# Limiting Reagent Walk-Through – 2nd Method

#### $AI(OH)_3 + 3NaCI \rightarrow AICI_3 + 3NaOH$ You start with 28.50 g of $AI(OH)_3$ and 65.00g of NaCl

How many grams of NaOH can you make, and how many moles of the excess (XS) reagent do you have left when done?

#### <u>STEP #1 – Calculate theoretical product with 1<sup>st</sup> reactant</u>

Use mole highway

28.50 g Al(OH) <sub>3</sub>	1 mol Al(OH)₃	3 mol NaOH	40.00g NaOH	= 43.85 g NaOH
	78.00 g Al(OH) <sub>3</sub>	1 mol Al(OH) <sub>3</sub>	1 mol NaOH	

### STEP #2 – Calculate theoretical product with 2<sup>nd</sup> reactant

Use mole highway

65.00 g NaCl	1 mol NaCl	3 mol NaOH	40.00g NaOH	= 44.49 g NaOH
	58.44 g NaCl	3 mol NaCl	1 mol NaOH	

### STEP #3 – Determine Limiting Reagent

The smaller amount of product produced tells you which reactant you will run out of first. Al(OH)<sub>3</sub> = 43.85 g NaOH NaCl = 44.49 g NaOH

Al(OH)<sub>3</sub> produces less NaOH therefore it is the limiting reagent. NaCl is therefore the excess reagent.

### **STEP #4 - Dimensional Analysis with Limiting Reagent**

Convert from moles of limiting reactant to desired unit of unknown substance asked for in the problem – use mole highway to determine where to start and end. If it is asking for grams then you already did this in Step #1 or Step #2 depending on the question being asked

 $AI(OH)_3 + 3NaCI \rightarrow AICI_3 + 3NaOH$ 

XS

LR

## STEP #5 - XS Left: Dimensional Analysis and then Subtract

Use amount of Limiting Reagent and mole highway to calculate how many grams of Excess Reagent are used up during the reaction:

- $AI(OH)_3 + 3NaCI \rightarrow AICI_3 + 3NaOH$
- LR XS 28.50g 65.00g
- 28.50g 05.0
- Al(OH)<sub>3</sub> NaCl

 28.50 g Al(OH)<sub>3</sub>
 1 mol Al(OH)<sub>3</sub>
 3 mol NaCl
 58.44 g NaCl
 = 64.06 g NaCl

 78.00 g Al(OH)<sub>3</sub>
 1 mol Al(OH)<sub>3</sub>
 1 mol NaCl
 used in rxn

Subtract grams of Excess Reagent you used from the amount of Excess Reagent you started with to determine how much is left over.

65.00 g of NaCl when reaction started

- 64.06 g of NaCl used during the rxn
- = 0.94 g of NaCl left over

### **STEP #6 - XS Left: Convert to desired unit if needed**

Use mole highway

0.94 g NaCl left over1 mol NaCl= 0.01608 mol of NaCl left over58.44 g NaCl