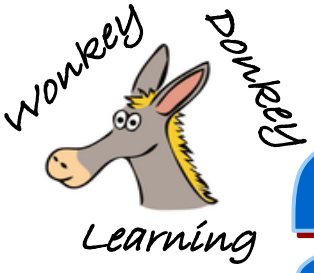
National 4 chemistry



acids and alkalis

pH introduction

Read

You should already have some knowledge of pH, acids, bases, neutralisation and salts from earlier chemistry courses.

To check your knowledge of measuring pH you are about to be given an investigation design task. You have available

- Universal indicator or pH paper
- A pH colour chart
- Some unknown solutions and/or solids
- General laboratory equipment

Your task is to design an experiment to work out the pH of the unknown solutions/solids.

Write a heading and write a plan of your experiment

The plan should include:

An aim (what you are trying to find out).
A list of equipment.
A labelled diagram of the experiment(s).
A description of how you will do the experiments.
A sentence saying what you will keep the same between the experiments.
A sentences saying what you will measure/observe.
A sentence saying what you will need to think about for safety with this experiment.

SHOW YOUR PLAN TO YOUR TEACHER BEFORE YOU START.

Take raw notes in your jotter of what you observe as you go along.

Tidy away your apparatus and continue by trying the following work.

1. How did you decide which solutions were acids, bases or neutral solutions?
2. Why would dry pH paper be no use for measuring the pH of solids?
3. Another pupil carried out a similar experiment. He used the dropper to put some of solution A into a dimple tile. Then he used the dropper to put some of solution B into a dimple tile. He then used the dropper to put universal indicator into each dimple and matched the colour to the pH chart. What can you say about the design of his experiment? Can you suggest how he could have improved it?
4. Try to suggest names for what you think the unknown samples could be.

Your teacher may ask you to write a report of this experiment as an assessment task. Use the learner guide sheet to help you.

Oxides, hydroxides and pH

Read

When some substances dissolve, the pH of the water can change. Whether the water becomes acid or alkali depends on whether the substance is a non-metal oxide or a metal oxide.

Your teacher may demonstrate the pH of some gases

- Sulphur dioxide (from combustion of fossil fuels)
- Nitrogen dioxide (from sparking air in car engines)

Write a heading and try the following work

1. What is the pH of pure water?
2. How would you measure the pH of pure water?
3. Are sulphur dioxide and nitrogen dioxide metal oxides or non-metal oxides? – explain your answer.
4. Describe what happened in the demonstrations your teacher showed you.
5. What does this tell you about the pH of these gases?

You are now going to find out about **metal** oxides and hydroxides. Write a heading and collect the sheet called "metal oxides and pH" to fill in as you go along.

Collect

A bottle of universal indicator

One tub each of various metal oxides and hydroxides

A 100ml beaker

A stirring rod

What to do.

1. Add water until the beaker is half full.
2. Add a spatula of one of the oxides to the beaker and stir.
3. Add some drops of universal indicator until you can see the colour well enough to match to the pH chart. Remember, if the pH changes **some** of the substance must have dissolved.
4. Repeat for the other oxides.

Remember to stick your table into your jotter.

Continue by trying the following work

1. Use the information from the demonstrations and your experiments to devise a rule about the pH of soluble metal oxides and metal hydroxides compared to non-metal oxides.
2. What can you say about insoluble metal oxides?
3. Use a data book to make a list of the names of the oxides that will turn water into an alkali and a list of those that will not affect the pH of water.
4. Look at the information about solubility of hydroxides in the data book and compare it to the oxides – what can you say about the solubility of the oxides and the hydroxides?

More non-metal oxides

Read

You have already observed what happens when sulphur dioxide and nitrogen dioxide dissolve in water.

Write a heading and collect the sheet about non-metal oxides. You should be able to fill in the answers for sulphur dioxide and nitrogen dioxide from the demonstrations that you saw in an earlier lesson.

Collect

A bottle of universal indicator
A clean straw
A 100ml beaker half full with water

What to do.

1. Half fill the beaker with water.
2. Add universal indicator.
3. Very carefully, use the straw to blow carbon dioxide into the water and observe what happens to the pH.

Stick your completed sheet into your jotter

Copy and complete the following sentences by choosing the correct words.

Non-metal oxides for example _____ dioxide dissolve in water and turn it into an ***acidic/alkaline*** solution.
Metal oxides for example _____ oxide dissolve in water and turn it into an ***acidic/alkaline*** solution.

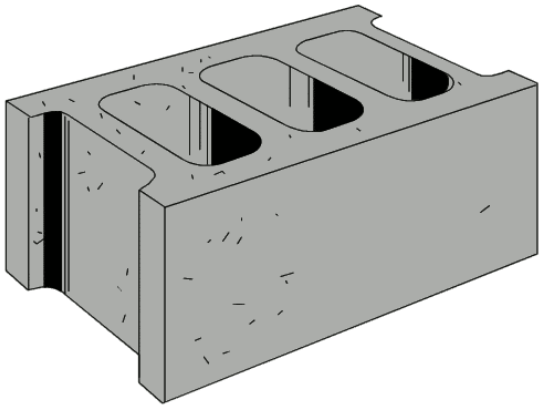
Sources of non-metal oxides

Read

Your teacher might ask you to do a research project to find out the main **man-made** sources of

