

Stoichiometry 3  
Chemistry

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Name

1. Given the following equation:  $2 \text{C}_4\text{H}_{10} + 13 \text{O}_2 \rightarrow 8 \text{CO}_2 + 10 \text{H}_2\text{O}$ , show what the following molar ratios should be.

- a.  $\text{C}_4\text{H}_{10} / \text{O}_2$       b.  $\text{O}_2 / \text{CO}_2$       c.  $\text{O}_2 / \text{H}_2\text{O}$       d.  $\text{C}_4\text{H}_{10} / \text{CO}_2$       e.  $\text{C}_4\text{H}_{10} / \text{H}_2\text{O}$

2. Given the following equation:  $2 \text{KClO}_3 \rightarrow 2 \text{KCl} + 3 \text{O}_2$   
How many moles of  $\text{O}_2$  can be produced by letting 12.00 moles of  $\text{KClO}_3$  react?

3. Given the following equation:  $2 \text{K} + \text{Cl}_2 \rightarrow 2 \text{KCl}$   
a) How many grams of  $\text{KCl}$  are produced from 2.50 g of  $\text{K}$  and excess  $\text{Cl}_2$ .

b) How many grams of  $\text{KCl}$  are produced from 1.00 g of  $\text{Cl}_2$  and excess  $\text{K}$ ?

4. Given the following equation:  $\text{Na}_2\text{O} + \text{H}_2\text{O} \rightarrow 2 \text{NaOH}$   
a) How many grams of  $\text{NaOH}$  are produced from 120. grams of  $\text{Na}_2\text{O}$ ?

b) How many grams of  $\text{Na}_2\text{O}$  are required to produce 160. grams of  $\text{NaOH}$ ?

5. Given the following equation:  $8 \text{ Fe} + \text{S}_8 \rightarrow 8 \text{ FeS}$

What mass of iron is needed to react with 16.0 grams of sulfur? And how many grams of FeS are produced?

6. Given the following equation:  $2 \text{ NaClO}_3 \rightarrow 2 \text{ NaCl} + 3 \text{ O}_2$

a) 12.00 moles of  $\text{NaClO}_3$  will produce how many grams of  $\text{O}_2$ ?

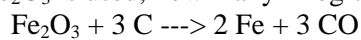
b) How many grams of  $\text{NaCl}$  are produced when 80.0 grams of  $\text{O}_2$  are produced?

7. Given the following equation:  $\text{Cu} + 2 \text{ AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2 \text{ Ag}$

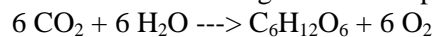
a) How many moles of  $\text{Cu}$  are needed to react with 3.50 moles of  $\text{AgNO}_3$ ?

b) If 89.5 grams of  $\text{Ag}$  were produced, how many grams of  $\text{Cu}$  reacted?

8. Molten iron and carbon monoxide are produced in a blast furnace by the reaction of iron(III) oxide and coke (pure carbon). If 25.0 kilograms of pure  $\text{Fe}_2\text{O}_3$  is used, how many kilograms of iron can be produced? The reaction is:



9. The average human requires 120.0 grams of glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) per day. How many grams of  $\text{CO}_2$  (in the photosynthesis reaction) are required for this amount of glucose? The photosynthetic reaction is:

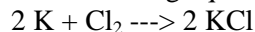


10. Given the reaction:  $4 \text{NH}_3 (\text{g}) + 5 \text{O}_2 (\text{g}) \rightarrow 4 \text{NO} (\text{g}) + 6 \text{H}_2\text{O} (\text{l})$   
When 1.20 mole of ammonia reacts, the **total number of moles** of products formed is:  
a. 1.20 b. 1.50 c. 1.80 d. 3.00 e. 12.0

1. Ratios: a. 2 / 13                      b. 13 / 8  
 c. 13 / 10                      d. 2 / 8 (or 1 / 4)                      e. 2 / 10 (or 1 / 5)

2. The  $\text{KClO}_3 / \text{O}_2$  molar ratio is 2/3.  
 $2 \text{ mol KClO}_3 / 3 \text{ mol O}_2 = 12.00 \text{ mol KClO}_3 / x$   
 $x = 18.00 \text{ mol of O}_2$

3. Given the following equation:



How many grams of KCl is produced from 2.50 g of K and excess  $\text{Cl}_2$ ?

$$\frac{2.50 \text{ g of K}}{39.098 \text{ g/mol}} = 0.0639 \text{ mol of K}$$

K	2	0.0639 mol of K
KCl	2	x

$$x = 0.0639 \text{ mol of KCl}$$

$$0.0639 \text{ mol} \times 74.551 \text{ g/mol of KCl} = 4.77 \text{ g of KCl}$$

From 1.00 g of  $\text{Cl}_2$  and excess K?

