

# The Chemical Apprentice

## Revision Guide

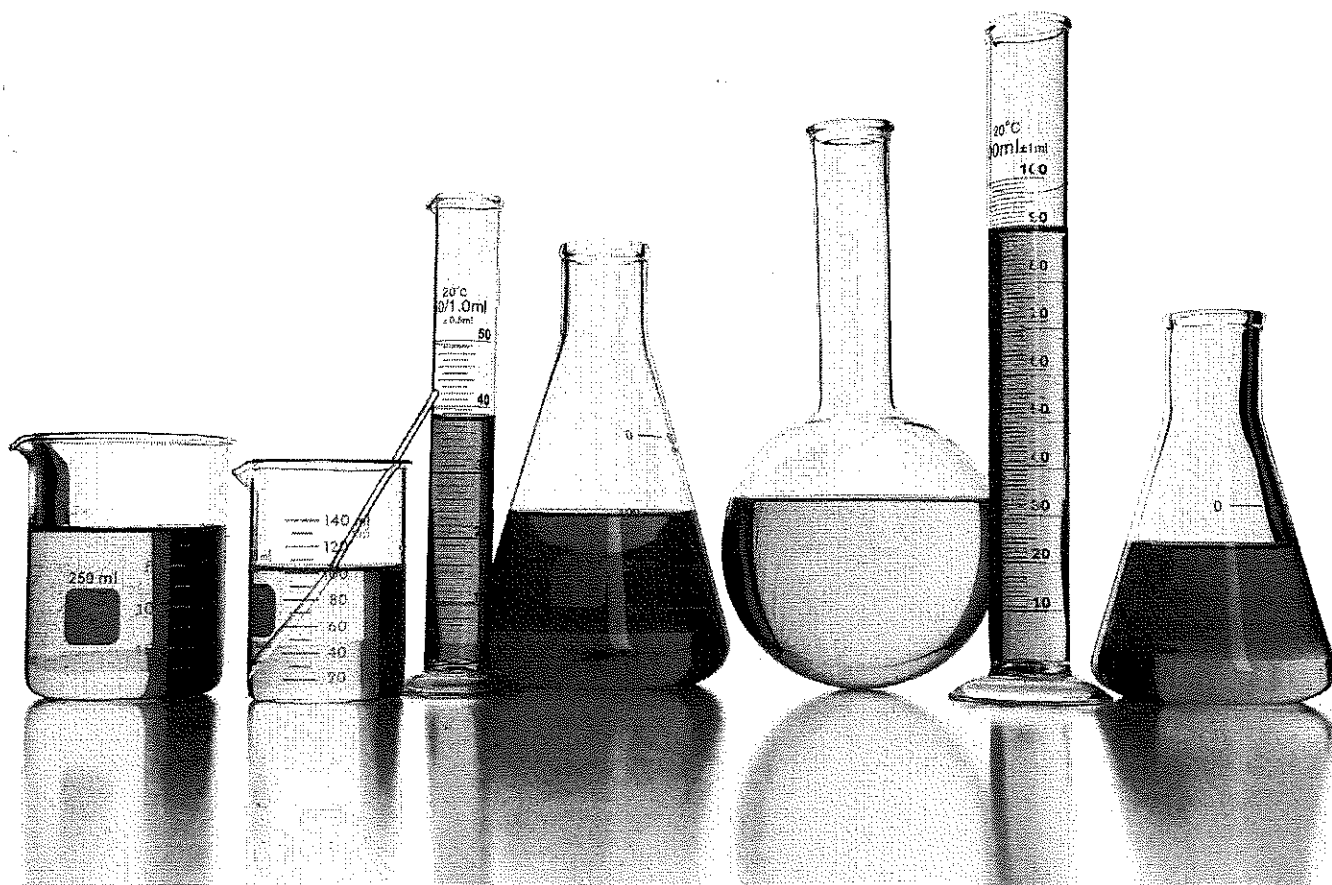
Name: \_\_\_\_\_

**Read** all the information before attempting to answer the questions.

**Highlight** key words. You could then turn these into flash cards.

**Make a revision resource** after you have done the tasks. This could be *flash cards, mind maps, or question and answer cards.*

Your teacher will look at your work if you take it to them.



Read through each specification and decide whether you feel confident, a little confident or not confident. Highlight target areas which you feel you need to focus on.

Specification question				Description	Target area?
What is a risk assessment in Science?					
Why do risk assessments need to be carried out?					
How are risk assessments carried out?					
What is a reaction?					
What is the difference between Chemical and Physical reactions?					
What are the reactants and products in a reaction?					
How do you write an equation in words?					
What happens when you burn a Hydrocarbon?					
What is the law of conservation of atoms?					
How do you Separate substances using filtration?					
How do you separate substances using evaporation?					
How do you separate substances using distillation?					
How do you separate of substances using Chromatography?					
What is an acid and give examples?					
What is an alkali and give examples?					

What does neutralisation mean?					
How can you detect acids and alkali's using universal indicator?					
What is the general structure of a metal?					
What is the function of metals?					
What are the reactions of metals?					
How can you make and detect Hydrogen gas?					