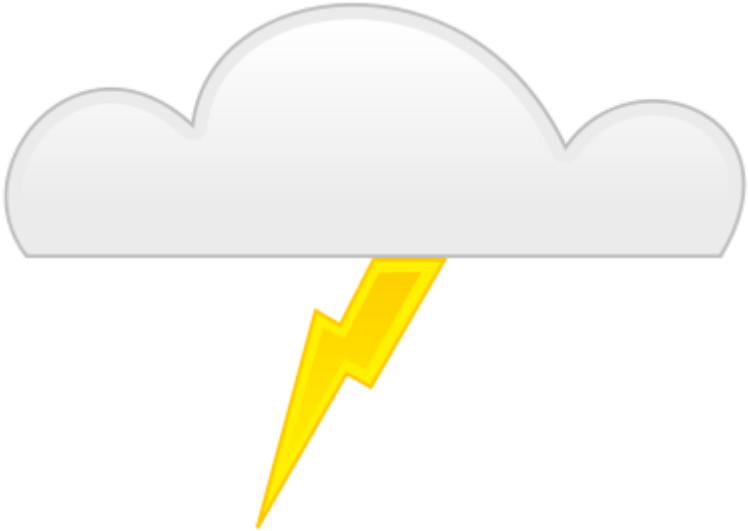
Carbon dioxide
Sulphur dioxide
Nitrogen dioxide

You may wish to try adding the key words **burning fossil fuels** and **making cement** to your searches.



You should also try to find out where these gases are made **naturally**.

Try to find out why lightning storms can fertilise soil.



Choose how to present the information you find - remember to add references to your presentation.

Effects of non-metal oxides

Read

An imbalance of non-metal oxides in the air can have damaging effects on our environment for example:

- Acid rain
- Global warming
- Ocean acidification is a problem caused by non-metal oxides that we often do not hear about.

Collect a copy of the sheet that shows possible internet sites to find out about non-metal oxides and their effect on the environment.

Have a look at some of the web sites and choose a way to present what you find out about these **three** environmental problems with non-metal oxides. You should include the damaging effects of non-metal oxides on stone buildings, metal structures, soil, animal and plant life and explain why decreasing your carbon footprint is important for the environment.

Reactions of acids

Read

Acids can react with different types of chemicals:

- **Metals** **e.g. magnesium**
- **Metal carbonates** **e.g. zinc carbonate**
- **Metal oxides** **e.g. copper oxide**
- **Metal hydroxides** **e.g. sodium hydroxide**

The new substances that are produced depend on what the acid reacts with.

Metal + acid ⟶ ? + ?

Metal carbonate + acid ⟶ ? + ? + ?

Metal oxide + acid ⟶ ? + ?

Metal hydroxide + acid ⟶ ? + ?

You may already be familiar with these reactions and may have some idea of the new substances that are produced.

Metals and acids

Read

You already know that acid rain can damage stone and metal. The acid in the rain reacts with the stone or metal and eats it away chemically.

The aim of the next experiment is to identify the gas made when metals react with acid by reacting magnesium with hydrochloric acid.

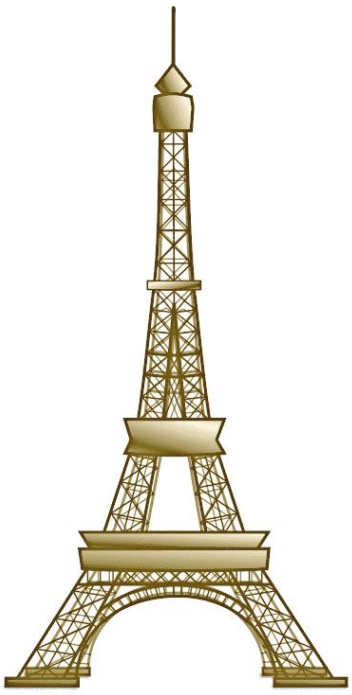
You have available

1M hydrochloric acid
Magnesium ribbon
Limewater
Other general lab. apparatus

Write a heading, an aim and a hypothesis **before** you start. Decide in your group how you will design the experiment and show your plan to your teacher **before** you begin.

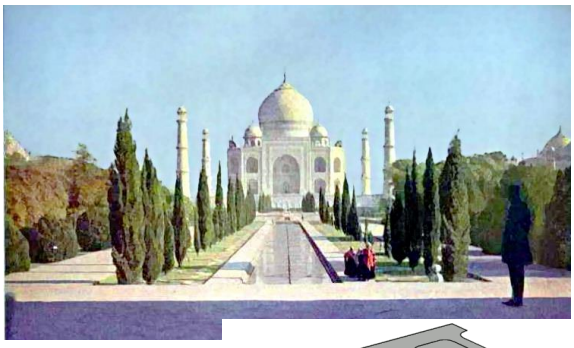
Write a heading and try the following work

1. What was the conclusion for your experiment?
2. How could you have made the gas made faster?
3. The Eiffel tower is made mainly from steel. Steel is an alloy containing iron and carbon. The pH of the rain in Paris was measured and was found to be pH6.5. Why are people concerned about the future of the monument?
4. Name 3 metals that do not react with acid (revision).

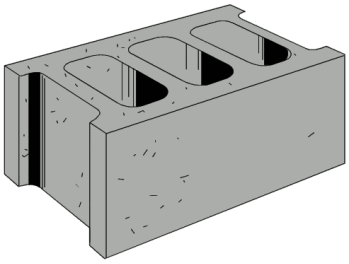


Metal carbonates and acids

Read



Metal carbonates are compounds that can be found naturally in rocks, stones and the shells of sea creatures like clams and mussels. Acid in rivers and oceans can be harmful to these creatures and acid rain can react with building materials.



