Hoërskool Birchleigh

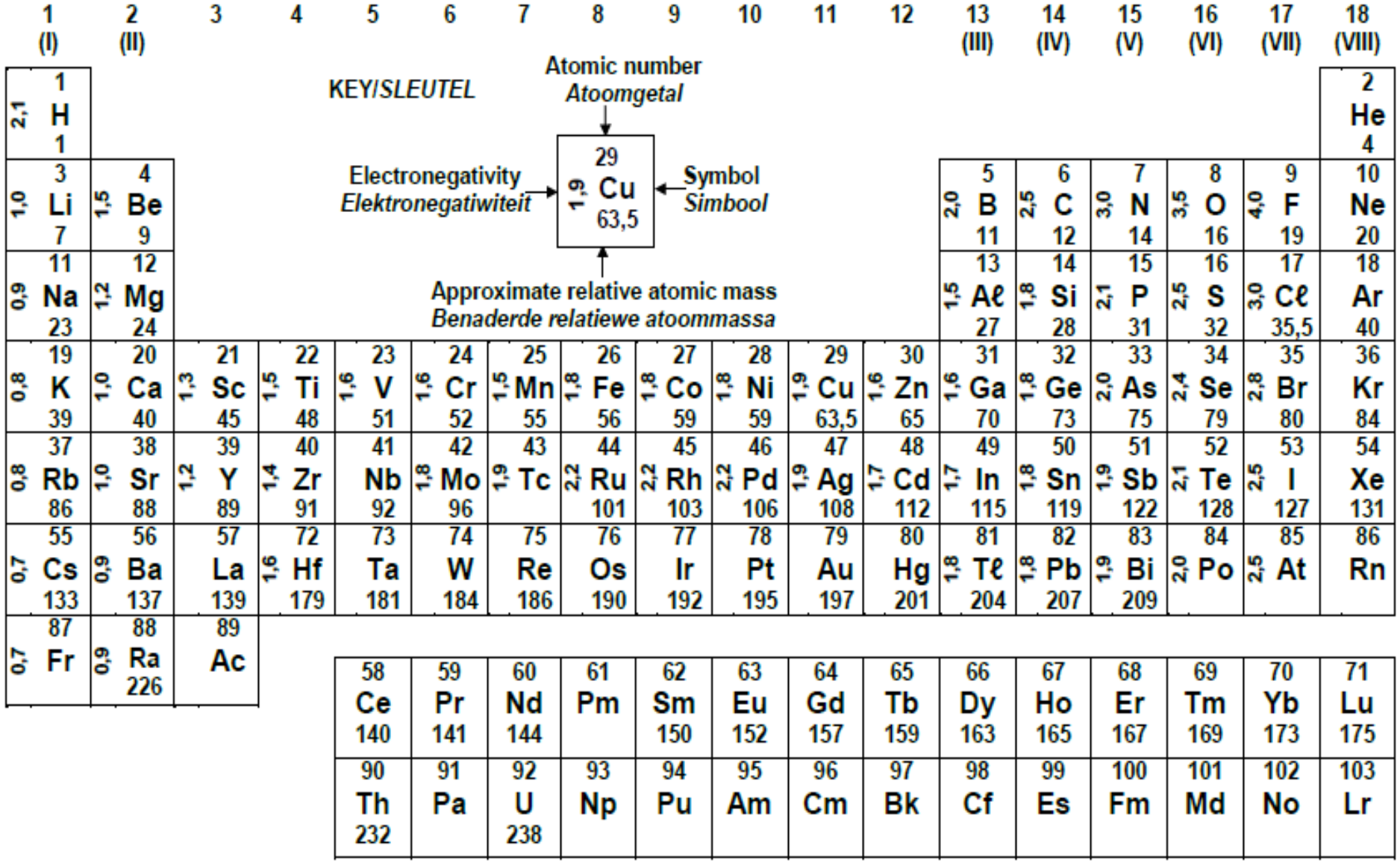
Grade 9 Natural Sciences

Strand 2: Matter and Materials

Name:_____

Class:_____ Lr Nr:_____

TABLE 3: THE PERIODIC TABLE OF ELEMENTS
TABEL 3: DIE PERIODIEKE TABEL VAN ELEMENTE



Day 1

Topic 1.1: The Periodic Table

✔ Let's learn Terminology!

Metal: a **shiny** element that is a **good conductor** of heat and electricity. All the electric wiring in your house is made with copper.

Non-metal: a **dull, brittle, non-magnetic** element that does not conduct heat or electricity. The lead in your pencil is made of carbon.

Semi-metal: an element that has **properties** of **both** a **metal** and a **non-metal**. Silicon is a **shiny, brittle semi-metal** and is used in making cement.

✔ Let's Read!

Read through page 76 in your textbook and study the diagram of the Periodic table on page 77.

✔ Let's sum it up!

Last year you learned that everything in the universe is made of **atoms**. You also learned that an **element** is **made up** of only one type of **atom**. For example, the element oxygen is only made of oxygen atoms. **Compounds** form when **different atoms** bond in f**ixed ratios**. Water is a compound formed when **oxygen atoms bond** with **hydrogen atoms** (H_2O).

The **Periodic Table of Elements** is a useful way to understand how elements can be classified and grouped.
Metals are normally **shiny**, can be **shaped** and are **good conductors** of electricity and heat.
Non-metals are **dull, brittle** and are **not good conductors** of heat or electricity.
Semi-metals have **characteristics** of **both** metals and non-metals.

Each element on the periodic table has a **name**, **symbol**, an **atomic number** (the smaller number) and a **mass number** (the larger number).

Elements in vertical columns (called groups) have similar properties.

Teacher Tip!

It is important that you know the first 20 elements in the Periodic Table as well as Copper, Iron and Zinc!

✔ Did you understand the work?

Complete the following exercise in your workbook. Refer to the Periodic Table on the back of your cover page.

1. Provide the names for the following elements:

1.1. Fe (1)
1.2. Cu (1)
1.3. Zn (1)

2. Give the mass for the following elements:

2.1. Carbon (1)
2.2. Calcium (1)

3. Give the atomic number of the following elements:

3.1. Magnesium (1)
3.2. Oxygen (1)

4. State whether the following elements are metals, non-metals or semi-metals:

4.1. Boron (1)
4.2. Nitrogen (1)
4.3. Lithium (1)
[10]

✔ Let's mark!

Check your answers for the above exercise to see if you understand the work.

