of Bread + 1 cheese produce 1 sandwich



Remember: $2Bd + Ch \rightarrow Bd_2Ch$

What if I had:

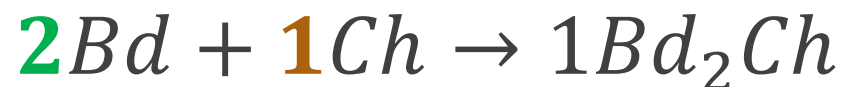


1. Which reagent is limiting, and which is in excess?
2. How much is there of my excess reactant?
3. How many sandwiches could I make?

What if: $6Bd + 4Ch \rightarrow ?$

1. Which reagent is limiting, and which is in excess?

check to see how much of each reagent is actually needed based on what is given and the original balanced equation



$$6Bd \times \frac{1Ch}{2Bd} = 3Ch$$

vs.

$$4Ch \times \frac{2Bd}{1Ch} = 8Bd$$

What if: $6Bd + 4Ch \rightarrow ?$

1. Which reagent is limiting, and which is in excess?

$$6Bd \times \frac{1Ch}{2Bd} = 3Ch \qquad \text{vs.} \qquad 4Ch \times \frac{2Bd}{1Ch} = 8Bd$$

compare what is needed to how much is given

- Have enough cheese compared to bread given
- More bread is required if we want to use the cheese given

What if: $6Bd + 4Ch \rightarrow ?$

1. Which reagent is limiting, and which is in excess?

Therefore we can say:

- Bread is my limiting reagent or reactant
- Cheese is in excess or is my excess reagent or reactant

What if: $6Bd + 4Ch \rightarrow ?$

2. How much is there of my excess reactant?

start with limiting reactant (bread) – dictates how much of the other reactant will be used

$$6Bd \times \frac{1Ch}{2Bd} = 3Ch \quad \text{*cheese **required** for 6 slices of bread*}$$



What if: $6Bd + 4Ch \rightarrow ?$

2. How much is there of my excess reactant?

$$6Bd \times \frac{1Ch}{2Bd} = 3Ch \quad \text{*cheese **required** for 6 slices of bread*}$$

compare what is required or needed to what is given and subtract to find out how much is in excess (in xs)

$$\begin{array}{r} 4Ch \\ -3Ch \\ \hline 1Ch \text{ in xs} \end{array}$$

What if: $6Bd + 4Ch \rightarrow ?$

2. How much is there of my excess reactant?

compare what is required or needed to what is given and subtract to find out how much is in excess (in xs)

$$\begin{array}{r} 4Ch \\ -3Ch \\ \hline 1Ch \text{ in xs} \end{array}$$

Therefore:

We have one slice of cheese in excess (in xs)



What if: $6Bd + 4Ch \rightarrow$

3. How many sandwiches could I make?

Recall original equation: $2Bd + Ch \rightarrow Bd_2Ch$

Ratio: $\frac{2 Bd}{1 Bd_2Ch}$ or $\frac{1 Bd_2Ch}{2 Bd}$

What if: $6Bd + 4Ch \rightarrow$

3. How many sandwiches could I make?

start with limiting reagent (bread)

$$6Bd \times \frac{1 Bd_2Ch}{2 Bd} = 3Bd_2Ch$$

Can only make 3 sandwiches



Recall: the baking bad analogy

Recipe requires 2 eggs for 4 dozen cookies

2 eggs $\rightarrow$ 4 dozen cookies

If I only have 1 egg then that dictates how many cookies I can make:

$$1 \text{ egg} \times \frac{4 \text{ dozen cookies}}{2 \text{ eggs}} = 2 \text{ dozen cookies}$$





What if:



1. Which reagent is limiting, and which is in excess?
2. How much is there of my excess reactant?
3. How many sandwiches could I make?



What if:



1. Which reagent is limiting, and which is in excess?

Following the previous example:

$$9832Bd \times \frac{1Ch}{2Bd} = 4916Ch \quad vs. \quad 7231Ch \times \frac{2Bd}{1Ch} = 14462Bd$$

Bread is our limiting reagent and Cheese is in excess



What if:



2. How much is there of my excess reactant?

$$9832Bd \times \frac{1Ch}{2Bd} = 4916Ch \text{ required}$$

$$\begin{array}{r} 7231 \text{ } Ch \\ -4916 \text{ } Ch \\ \hline 2315 \text{ } Ch \text{ in } xs \end{array}$$



What if:



3. How many sandwiches could I make?

$$9832Bd \times \frac{1 Bd_2Ch}{2 Bd} = 4916Bd_2Ch$$

I can only make 4916 sandwiches