## Key Words

Key word	Definition
Risk	
Risk assessment	
Reaction	
Chemical reaction	
Physical reaction	
Observation	
Reactants	
Products	
Equation	
Hydrocarbon	
Distillation	
Evaporation	

<b>Filtration</b>	
<b>Chromatography</b>	
<b>Acid</b>	
<b>Alkali</b>	
<b>pH</b>	
<b>Universal indicator</b>	
<b>Neutralisation</b>	
<b>Metal</b>	

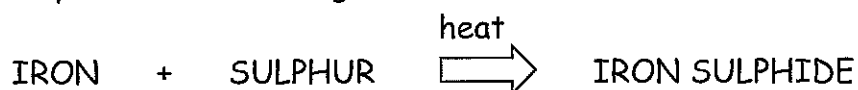
## W.S.52. Types of chemical reaction.

Name .....

There are several different types of chemical reaction.

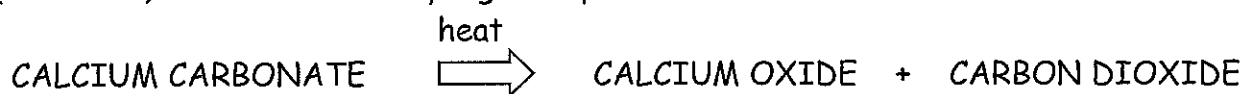
### Synthesis

Two or more substances join together to make a single new substance. For example when iron and sulphur are heated together :



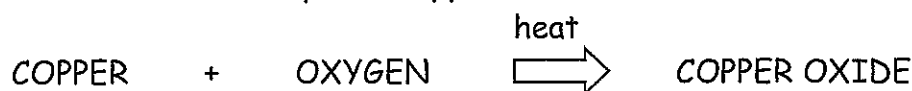
### Decomposition

A substance breaks down into simpler substances. For example, if calcium carbonate (limestone) is heated to a very high temperature :



### Oxidation

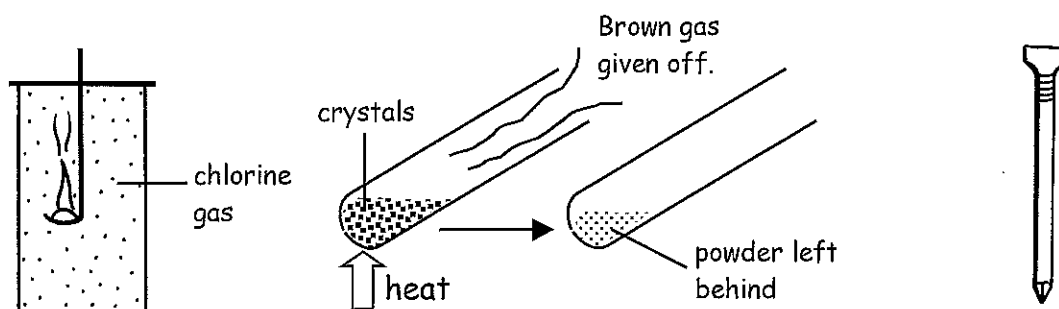
A substance gains oxygen during a chemical reaction. The substance that gains the oxygen is OXIDISED. For example, if copper is heated in air :



Exercise 1 - Complete the sentences below.

- 1) Synthesis means when substances \_\_\_\_\_ together.
- 2) Decomposition means when a substance \_\_\_\_\_ down.
- 3) Oxidation is when a substance gains \_\_\_\_\_ in a chemical reaction.

Exercise 2 - For each diagram below write down the type of chemical reaction it shows.



1) Burning sodium metal in chlorine gas to form sodium chloride (salt). This type of reaction is :

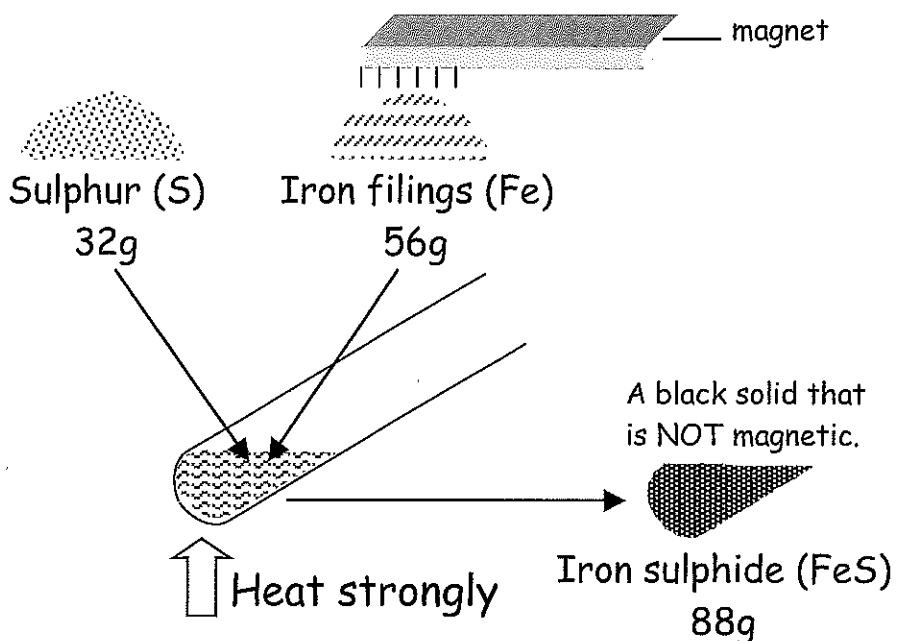
2) Heating white lead nitrate crystals to produce a yellow powder and a brown gas. This type of reaction is :

3) If an iron nail is exposed to air it forms orange iron oxide (rust). This type of reaction is :

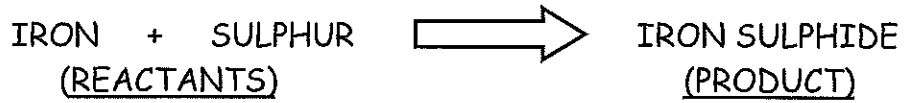
**W.S.51. Chemical reactions.**

Name .....