1.1. Iron ✓
1.2. Copper ✓
1.3. Zinc ✓

2.1. 12.01 ✓
2.2. 40.08 ✓

3.1. 12 ✓
3.2. 8 ✓

4.1. Semi-metal ✓
4.2. Non-metal ✓
4.3. Metal ✓

What was your score? $\frac{\quad}{10}$ 

If you didn't achive at least 7/10, it is in your best interest to please go through the work again.

Well done!!! 

Day 2

Topic 1.2 Names of compounds

✔ Let's learn Terminology!

Mon(o): A prefix that means ONE **atom**. Carbon **Mon**oxide is a compound that has ONE oxygen atom (C**O**).

Di: A prefix that means TWO **atoms**. Carbon **Di**oxide is a compound that has TWO oxygen atoms (C$\mathbf{O_2}$).

Tri: A prefix that means THREE **atoms**. Sulfur **Tri**oxide is a compound that has THREE oxygen atoms (S$\mathbf{O_3}$).

✔ Let's Read!

Read through page 79 in your textbook.

✔ Let's sum it up!

A **compound** is made up of **more than one** type of **atom**. It can be written as a chemical formula where **each element** in the compound is **represented** by its **symbol**. For example, water (H_2O) is a **compound** that has TWO hydrogen atoms and ONE oxygen atom in the ratio 2 : 1.

The name of a **compound** can tell you what **elements** are in the compound. For example, sodium chloride consists of sodium and chlorine.

If an element in the name of a compound starts with **mono**, it means that there is **ONE atom** of that element in the compound.
If an element starts with **di**, it means that there are **TWO atoms** of that element in the compound.
If an element starts with **tri**, it means that there are **THREE atoms** of that element in the compound.

✔ Did you understand the work?

1. Write down the names of the elements that the following compounds are made of:

1.1. Sulfur Dioxide (1)
1.2. O_2 (1)
1.3. NaCl (1)
1.4. Copper Oxide (1)
1.5. Iron Oxide (1)

2. Write down the number of atoms found in each element for the following compounds:

2.1. Sulfur Dioxide (1)
2.2. O_2 (1)
2.3. Sodium Chloride (1)
2.4. CuO (1)
2.5. Fe_2O_3 (1)
[10]

✔ Let's mark!

1.1. Sulfur and Oxygen ✓
1.2. Oxygen ✓
1.3. Sodium and Chlorine ✓
1.4. Copper and Oxygen ✓
1.5. Iron and Oxygen ✓

2.1. 1 Sulfur and 2 Oxygen ✓
2.2. 2 Oxygen ✓
2.3. 1 Sodium and 1 Chlorine ✓
2.4. 1 Copper and 1 Oxygen ✓
2.5. 2 Iron and 3 Oxygen ✓

What was your score? $\frac{\quad}{10}$ 

If you didn't achive at least 7/10, it is in your best interest to please go through the work again.

✔ <u>Let's revise the elements you need to know by filling in the open spaces in the table below:</u>

Atomic Number	Name	Symbol
1		
	Helium	
		Li
4		
	Boron	
		C
7		
	Oxygen	
		F
10		
	Sodium	
		Mg
13		
	Silicon	
		P
16		
	Chlorine	
		Ar
19		
	Calcium	
		Cu
30		
	Iron	

Day 3

Topic 2.1 Chemical reactions

✔ Let's learn Terminology!

Reactant: A substance that is present at the **start** of a **chemical reaction**. For example, when carbon and oxygen react to form carbon dioxide, **carbon** and **oxygen** are the **reactants**.

Product: A substance **formed by** a **chemical reaction**. For example, when carbon and oxygen react to form carbon dioxide, **carbon dioxide** is the **product**.

✔ Let's Read!

Read through pages 80 and 81 in your textbook.

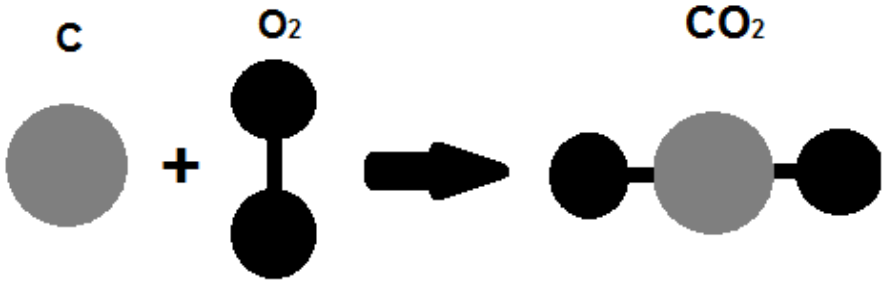
✔ Let's sum it up!

A **chemical reaction** occurs when **elements** or **compounds combine** to form **new substances**. These **reactions** can be represented by **models** of the substances or can be represented by **chemical equations.**

In chemical equations we use an **arrow** instead of an equal sign to show that the **reactants** combine to form a new **product**.

For example, carbon and oxygen react to produce carbon dioxide.

Model:



Chemical equation: $C + O_2 \rightarrow CO_2$

The **reactants**, carbon (C) and oxygen (O_2) are written on the **left side** of the arrow.
The **product**, carbon dioxide (CO) is written on the **right side** of the arrow.

Teacher Tip!

The small number behind each element tells you what ratio the elements have in the compound. Example:
Carbon Dioxide's (CO_2) ratio of carbon to oxygen is 1 : 2.
Sulfur Trioxide's (SO_3) ratio of sulfur to oxygen is 1 : 3.

✔ Did you understand the work?

1. Look at the following compounds and state how many atoms are present for each element.

1.1. SO_3 (2)
1.2. $C_6H_{12}O_6$ (3)

2. For each of the following compounds, state in which ratio the elements occur:

2.1. H_2O (1)
2.2. MgO (1)
2.3. $ZnCl_2$ (1)
2.4. $CaCO_3$ (1)
2.5. Na_2O (1)
[10]

✔ Let's mark!

1.1. 1 Sulfur atom ✓
3 Oxygen atoms ✓

1.2. 6 Carbon atoms ✓
12 Hydrogen atoms ✓
6 Oxygen atoms ✓

2.1. 2 : 1 ✓
2.2. 1 : 1 ✓
2.3. 1 : 2 ✓
2.4. 1 : 1 : 3 ✓
2.5. 2 : 1 ✓

What was your score? ___/10

If you didn't achive at least 7/10, it is in your best interest to please go through the work again.

Great job!!!