You already know that metals react with acid to produce hydrogen gas. **Metal carbonates also react with acids to produce a gas.**

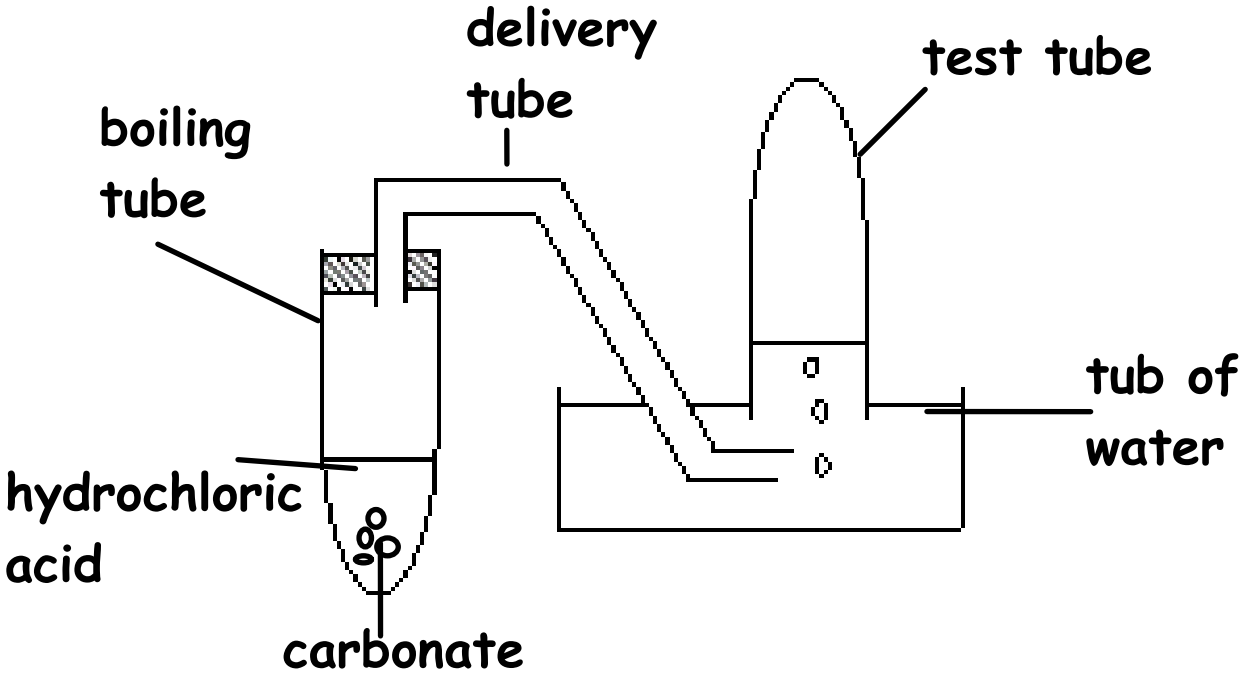
The aim of the next experiment is to identify the new gas made when sodium carbonate and/or copper carbonate reacts with hydrochloric acid.

You have available

1M hydrochloric acid
Sodium carbonate
Copper carbonate
Limewater
Other general lab. apparatus

Write a heading, an <u>aim</u> and a <u>hypothesis</u> **before** you start.

Decide in your group how you will design the experiment and show your plan to your teacher **before** you begin. Include a diagram to show how you will collect the gas.



Try the following work.

1. What was the conclusion for your experiment?
2. Copy and complete the following sentence.

When a metal reacts with acid, _____ gas is made but when a metal carbonate reacts with acid _____ _____ gas is made.

Cancelling acidity

Read

It is important that chemists find ways to cancel acidity out to prevent problems with acid rain. The reaction for cancelling out an acid to form water is called **neutralisation**.

The aim of the next experiment is to investigate which types of compounds can be used to cancel out acidity. You should use 20cm^3 of acid in a beaker for each experiment.

You have available

Vinegar (ethanoic acid)
a variety of compounds that include chlorides, oxides, hydroxides and carbonates
universal indicator
normal laboratory equipment

Write a heading and try the following work

1. Discuss in your group how you will design the experiment and write a plan for the experiment you have designed. Your plan should include

- an aim
- your hypothesis
- a list of what you will need to use
- a description of what you are going to do

Your teacher may say that the plan only needs to be written into one person's jotter in the group.

Show your teacher your plan <u>before</u> you start the experiment.

As you do the experiment everyone in the group should take notes of what is observed.

2. Make a list of the names of the compounds that were able to cancel out acidity.
3. How did you know that these compounds had cancelled out the acidity?
4. Was your hypothesis correct?
5. Copy and complete the following sentences

A base is a compound that can <u>neutralise</u> an acid. Bases are

- metal o_____,
- metal h_____
- and metal c_____.

A base plus acid makes water. This reaction is called _____.

6. Which chemicals fizzed when they were added to the vinegar – what does this tell us about the reaction?
7. Look up the names of the chemicals you used in the solubility table in a data book. Which chemicals are insoluble?

Your teacher may ask you to try the experiment again <u>without</u> adding universal indicator with copper carbonate and calcium oxide which are insoluble chemicals.

8. Can you still tell that all the acid has been used up/neutralised – explain your answer?

Uses of neutralisation reactions

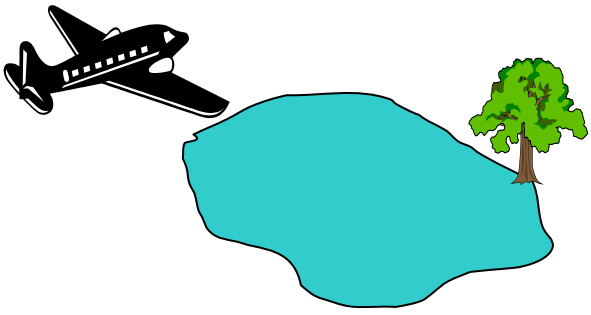
Read

Your teacher may show you what happens in your body when you take indigestion tablets.

Neutralisation reactions are used in everyday life.

Tom Smith runs a car repair garage and he always keeps a tin of **baking soda (sodium bicarbonate)** handy. If he spills any battery acid, he sprinkles the baking soda onto it. **Baking soda is an alkali so it neutralises the battery acid** and turns it into water. Once the acid is neutralized, it can be cleaned up without the danger of the acid burning Tom.

