

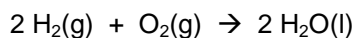
Name: _____

Hour: _____ Date: _____

Chemistry: *Quantitative Relationships in Chemical Equations*

When we balance a chemical equation, we are satisfying the law of conservation of mass; that is, we are making sure that there are the same number of atoms of each element on both sides of the equation. The coefficients we place in front of the substances in an equation are very important because they tell us the mole ratio of the substances in that reaction. For instance, the balanced equation...

hydrogen gas + oxygen gas → liquid water



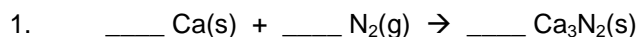
can be thought of in terms of...



Directions:

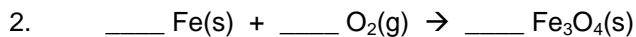
A. *Balance each equation.*

B. *Solve the problems, assuming that you have excess of the other reactant(s).*



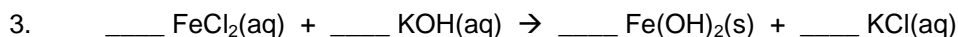
a. How many moles of Ca₃N₂ can be made from 16.8 moles of Ca?

b. If you need to make 34.4 moles of Ca₃N₂, how many moles of N₂ will you need?



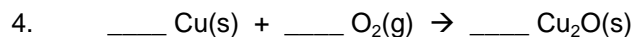
a. How many moles of O₂ will react with 42.5 moles of Fe?

b. If you need to make 1.56 moles of Fe₃O₄, how many moles of Fe will you need?



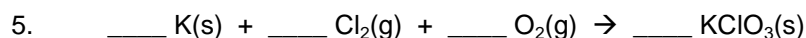
a. How many moles of KOH will react with 86.2 moles of FeCl₂?

b. If you need to make 12.4 moles of KCl, how many moles of FeCl₂ will you need?



a. How many moles of Cu_2O can be made from 25.6 moles of Cu?

b. How many moles of O_2 does it take to produce 214 moles of Cu_2O ?



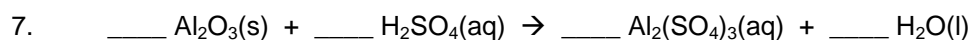
a. How many moles of KClO_3 can be made from 89 moles of O_2 ?

b. If you have 24.6 moles of Cl_2 , how many moles of KClO_3 can you produce?



a. How many moles of $(\text{NH}_4)_2\text{S}$ can be made from 15.8 moles of NH_3 ?

b. If you have 462 moles of NH_3 , how many moles of H_2S do you need?



a. How many moles of $\text{Al}_2(\text{SO}_4)_3$ can be made from 6.3 moles of H_2SO_4 ?

b. How many moles of Al_2O_3 does it take to make 7.2 moles of H_2O ?

c. If you have 588 moles of Al_2O_3 , how many moles of $\text{Al}_2(\text{SO}_4)_3$ can you produce?

Answers:

1a. 5.6 mol Ca_3N_2
1b. 34.4 mol N_2
2a. 28.3 mol O_2
2b. 4.68 mol Fe

3a. 172.4 mol KOH
3b. 6.2 mol FeCl_2
4a. 12.8 mol Cu_2O
4b. 107 mol O_2

5a. 59.3 mol KClO_3
5b. 49.2 mol KClO_3
6a. 7.9 mol $(\text{NH}_4)_2\text{S}$
6b. 231 mol H_2S

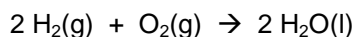
7a. 2.1 mol $\text{Al}_2(\text{SO}_4)_3$
7b. 2.4 mol Al_2O_3
7c. 588 mol $\text{Al}_2(\text{SO}_4)_3$

KEY

Chemistry: *Quantitative Relationships in Chemical Equations*

When we balance a chemical equation, we are satisfying the law of conservation of mass; that is, we are making sure that there are the same number of atoms of each element on both sides of the equation. The coefficients we place in front of the substances in an equation are very important because they tell us the mole ratio of the substances in that reaction. For instance, the balanced equation...

hydrogen gas + oxygen gas \rightarrow liquid water



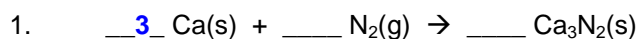
can be thought of in terms of...



Directions:

C. Balance each equation.

D. Solve the problems, assuming that you have excess of the other reactant(s).



a. How many moles of Ca₃N₂ can be made from 16.8 moles of Ca?

$$x \text{ mol Ca}_3\text{N}_2 = 16.8 \text{ mol Ca} \left(\frac{1 \text{ mol Ca}_3\text{N}_2}{3 \text{ mol Ca}} \right) = 5.6 \text{ mol Ca}_3\text{N}_2$$

b. If you need to make 34.4 moles of Ca₃N₂, how many moles of N₂ will you need?

$$x \text{ mol N}_2 = 34.4 \text{ mol Ca}_3\text{N}_2 \left(\frac{1 \text{ mol N}_2}{1 \text{ mol Ca}_3\text{N}_2} \right) = 34.4 \text{ mol N}_2$$

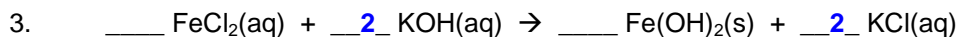


a. How many moles of O₂ will react with 42.5 moles of Fe?

