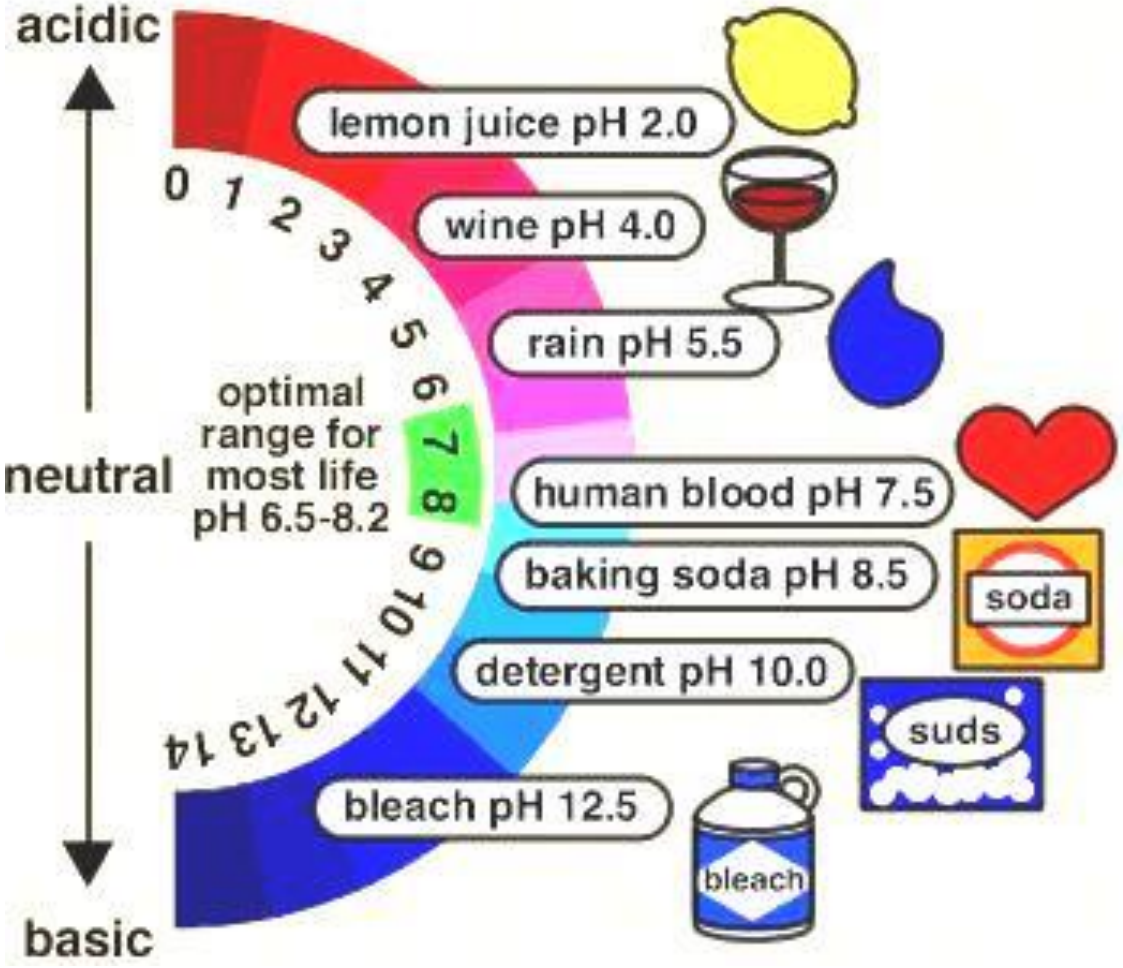
Name: ……. Class: ……

Student Workbook

Unit 7 Material Changes (Acids & Alkalis)



Pixelcowboy

Learning Objectives:	✓	x
• Know that many household materials are acids and are not hazardous.		
• Recognise some common substances as acids, e.g. vinegar, lemon juice.		
• Be able to recognise and interpret common hazard signs.		
• Identify some everyday uses of acids, e.g. in foods, medicines, cleaning products.		
• Know how to deal with acids or alkalis if they are spilt or splashed on the skin.		
• Know that that adding water to an acid or alkali solution dilutes it and makes it less hazardous.		
• Recall the names of some common laboratory acids and alkalis.		
• Be able to classify solutions as acidic or alkaline, using indicators.		
• Know that universal indicator gives a range of colours in acidic and alkaline solutions.		
• Understand that pH numbers indicate how acidic or alkaline a solution.		
• Recall that neutral solutions are pH7, acidic solutions below 7 and alkaline solutions above 7.		
• Recall that when an acid is added to an alkali, it lowers the pH.		
• Know that a neutral solution can be obtained by adding an acid to an alkali.		

Word Sheets

Word	Pronunciation	Meaning
acetic acid	*a-**see**-tick*	The old name for ethanoic acid. It is the acid in vinegar.
acid		A substance that turns litmus red. It has a pH of less than 7.
ascorbic acid	*a-**score**-bick*	Chemical name for vitamin C.
citric acid	***sit**-rick*	The acid in citrus fruits.
ethanoic acid	*eth-an-**know**-ic*	The acid in vinegar.
gas		Something made of particles that are very spread out and have no bonds between them.
sweetener		A substance that makes things taste sweeter. Sugar is a natural sweetener.