Many gardeners have bags of a powder called **lime (calcium oxide)** in their garden sheds. If the soil in their garden is **too acidic**, they will sprinkle the lime onto the soil. **Lime is an alkali so it will neutralise the acid in the soil.**



Due to acid rain, many lakes in Sweden are turning acidic. This is killing the fish. **Lime powder is sprinkled from aeroplanes onto these lakes to neutralise the acid and help save the fish.**

Write a heading and do the work below.

1. What is the scientific reaction for cancelling out an acid to make water?
2. What is the common name **and** the chemical name of the household alkali that Tom keeps handy in his garage?
3. Acid can sometimes be spilt in a car garage. Where does the acid come from?
4. What is the name of the chemical reaction that happens when baking soda is added to battery acid?
5. What is the common name **and** the chemical name for lime?
6. What does lime do to acid in soil?
7. Describe why Sweden uses thousands of tonnes of lime every year.

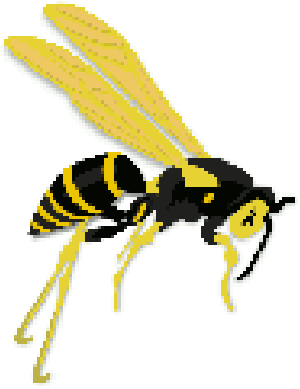
Medical uses of neutralisation

Read

You will probably have heard people complaining of **indigestion**. This is often because there is **too much acid in the stomach**. To neutralise the acid people take indigestion remedies like Rennies or milk of magnesia (magnesium hydroxide). **Rennies and milk of magnesia neutralise the stomach acid** and stop the pain. Often indigestion cures have ingredients like sodium bicarbonate, calcium carbonate, magnesium carbonate and magnesium hydroxide.

Have you ever been stung by a bee? If you do get stung remember some neutralisation chemistry! A bee sting is **acidic**. Many people put baking soda onto bee stings because **baking soda (sodium bicarbonate) is an alkali and it neutralises the acid in the bee sting**.

Wasp stings are different from bee stings. Wasp stings are **alkaline** so to neutralise a



wasp sting we need to add an acid. Many people put vinegar onto a wasp sting. **Vinegar mainly contains an acid called ethanoic acid it will neutralise the alkali in the wasp sting** and help stop the pain.

Write a heading and do the work below.

1. What causes indigestion?
2. What is the name of the main chemical in milk of magnesia?
3. What chemical names can be ingredients in indigestion remedies?
4. What type of substance is a bee sting made of?
5. What chemical should be put on a bee sting - explain how it works?
6. What is the chemical name for the main chemical in vinegar?
7. Explain why vinegar helps stop the pain from the wasp sting.
8. Look at the chemical names for baking soda, lime, and indigestion ingredients. Think back to what you learned before. All of these chemical neutralise acids – what type of chemical are they?
9. The chemical formula for lime is CaO. Will lime conduct electricity when it is
   a) solid
   b) melted
   c) give a reason for your answers.

Salts from acids

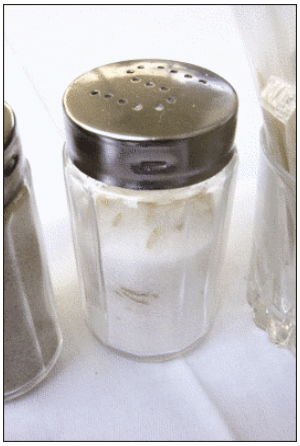
Read

When acids react a chemical called a salt is also made. We can show this in general equations

Metal + acid	➔	salt + hydrogen
Metal oxide + acid	➔	salt + water
Metal hydroxide + acid	➔	salt + water
Metal carbonate + acid	➔	salt + water + carbon dioxide

We couldn't see the salt in many of the experiments we did because most of the salts dissolve in the solution.

The general word equation does not tell us the exact names of the acid, alkali or salt.



The name of the salt we put on our food is a compound called **sodium chloride** but there are many different salts. Potassium chloride is the main chemical in LOSALT and is often used by people who have high blood pressure. The word salt is a general name for a type of chemical, it does not tell us the actual name. The exact name of salt **depends on the name of the acid and the alkali that reacted to make it**.

The **first** part of the salt name comes from the name of the **alkali** e.g. if the salt was made using the alkali called sodium hydroxide, the salt name would start with **sodium**. For example, sodium hydroxide makes sodium chloride and potassium hydroxide makes potassium chloride.

Write a heading and try the following work.

1. What type of substance is always made when an acid and base or metal react?
2. Why is the reaction between an acid and an alkali is called neutralisation?
3. Why is this

acid + base ⟶ salt + water

called a **general** word equation?

4. What is the name of the salt that we use to flavour our food?
5. What is the name of the salt in LOSALT and why is it used instead of sodium chloride?
6. What does the exact name of a salt depend on?
7. Where does the first part of the name of a salt come from?
8. Copy and complete the sentences below

Sodium hydroxide makes salts that start with _____.
Potassium hydroxide makes salts that start with _____.
Lithium hydroxide makes salts that start with _____.
Calcium hydroxide makes salts that start with _____.

Working out the second part of the salt name

Read

The second part of the salt name depends on the acid.

Hydrochloric acid makes salts with names that end in **chloride**. For example hydrochloric acid makes calcium chloride.

Sulphuric acid makes salts with names that end in **sulphate**. For example sulphuric acid makes magnesium sulphate.

Nitric acid makes salts with names that end in **nitrate**. For example nitric acid makes calcium nitrate.

