

## Stoichiometry



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## STOICHIOMETRY FOUR STEP SOLUTION

- Step 1 Write and balance the reaction.
- Step 2 List conversion factors.
- Step 3 Set up mole ratios.
- Step 4 Solve using dimensional analysis



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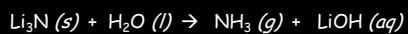
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## Stoichiometry: Problem #1

Lithium Nitride reacts with water to form ammonia and aqueous lithium hydroxide.



What mass of water is needed to react with 32.9 g of  $\text{Li}_3\text{N}$ ?



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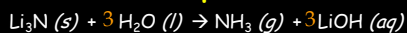
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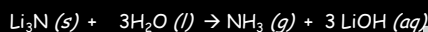
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## Step 1: Write and Balance the equation



3	Li	<del>1</del>	3
1	N	1	1
<del>2</del>	6	4	6
<del>1</del>	3	<del>1</del>	3




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## Step 2: Get conversion factors

Mass/mole conversion factor for  $\text{Li}_3\text{N}$

1 mole of  $\text{Li}_3\text{N}$   
 =  $3 \times 6.94 \text{ g of Li/mol} + 1 \times 14.01 \text{ g of N/mol}$   
 = 34.7 grams  $\text{Li}_3\text{N} / \text{mol}$

$$\frac{34.7 \text{ g Li}_3\text{N}}{1 \text{ mol Li}_3\text{N}}$$

Mass/mole conversion factor for water ( $\text{H}_2\text{O}$ )

1 mole of  $\text{H}_2\text{O}$   
 =  $2 \times 1.01 \text{ g of H/mol} + 1 \times 16.00 \text{ g of O/mol}$   
 = 18.02 grams  $\text{H}_2\text{O} / \text{mol}$

$$\frac{18.2 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}}$$




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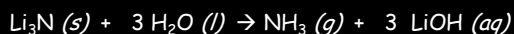
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## Step 3: Show the Mole Ratio

Using the balanced equation, write down the mole ratios for the compounds in the problem



problem asked to find grams of water ( $\text{H}_2\text{O}$ )  
 needed to react with 32.9 g of  $\text{Li}_3\text{N}$

The mole ratio is  $\frac{3 \text{ H}_2\text{O}}{1 \text{ Li}_3\text{N}}$




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$\text{Li}_3\text{N} (s) + 3\text{H}_2\text{O} (l) \rightarrow \text{NH}_3 (g) + 3 \text{LiOH} (aq)$   
 find grams of water ( $\text{H}_2\text{O}$ ) needed  
 to react with 32.9 g of  $\text{Li}_3\text{N}$

$18.2 \text{ g H}_2\text{O}$	$34.7 \text{ g Li}_3\text{N}$	$3 \text{ H}_2\text{O}$
$1 \text{ mol H}_2\text{O}$	$1 \text{ mol Li}_3\text{N}$	$1 \text{ Li}_3\text{N}$

Solve

$32.9 \text{ g Li}_3\text{N}$	$1 \text{ mol Li}_3\text{N}$	$18 \text{ g H}_2\text{O}$	$3 \text{ mol H}_2\text{O}$
$34.7 \text{ g Li}_3\text{N}$	$1 \text{ mol H}_2\text{O}$	$1 \text{ mol Li}_3\text{N}$	
$= 51.3 \text{ g H}_2\text{O}$			




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Your Turn (and I will help every step of way):

- **Sample Problem**
- Tin(II) fluoride,  $\text{SnF}_2$ , is used in some toothpastes. It is made by the reaction of tin with hydrogen fluoride according to the following equation.
  - $\text{Sn}(s) + 2\text{HF}(g) \rightarrow \text{SnF}_2(s) + \text{H}_2(g)$
- How many grams of  $\text{SnF}_2$  are produced from the reaction of 30.00 g HF with Sn?




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Answer Step 1


Tin(II) fluoride,  $\text{SnF}_2$ , is used in some toothpastes. It is made by the reaction of tin with hydrogen fluoride according to the following equation:

$$\text{Sn}(s) + 2\text{HF}(g) \rightarrow \text{SnF}_2(s) + \text{H}_2(g)$$

Write and Balance Equations

$$\text{Sn}(s) + 2\text{HF}(g) \rightarrow \text{SnF}_2(s) + \text{H}_2(g)$$

“How many grams of  $\text{SnF}_2$  are produced from the reaction of 30.00 g HF with Sn?” Circle what is important to solve the problem.




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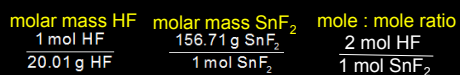
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## Step 2



### 2. Write Conversion Factors



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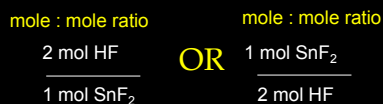
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## Step 3



### 3. Show Mole Ratio



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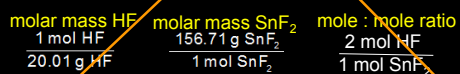
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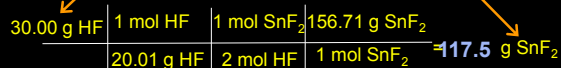
## Step 4 Solve the problem

"How many grams of SnF<sub>2</sub> are produced from the reaction of 30.00 g HF with Sn?"

Conversion Factors



### 4. Solve



$$30 \times 156.71 \div (20.01 \times 2) = 117.5$$



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