$$x \text{ mol O}_2 = 42.5 \text{ mol Fe} \left(\frac{2 \text{ mol O}_2}{3 \text{ mol Fe}} \right) = 28.3 \text{ mol O}_2$$

b. If you need to make 1.56 moles of Fe₃O₄, how many moles of Fe will you need?

$$x \text{ mol Fe} = 1.56 \text{ mol Fe}_3\text{O}_4 \left(\frac{3 \text{ mol Fe}}{1 \text{ mol Fe}_3\text{O}_4} \right) = 4.68 \text{ mol Fe}$$

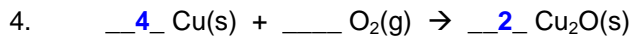


a. How many moles of KOH will react with 86.2 moles of FeCl₂?

$$x \text{ mol KOH} = 86.2 \text{ mol FeCl}_2 \left(\frac{2 \text{ mol KOH}}{1 \text{ mol FeCl}_2} \right) = 172.4 \text{ mol KOH}$$

b. If you need to make 12.4 moles of KCl, how many moles of FeCl₂ will you need?

$$x \text{ mol FeCl}_2 = 12.4 \text{ mol KCl} \left(\frac{1 \text{ mol FeCl}_2}{2 \text{ mol KCl}} \right) = 6.2 \text{ mol FeCl}_2$$

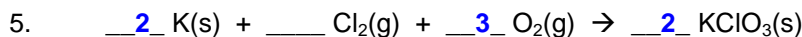


a. How many moles of Cu₂O can be made from 25.6 moles of Cu?

$$x \text{ mol Cu}_2\text{O} = 25.6 \text{ mol Cu} \left(\frac{2 \text{ mol Cu}_2\text{O}}{4 \text{ mol Cu}} \right) = 12.8 \text{ mol Cu}_2\text{O}$$

b. How many moles of O₂ does it take to produce 214 moles of Cu₂O?

$$x \text{ mol O}_2 = 214 \text{ mol Cu}_2\text{O} \left(\frac{1 \text{ mol O}_2}{2 \text{ mol Cu}_2\text{O}} \right) = 107 \text{ mol O}_2$$



a. How many moles of KClO₃ can be made from 89 moles of O₂?

$$x \text{ mol KClO}_3 = 89 \text{ mol O}_2 \left(\frac{2 \text{ mol KClO}_3}{3 \text{ mol O}_2} \right) = 59.3 \text{ mol KClO}_3$$

b. If you have 24.6 moles of Cl₂, how many moles of KClO₃ can you produce?

$$x \text{ mol KClO}_3 = 24.6 \text{ mol Cl}_2 \left(\frac{2 \text{ mol KClO}_3}{1 \text{ mol Cl}_2} \right) = 49.2 \text{ mol KClO}_3$$

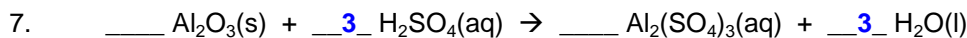


a. How many moles of (NH₄)₂S can be made from 15.8 moles of NH₃?

$$x \text{ mol (NH}_4)_2\text{S} = 15.8 \text{ mol NH}_3 \left(\frac{1 \text{ mol (NH}_4)_2\text{S}}{2 \text{ mol NH}_3} \right) = 7.9 \text{ mol (NH}_4)_2\text{S}$$

b. If you have 462 moles of NH₃, how many moles of H₂S do you need?

$$x \text{ mol H}_2\text{S} = 462 \text{ mol NH}_3 \left(\frac{1 \text{ mol H}_2\text{S}}{2 \text{ mol NH}_3} \right) = 231 \text{ mol H}_2\text{S}$$



a. How many moles of Al₂(SO₄)₃ can be made from 6.3 moles of H₂SO₄?

$$x \text{ mol Al}_2(\text{SO}_4)_3 = 6.3 \text{ mol H}_2\text{SO}_4 \left(\frac{1 \text{ mol Al}_2(\text{SO}_4)_3}{3 \text{ mol H}_2\text{SO}_4} \right) = 2.1 \text{ mol Al}_2(\text{SO}_4)_3$$

b. How many moles of Al₂O₃ does it take to make 7.2 moles of H₂O?

$$x \text{ mol Al}_2\text{O}_3 = 7.2 \text{ mol H}_2\text{O} \left(\frac{1 \text{ mol Al}_2\text{O}_3}{3 \text{ mol H}_2\text{O}} \right) = 2.4 \text{ mol Al}_2\text{O}_3$$

c. If you have 588 moles of Al₂O₃, how many moles of Al₂(SO₄)₃ can you produce?

$$x \text{ mol Al}_2(\text{SO}_4)_3 = 588 \text{ Al}_2\text{O}_3 \left(\frac{1 \text{ mol Al}_2(\text{SO}_4)_3}{1 \text{ mol Al}_2\text{O}_3} \right) = 588 \text{ mol Al}_2(\text{SO}_4)_3$$

Answers:

1a. 5.6 mol Ca₃N₂
1b. 34.4 mol N₂
2a. 28.3 mol O₂
2b. 4.68 mol Fe

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6a. 7.9 mol (NH₄)₂S
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7a. 2.1 mol Al₂(SO₄)₃
7b. 2.4 mol Al₂O₃
7c. 588 mol Al₂(SO₄)₃