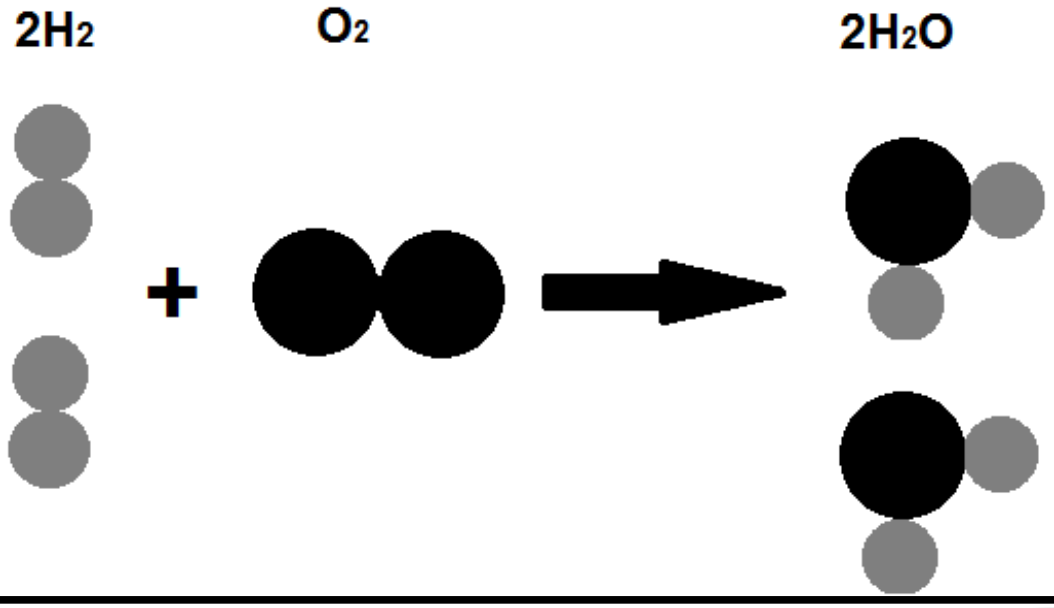
Teacher Tip!

If we look at the equation $2H_2 + O_2 \rightarrow 2H_2O$ we can see that:

The number 2 **behind** the H means that there are TWO hydrogen **atoms** in the molecule.
The number 2 **in front** of the H means that there are TWO hydrogen **molecules** in the reaction.

This means that there need to be TWO molecules of hydrogen that combine with ONE molecule of oxygen to form TWO molecules of water (H_2O).

This shows the ratio in which the molecules react to form the product.



Day 4

Topic 2.2 Balancing equations

✔ Let's learn Terminology!

Atom: the **smallest building block** of matter.

Compound: a **group** of two or more **atoms** that are **bonded**.

Molecule: **atoms** that are **chemically bound** by **forces**.

✔ Let's Read!

Read through pages 82 and 83 in your textbook.

SUMMARY

✔ Let's sum it up!

In **chemical equations**, **no atoms** are **created** or **destroyed**. This means the **number** and **type** of **atoms** on the **left side** of the equation must be the **same** as on the **right side**. This makes the equation a **balanced equation**.

Study the equation below:

$C + O_2 \longrightarrow CO_2$

Take note of the **number** of **atoms** on the **left** side of the equation: there is ONE carbon atom and TWO oxygen atoms.
After the reaction has taken place there is ONE carbon atom and TWO oxygen atoms on the **right** side of the equation. The **number of atoms** on the **left** side is **equal** to the **right** side, therefore the **equation** is **balanced**.

Study the equation below:

$Mg + O_2 \longrightarrow MgO$

On the **left** of the equation there is ONE magnesium atom and TWO oxygen atoms. On the **right**, there is ONE magnesium atom and ONE oxygen atom, therefore the **equation** is **unbalanced**. If we want the equation to be balanced, the **number** of atoms on the **left** side must be **equal** to the **right** side.

If we add another MgO **molecule** to the **right** side, the oxygen atoms are **balanced** because there are TWO oxygen atoms on the left side and TWO on the right side.

$Mg + O_2 \longrightarrow \underline{2}MgO$

There is still an **imbalance** of magnesium **atoms**, because there is ONE on the left side and TWO on the right side. To balance the magnesium atoms, we add ONE magnesium atom to the **left** side.

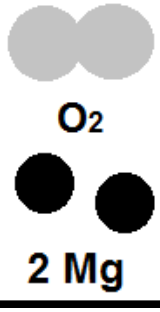
$\underline{2}Mg + O_2 \longrightarrow 2MgO$

The equation is now balanced.

Teacher Tip!

You CANNOT change the small number behind an element (the number of atoms in the molecule).

You CAN change the big number in front of the molecule (the number of molecules in the reaction).



Use this method to balance your equations:

Use a pencil when balancing equations.

Teacher Tip!

When balancing equations, always start on the side with the biggest compound.

Step 1: $Mg + O_2 \longrightarrow MgO$

Mg Mg
O O

Step 1: Write all the element symbols underneath each other on the left and right side of the equation in the same order.

Step 2: $Mg + O_2 \longrightarrow MgO$

Mg = 1 Mg = 1
O = 2 O = 1

Step 2: Count the number of atoms for each element on both sides of the equation.

Step 3: $Mg + O_2 \longrightarrow \mathbf{3}MgO$

Mg = 1 Mg = 3
O = 2 O = 3

Step 3: Add a coefficient in front of your biggest compound in an attempt to balance with the opposite side.
Add up the changes to the number of atoms underneath the equation.

Step 4: $Mg + O_2 \longrightarrow \mathbf{2}MgO$

Mg = 1 Mg = 2
O = 2 O = 2

Step 4: If the coefficient does not balance the equation, change it and try another number.

Step 5: $\mathbf{2}Mg + O_2 \longrightarrow 2MgO$

Mg = 2 Mg = 2
O = 2 O = 2

Step 5: Add a coefficient to the compounds on the other side of the equation in an attempt to balance them with the compound.
Add up the changes to the number of atoms underneath the equation.

Step 6: $2Mg + O_2 \longrightarrow 2MgO$

Step 6: Rewrite the balanced equation. (Marks are only given for the final balanced equation. No marks are given for the workings)

✔ Did you understand the work?

1. Write balanced equations for the following equations:

1.1. $Na + O_2 \longrightarrow Na_2O$ (2)

1.2. $Cu + O_2 \longrightarrow CuO$ (2)

1.3. $Ca + O_2 \longrightarrow CaO$ (2)

1.4. $Fe + O_2 \longrightarrow Fe_2O_3$ (3)

1.5. $CO_2 + H_2O \longrightarrow C_6H_{12}O_6 + O_2$ (3)

[12]

✔ Let's mark!