Write a heading and try the following work

1. What does the second part of the name of a salt depend on?
2. What is the end of the salt name that is made from
   a) hydrochloric acid?
   b) sulphuric acid?
   c) nitric acid?
3. Copy the sentences below

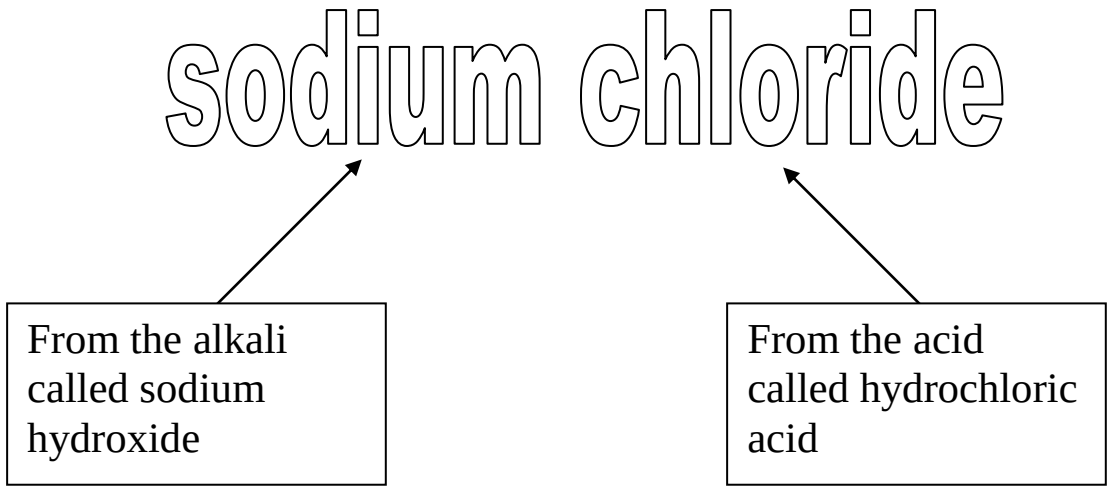
Sodium chloride is made from _____ acid.
Sodium sulphate is made from _____ acid.
Sodium nitrate is made from _____ acid.
Potassium _____ is made from sulphuric acid.

Working out the full name of the salt

Read

We now know how to work out the full name of a salt.

If sodium hydroxide is added to hydrochloric acid a **neutralisation** reaction happens and a salt and water are made. The name of the salt will begin with sodium and end with chloride so the salt made is called **sodium chloride**.



Write a heading and try the following work

1. What is the name of the salt that will be made from
   a) potassium hydroxide and hydrochloric acid?
   b) lithium hydroxide and hydrochloric acid?
   c) magnesium hydroxide and hydrochloric acid?
   d) potassium hydroxide and sulphuric acid?
   e) lithium hydroxide and sulphuric acid?
   f) sodium hydroxide and sulphuric acid?
   g) potassium hydroxide and nitric acid?
   h) calcium hydroxide and nitric acid?
   i) ammonium hydroxide and nitric acid?
2. Copy and complete the following table.

name of alkali used	name of acid used	name of salt made
sodium hydroxide	nitric acid	
potassium hydroxide	sulphuric acid	
	sulphuric acid	sodium sulphate
	hydrochloric acid	lithium chloride
lithium hydroxide		lithium sulphate
potassium hydroxide		potassium nitrate
		sodium nitrate
		calcium nitrate
		potassium chloride
		sodium chloride
		magnesium sulphate
		aluminium sulphate

3. What do you notice about the salts that are made from

a) hydrochloric acid?

b) sulphuric acid?

c) nitric acid?

4. Write the formula for the salt called

a) lithium chloride

b) magnesium chloride

c) aluminium chloride

d) calcium chloride

5. How did you work out your answers to the last question?

Ask your teacher if you should do the work with the compounds display. Separate the substances into two groups – salts or not salts. Copy your lists into your jotter and explain how you worked the lists out.

Neutralisation and word equations

Read

We already know that when we add an acid and an alkali together a chemical reaction happens that makes a salt and water. This is called a **neutralisation** reaction.

We can write a word equation for this reaction using an arrow and + signs like we did earlier in this unit. Remember, the names of the chemicals we used go on the left of the arrow and the names of the chemicals we make go on the right. The different chemicals are separated by + signs.

acid + alkali ⟶ salt + water

This word equation is a general word equation for any neutralisation reaction. It does not tell us the exact names of the acid, alkali or salt.

To help you work out which chemical is the salt a picture has been put beside each salt in the equations.

If sodium hydroxide is added to hydrochloric acid a salt called sodium chloride and water are made. The word equation for this reaction would be:

sodium hydroxide + hydrochloric acid ⟶ sodium chloride + water

Write a heading and try the following work.

1. If the alkali called potassium hydroxide is added to hydrochloric acid a salt called potassium chloride and water are made. Copy and complete the word equation below.

potassium hydroxide + _____ acid ⟶ potassium chloride + water

2. If the alkali called potassium hydroxide is added to sulphuric acid a salt called potassium sulphate and water are made. Copy and complete the word equation below.

potassium hydroxide + _____ acid ⟶ potassium sulphate + water

3. Copy and complete the word equation below.

_____ hydroxide + nitric acid ⟶ potassium nitrate + water

4. Copy and complete the following word equation.

_____ hydroxide + _____ acid ⟶ lithium chloride + water

5. Copy and complete the word equation below.

magnesium + hydrochloric acid ⟶ _____ + _____

hydroxide _____

6. Copy and complete the word equation below.

calcium + sulphuric acid ⟶ _____ + _____

hydroxide _____

7. Write the word equation for the reaction between
   a) calcium hydroxide and nitric acid
   b) magnesium hydroxide and hydrochloric acid.

Choose a colour for reactants and a colour for products and highlight/shade in the names of the reactants and products in the word equations you have written.

