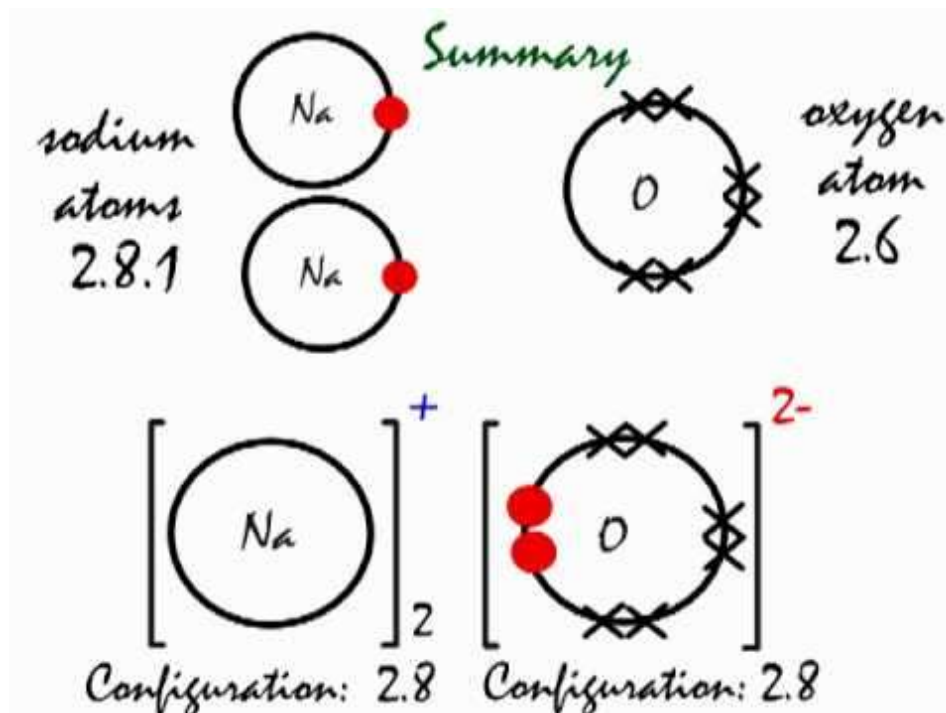


REACTIONS OF METALS REVIEW

PREVIOUS KNOWLEDGE REQUIRED

- metals always **DONATE** electrons
- non-metals always **GAIN** electrons
- the number of electrons donated by the metal **MUST EQUAL** the number of electrons gained by the non-metal
- compounds are always **NEUTRAL** so balance the electrons by using **SMALL NUMBERS**

e.g. **Name:** sodium oxide
Elements in the formula will be: Na and O
Valency of Na: Na loses 1 electron so Na⁺
Valency of O: O gains 2 electrons so O²⁻
Formula of sodium oxide: Na₂O



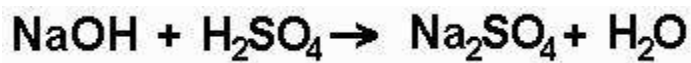
Positive Ions (cations)		Negative Ions (anions)	
Name	Formula	Name	Formula
Hydrogen	H ⁺	Chloride	Cl ⁻
Sodium	Na ⁺	Bromide	Br ⁻
Silver	Ag ⁺	Fluoride	F ⁻
Potassium	K ⁺	Iodide	I ⁻
Lithium	Li ⁺	Hydroxide	OH ⁻
Ammonium	NH ₄ ⁺	Nitrate	NO ₃ ⁻
Barium	Ba ²⁺	Oxide	O ²⁻
Calcium	Ca ²⁺	Sulphide	S ²⁻
Copper(II)	Cu ²⁺	Sulphate	SO ₄ ²⁻
Magnesium	Mg ²⁺	Carbonate	CO ₃ ²⁻
Zinc	Zn ²⁺	Hydrogencarbonate	HCO ₃ ⁻
Lead	Pb ²⁺		
Iron(II)	Fe ²⁺		
Iron(III)	Fe ³⁺		
Aluminium	Al ³⁺		

WRITING FORMULAS PRACTICE

	Cl ⁻	CO ₃ ⁻²	OH ⁻	SO ₄ ⁻²	PO ₄ ⁻³	NO ₃ ⁻
Na ⁺		Na ₂ CO ₃				
NH ₄ ⁺						
K ⁺						
Ca ⁺²						
Mg ⁺²						
Zn ⁺²						
Fe ⁺³						
Fe ⁺²						

FOUR STEPS TO BALANCING CHEMICAL EQUATIONS

1. Get yourself an unbalanced equation.



2. Draw boxes around all the chemical formulas. This is to remind you that **YOU CAN'T CHANGE THE FORMULA!**



3. Make an inventory of elements and compounds in your equation.

If a functional group, in this case SO₄ stays the same on each side of the equation then **DON'T BREAK IT UP!**



1	Na	2
1	SO ₄	1
3	H	2
1	O	1

4. Write numbers in front of each of the boxes until the inventory for each element is the same both before and after the reaction.

