

This activity will help you develop the following key skills in the Quantitative Chemistry topic:

- counting atoms in formulas
- calculating relative formula mass (M_r)
- identifying state symbols
- identifying mass changes in chemical reactions
- balancing equations.

Task

Work through each question in order, from a-e.

1	$\text{Mg(s)} + \text{HCl(aq)} \longrightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$	c.	On which side of the arrow is there a gas?	reactant / product
a.	How many atoms of each element are present:			
	Mg:	H:	Mg:	H:
		Cl:	Cl:	
b.	Calculate the relative formula mass (M_r) for each reactant and product below:		d.	If the reaction was carried out on a balance, how would the mass change?
	HCl	MgCl ₂	e.	Go back and balance the equation
				H ₂

2.	$\text{Na(s)} + \text{H}_2\text{O(l)} \longrightarrow \text{NaOH(aq)} + \text{H}_2\text{(g)}$	c.	On which side of the arrow is there a gas?	reactant / product												
a. How many atoms of each element are present:																
	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;"></td> <td style="width: 33%; text-align: center;">Na:</td> <td style="width: 33%;"></td> </tr> <tr> <td style="text-align: center;">Na:</td> <td style="text-align: center;">H:</td> <td style="text-align: center;">O:</td> </tr> <tr> <td></td> <td style="text-align: center;">O:</td> <td style="text-align: center;">H:</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">H:</td> </tr> </table>		Na:		Na:	H:	O:		O:	H:			H:	d.	If the reaction was carried out on a balance, how would the mass change?	increase / decrease
	Na:															
Na:	H:	O:														
	O:	H:														
		H:														
b. Calculate the relative formula mass (M_r) for each reactant and product below:																
	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; text-align: center;">H₂O</td> <td style="width: 33%; text-align: center;">NaOH</td> <td style="width: 33%; text-align: center;">H₂</td> </tr> </table>	H ₂ O	NaOH	H ₂	e.	Go back and balance the equation										
H ₂ O	NaOH	H ₂														
3. $\text{Mg(s)} + \text{O}_2\text{(g)} \longrightarrow \text{MgO(s)}$																
3.	$\text{Mg(s)} + \text{O}_2\text{(g)} \longrightarrow \text{MgO(s)}$	c.	On which side of the arrow is there a gas?	reactant / product												
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	Mg:															
Mg:	O:	Mg:														
		O:														
b. Calculate the relative formula mass (M_r) for each reactant and product below:																
	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; text-align: center;">O₂</td> <td style="width: 33%;"></td> <td style="width: 33%; text-align: center;">MgO</td> </tr> </table>	O ₂		MgO	e.	Go back and balance the equation										
O ₂		MgO														

4. $\text{K(s)} + \text{HNO}_3(\text{aq}) \longrightarrow \text{KNO}_3(\text{aq}) + \text{H}_2(\text{g})$	c. On which side of the arrow is there a gas?	reactant / product									
a. How many atoms of each element are present:											
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;"></td> <td style="width: 33%; text-align: center;">H:</td> <td style="width: 33%; text-align: center;">K:</td> </tr> <tr> <td style="text-align: center;">K:</td> <td style="text-align: center;">N:</td> <td style="text-align: center;">N:</td> </tr> <tr> <td></td> <td style="text-align: center;">O:</td> <td style="text-align: center;">O:</td> </tr> </table>		H:	K:	K:	N:	N:		O:	O:	d. If the reaction was carried out on a balance, how would the mass change?	increase / decrease
	H:	K:									
K:	N:	N:									
	O:	O:									
b. Calculate the relative formula mass (M_r) for each reactant and product below:		e. Go back and balance the equation									
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">HNO₃</td> <td style="width: 33%;">KNO₃</td> <td style="width: 33%;">H₂</td> </tr> </table>		HNO ₃	KNO ₃	H ₂							
HNO ₃	KNO ₃	H ₂									
5. $\text{CuCO}_3(\text{s}) \longrightarrow \text{CuO}(\text{s}) + \text{CO}_2(\text{g})$	c. On which side of the arrow is there a gas?	reactant / product									
a. How many atoms of each element are present:											
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center;">Cu:</td> <td style="width: 33%;"></td> <td style="width: 33%;"></td> </tr> <tr> <td style="text-align: center;">C:</td> <td style="text-align: center;">Cu:</td> <td style="text-align: center;">C:</td> </tr> <tr> <td style="text-align: center;">O:</td> <td style="text-align: center;">O:</td> <td style="text-align: center;">O:</td> </tr> </table>	Cu:			C:	Cu:	C:	O:	O:	O:	d. If the reaction was carried out on a balance, how would the mass change?	increase / decrease
Cu:											
C:	Cu:	C:									
O:	O:	O:									
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<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">CuCO₃</td> <td style="width: 33%;">CuO</td> <td style="width: 33%;">CO₂</td> </tr> </table>		CuCO ₃	CuO	CO ₂							
CuCO ₃	CuO	CO ₂									

