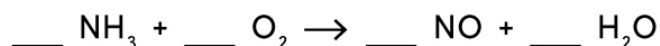


Stoichiometry Limiting Reactant

- ① How many grams of calcium phosphate can be produced from the reaction between 2.50 L of 0.250 M calcium chloride with an excess of phosphoric acid?
- ② How many milliliters of 1.50 M nitric acid is required to react with 100.0 g of cuprous oxide?

- ③ Consider the following unbalanced reaction:



Balance the reaction. 3.25 g of NH_3 is allowed to react with 3.5 g of O_2 .

- a) Which reactant is the limiting reagent?
- b) How many grams of NO are formed?
- c) How much excess reagent remains after the reaction?

Stoichiometry Limiting Reactant

Answers

- ① How many grams of calcium phosphate can be produced from the reaction between 2.50 L of 0.250 M calcium chloride with an excess of phosphoric acid?



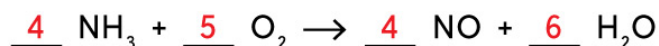
$$2.50 \text{ L CaCl}_2 \times \frac{0.250 \text{ mol CaCl}_2}{1 \text{ L CaCl}_2} \times \frac{1 \text{ mol Ca}_3(\text{PO}_4)_2}{3 \text{ mol CaCl}_2} \times \frac{310 \text{ g Ca}_3(\text{PO}_4)_2}{1 \text{ mol Ca}_3(\text{PO}_4)_2} = 64.6 \text{ g Ca}_3(\text{PO}_4)_2$$

- ② How many milliliters of 1.50 M nitric acid is required to react with 100.0 g of cuprous oxide?



$$100 \text{ g Cu}_2\text{O} \times \frac{1 \text{ mol Cu}_2\text{O}}{143 \text{ g Cu}_2\text{O}} \times \frac{14 \text{ mol HNO}_3}{3 \text{ mol Cu}_2\text{O}} \times \frac{1000 \text{ ml HNO}_3}{1.5 \text{ mol HNO}_3} = 2180 \text{ ml HNO}_3$$

- ③ Consider the following unbalanced reaction:



Balance the reaction. 3.25 g of NH_3 is allowed to react with 3.5 g of O_2 .

- a) Which reactant is the limiting reagent?

$$3.25 \text{ g NH}_3 \times \frac{1 \text{ mol NH}_3}{17.03 \text{ g NH}_3} \times \frac{4 \text{ mol NO}}{4 \text{ mol NH}_3} \times \frac{30.01 \text{ g NO}}{1 \text{ mol NO}} = 5.73 \text{ g NO}$$

$$3.5 \text{ g O}_2 \times \frac{1 \text{ mol O}_2}{32 \text{ g O}_2} \times \frac{4 \text{ mol NO}}{5 \text{ mol O}_2} \times \frac{30.01 \text{ g NO}}{1 \text{ mol NO}} = 2.63 \text{ g NO}$$

O_2 is the limiting reagent.

- b) How many grams of NO are formed?

2.63 g of NO are formed.

- c) How much excess reagent remains after the reaction?

$$3.5 \text{ g O}_2 \times \frac{1 \text{ mol O}_2}{32 \text{ g O}_2} \times \frac{4 \text{ mol NH}_3}{5 \text{ mol O}_2} \times \frac{17.03 \text{ g NH}_3}{1 \text{ mol NH}_3} = 1.49 \text{ g NH}_3 \text{ used}$$

$$3.25 \text{ g NH}_3 - 1.49 \text{ g NH}_3 = 1.76 \text{ g NH}_3 \text{ remains.}$$