All of the different materials around us have been formed by chemical reactions from about one hundred simple elements. The diagram below shows a chemical reaction between the elements iron and sulphur.



This reaction can be shown as a word equation:



The new substance formed is a compound called iron sulphide. It has different properties to the iron and sulphur that it is made from.

**Exercise 1** - fill in the missing words in the sentences below.

1. The mass of the reactants (starting chemicals) is E \_ \_ \_ \_ to the mass of the products (the chemicals that are made).
2. The products have different P \_ \_ \_ \_ \_ \_ \_ \_ to the reactants.
3. During a chemical reaction H \_ \_ \_ is either taken in or given out.
4. A chemical change is difficult to R \_ \_ \_ \_ \_ (go backwards).

**Exercise 2** - Join up each word in the left hand column with its meaning on the right.

ELEMENTS	The chemicals that are made.
PRODUCTS	The simplest substances.
COMPOUND	Starting chemicals.
REACTANTS	Elements joined together.

**W.S.54. Products from chemical reactions.** Name .....

Most of the materials that we use every day have been made by chemical reactions. Some of the most common products are made from two important raw materials, METAL ORES and CRUDE OIL.

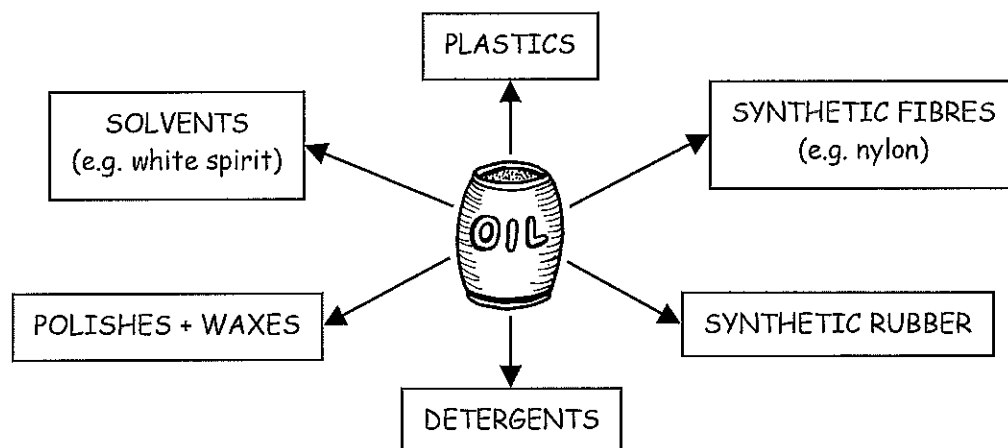
Metal ores.

Most metals exist as compounds called ORES inside rocks. Ores must be reacted with other chemicals to extract the metals that they contain. The more reactive the metal is, the more difficult it is to release from its ore. If a metal is less reactive than carbon it can be extracted by heating its ore with coke in a furnace. For example HAEMATITE (iron ore) contains iron oxide :



Crude oil.

Natural oil from the ground is called CRUDE OIL. It contains a mixture of substances that can be changed into many useful products.



Exercise - Complete the sentences below.

- 1) Many useful materials are made by chemical R \_\_\_\_\_
- 2) An ore contains a M \_\_\_\_\_ joined to other elements.
- 3) If a metal is less reactive than C \_\_\_\_\_ it can be extracted using coke in a furnace.
- 4) Crude oil is a M \_\_\_\_\_ of useful substances.
- 5) N \_\_\_\_\_ is a synthetic fibre.



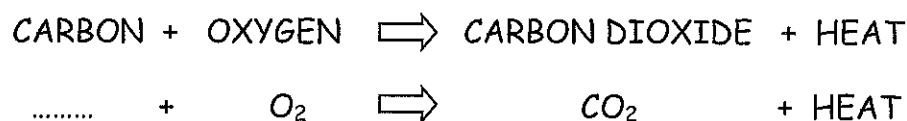
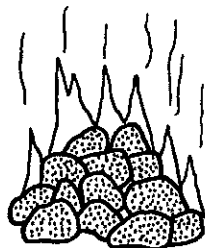
## W.S.42. Compounds.

Name .....

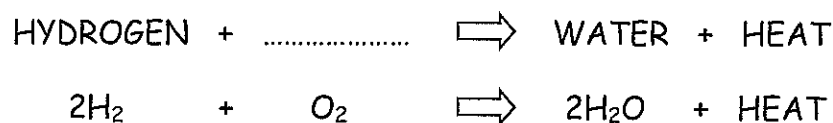
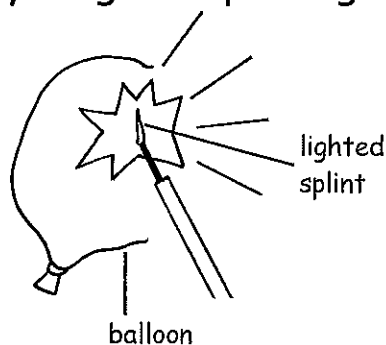
Elements join together by chemical reactions to form compounds. Compounds have different properties to the elements that formed them. In a chemical reaction new substances are formed and energy is taken in or given out. It is also difficult to make a reaction go backwards.