Now, what happens when we put a number in front of a formula?

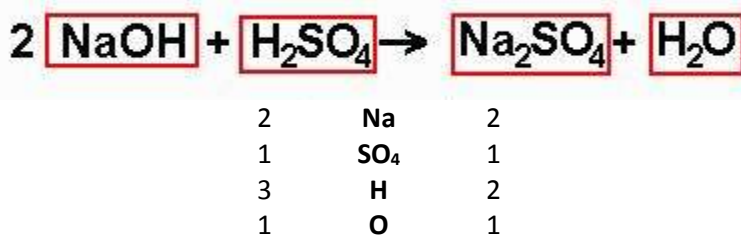
Basically, anything in that box is multiplied by that number, because we're saying that we have that many of that kind of molecule.

So, looking at the inventory, what should we do?

Well, we can see that on the left side of the inventory, there is one atom of sodium and on the right there are two.

The solution: Stick a **BIG NUMBER** "2" in front of the sodium hydroxide on the left side of the equation so that the numbers of sodium atoms are the same on both sides of the equation.

When we do this, the new atom inventory should look like this:



Now what?

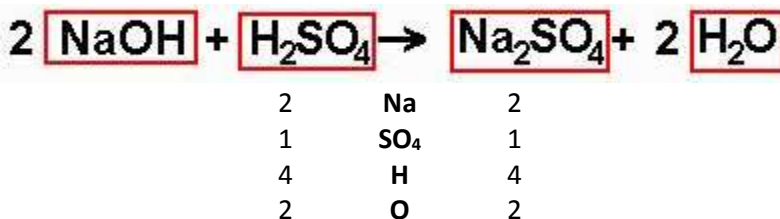
Well, looking at the new inventory, we can see that we now have two sodium atoms on both the left and the right sides, but the others still don't match up. What to do?

You can see from the inventory that on the right side of the equation, there are two hydrogen atoms and on the left there are four.

Using your amazing powers of mathematics (and hopefully not needing to use a calculator), you can see that two multiplied by the number two becomes four.

That's what you need to do. How? Put a "2" in front of the water on the right side of the equation to make the hydrogens balance out.

Now that this is done, you should make a new inventory that looks something like this:



Since both sides of the inventory match, the equation is now balanced!

All other equations will balance in exactly the same way, though it might take a few more steps in some cases.

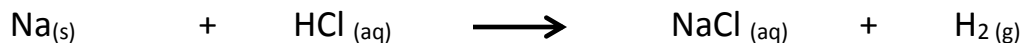
METALS AND ACID REACTIONS

Review:

- When a **metal** reacts with an **acid**, a **salt** is formed and **hydrogen gas** is released.
- This is because the hydrogen in an acid is **DISPLACED** by a more reactive metal.



e.g.



Practice

1. a) Complete the word equation for the reaction below:



b) Complete the formula equation for the reaction below:

*Use the method you reviewed earlier for making sure your formulas are correct!
Do not worry about balancing the equation yet!*



c) Balance the formula equation you wrote in part b).

Use the 4 part method you reviewed earlier for making sure you balance correctly!



1	Ca	
1	Cl	
1	H	

Don't forget to take an inventory!

2. a) Complete the word equation for the reaction below:



b) Complete the formula equation for the reaction below:

*Use the method you reviewed earlier for making sure your formulas are correct!
Do not worry about balancing the equation yet!*



c) Balance the formula equation you wrote in part b).

Use the 4 part method you reviewed earlier for making sure you balance correctly!



	Mg	
	SO ₄	
	H	

3. a) Complete the word equation for the reaction below:



b) Complete the formula equation for the reaction below:



c) Balance the formula equation you wrote in part b).



METAL OXIDES AND ACID REACTIONS

Review:

- When a **metal oxide** reacts with an **acid**, a **salt** is formed and **water** is released. This is because the hydrogen in an acid is **DISPLACED** by a more reactive metal.
- The **released hydrogen** combines with the **released oxygen** to form **water**
- This is also known as a **NEUTRALISATION** reaction.
- **Metal oxides are alkaline when dissolved** and when they combine with an acid, a metal salt and water are formed which are both **pH neutral**.



e.g.



Practice

1. a) Complete the word equation for the reaction below:



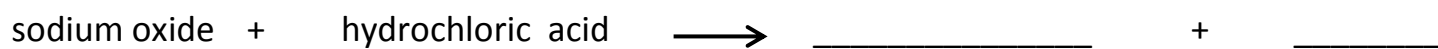
b) Complete the formula equation for the reaction below:



c) Balance the formula equation you wrote in part b).