Draw a circle around the salt in the equations you have written.

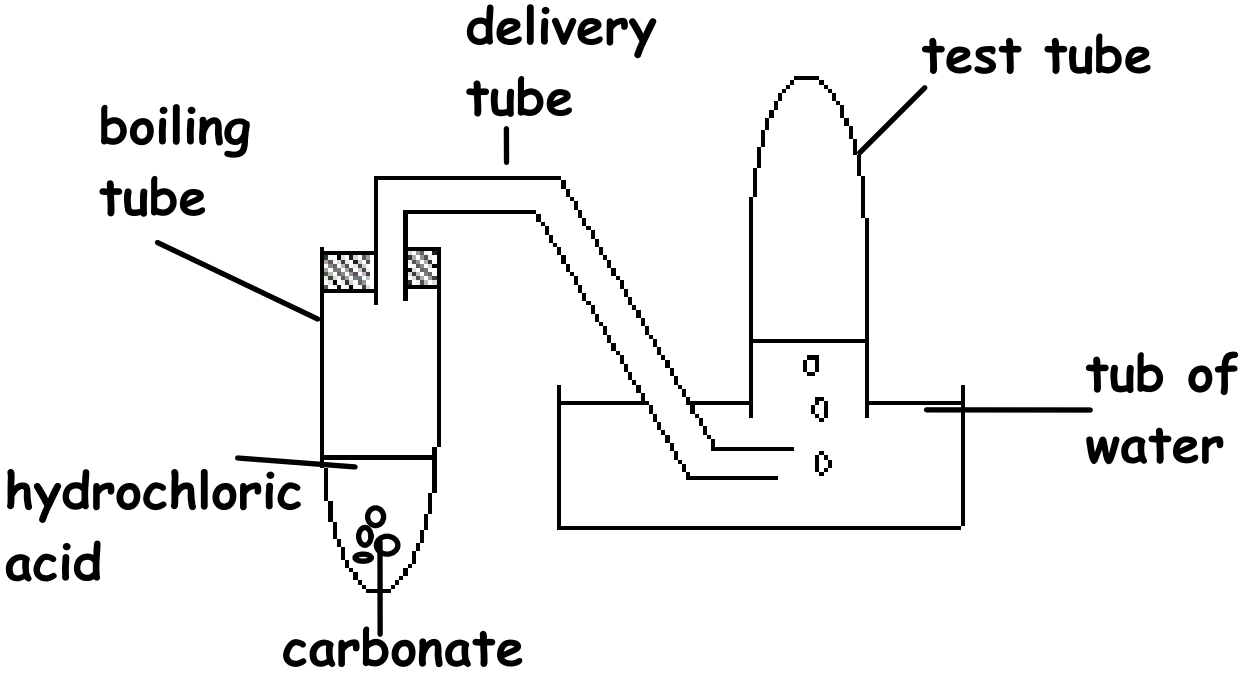
Making salts from acids and carbonates

Read

We already know that we can make salts by reacting an acid and hydroxides together. We also make water in this reaction.

acid + hydroxide ⟶ salt + water

We have also learned that metal carbonates are bases so they neutralise acids but this reaction also produces a gas.



When some limewater is added to the gas, the limewater goes cloudy telling us that the new gas is **carbon dioxide**.
A salt, water and carbon dioxide are made in this reaction.

acid + carbonate ⟶ salt + water + carbon dioxide

The name of the salt that is made depends on the name of the metal carbonate and the name of the acid.

The **first** part of the salt name comes from the **metal carbonate** that was used to make it.

For example sodium carbonate makes a salt called sodium chloride. Potassium carbonate makes a salt called potassium sulphate.

Write a heading and do the work below.

1. Why are metal carbonates bases?
2. Copy the diagram of the apparatus that could be used to catch the gas that is made when acid reacts with carbonate chemicals.
3. How did we know that the gas was carbon dioxide?
4. Look at the following list of compounds.

a) Copy them out and draw a circle around the ones that are bases and a square around the ones that are salts **or** choose a colour to highlight the bases and another colour for the salts.

sodium oxide sodium chloride sodium carbonate

copper sulphate copper oxide copper nitrate

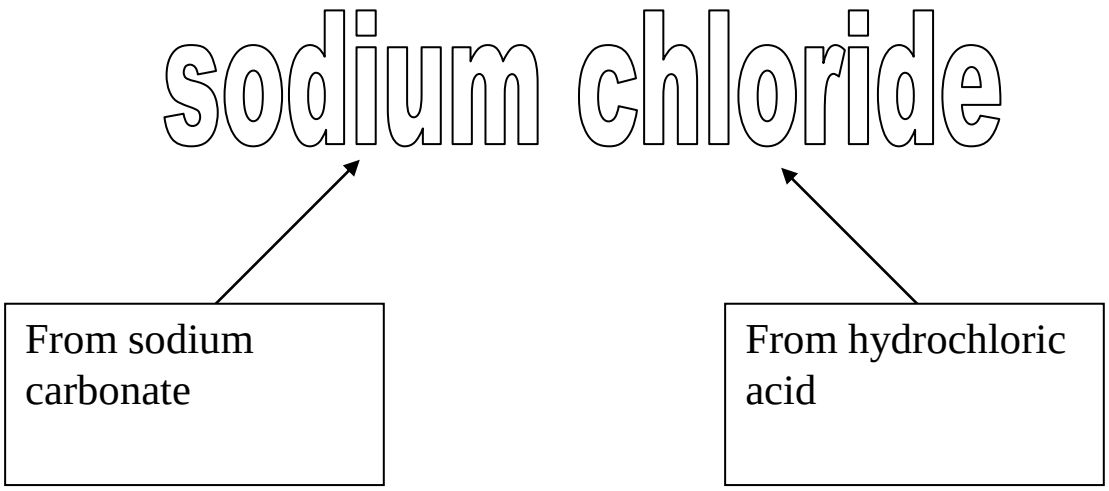
potassium hydroxide potassium sulphate

tin chloride tin oxide tin nitrate

b) Put a * beside the salts that came from hydrochloric acid.
c) Put a $ beside the salts that came from sulphuric acid.
d) Choose a symbol for the salts from nitric acid.
e) How did you know which ones were bases?