1.1. $Na + O_2 \longrightarrow Na_2O$

Na = 1 Na = 2
O = 2 O = 1

Step 1: $Na + O_2 \longrightarrow \mathbf{2}Na_2O$

Na = 1 Na = 4
O = 2 O = 2

Step 2: $\mathbf{4}Na + O_2 \longrightarrow 2Na_2O$

Na = 4 Na = 4
O = 2 O = 2

Step 3: $4Na$ ✓ $+ O_2 \longrightarrow 2Na_2O$ ✓

Remember to rewrite the finished balanced equation

1.2. $Cu + O_2 \longrightarrow CuO$

Cu = 1 Cu = 1
O = 2 O = 1

Step 1: $Cu + O_2 \longrightarrow \mathbf{2}CuO$

Cu = 1 Cu = 2
O = 2 O = 2

Step 2: $\mathbf{2}Cu + O_2 \longrightarrow 2CuO$

Cu = 2 Cu = 2
O = 2 O = 2

Step 3: $2Cu$ ✓ $+ O_2 \longrightarrow 2CuO$ ✓

Remember to rewrite the finished balanced equation

1.3. $Ca + O_2 \longrightarrow CaO$

Ca = 1	Ca = 1
O = 2	O = 1

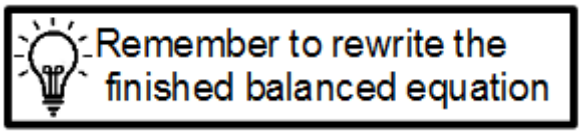
Step 1: $Ca + O_2 \longrightarrow \mathbf{2}CaO$

Ca = 1	Ca = 2
O = 2	O = 2

Step 2: $\mathbf{2}Ca + O_2 \longrightarrow 2CaO$

Ca = 2	Ca = 2
O = 2	O = 2

Step 3: $2Ca$ ✓ $+ O_2 \longrightarrow 2CaO$ ✓



1.4. $Fe + O_2 \longrightarrow Fe_2O_3$

Fe = 1	Fe = 2
O = 2	O = 3

Step 1: $Fe + O_2 \longrightarrow \mathbf{2}Fe_2O_3$

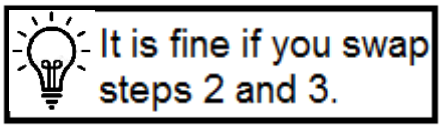
Fe = 1	Fe = 4
O = 2	O = 6

Step 2: $\mathbf{4}Fe + O_2 \longrightarrow 2Fe_2O_3$

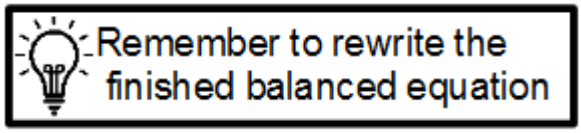
Fe = 4	Fe = 4
O = 2	O = 6

Step 3: $4Fe + \mathbf{3}O_2 \longrightarrow 2Fe_2O_3$

Fe = 4	Fe = 4
O = 6	O = 6



Step 4: $4Fe$ ✓ $+ 3O_2$ ✓ $\longrightarrow 2Fe_2O_3$ ✓



1.5. $CO_2 + H_2O \longrightarrow C_6H_{12}O_6 + O_2$

C = 1	C = 6
H = 2	H = 12
O = 3	O = 8

Step 1: $\mathbf{6}CO_2 + H_2O \longrightarrow C_6H_{12}O_6 + O_2$

C = 6	C = 6
H = 2	H = 12
O = 13	O = 8

Your biggest compound is sucrose($C_6H_{12}O_6$) .
Start balancing by beginning with the first element, carbon.

Step 2: $6CO_2 + \mathbf{6}H_2O \longrightarrow C_6H_{12}O_6 + O_2$

C = 6	C = 6
H = 12	H = 12
O = 18	O = 8

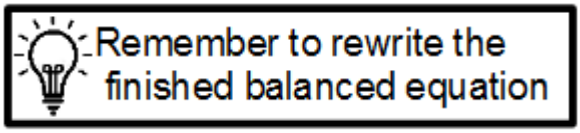
Your next step is to try balance The second element, hydrogen.

Step 3: $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + \mathbf{6}O_2$

C = 6	C = 6
H = 12	H = 12
O = 18	O = 18

Your final step is to try balance the last element, oxygen.

Step 4: $6CO_2$ ✓ + $6H_2O$ ✓ ⟶ $C_6H_{12}O_6 + 6O_2$ ✓



What was your score? $\frac{\quad}{12}$ 

If you didn't achive at least 9/12, it is in your best interest to please go through the work again.

Well done!!! 

Day 5

Revision Exercise for Week 1

Complete the following exercises in your workbook to revise the work covered in Week 1.

Question 1

1.1. Provide the names of the following compounds:

1.1.1. MgO (1)
1.1.2. $ZnCl_2$ (1)
1.1.3. Fe_2O_3 (1)

1.2. Give the ratio of the elements that occur in the following compounds:

1.2.1. MgO (1)
1.2.2. $ZnCl_2$ (1)
1.2.3. Fe_2O_3 (1)
[6]

Question 2

State whether the following elements are metals, non-metals or semi-metals:

2.1. Hg (1)
2.2. P (1)
2.3. Si (1)
[3]

Question 3

Write balanced equations for the following equations:

3.1. $SO_2 + O_2 \longrightarrow SO_3$ (2)
3.2. $K_2O_2 + K \longrightarrow K_2O$ (2)
3.3. $Al + O_2 \longrightarrow Al_2O_3$ (3)
3.4. $Al + HCl \longrightarrow ACl_3 + H_2$ (4)
[11]

Total: [20]

✔ Let's mark!

1.1.1. Magnesium Oxide ✓
1.1.2. Zinc Chloride ✓
1.1.3. Iron Oxide ✓

1.2.1. 1 : 1 ✓
1.2.2. 1 : 2 ✓
1.2.3. 2 : 3 ✓

2.1. Metal ✓
2.2. Non-metal ✓
2.3. Semi-metal ✓

3.1. $SO_2 + O_2 \longrightarrow SO_3$

S = 1 S = 1
O = 4 O = 3

Step 1: $SO_2 + O_2 \longrightarrow \mathbf{2}SO_3$

S = 1 S = 2
O = 4 O = 6

Step 2: $\mathbf{2}SO_2 + O_2 \longrightarrow 2SO_3$

S = 2 S = 2
O = 6 O = 6

Step 3: $2SO_2$ ✓ $+ O_2 \longrightarrow 2SO_3$ ✓

Remember!