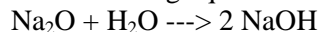
$$\frac{1.00 \text{ g of Cl}_2}{70.098 \text{ g/mol}} = 0.0141 \text{ mol of Cl}_2$$

$\text{Cl}_2$	1	0.0141 mol of $\text{Cl}_2$
KCl	2	x

$$x = 0.0282 \text{ mol of KCl}$$

$$0.0282 \text{ mol} \times 74.551 \text{ g/mol} = 2.10 \text{ g of KCl}$$

4. Given the following equation:



How many grams of NaOH is produced from 120grams of  $\text{Na}_2\text{O}$ ?

$$\frac{120 \text{ g of Na}_2\text{O}}{61.979 \text{ g/mol}} = 1.94 \text{ mol of Na}_2\text{O}$$

$\text{Na}_2\text{O}$	1	1.94
NaOH	2	x

$$x = 3.87 \text{ mol of NaOH}$$

$$3.87 \text{ mol} \times 40.00 \text{ g/mol} = 155 \text{ g of NaOH}$$

How many grams of  $\text{Na}_2\text{O}$  are required to produce 160 grams of NaOH?

$$\frac{160 \text{ g of NaOH}}{40.00 \text{ g/mol}} = 4.00 \text{ mol of NaOH}$$

$\text{Na}_2\text{O}$	1	x
NaOH	2	4

$$x = 2.00 \text{ mol of Na}_2\text{O}$$

$$2.00 \text{ mol} \times 61.979 \text{ g/mol} = 124 \text{ g of Na}_2\text{O}$$

5. Given the following equation:  $8 \text{ Fe} + \text{S}_8 \rightarrow 8 \text{ FeS}$   
 What mass of iron is needed to react with 16.0 grams of sulfur?

$$\frac{16.0 \text{ g of S}_8}{256.5 \text{ g/mol}} = 0.0624 \text{ mol of S}_8$$

$\text{S}_8$	1	0.0624
Fe	8	x

$$x = 0.499 \text{ mol of Fe}$$

$$0.499 \text{ mol} \times 55.85 \text{ g/mol} = 27.9 \text{ g of Fe}$$

How many grams of FeS are produced?

$\text{S}_8$	1	0.0624
FeS	8	x

$$x = 0.499 \text{ mol of FeS}$$

$$0.499 \text{ mol} \times 87.92 \text{ g/mol} = 43.9 \text{ g of FeS}$$

6. Given the following equation:  $2 \text{ NaClO}_3 \rightarrow 2 \text{ NaCl} + 3 \text{ O}_2$   
 12.00 moles of  $\text{NaClO}_3$  will produce how many grams of  $\text{O}_2$ ?

$\text{NaClO}_3$	2	12.00
$\text{O}_2$	3	x

$$x = 18.00 \text{ mol of O}_2$$

$$18.00 \text{ mol O}_2 \times 32.00 \text{ g/mol} = 576.0 \text{ g of O}_2$$

How many grams of NaCl are produced when 80.0 grams of  $\text{O}_2$  are produced?

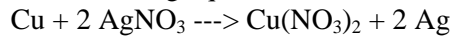
$$\frac{80.0 \text{ g of O}_2}{32.00 \text{ g/mol}} = 2.50 \text{ mol of O}_2$$

$\text{O}_2$	3	2.50
NaCl	2	x

$$x = 1.67 \text{ mol of NaCl}$$

$$1.67 \text{ mol} \times 58.44 \text{ g/mol} = 97.4 \text{ g of NaCl}$$

7. Given the following equation:



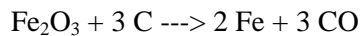
How many moles of Cu are needed to react with 3.50 moles of  $\text{AgNO}_3$ ?

$\text{AgNO}_3$	2	3.50
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Cu	1	x
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x = 1.75 mol of Cu		

If 89.5 grams of Ag were produced, how many grams of Cu reacted?

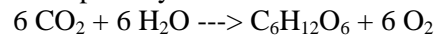
89.5 g		
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= 0.829 mol of Ag		
107.9 g/mol		
Ag	2	0.829
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Cu	1	x
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x = 0.415 mol of Cu		
0.415 mol x 63.55 g/mol = 26.4 g of Cu		

8. Molten iron and carbon monoxide are produced in a blast furnace by the reaction of iron(III) oxide and coke (pure carbon). If 25.0 kilograms of pure  $\text{Fe}_2\text{O}_3$  is used, how many kilograms of iron can be produced? The reaction is:



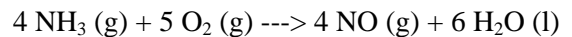
25,000 g		
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= 156.55 mol of $\text{Fe}_2\text{O}_3$		
159.694 g/mol		
$\text{Fe}_2\text{O}_3$	1	156.55
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Fe	2	x
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x = 313.1 mol of Fe		
313.1 mol x 55.847 g/mol = 17,486 g		
= 17.5 kg		

9. The average human requires 120.0 grams of glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) per day. How many grams of  $\text{CO}_2$  (in the photosynthesis reaction) are required for this amount of glucose? The photosynthetic reaction is:



120.0 g		
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= 0.666 mol of $\text{C}_6\text{H}_{12}\text{O}_6$		
180.162 g/mol		
$\text{CO}_2$	6	x
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$\text{C}_6\text{H}_{12}\text{O}_6$	1	0.666
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x = 3.996 mol of $\text{CO}_2$		
3.996 mol x 44.011 g/mol = 175.9 g of $\text{CO}_2$		

10. Given the reaction:



When 1.20 mole of ammonia reacts, the total number of moles of products formed is:

a. 1.20 b. 1.50 c. 1.80 d. 3.00 e. 12.0

The correct answer is d.

$$\text{NH}_3 / (\text{NO} + \text{H}_2\text{O}) = 4 / 10$$

$$4 / 10 = 1.20 / x$$

$$x = 3.00 \text{ mol}$$