Exercise 1 - Fill in the missing words or symbols for the chemical reactions below.

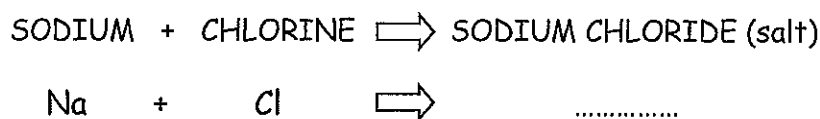
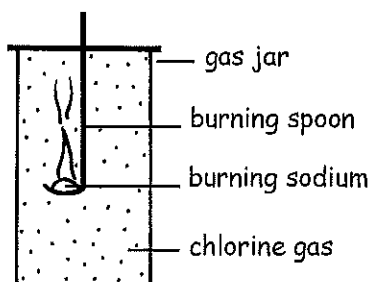
### Coal burning



### Hydrogen exploding



### Making salt



Exercise 2 - For each of the changes below write down if it is a physical or chemical change.

When a firework explodes it is a \_\_\_\_\_ change.

When salt dissolves in water it is a \_\_\_\_\_ change.

When a cake is baked in an oven it is a \_\_\_\_\_ change.

When ice melts it is a \_\_\_\_\_ change.

## W.S.53. Burning.

Name .....

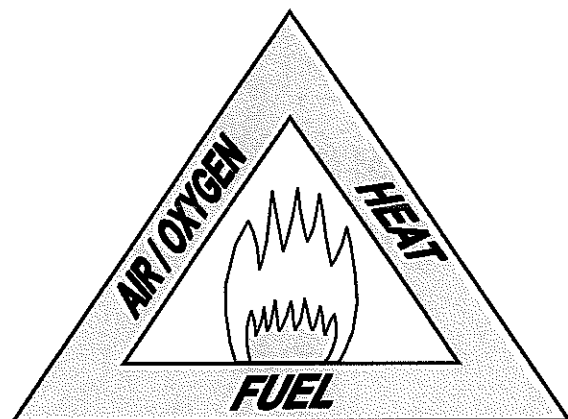
Burning is a type of oxidation reaction. It happens when a substance reacts with oxygen in the air to produce heat and light. The substance that burns is oxidised during the reaction. For example when carbon in the form of coke is burnt :



FUELS can be burnt to release useful energy. They burn more strongly in pure oxygen. If a smouldering wooden splint is placed into a jar that contains oxygen it will relight. This is a test for oxygen gas.

### The fire triangle.

The fire triangle shows the three things that are needed for burning to happen. Removing any of them stops a fire.



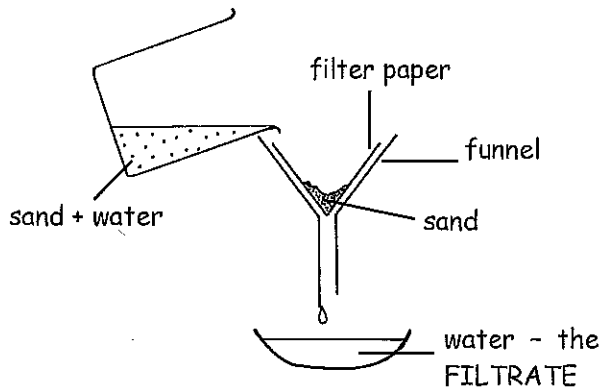
Exercise - Complete the sentences below.

- 1) Burning is a chemical reaction between fuel and O \_\_\_\_\_
- 2) When carbon burns C \_\_\_\_\_ D \_\_\_\_\_ gas is produced.
- 3) Burning can be useful because it releases E \_\_\_\_\_
- 4) The test for oxygen is a smouldering S \_\_\_\_\_
- 5) The three things needed for a fire are oxygen, F \_\_\_\_\_ and heat.
- 6) A fire blanket is used to stop A \_\_\_\_ getting to a fire.
- 7) Pouring water onto a fire takes away the H \_\_\_\_\_

**W.S.43. Separating mixtures.**

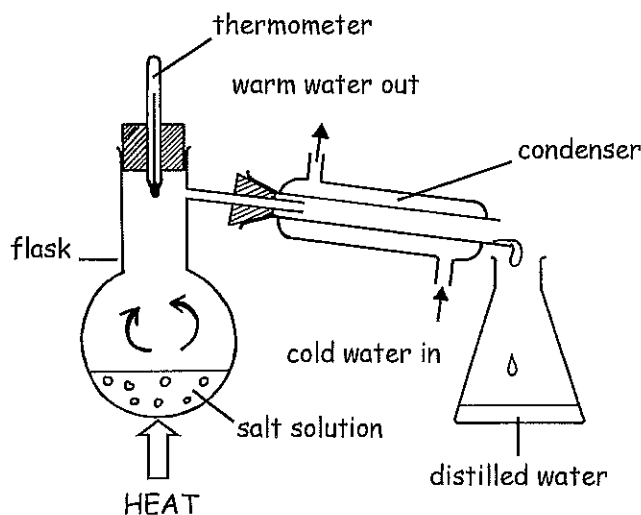
Name .....