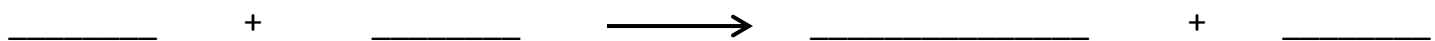
2. a) Complete the word equation for the reaction below:



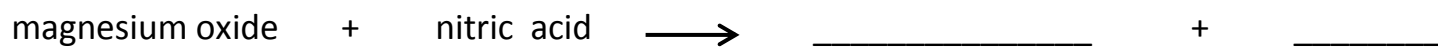
b) Complete the formula equation for the reaction below:



c) Balance the formula equation you wrote in part b).



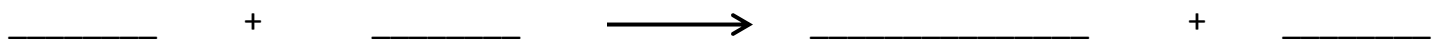
3. a) Complete the word equation for the reaction below:



b) Complete the formula equation for the reaction below:



c) Balance the formula equation you wrote in part b).



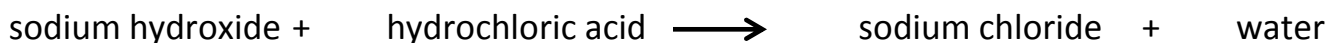
METAL HYDROXIDES AND ACID REACTIONS

Review:

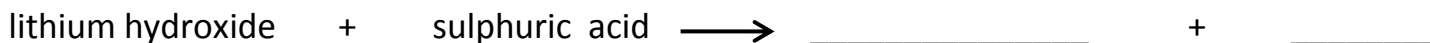
- When a **metal hydroxide** reacts with an **acid**, a **salt** is formed and **water** is released. This is because the hydrogen in an acid is **DISPLACED** by a more reactive metal.
- The **released hydrogen** combines with the **released hydroxide** to form **water**.
- This is also known as a **NEUTRALISATION** reaction.
- **Metal hydroxides are alkaline** when dissolved.
- When they combine with an acid, a metal salt and water are formed which are both **pH neutral**.



e.g.



1. a) Complete the word equation for the reaction below:



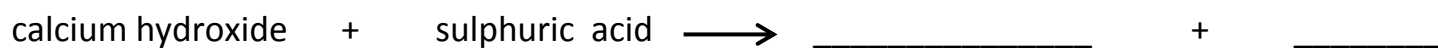
b) Complete the formula equation for the reaction below:



c) Balance the formula equation you wrote in part b).



2. a) Complete the word equation for the reaction below:



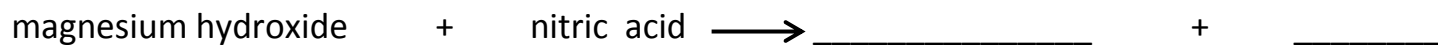
b) Complete the formula equation for the reaction below:



c) Balance the formula equation you wrote in part b).



3. a) Complete the word equation for the reaction below:



b) Complete the formula equation for the reaction below:



c) Balance the formula equation you wrote in part b).



METAL CARBONATES AND ACID REACTIONS

Review:

- When a **metal carbonate** reacts with an **acid**, a **salt** is formed and **water and carbon dioxide** are released.
- This is because the hydrogen in an acid is **DISPLACED** by a more reactive metal.
- The **released hydrogen** combines with an **oxygen from the carbonate group** to form **water**.
- The remaining carbon and oxygen atoms are released as **carbon dioxide gas**

metal carbonate + acid \longrightarrow metal salt + water + carbon dioxide

e.g.

calcium carbonate + hydrochloric acid \longrightarrow calcium chloride + water + carbon dioxide



Practice

1. a) Complete the word equation for the reaction below:

magnesium carbonate + sulphuric acid \longrightarrow _____ + _____ + _____

b) Complete the formula equation for the reaction below:

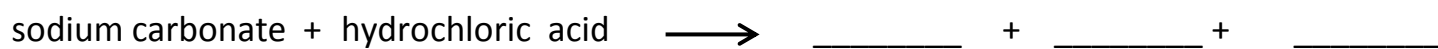
_____ + H_2SO_4 \longrightarrow _____ + _____ + _____

c) Balance the formula equation you wrote in part b).

_____ + H_2SO_4 \longrightarrow _____ + _____ + _____

	Mg	
	C	
	O	
	H	
	SO ₄	

2. a) Complete the word equation for the reaction below:



b) Complete the formula equation for the reaction below:



c) Balance the formula equation you wrote in part b).



3. a) Complete the word equation for the reaction below:



b) Complete the formula equation for the reaction below:



c) Balance the formula equation you wrote in part b).