When balancing equations, always start on the side with the biggest compound.

3.2. $K_2O_2 + K \longrightarrow K_2O$

K = 3 K = 2
O = 2 O = 1

Step 1: $K_2O_2 + K \longrightarrow \mathbf{2}K_2O$

K = 3 K = 4
O = 2 O = 2

Step 2: $K_2O_2 + \mathbf{2}K \longrightarrow 2K_2O$

K = 4 K = 4
O = 2 O = 2

Step 3: $K_2O_2 + 2K$ ✓ $\longrightarrow 2K_2O$ ✓

3.3. $Al + O_2 \longrightarrow Al_2O_3$

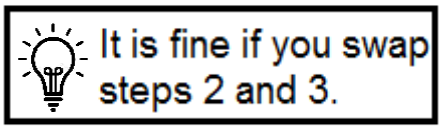
Al = 1	Al = 2
O = 2	O = 3

Step 1: $Al + O_2 \longrightarrow \mathbf{2}Al_2O_3$

Al = 1	Al = 4
O = 2	O = 6

Step 2: $Al + \mathbf{3}O_2 \longrightarrow \mathbf{2}Al_2O_3$

Al = 1	Al = 4
O = 6	O = 6



Step 3: $\mathbf{4}Al + \mathbf{3}O_2 \longrightarrow \mathbf{2}Al_2O_3$

Al = 4	Al = 4
O = 6	O = 6

Step 4: $4Al$ ✓ $+ 3O_2$ ✓ $\longrightarrow 2Al_2O_3$ ✓

3.4. $Al + HCl \longrightarrow AlCl_3 + H_2$

Al = 1	Al = 1
H = 1	H = 2
Cl = 1	Cl = 3

Step 1: $Al + HCl \longrightarrow \mathbf{2}AlCl_3 + H_2$

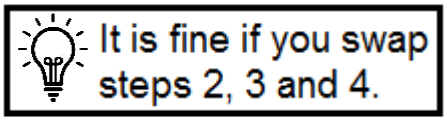
Al = 1	Al = 2
H = 1	H = 2
Cl = 1	Cl = 6

Step 2: $\mathbf{2}Al + HCl \longrightarrow 2AlCl_3 + H_2$

Al = 2	Al = 2
H = 1	H = 2
Cl = 1	Cl = 6

Step 3: $2Al + \mathbf{6}HCl \longrightarrow 2AlCl_3 + H_2$

Al = 2	Al = 2
H = 6	H = 2
Cl = 6	Cl = 6



Step 4: $2Al + 6HCl \longrightarrow 2AlCl_3 + \mathbf{3}H_2$

Al = 2	Al = 2
H = 6	H = 6
Cl = 6	Cl = 6

Step 5: $2Al$ ✓ $+ 6HCl$ ✓ $\longrightarrow 2AlCl_3$ ✓ $+ 3H_2$ ✓

What was your score? $\frac{\quad}{20}$ 

If you didn't achive at least 15 /20, it is in your best interest to please go through the weeks work again.

Congratulations on completing Week 1!!!

Day 1

Topic 3.1 Reactions of metals with oxygen

Week 2

✔ Let's learn Terminology!

Oxide: a **compound** formed during a **chemical reaction** between **oxygen** and another **element**.

Combustion Reaction: a **reaction** that occurs when a **substance burns** in **oxygen**.

✔ Let's Read!

Read through pages 84 – 86 in your textbook.

✔ Let's sum it up!

Have you noticed that **copper** bangles or **iron** gutters do not shine as bright as they did when you first got them and that they are **covered** by a dark **coating**? The dark coating forms when the **substance reacts** with **oxygen**. When an **element reacts** with **oxygen**, it forms an **oxide**. The compound that covers the **copper** bangle is **copper oxide**, and the compound covering the **iron** gutter is **iron oxide**.

While some **reactions** like copper and iron can happen at room temperature, many **reactions** need **heat** for the reaction to take place. The reaction of **oxygen** and a **metal** with **heat** present is called a **combustion reaction**.

The general equation for the reaction between a metal and oxygen is:

metal + oxygen ⟶ metal oxide

Teacher Tip!

It is important that you know the general equation for this type of reaction.

- Example: when **iron** reacts with **oxygen** it forms **iron oxide**.

The word equation: iron + oxygen ⟶ iron oxide

The unbalanced equation: $Fe + O_2 \longrightarrow Fe_2O_3$

- When **copper** reacts with **oxygen** it forms **copper oxide**.

The word equation: copper + oxygen ⟶ copper oxide

The unbalanced equation: $Cu + O_2 \longrightarrow CuO$

- When **magnesium** reacts with **oxygen** it forms **magnesium oxide**.

The word equation: magnesium + oxygen ⟶ magnesium oxide

The unbalanced equation: $Mg + O_2 \longrightarrow MgO$

✔ Did you understand the work?

1. For the following reactions, write down the name of the product that would form.

1.1. Lithium + oxygen ⟶ _____ (1)

1.2. Magnesium + oxygen ⟶ _____ (1)

1.3. Zinc + oxygen ⟶ _____ (1)

1.4. Sodium + oxygen ⟶ _____ (1)

2. State whether the following reactions provide a metal oxide as a product. Provide a reason for your answer. Refer to your periodic table for help.

2.1. Calcium + oxygen. (2)

2.2. Carbon + oxygen. (2)

2.3. Potassium + oxygen. (2)

[10]

✔ Let's mark!

1.1. Lithium oxide ✓

1.2. Magnesium oxide ✓

1.3. Zinc oxide ✓

1.4. Sodium oxide ✓

2.1. Yes, Calcium oxide is a metal oxide ✓ because calcium is a metal. ✓

2.2. No, Carbon oxides are NOT a metal oxide ✓ because carbon is a non-metal. ✓

2.3. Yes, Potassium oxide is a metal oxide ✓ because potassium is a metal.✓

What was your score? ___/10

If you didn't achive at least 7/10, it is in your best interest to please go through the work again.

Great job!!!

Day 2

Topic 3.2 Formation of rust

✔ Let's learn Terminology!

Rust: the reddish-brown **coating** that forms on **iron**.

Electrolysis: the **process** used to **coat** one **metal** with another.

✔ Let's Read!

Read through pages 87 – 89 in your textbook.

✔ Let's sum it up!

Oxygen is a **very active** element and will **react** with most substances. If you look at old iron objects, you will see they are **covered** with a **reddish-brown layer**. When iron **reacts** with air (a mixture of oxygen, water and other substances), it **corrodes** and produces **rust** (a complex compound that contains **iron oxide**).

