**FIREWORKS – Elements, Mixtures and Compounds.Summary Notes**

**Elements**

Everything in the world is made from about one hundred ***elements***. Each one has a name and a ***symbol*** that consists of one or two letters. The first letter is always a ***capital*** letter (upper case) and the second letter is always lower case (a small letter), e.g. the symbol for carbon is ***C*** but the symbol for ***calcium*** is Ca.



Chemists have arranged elements

in the ***Periodic Table***.

* Most elements are solid at room temperature, e.g. ***carbon*** and ***copper***. The two elements that are liquid at room temperature are ***bromine*** and ***mercury***.
* Some elements are gases at room temperature, e.g. ***oxygen*** and ***hydrogen***.\*
* Elements can be classified as ***metals*** and non-metals.
* There are many more ***metals*** than ***non-metals***.
* The metals are found to the ***left*** side of the zig-zag line in the Periodic Table. The ***non-metals*** are on the ***right side.***
* The most recently ***discovered*** elements have been made by scientists. These elements are found after uranium at the ***bottom*** of the Periodic Table.
* Elements in the same ***GROUP (columns)*** of the Periodic Table show similar chemical properties, e.g. sodium, ***lithium*** and ***potassium*** are all stored under oil because they are very ***reactive***.
* The columns of elements are called groups. Common groups are **Group 1 Alkali metals, Group 7 Halogens, Group 0 Noble gases**
* The **rows** the Periodic table are called ***PERIODS***

**Compounds**

A ***compound*** is a substance that is made up of two or more elements chemicallyjoined together and cannot be easily separated, e.g.



 **+ ®**

 **iron sulphur iron sulphide**

Compounds with a name ending in ‘-ide’ contain the two elements indicated, e.g. the compound that contains calcium and oxygen is called ***calcium oxide***.

The name ending ‘-ite’ or ‘-ate’ indicates the additional element ***oxygen*** in the compound, e.g. potassium sulphite and potassium sulphate both contain potassium, ***sulphur*** and ***oxygen***.

**Mixtures**

When two or more substances come together without reacting, a

***mixture*** is formed. The substances in the mixture can be easily separated.

**Chemical reactions**

In a **chemical reaction** a new substance is always formed. Most chemical changes

are not easily reversed; they are **irreversible**.

In a **physical change** no new substance is formed. Melting and evaporation are examples of physical changes. Physical changes are usually reversible.

You can tell that a reaction has occurred if there is a **colour change** or when a **gas** is given off. Most chemical reactions also involve an **energy change**. This is usually in the form of heat, but can also involve light being given off (for example, when something burns).

Chemical reactions can also be identified by *temperature* changes that take place, e.g. when an alkali reacts with an acid, nothing is seen but the test-tube becomes *hot* because energy is produced, showing that a chemical reaction is taking place.

* **Exothermic** reaction – a reaction in which energy is given out,

usually in the form of heat. The reaction gets hotter.

* **Endothermic** reaction – a reaction in which energy is taken in.

The reaction gets colder.

**Burning (Combustion)**

When a metal burns, the metal combines with oxygen from the air to form a chemical

called an **oxide**. We can show this using a **word equation**. The chemicals that you

start with are called the **reactants**. The chemicals at the end are called the products.

magnesium + oxygen ---🡪 magnesium oxide

*reactants products*

**Word equations**

In a chemical reaction, the starting substances are called the ***reactants*** and the new substances that are formed are called the ***products***.

A short-hand way of representing a chemical reaction is by a word ***equation***.

EXAMPLE 1 - The reaction of paraffin with oxygen to form water and carbon dioxide. The reactants are ***paraffin*** and ***oxygen***. The products are ***water*** and ***carbon dioxide***.

EXAMPLE 2 - The word equation for the reaction of sodium with water to form hydrogen and sodium hydroxide is:

***Sodium*** **+**  ***water 🡪 hydrogen* +** ***sodium hydroxide***

EXAMPLE 3 - This word equation describes the reaction between ***ammonia*** and ***oxygen*** to form ***nitrogen*** and ***water***.

ammonia + oxygen 🡪 nitrogen + water

In a word equation:

• the ***+ (plus)*** sign means **and**

• the🡪 ***(arrow)*** means **changes into**

the **reactants** are always written to the ***left*** side of the arrow and the products are always on the ***right*** side of the arrow.

**RATE OF REACTIONS**

Reaction rates can be increased by the following methods.

1. Increasing the temperature of the reactants.

2. Increasing the concentration of the reactants.

3. Increasing the surface area by decreasing particle size.

4. Adding a catalyst (which does not get used up).

**ATOMS AND ATOMIC STRUCTURE**

**Structure of the Atom**

Elements are listed in the Periodic Table in order of their Atomic Number.

**Atomic number** = number of **protons**.

**Mass number** = number of **protons** + number of **neutrons**.

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**Atoms and fireworks!**

**Flame Colours**

Each element has its own **unique atomic number** and therefore a particular number of electrons. The electrons orbit in specific shells around the nucleus a bit like the planets around the sun.

When a substance containing metal atoms is heated, the electrons in the metal get excited gain energy and move to shells further away from the nucleus. Once there they then fall back to their original shell and release the energy as light. The colour of light depends upon the number of electrons in the metal and so each metal has its own unique flame colour.

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| --- | --- | --- | --- | --- | --- | --- |
| **Strontium** | **calcium** | **Magnesium** | **Sodium** | **Barium** | **Copper** | **Potassium** |
| **Red** | **Orange** | **White** | **Yellow** | **Apple Green** | **Green** | **Lilac** |