A mixture contains a number of substances that are not chemically joined. The diagrams below show different ways of separating mixtures. Fill in the missing words in the paragraphs beside each method.



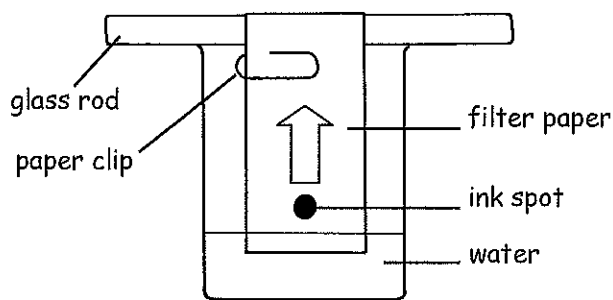
**Filtration.**

This method separates small, solid particles from liquids. In the diagram a mixture of sand and water is being filtered. The ..... passes through the filter paper and the ..... is held back. The sand particles are too big to pass through the pores in the .....



**Distillation.**

This method separates dissolved chemicals (SOLUTES) from the liquids that they are dissolved in (SOLVENTS). In the diagram salt solution is being separated into salt and ..... The water evaporates from the boiling solution and then condenses as it is ..... in the condenser. The salt is left behind in the .....



**Chromatography.**

In the diagram the colours in pen ink are being separated. As water rises up the ..... it takes the colours with it. Different colours travel at different ..... If the ink contains more than one colour they will separate out along the paper.

**Exercise 2** - Join up each mixture below with the correct method for separating it.

muddy water

distillation

copper sulphate solution

filtration

peas and sand

magnetic attraction

iron filings and sawdust

sieving

**W.S.59. Acids and alkalis.**

Name .....

Acids are **CORROSIVE** (eat into materials). They react with some metals to form hydrogen gas and a salt. Acids have a sour taste, and many are poisonous. A purple dye called **LITMUS** changes to a **red** colour in acids.

Alkalis are the chemical opposites of acids, but some of them are also very corrosive. They dissolve in water and often have a soapy feel. Alkalis turn litmus **blue** and they can be used to **NEUTRALISE** (cancel out) acids. A **NEUTRAL** solution is neither acid or alkali.

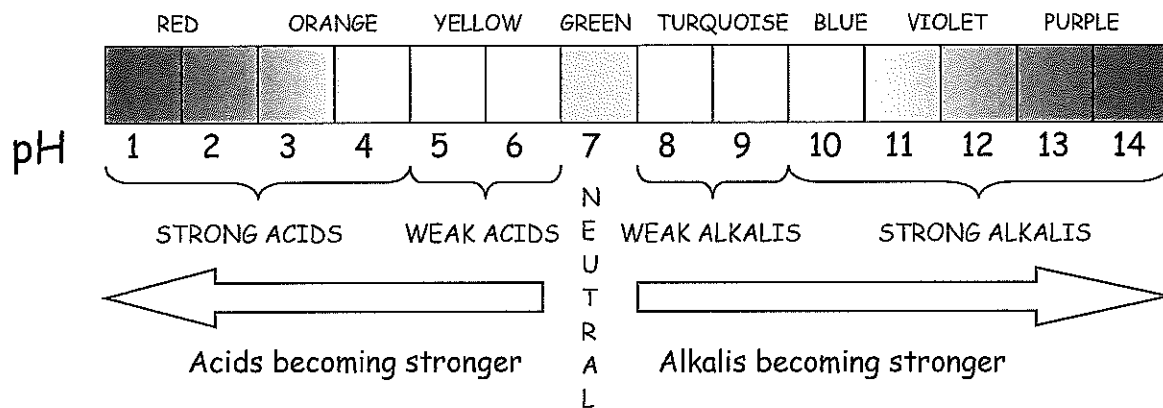
**Acids**

**Alkalis**

STRONG	WEAK	STRONG	WEAK
These are the poisonous mineral acids: - hydrochloric acid - sulphuric acid	ethanoic acid in vinegar citric acid in fruit juices carbonic acid in soda water	sodium hydroxide oven cleaner washing powder	soap sodium bicarbonate (baking powder)

Universal Indicator and the pH scale.

Universal indicator changes to different colours with acids and alkalis. The colour change tells us the pH number of the substance being tested which tells us how strong the acid or alkali is.



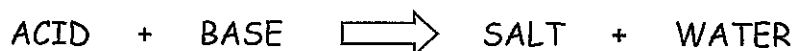
Exercise - Complete the sentences below.

- 1) If a chemical is \_\_\_\_\_ it will eat into materials.
- 2) Acids react with some \_\_\_\_\_ to produce hydrogen gas.
- 3) Litmus turns \_\_\_ in acid and \_\_\_ in alkali.
- 4) The pH is a measure of how \_\_\_\_\_ the acid or alkali is.
- 5) A chemical with a pH number of six is a \_\_\_\_\_ acid.

## W.S.61. Acids and bases.

Name .....