When iron or steel **rusts**, it forms loose layers on the **metal** which peel off easily and expose **new layers**. **Rusting** is a slow process that will slowly **ruin** iron or steel unless the rusting is **prevented**.

The word equation for the rusting process:

Iron + oxygen + water ⟶ rust

Teacher Tip!

It is important that you know the general equation for the rusting process.

Rusting **weakens** and **damages** iron structures so it is important to protect items from rusting.

Ways to prevent rusting:

1. Painting, greasing and oiling: Coating the iron can **prevent** rust but rusting can occur if the **surface** is **damaged** so it is important to **regularly repaint** the surfaces.

2. Electroplating: Coating the iron with a **metal** that is **less reactive**, such as chromium or aluminium, can **protect** the iron underneath because the **covering metal** will not be damaged by the oxygen. The **process** of coating the iron with a **less reactive** metal is known as **electrolysis**.

3. Galvanising: Coating the iron with zinc, which is **more reactive** than the iron, can protect the metal. The zinc **reacts** with oxygen **instead** of the iron.

✔ Did you understand the work?

1. What is the importance of giving iron structures a protective coating? (2)

2. Why are layers of metal like chromium used to cover iron or steel? (2)

3. Provide the name of the processes used to coat iron with a layer of:

3.1. Zinc (1)
3.2. Aluminium (1)
[6]

✔ Let's mark!

1. Unprotected iron can rust ✓ which will weaken and damage the structure.✓

2. These metals are less reactive than iron ✓ and the layer will protect the iron underneath. ✓

3.1. Galvanising ✓
3.2. Electrolysis ✓

What was your score? $\frac{}{6}$ 

If you didn't achive at least 4/6, it is in your best interest to please go through the work again.

Keep it up!!! 

Day 3

Topic 4.1 Reactions of non-metals with oxygen

✔ Let's learn Terminology!

Acidic oxide: an **oxide** that **forms** an **acid** when it **reacts** with **water**.

✔ Let's Read!

Read through pages 90 – 92 in your textbook.

✔ Let's sum it up!

When **non-metals burn** in air they produce **non-metal oxides**. **Non-metals** react with the **oxygen** in the air. This can take time because **air** only contains 21% oxygen. That is why it is better to use **pure oxygen** (100%) for experiments.

The general equation for the reaction between a non-metal and oxygen is:

non-metal + oxygen ⟶ non-metal oxide

Teacher Tip!

It is important that you know the general equation for this type of reaction.

- Example: when **carbon** reacts with **oxygen** it forms **carbon dioxide**.

The word equation: carbon + oxygen ⟶ carbon dioxide

The unbalanced equation: $C + O_2 \longrightarrow CO_2$

- When **sulfur** reacts with **oxygen** it forms **sulfur dioxide**.

The word equation: sulfur + oxygen ⟶ sulfur dioxide

The unbalanced equation: $S + O_2 \longrightarrow SO_2$

- When **phosphorus** reacts with **oxygen** it forms **phosphorus pentoxide**.

The word equation: phosphorus + oxygen ⟶ phosphorus pentoxide

The unbalanced equation: $4P + 5O_2 \longrightarrow P_4O_{10}$

Non-metal oxides can be **classified** as **acidic oxides**. This is because the **non-metal oxides** form an **acid** if they **react** with **water**.

✔ Did you understand the work?

1. Write word reactions for the following chemical reactions.

1.1. $C + O_2 \longrightarrow CO_2$ (3)

1.2. $S + O_2 \longrightarrow SO_2$ (3)

2. Explain why non-metal oxides are classified as acidic oxides. (2)

[8]

✔ Let's mark!

1.1. Carbon ✓ + Oxygen ✓ ⟶ Carbon Dioxide ✓

1.2. Sulfur ✓ + Oxygen ✓ ⟶ Sulfur Dioxide ✓

2. When a non-metal oxide reacts with water ✓ it forms an acid. ✓

What was your score? $\frac{\quad}{8}$ 

If you didn't achive at least 6/8, it is in your best interest to please go through the work again.

Great work!!! 

Day 4

Important!

Do not touch or taste any liquid that you are testing.

Topic 5.1 Acids, Bases and pH

✔ Let's learn Terminology!

Acid: a **substance** with a **pH** value **lower** than 7.

Base: a **substance** with a **pH** value **higher** than 7.

✔ Let's Read!

Read through pages 93 – 95 in your textbook.

✔ Let's sum it up!

Substances can be **classified** as either **acids**, **bases** or **neutrals**.

Acids are sour in taste and feel rough, and can be **corrosive** if they are strong. Vinegar and lemon-juice are examples of **acids** you could find in your house.

Bases taste bitter and feel soapy. Household cleaners like Sunlight are examples of bases you can find in your house.

The **pH scale** is a scale of numbers from 0 – 14 that indicates how **acidic** or **basic** a substance is.

Acids have a pH of 0 – 6, with **strong** acids like stomach acid having a pH of **1** and **weak** acids like some fruit having a pH of **5**.

