

1. Nitrogen and hydrogen react to form ammonia gas according to the following equation.



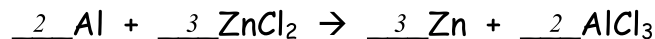
- a. If 56.0 grams of nitrogen are used up by the reaction, how many grams of ammonia will be produced?

$$? \text{ g NH}_3 = 56.0 \text{ g N}_2 \times \frac{1 \text{ mol N}_2}{28.0 \text{ g N}_2} \times \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} \times \frac{17.0 \text{ g NH}_3}{1 \text{ mol NH}_3} = 68.0 \text{ g NH}_3$$

- b. How many grams of hydrogen must react if the reaction needs to produce 63.5 grams of ammonia?

$$? \text{ g H}_2 = 63.5 \text{ g NH}_3 \times \frac{1 \text{ mol NH}_3}{17.0 \text{ g NH}_3} \times \frac{3 \text{ mol H}_2}{2 \text{ mol NH}_3} \times \frac{2.0 \text{ g H}_2}{1 \text{ mol H}_2} = 11 \text{ g H}_2$$

2. Aluminum metal reacts with zinc chloride to produce zinc metal and aluminum chloride.



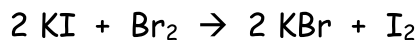
- a. A mass of 45.0 grams of aluminum will react with how many grams of zinc chloride?

$$? \text{ g ZnCl}_2 = 45.0 \text{ g Al} \times \frac{1 \text{ mol Al}}{27.0 \text{ g Al}} \times \frac{3 \text{ mol ZnCl}_2}{2 \text{ mol Al}} \times \frac{136.4 \text{ g ZnCl}_2}{1 \text{ mol ZnCl}_2} = 341 \text{ g ZnCl}_2$$

- b. What mass of aluminum chloride will be produced if 22.6 grams of zinc chloride are used up in the reaction?

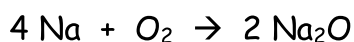
$$? \text{ g AlCl}_3 = 22.6 \text{ g ZnCl}_2 \times \frac{1 \text{ mol ZnCl}_2}{136.4 \text{ g ZnCl}_2} \times \frac{2 \text{ mol AlCl}_3}{3 \text{ mol ZnCl}_2} \times \frac{133.5 \text{ g AlCl}_3}{1 \text{ mol AlCl}_3} = 14.7 \text{ g AlCl}_3$$

3. For the reaction whose balanced equation is as follows, find the number of grams of I_2 that will be formed when 300.0 g of bromine react.



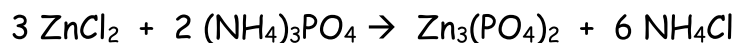
$$? \text{ g } I_2 = 300.0 \text{ g } \cancel{\text{Br}_2} \times \frac{1 \text{ mol } \cancel{\text{Br}_2}}{159.8 \text{ g } \cancel{\text{Br}_2}} \times \frac{1 \text{ mol } I_2}{1 \text{ mol } \cancel{\text{Br}_2}} \times \frac{253.8 \text{ g } I_2}{1 \text{ mol } I_2} = 476.5 \text{ g } I_2$$

4. For the reaction whose balanced equation is as follows, find the number of grams of sodium that must react to produce 42.0 grams of sodium oxide.



$$? \text{ g } Na = 42.0 \text{ g } \cancel{\text{Na}_2\text{O}} \times \frac{1 \text{ mol } \cancel{\text{Na}_2\text{O}}}{62.0 \text{ g } \cancel{\text{Na}_2\text{O}}} \times \frac{4 \text{ mol } Na}{2 \text{ mol } \cancel{\text{Na}_2\text{O}}} \times \frac{23.0 \text{ g } Na}{1 \text{ mol } Na} = 31.2 \text{ g } Na$$

5. For the reaction whose balanced equation is as follows, find how many grams of zinc phosphate will be produced by the reaction of 5.00 grams of ammonium phosphate.



$$\begin{aligned} ? \text{ g } \text{Zn}_3(\text{PO}_4)_2 &= 5.00 \text{ g } \cancel{(\text{NH}_4)_3\text{PO}_4} \times \frac{1 \text{ mol } \cancel{(\text{NH}_4)_3\text{PO}_4}}{149.0 \text{ g } \cancel{(\text{NH}_4)_3\text{PO}_4}} \times \frac{1 \text{ mol } \text{Zn}_3(\text{PO}_4)_2}{2 \text{ mol } \cancel{(\text{NH}_4)_3\text{PO}_4}} \\ &\times \frac{386.2 \text{ g } \text{Zn}_3(\text{PO}_4)_2}{1 \text{ mol } \text{Zn}_3(\text{PO}_4)_2} = 6.48 \text{ g } \text{Zn}_3(\text{PO}_4)_2 \end{aligned}$$