Bases can neutralise (cancel out) acids. Bases that dissolve in water are called alkalis. A base reacts with an acid to form a salt and water :



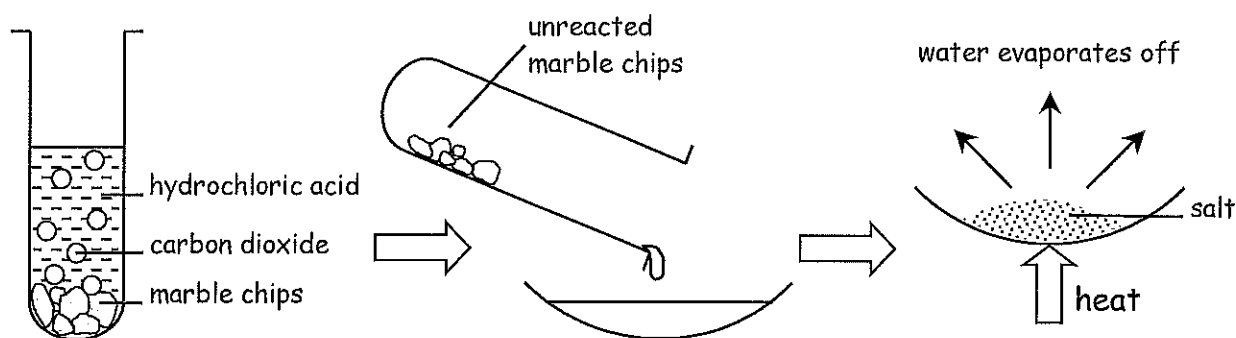
For example, if sodium hydroxide, which is a very strong alkali, is reacted with hydrochloric acid then sodium chloride (common salt) is formed.

### Reaction with carbonates.

Carbonates are bases that contain the elements carbon and oxygen. They react with acids to form a salt, carbon dioxide gas and water. The reaction is fizzy due to the carbon dioxide gas given off :



The experiment below shows the reaction between calcium carbonate (marble chips) and hydrochloric acid.



1) The marble chips react with the acid.

2) A solution of calcium chloride has formed.

3) Calcium chloride salt is left behind.



Exercise - Complete the missing words in the sentences and equations below.

1) A B \_\_\_ is a chemical that can neutralise an acid.

2) Bases that dissolve in water are called A \_\_\_\_\_

3) ACID + BASE  $\Longrightarrow$  \_\_\_\_\_ + WATER

4) Sodium C \_\_\_\_\_ is common salt.

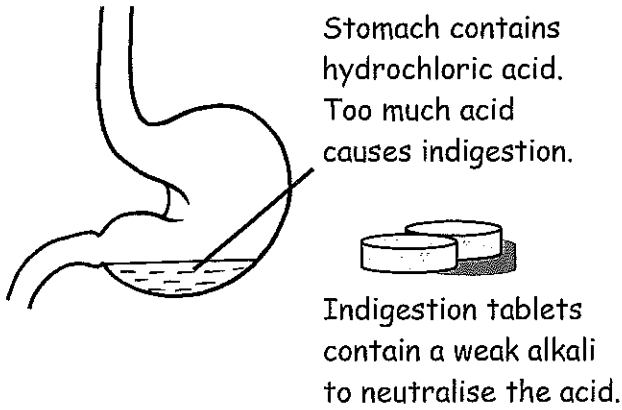
5) Carbonates contain the elements carbon and O \_\_\_\_\_

6) Carbonates react with acids to produce C \_\_\_\_\_ D \_\_\_\_\_

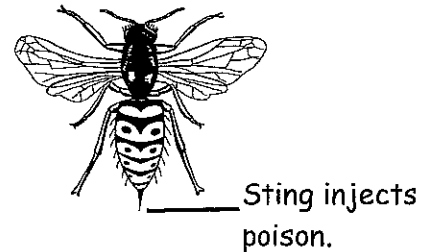
7) Marble chips will F \_\_\_ in acid until it has all been neutralised.

Sometimes we need to NEUTRALISE (cancel out) acids or alkalis. Acids and alkalis can be used to neutralise each other. The diagrams below show some examples of this.

Acid indigestion

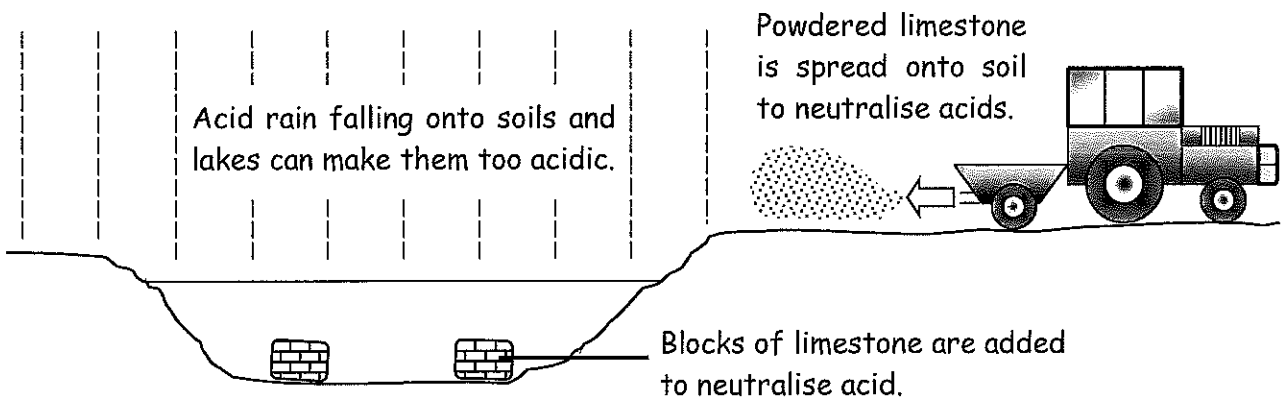


Insect stings



WASP STING - alkaline so treat it with a weak acid such as vinegar.  
BEE STING - acidic so treat it with a weak alkali such as sodium bicarbonate.

