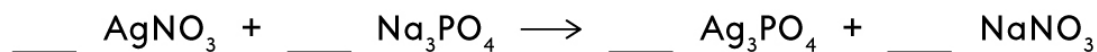


# STOICHIOMETRY LIMITING REAGENT

① Consider the following reaction:

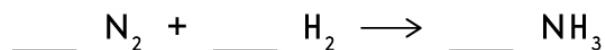


Balance the reaction.

a 200 grams of each reactant react. How many grams of silver phosphate are formed?

b How much excess reagent is left?

② Consider the following reaction:



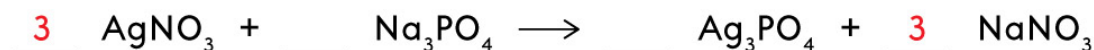
Balance the reaction.

How many grams of  $\text{NH}_3$  are produced when 28 g of  $\text{N}_2$  reacts with 25 g of  $\text{H}_2$ ? What is the limiting reagent? What is the excess reagent? How many grams of excess reagent remain?

# STOICHIOMETRY LIMITING REAGENT

## Answers

① Consider the following reaction:



Balance the reaction.

a) 200 grams of each reactant react. How many grams of silver phosphate are formed?

$$200 \text{ g AgNO}_3 \times \frac{1 \text{ mol AgNO}_3}{170 \text{ g AgNO}_3} \times \frac{1 \text{ mol Ag}_3\text{PO}_4}{3 \text{ mol AgNO}_3} \times \frac{419 \text{ g Ag}_3\text{PO}_4}{1 \text{ mol Ag}_3\text{PO}_4} = 164 \text{ g Ag}_3\text{PO}_4$$

$$200 \text{ g Na}_3\text{PO}_4 \times \frac{1 \text{ mol Na}_3\text{PO}_4}{164 \text{ g Na}_3\text{PO}_4} \times \frac{1 \text{ mol Ag}_3\text{PO}_4}{1 \text{ mol Na}_3\text{PO}_4} \times \frac{419 \text{ g Ag}_3\text{PO}_4}{1 \text{ mol Ag}_3\text{PO}_4} = 511 \text{ g Ag}_3\text{PO}_4$$

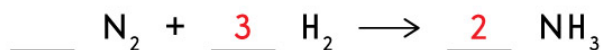
164 g of  $\text{Ag}_3\text{PO}_4$  are produced.

b) How much excess reagent is left?

$$200 \text{ g AgNO}_3 \times \frac{1 \text{ mol AgNO}_3}{170 \text{ g AgNO}_3} \times \frac{1 \text{ mol Na}_3\text{PO}_4}{3 \text{ mol AgNO}_3} \times \frac{164 \text{ g Na}_3\text{PO}_4}{1 \text{ mol Na}_3\text{PO}_4} = 64.3 \text{ g Na}_3\text{PO}_4 \text{ used}$$

$$200 \text{ g Na}_3\text{PO}_4 - 64.3 \text{ g Na}_3\text{PO}_4 = 135.7 \text{ g Na}_3\text{PO}_4 \text{ remains}$$

② Consider the following reaction:



Balance the reaction.

How many grams of  $\text{NH}_3$  are produced when 28 g of  $\text{N}_2$  reacts with 25 g of  $\text{H}_2$ ? What is the limiting reagent? What is the excess reagent? How many grams of excess reagent remain?

$$28 \text{ g N}_2 \times \frac{1 \text{ mol N}_2}{28 \text{ g N}_2} \times \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} \times \frac{17 \text{ g NH}_3}{1 \text{ mol NH}_3} = 34 \text{ g NH}_3$$

$$25 \text{ g H}_2 \times \frac{1 \text{ mol H}_2}{2 \text{ g H}_2} \times \frac{2 \text{ mol NH}_3}{3 \text{ mol H}_2} \times \frac{17 \text{ g NH}_3}{1 \text{ mol NH}_3} = 142 \text{ g NH}_3$$

$\text{N}_2$  is the limiting reagent, and  $\text{H}_2$  is the excess reagent. 34 g of  $\text{NH}_3$  can be produced. Let us calculate how much excess reagent remains.

$$28 \text{ g N}_2 \times \frac{1 \text{ mol N}_2}{28 \text{ g N}_2} \times \frac{3 \text{ mol H}_2}{1 \text{ mol N}_2} \times \frac{2 \text{ g H}_2}{1 \text{ mol H}_2} = 6 \text{ g H}_2 \text{ used}$$

$$25 \text{ g H}_2 - 6 \text{ g H}_2 = 19 \text{ g H}_2 \text{ remains}$$