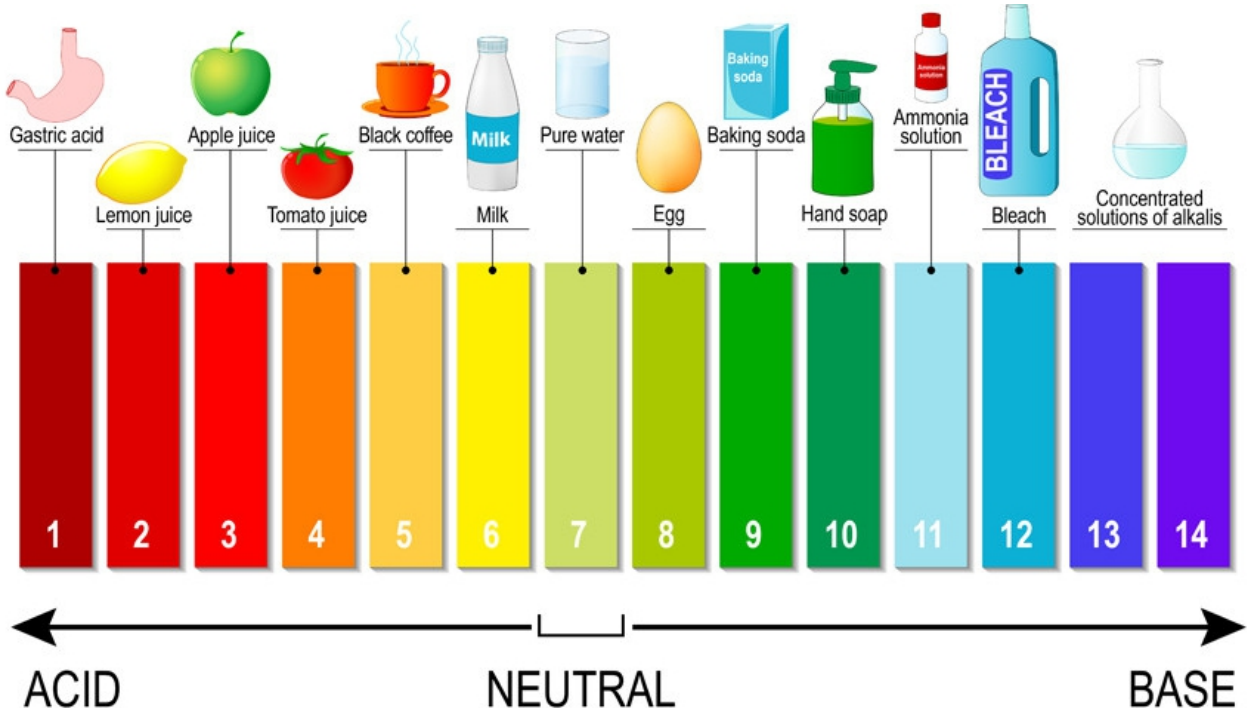
Distilled (pure) water is a **neutral** with a pH of **7**.

Bases have a pH of 8 -14, with **weak** bases like baking soda having a pH of **9** and **strong** bases like bleach having a pH of **12**.

Indicators:

Indicators are **chemicals** used to **determine** whether a substance is an **acid**, **base** or **neutral**. **Indicators change colour** when they come into contact with **acids** or **bases**.

Universal indicator can **change** into a full range of colours **according** to the **pH value** of the substance being **tested**. **Acidic substances** turn red, orange or yellow and **basic substances** turn blue or purple. **Neutrals** turn green.



✔ Did you understand the work?

1. Study the diagram above and state whether the following statements are TRUE or FALSE, and correct the statement if it is FALSE:

1.1. An egg is a strong base. (1)
1.2. Lemon juice is a weak acid. (1)
1.3. Distilled water is a weak acid. (1)
1.4. Milk is a weak acid. (1)
1.5. Bleach is a strong base. (1)
[5]

✔ Let's mark!

1.1. False, an egg is a WEAK base. ✓
1.2. False, lemon juice is a STRONG acid. ✓
1.3. False, distilled water is a NEUTAL. ✓
1.4. True. ✓
1.5. True. ✓

What was your score? $\frac{}{5}$

If you didn't achive at least 3/5, it is in your best interest to please go through the work again.

Great work!!!

Day 5

Revision Exercise for Week 2

Complete the following exercises in your workbook to revise the work covered in Week 2.

1. Provide the missing compounds for the following metal oxide reactions:

1.1. $2Mg + O_2 \rightarrow$ _____ (1)
1.2. ___ $+ 3O_2 \rightarrow 2Fe_2O_3$ (1)
1.3. $2Li + O_2 \rightarrow$ _____ (1)
1.4. ___ $+ O_2 \rightarrow 2CuO$ (1)
[4]

2. List the two substances that react with iron to create rust. (2)

3. Explain the importance of protecting iron structures from rust. (2)

4. Give the name of the element used to galvanise iron. (1)

5. Provide the missing compounds for the following non-metal oxide reactions:

5.1. $S + O_2 \rightarrow$ _____ (1)
5.2. ___ $+ 5O_2 \rightarrow P_4O_{10}$ (1)
5.3. $C +$ ____ $\rightarrow CO_2$ (1)
[3]

6. Study the pH table provided in Topic 5.1 and state whether the following statements are TRUE or FALSE. Correct the statement if it is FALSE.

6.1. Baking soda is a stronger base than hand soap. (1)
6.2. Lemon juice is a stronger acid than apple juice. (1)
6.3. Bleach is a stronger base than ammonia. (1)
[3]

Total: [15]

✔ Let's mark!

1.1. 2MgO ✓
1.2. 4Fe ✓
1.3. 2LiO ✓
1.4. 2Cu ✓

2. Oxygen ✓ Water ✓

3. Unprotected iron will rust ✓ causing damage to the structure. ✓

4. Zinc. ✓

5.1. SO_2 ✓
5.2. 4P ✓
5.3. O_2 ✓

6.1. False, baking soda is a weaker base than hand soap. ✓
6.2. True. ✓
6.3. True. ✓

What was your score? $\frac{\quad}{15}$ 

If you didn't achive at least 12/15, it is in your best interest to please go through the weeks work again.

Congratulations on completing Week 2!!!

Day 1

Topic 6.1 Neutralisation and pH

✔ Let's learn Terminology!

Neutralisation reaction: a **reaction** that takes place when an **acid reacts** with a **base**.

✔ Let's Read!

Read through page 97 in your textbook.

✔ Let's sum it up!

A **neutralisation reaction** takes place when an **acid reacts** with a **base**. Adding a **base** to as **acid** will **raise** the **pH** and make the acid **less** acidic. Adding an **acid** to a **base** will **lower** the **pH** of the **base**. During a **neutralisation reaction** the **pH** moves **closer** to a **neutral** substance (pH7).

Adding an **acid** to a **base** does not always form a **neutral substance**. This depends on the **strength** of the **acid** or **base** used as well as the **volume** (amount) of the **substances** used.

Adding a **strong acid** (pH 2) to a **weak base** (pH 8) will result in an **acid**.
Adding a **strong base** (pH13) to a **weak acid** (pH 6) will result in a **base**.

Teacher Tip!

A neutralisation reaction always results in a pH closer to 7.

✔ Did you understand the work?

1. Provide the definition of a neutralisation reaction. (2)

2. For the following reactions, state whether the pH will increase or decrease. Refer to the diagram provided in Topic 5.1.

2.1. Adding an egg to black coffee. (1)
2.2. Adding tomato juice to hand soap. (1)
2.3. Adding baking soda to lemon juice. (1)
[5]

✔ Let's mark!

1. A reaction that takes place when an acid ✓ reacts with a base. ✓

2.1. pH will increase ✓
2.2. pH will decrease ✓
2.3. pH will increase ✓

What was your score? 5

If you didn't achive at least 3/5, it is in your best interest to please go through the work again.

Keep it up!!!