Acid soils and lakes



Exercise - Fill in the missing words in the passage below.

The stomach contains ..... acid. If there is too much acid in the stomach it causes ..... Tablets can be taken that contain a weak ..... to neutralise the acid. A bee sting is ..... and must be treated with a weak alkali such as sodium ..... A wasp sting is alkaline and must be treated with a weak acid such as ..... Soils and lakes can become too acidic in areas that are polluted with acid ..... Blocks of ..... can be added to lakes to neutralise the acid and ..... limestone can be spread onto fields.

- powdered      vinegar      hydrochloric      acidic      limestone      rain  
 alkali      bicarbonate      indigestion

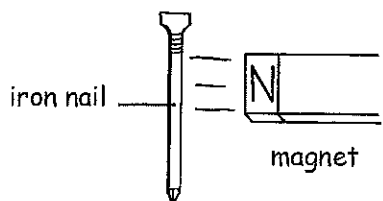
**W.S.44. Metals and non-metals.**

Name .....

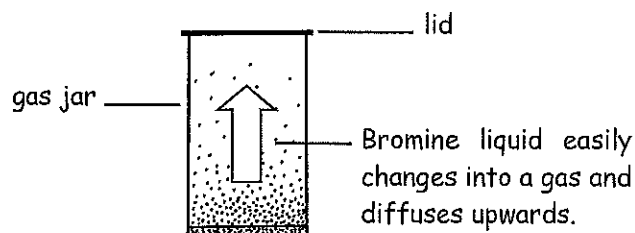
The elements can be divided into two main groups which are METALS and NON-METALS. The table below shows the properties of each group.

Metals	Non-metals
Most are shiny solids at room temperature although mercury is a liquid. They usually have high melting points.	They vary in their properties. They usually have low melting points and many are gases at room temperature.
Good conductors of heat.	Most are poor conductors of heat.
Good conductors of electricity.	Poor conductors of electricity except for graphite which is a form of carbon.
A few are magnetic (iron, cobalt and nickel).	None are magnetic.
They are often flexible (bendy) and can be hammered into shape.	They are often brittle (hard but break easily).

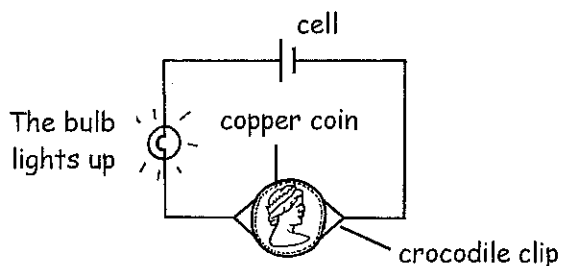
**Exercise 1** - For each diagram below write down if the element is a metal or a non-metal.



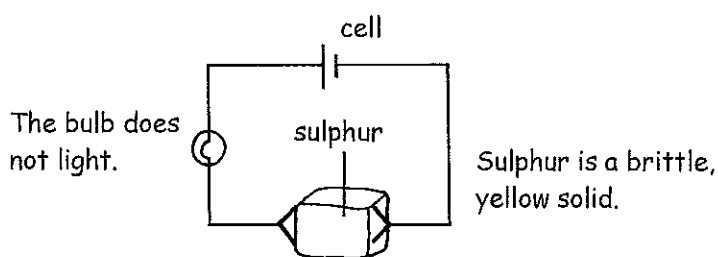
Iron is a \_\_\_\_\_



Bromine is a \_\_\_\_\_



Copper is a \_\_\_\_\_



Sulphur is a \_\_\_\_\_

**Exercise 2** - Complete the sentences below.

- 1) M \_\_\_\_\_ is the only metal that is a liquid at room temperature.
- 2) G \_\_\_\_\_ is the only non-metal that is a good conductor of electricity.
- 3) The M \_\_\_\_\_ metals are iron, cobalt and nickel.
- 4) M \_\_\_\_\_ can be hammered into shape.