Remember

The total name of a salt comes from the names of the chemicals that were reacted to make it.



Continue with the work in your jotter by answering the following questions.

5. What is the name of the salt that will be made from
   a) potassium carbonate and hydrochloric acid?
   b) lithium carbonate and hydrochloric acid?
   c) magnesium carbonate and hydrochloric acid?
   d) potassium carbonate and sulphuric acid?
   e) lithium carbonate and sulphuric acid?
   f) sodium carbonate and sulphuric acid?
   g) potassium carbonate and nitric acid?
   h) calcium carbonate and nitric acid?
   i) ammonium carbonate and nitric acid?

6. Copy and complete the table below.

name of carbonate used	name of acid used	name of salt made
sodium carbonate	nitric acid	
potassium carbonate	sulphuric acid	
	sulphuric acid	sodium sulphate
	hydrochloric acid	lithium chloride
lithium carbonate		lithium sulphate
potassium carbonate		potassium nitrate
		sodium nitrate
		calcium nitrate
		potassium chloride
		sodium chloride
		magnesium sulphate
		aluminium sulphate

7. Write the formula for the salt called

a) potassium chloride

b) strontium chloride

c) sodium chloride

d) barium chloride

Word equations for acids and carbonates

Read

We already know that when we add an acid and a metal carbonate together a chemical reaction happens that makes a salt, water and carbon dioxide.

Remember the names of the chemicals we used go on the left of the arrow and the names of the chemicals we make go on the right of the arrow. All of the different chemicals are separated by + signs.

acid + carbonate ⟶ salt + water + carbon dioxide

This word equation is a **general** word equation for any carbonate and any acid. It does not tell us the exact names of the chemicals.

If sodium carbonate is added to hydrochloric acid a salt called sodium chloride, water and carbon dioxide are made. The word equation for this reaction would be:

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

Write a heading and try the following work.

1. Copy and complete the following word equations.

potassium carbonate + hydrochloric acid ⟶ _____ + water + _____
_____ _____

sodium carbonate + sulphuric acid ⟶ _____ + water + _____
_____ _____

_____ + hydrochloric acid ⟶ lithium carbonate + water + _____
_____ _____

2. Write the word equation for the reaction between
   a) calcium carbonate and nitric acid.
   b) magnesium carbonate and hydrochloric acid.

Making a pure dry salt

Read

Ask your teacher if you have time to make pure, dry salt crystals by reacting copper carbonate and sulphuric acid. Copper carbonate is insoluble but will react with the acid and dissolve. It is good to use an insoluble base because when the acid is used up, the copper carbonate can be filtered away from the salt solution. This experiment involves

- **Reacting 50cm^3 0.5M sulphuric acid with copper carbonate until all the acid is used up (it stops fizzing and insoluble copper carbonate is seen left over in the mixture).**
- **Filtering the mixture into an evaporating basin to separate the solution and the left-over insoluble powder.**
- **Evaporating the blue solution until it is 1/3 the volume.**
- **Leaving the basin to evaporate slowly until crystals form.**

Your teacher will let you know if you have time to do this experiment.

Write a heading and try the following work.

1. Describe what you will do before you start and show your teacher your jotter.
2. Take notes of what you see during the experiment.

3. What are the 2 observations that told you the acid had been used up?

4. Why is it good to use an insoluble base for this reaction?

5. Which gas was produced in this reaction – how do you know this?

6. What did you do to obtain dry salt crystals?

7. Write a word equation for the reaction and circle the name of the salt and draw a square around the name of the base.

8. What type of reaction is this? – explain why.

The pH of food and drink

Read

Many of the foods and drinks that we use in every day life are acidic or alkaline. Alcoholic drinks and soft drinks are acidic. Dentists have been raising awareness of tooth erosion where teeth get worn away by reacting with the acid in our food and drink. Even if we eat foods that are alkali, bacteria in our mouth make extra acid that can cause tooth decay.

Write a heading and try the following work

1. Why are dentists concerned about the volume of fizzy juice that we drink in our everyday lives?

Collect the table that shows the pH of food and drink.

2. List the food categories that this table shows.
3. What does this table tell us about processed fruit juice?
4. Name a type of milk that is low alkali.
5. If you had heart burn, which nuts would you eat and why?
6. Which fruits are most acidic and which are least acidic?
7. Some papaya juice is mixed with some blueberry juice. What will happen to the pH number of the blueberry juice and why?
8. Why do you think the foods and drinks in the table are represented with only shades of yellow and green and not any red, blue or purple colours?
9. Toothpaste contains several ingredients for different reasons. Fluoride is present to help prevent tooth decay. Flavouring is added to make it taste better. To make the toothpaste look attractive, colouring may be added. A gritty powder is present to help scrub teeth clean.

   a) Present this information in a table with two headings.

b) Toothpaste needs to neutralize the acid in saliva. What **type** of compound might be in toothpaste to neutralize acid?

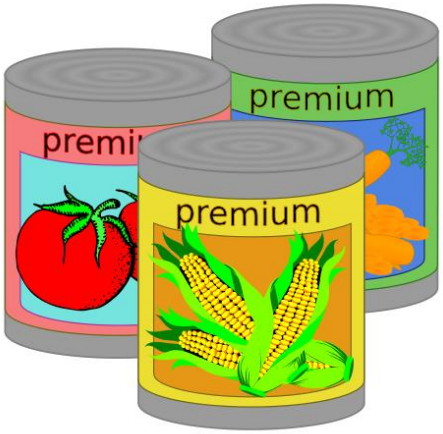
c) What pH do you think toothpaste is – explain your answer.