Day 2

Topic 6.2 Reactions of an acid with a metal oxide

✔ Let's learn Terminology!

Salt: a **substance** that **forms** when an **acid reacts** with a **base**.

✔ Let's Read!

Read through pages 99 – 101 in your textbook.

✔ Let's sum it up!

When an **acid reacts** with a **metal oxide**(**base**), a **neutralisation reaction** takes place. The **products** formed are a **salt** and **water**.

The general equation for the reaction is:

acid + metal oxide ⟶ salt + water

Teacher Tip!

It is important that you know the general equation for this type of reaction.

The type of **salt** formed **depends** upon which **acid** and **metal oxide react**. The **name** of the **salt** is taken from the **metal** in the **metal oxide** and the **negative ion** in the acid.

For example: when **hydrochloric acid** (HCl) reacts with with **magnesium oxide** (MgO), the **salt** formed is **magnesium chloride** ($MgCl_2$).

- The word equation:

hydrochloric acid + magnesium oxide ⟶ magnesium chloride + water

- The chemical equation is:

$HCl + MgO \longrightarrow MgCl_2 + H_2O$

- The balanced chemical equation is:

$2HCl + MgO \longrightarrow MgCl_2 + H_2O$

Applications: **Overusing fertiliser** can make the **soil acidic** which **negatively** affects **plant growth**. Farmers **neutralise** the **acidity** of the soil by adding limestone.

Acid rain: **Burning fossil fuels** releases **gases** into the **atmosphere**. These **gases mix** with **water** in the **atmosphere** and form **acid rain**. **Acid rain** causes the **pH** of **water** to **drop** making it toxic to aquatic life. **Acid rain** also causes the **pH** of **soil** to **drop** which **negatively affects plant** growth.

✔ Did you understand the work?

1. Write word equations for the following reactions:

1.1. hydrochloric acid and calcium oxide (2)
1.2. hydrochloric acid and copper oxide (2)
1.3. hydrochloric acid and sodium oxide (2)

✔ Let's mark!

1.1. hydrochloric acid + calcium oxide ⟶ calcium chloride ✓ + water ✓
1.2. hydrochloric acid + copper oxide ⟶ copper chloride ✓ + water ✓
1.3. hydrochloric acid + sodium oxide ⟶ sodium chloride ✓ + water ✓

What was your score? $\frac{\quad}{6}$ 

If you didn't achive at least 4/6, it is in your best interest to please go through the work again.

Great work!!!

Day 3

Topic 6.3 Reactions of an acid with a metal hydroxide

✔ Let's learn Terminology!

Metal hydroxide: A **compound** formed when a **metal reacts** with **water**, and contains an **OH ion**.

Ion: a **molecule** with an **electric charge** due to the **loss** or **gain** of an **electron**.

Aqueous solution: a **solution** where the **solute**(dissolved substance) is dissolved in **water**.

✔ Let's Read!

Read through pages 101 – 103 in your textbook.

✔ Let's sum it up!

Another type of **neutralisation reaction** is between an **acid** and a **metal hydroxide**(base).

The general equation for the reaction is:

acid + metal hydroxide ⟶ salt + water

Teacher Tip!

It is important that you know the general equation for this type of reaction.

The type of **salt** formed depends on which **acid** and **metal hydroxide** react. The **name** of the **salt** is taken from the **metal** in the metal hydroxide and the **negative ion** in the acid.

For example, when **hydrochloric acid** (HCl) reacts with **sodium hydroxide**(NaOH), the salt formed is **sodium chloride**(NaCl).

- The word equation:

hydrochloric acid + sodium hydroxide ⟶ sodium chloride + water

- The chemical equation is:

$HCl + NaOH \longrightarrow NaCl_2 + H_2O$

The product is an **aqueous solution**, meaning that the **salt** (sodium chloride) is **dissolved** in **water**. If we want to **extract** the **salt**, we need to **evaporate** the water by boiling it.

✔ Did you understand the work?

1. Write word equations for the following reactions:

1.1. hydrochloric acid and calcium hydroxide (2)
1.2. hydrochloric acid and potassium hydroxide (2)
1.3. hydrochloric acid and lithium hydroxide (2)

✔ Let's mark!

1.1. hydrochloric acid + calcium hydroxide ⟶ calcium chloride ✓ + water ✓
1.2. hydrochloric acid + potassium hydroxide ⟶ potassium chloride ✓ + water ✓
1.3. hydrochloric acid + lithium hydroxide ⟶ lithium chloride ✓ +water ✓

What was your score? $\frac{\quad}{6}$ 

If you didn't achive at least 4/6, it is in your best interest to please go through the work again.

Good job!!! 

Day 4

Topic 6.4 Reaction of an acid with a metal carbonate

✔ Let's learn Terminology!

Limewater: a **solution** of **calcium hydroxide** ($Ca(OH)_2$).

✔ Let's Read!

Read through pages 104 – 105 in your textbook.

✔ Let's sum it up!

When an **acid reacts** with a **metal carbonate** (base), the products formed are a **salt**, **carbon dioxide** and **water**.
The general equation for the reaction is:

acid + metal carbonate ⟶ salt + carbon dioxide + water

Teacher Tip!

It is important that you know the general equation for this type of reaction.

For example, when **hydrochloric acid** (HCl) reacts with **calcium carbonate** ($CaCO_3$), the **salt** formed is **calcium chloride**($CaCl_2$).

- The word equation:

hydrochloric acid + calcium carbonate ⟶ calcium chloride + carbon dioxide + water

- The chemical equation is:

$2HCl + CaCO_3 \longrightarrow CaCl_2 + CO_2 + H_2O$

Testing for carbon dioxide:

We can **test** for the **presence** of **carbon dioxide** by using the **limewater test**. **Carbon dioxide** will turn **limewater** milky or **cloudy**.

When **carbon dioxide** is bubbled through it, a solid precipitate of **calcium carbonate**($CaCO_3$) is formed. The **calcium carbonate** that is formed makes the **limewater cloudy**.

✔ Did you understand the work?

1. Write word equations for the following reactions:

1.1. hydrochloric acid and sodium carbonate (3)
1.2. hydrochloric acid and magnesium carbonate (3)

✔ Let's mark!

1.1. hydrochloric acid + sodium carbonate ⟶ sodium chloride ✓ + carbon dioxide ✓ + water ✓
1.2. hydrochloric acid + magnesium carbonate ⟶ magnesium chloride ✓ + carbon dioxide ✓ + water ✓

What was your score? $\frac{\quad}{6}$

If you didn't achive at least 4/6, it is in your best interest to please go through the work again.