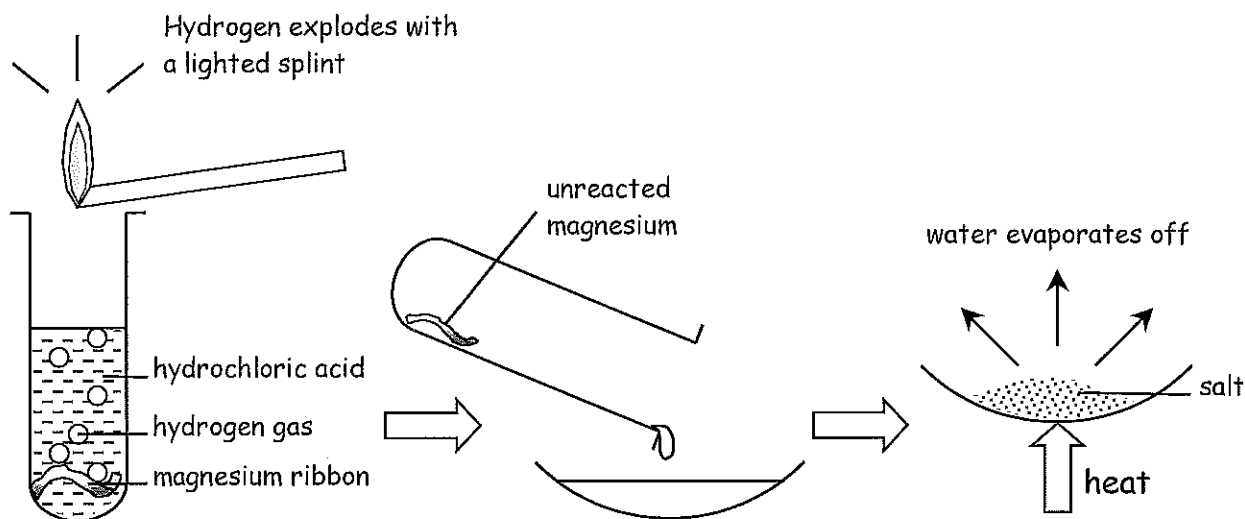
W.S.60. Acids and metals.

Name .....

Metals that are more reactive than copper will react with acids to form hydrogen gas and a salt.



The more reactive the metal is, the faster the reaction will be. The experiment below shows the reaction between hydrochloric acid and magnesium.



1) The magnesium reacts with the acid.

2) A solution of magnesium chloride has formed.

3) Magnesium chloride salt is left behind.

Exercise - Complete the missing words in the sentences and equations below.

1) A metal must be more reactive than C \_\_\_\_\_ to react with an acid.

2) ACID + METAL  $\Rightarrow$  HYDROGEN + \_\_\_\_\_

3) Reactive metals produce hydrogen F \_\_\_\_\_ than unreactive metals.

4) The test for H \_\_\_\_\_ is a lighted splint.

5) Hydrogen is an E \_\_\_\_\_ gas.

6) hydrochloric acid + magnesium  $\Rightarrow$  \_\_\_\_\_ + magnesium chloride

7) All of the A \_\_\_\_\_ has reacted when there are no more hydrogen bubbles given off.

8) The S \_\_\_\_\_ that has been made is magnesium chloride.



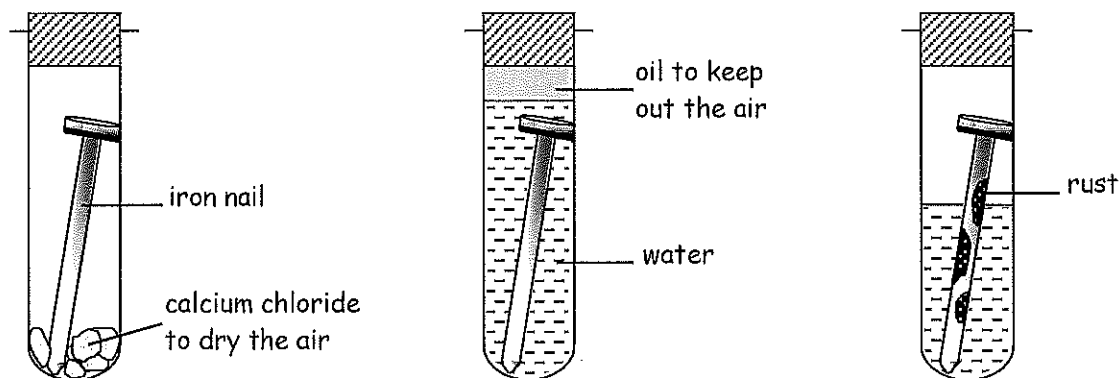
## W.s.55. Harmful chemical reactions.

Name .....

Some chemical reactions are harmful because they destroy our products.

### Corrosion of metals.

Metals may be attacked by air, water or other substances around them. Usually the more reactive the metal is, the faster it corrodes. The corrosion of iron and steel is called RUSTING. The experiment below shows that both air and water are needed for rusting to happen.



In dry air the iron nail does not rust.

In water without air the iron nail does not rust.

In air and water the iron nail rusts.

To stop rusting metals can be coated with a substance that keeps out air and water. Paint, grease, plastic, or a thin layer of tin or zinc can be used.

### Oxidation of foods.

Some foods react with oxygen gas in the air. This makes them taste unpleasant. Fat can be oxidised quickly, therefore fatty foods such as butter should be kept in a fridge to slow down the rate of oxidation. Another way of stopping oxidation is to keep air away from the food by using sealed packets or tins.

Exercise - Fill in the missing words in the passage below.

The corrosion of iron and steel is called ..... Iron will only rust if it is exposed to both air and ..... We can stop rusting by ..... the metal with a substance that keeps out ..... and water. This is why motor cars are given several layers of ..... Some foods are ..... when exposed to air. This gives them an unpleasant ..... Keeping foods ..... will slow down the rate of oxidation. Another way of stopping ..... is to make sure that the food does not come into contact with air.

air   rusting   taste   cool   water   oxidation   coating   oxidised   paint