10. Why do you think chocolate is in the beans, vegetables and legumes food category?

Food additives and E numbers

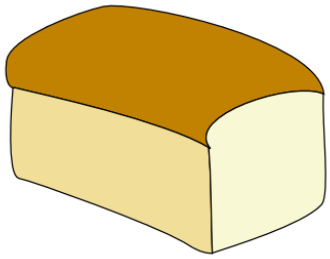
Read

Food additives are chemicals that are added to food for certain reasons. They are often called E numbers. There are different types of food additives for example

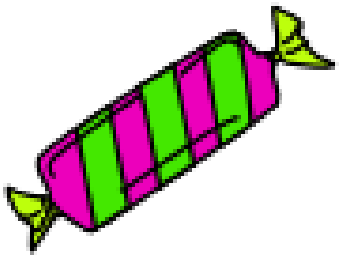


- Colourings
- Flavourings
- Preservatives

To make the food more nutritious, food chemists may add extra vitamins and minerals to foods e.g. some juices have extra vitamin C added.



To help stop food rotting too soon, chemicals called food preservatives are added. Bread sometimes has preservatives in it to stop it rotting too quickly.



Chemicals called food colourings are often added to make food look better. Food colourings are added to lots of different foods e.g. ice-cream, fizzy juice, jelly, sweets and jam.

Sometimes chemicals called food flavourings are added to make the food taste better. Many take-away foods have a chemical called monosodium glutamate added to them to make them taste better. Often low calorie drinks have sweeteners added.

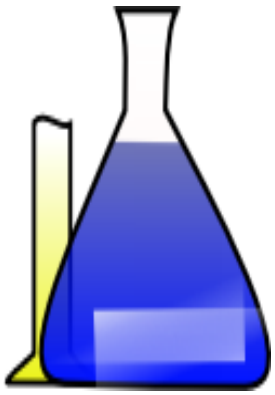
Other food additives can be chemicals called antioxidants, emulsifiers, stabilisers, firming agents, flour improvers, glazing agents.

There are strict laws about using food additives because they could be toxic or even cause allergic reactions. The food chemicals must be tested and approved by government scientists.

Write a heading and try the work below.

1. What is a food additive?
2. Why are vitamins and minerals sometimes added to foods?
3. Why do some foods contain chemicals called food preservatives?
4. What type of food additive is added to food to make it look better?
5. What is the name of the chemical that is often added to take-away food?
6. What type of food additive are sweeteners?
7. Make a list of the names of some other food additives.

8. Why do you think that there are strict laws controlling the additives that are put into our food?
9. Collect a food label. Make a list the E numbers that are in the food. Later you may be able to do some research to find why each E number chemical is added to the food.



Some food additives are called acidity regulators. These are added to food to help prevent the acidity in foods from changing during storage or to help preserve foods. Ethanoic acid (E260), citric acid (E330) and sodium bicarbonate (E500) are acidity regulators and benzoic acid (E210) is added to food as a preservative.

You can see how this works using a simple experiment you can try at home. Cut 2 pieces of apple and squeeze lemon juice onto one piece. Leave the apples for an hour and observe what happens. You should see that the lemon juice stops the apple from reacting so quickly with the air.

If you have time your teacher may ask you to find out more about food colourings and/or vitamins.

You can find more information on food additives at
http://www.food-info.net/uk/index.htm

Write a heading and try the following work

1. What is meant by a food additive?
2. Some cough syrups have sugar added. What type of food additive is this?

3. Why do you think preservative chemicals are added to food? You may want to use a dictionary to help you find out.
4. Why are acidity regulators added to foods?
5. Make a list of the chemical names and E numbers of some acidity regulators.
6. Use the internet to
   a) Try to find out the E numbers and the chemical names for <u>other</u> acidity regulators. Draw a table with two headings to show the chemical name and it's E number.
   b) Write the chemical names and E numbers for some food additives that are colourings.

Possible investigation about acid and teeth/bone

Read

Your teacher may ask you to carry out a practical investigation into the effect of acids on bone, teeth, limestone, marble.

You may have available:

Powdered teeth/bone
Variety of juices
Universal indicator
Different concentrations of hydrochloric acid

You could try to find out how fast the teeth/bone reacts (is eaten away) by the acid in different juices.

For example,

- does it make a difference if the juice is diet or full sugar
- does it make a difference whether the juice is fizzy or has been allowed to go flat
- does it make a difference if the juice is different flavours (cola, lemonade, irn bru)
- does it make a difference if the juice is different types (fizzy juice versus fruit juice).

You could do the experiment with the teeth and juice and then do same experiment with different concentrations of acids instead of juice to try to estimate the acid concentrations of the juices.

You could also measure the pH of each juice to see whether the most acidic one is the one that reacts the fastest with the teeth.

Write a heading and write a plan of your experiment.

The plan should include:

An aim - decide what you would like the aim of your experiment to be. Write your aim into your jotter and show it to your teacher before you continue writing your plan.

A list of equipment.
A labelled diagram of the experiment(s).
A description of how you will do the experiments.
A sentence saying what you will keep the same between the experiments.
A sentence saying what you will measure/observe.
A sentence saying what you will need to think about for safety with this experiment.

SHOW YOUR PLAN TO YOUR TEACHER BEFORE YOU START. Write raw notes in your jotter of what you observe.

Your teacher may ask you to write a report of this experiment as an assessment task. Use the learner guide sheet to help you.