Answers

1.	$\text{Mg(s)} + 2 \text{HCl(aq)} \longrightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$	c.	On which side of the arrow is there a gas?	reactant / product		
a.	How many atoms of each element are present:					
	Mg: 1 H: 1 Cl: 1		Mg: 1 H: 2 Cl: 2	d.	If the reaction was carried out on a balance, how would the mass change?	increase / decrease
b.	Calculate the relative formula mass (M_r) of each reactant and product:					
	HCl 36.5	MgCl ₂ 95	H ₂ 2	e.	Go back and balance the equation	
2.	$2 \text{Na(s)} + 2 \text{H}_2\text{O(l)} \longrightarrow 2 \text{NaOH(aq)} + \text{H}_2\text{(g)}$	c.	On which side of the arrow is there a gas?	reactant / product		
a.	How many atoms of each element are present:					
	Na: 1 H: 2 O: 1		Na: 1 O: 1 H: 1	d.	If the reaction was carried out on a balance, how would the mass change?	increase / decrease
b.	Calculate the relative formula mass (M_r) of each reactant and product:					
	H ₂ O 18	NaOH 40	H ₂ 2	e.	Go back and balance the equation	

3. $2 \text{Mg(s)} + \text{O}_2\text{(g)} \longrightarrow 2 \text{MgO(s)}$	c. On which side of the arrow is there a gas? reactant / product									
a. How many atoms of each element are present:										
<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;"></td> <td style="width: 33%; text-align: center;">Mg: 1</td> <td style="width: 33%;"></td> </tr> <tr> <td style="text-align: center;">Mg: 1</td> <td style="text-align: center;">O: 2</td> <td style="text-align: center;">O: 1</td> </tr> </table>		Mg: 1		Mg: 1	O: 2	O: 1	d. If the reaction was carried out on a balance, how would the mass change? increase / decrease			
	Mg: 1									
Mg: 1	O: 2	O: 1								
b. Calculate the relative formula mass (M_r) of each reactant and product:	e. Go back and balance the equation									
<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; text-align: center;">O_2</td> <td style="width: 33%; text-align: center;">MgO</td> <td style="width: 33%;"></td> </tr> <tr> <td style="text-align: center;">32</td> <td style="text-align: center;">40</td> <td></td> </tr> </table>	O_2	MgO		32	40					
O_2	MgO									
32	40									
4. $2 \text{K(s)} + 2 \text{HNO}_3\text{(aq)} \longrightarrow 2 \text{KNO}_3\text{(aq)} + \text{H}_2\text{(g)}$	c. On which side of the arrow is there a gas? reactant / product									
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<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;"></td> <td style="width: 33%; text-align: center;">H: 1</td> <td style="width: 33%; text-align: center;">K: 1</td> </tr> <tr> <td style="text-align: center;">K: 1</td> <td style="text-align: center;">N: 1</td> <td style="text-align: center;">N: 1 H: 2</td> </tr> <tr> <td></td> <td style="text-align: center;">O: 3</td> <td style="text-align: center;">O: 3</td> </tr> </table>		H: 1	K: 1	K: 1	N: 1	N: 1 H: 2		O: 3	O: 3	d. If the reaction was carried out on a balance, how would the mass change? increase / decrease
	H: 1	K: 1								
K: 1	N: 1	N: 1 H: 2								
	O: 3	O: 3								
b. Calculate the relative formula mass (M_r) of each reactant and product:	e. Go back and balance the equation									
<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; text-align: center;">HNO_3</td> <td style="width: 33%; text-align: center;">KNO_3</td> <td style="width: 33%; text-align: center;">H_2</td> </tr> <tr> <td style="text-align: center;">63</td> <td style="text-align: center;">101</td> <td style="text-align: center;">2</td> </tr> </table>	HNO_3	KNO_3	H_2	63	101	2				
HNO_3	KNO_3	H_2								
63	101	2								

5 .	$\text{CuCO}_3(\text{s}) \longrightarrow \text{CuO}(\text{s}) + \text{CO}_2(\text{g})$			c. On which side of the arrow is there a gas?	reactant / product
a. How many atoms of each element are present:					
<p>Cu: 1</p> <p>C: 1</p> <p>O: 3</p>			<p>Cu: 1</p> <p>O: 1</p>		<p>C: 1</p> <p>O: 2</p> <p>d. If the reaction was carried out on a balance, how would the mass change?</p> <p>increase / decrease</p>
b .	Calculate the relative formula mass (M_r) of each reactant and product:				e. Go back and balance the equation
	CuCO ₃	CuO	CO ₂		
	123.5	79.5	44		