Word	Pronunciation	Meaning
corrosive	*cor-**row**-sive*	Substances that attack metals, stonework and skin are called corrosive.
harmful		Another word for irritant.
hydrochloric acid		A common acid that is also found in your stomach.
irritant		Something that irritates the skin and eyes.
nitric acid		A common acid.
sulphuric acid		A common acid. Used in car batteries.

Word	Pronunciation	Meaning
alkali	***alk**-al-lie*	Substance that turns litmus blue. Has a pH of more than 7.
indicator	***ind**-ic-ay-ter*	A dye that will change colour in acids and alkalis.
litmus		A simple kind of indicator. It turns red in acids and blue in alkalis.
neutral		Substance that is not an acid or an alkali. Has a pH of 7.

Word	Pronunciation	Meaning
antacid	*ant-**ass**-id*	A medicine containing an alkali used to cancel out some of the acid in the stomach to treat heartburn.
pH scale		A numbered scale from 1–14 showing the strengths of acids and alkalis. Numbers below 7 are acids. Numbers above 7 are alkalis. pH 7 is neutral.
universal indicator		A mixture of indicators giving a different colour depending on how weak or strong an acid or alkali is.

Word	Pronunciation	Meaning
burette	*bew-**rett***	A tube with a tap at the bottom and a measuring scale on its side. Used to add a measured quantity of a liquid to another one.
dilute	*die-**loot***	We dilute a solution by adding more of the solvent to it.
neutralisation		When something is neutralised.
neutralise		When an acid is added to a base (or alkali) a neutral substance is produced.

Homework set for this topic:

	Task(s)	Date Due	Comments
1	Read 7.1 Acids and Alkalis (Coursebook pp90-91); Complete Ex 7.1 Acids and Alkalis (Science 7 Workbook p52)	..../..../....	
2	Read 7.2 Is it an Acid or an Alkali (Coursebook p92) & 7.3 The pH Scale (p96); Complete Ex 7.2 Indicators (Science 7 Workbook p58-59)	..../..../....	
3	Alkalis in the Home Poster	..../..../....	
4	Read 7.3 Neutralisation (Coursebook pp90-91); Complete Ex 7.3 Neutralisation (Science 7 Workbook p60-61)	..../..../....	
5	Complete Acids and Alkalis Reverseword Puzzle	..../..../....	

Investigation # 1 Taste Tests

Apparatus

- Blindfold
- Substances to test
- Straw

Make sure that you keep all the apparatus clean.

Method

1 Work with a partner.

2 One person puts on the blindfold and puts their tongue out.

3 The second person takes a few drops of one of the liquids in a straw.

4 Drop the liquid on to the tongue of the blindfolded person.

5 Describe the taste. Can you guess what the liquid is?

6 Do the test again with the other liquids.

Recording your results

Liquid	Words to describe the taste	I think that this liquid is…
A		
B		
C		
D		
E		
F		

Considering your results/conclusions

Write the names of all the acids that you used

_____

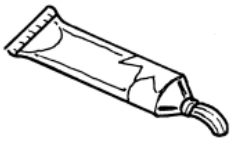
What sort of taste do all the acids have? _____

Activity #1 Acids in the Home

Read page 90 of your Science 7 Course book.

The chart shows the names of some substances you find in the home.

Five of them are acids, five are not. Write 'acid' or 'not an acid' in each blank box. One has been done for you.

				
vinegar	toothpaste	picked onions	orange juice	washing powder

				
soap	lemonade	bleach	milk of magnesia	hair perming lotion
		acid		

Activity 2

Make a display showing the examples of acids that you use in your home.

You could:

- cut out the pictures from the table
- use labels from cans, jars and bottles
- cut out pictures from magazine adverts
- use computer graphics.

knowledge, research

Investigation #2 Spot the Hazard

In this experiment you will be comparing three different acids. You will find out which is the most hazardous.

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Apparatus

- Test tube rack
- Test tubes
- Acids A, B and C
- 3 pieces of magnesium
- 3 marble chips
- Thermometer
- Eye protection

Eye protection should be worn.

Method

1 Fill a test tube about one third full of acid A, as shown in the diagram.

2 Put one of the pieces of magnesium into the tube.

3 Watch what happens. Write the results in the table.

4 When the fizzing stops, measure the temperature of the liquid.

5 Put acid B into a second tube.

6 Put another piece of magnesium into this tube. Record your results.

7 Now put acid C into a third tube.

8 Do the experiment again using acid C. Record your results.

9 When the tests are finished, pour all the liquid away.

10 Refill the three tubes with fresh acid: A, B and C.

11 Do the tests again, using a marble chip instead of the magnesium.

***As you test each acid and metal, record your results on the next page.**

Record of My Results:

Acid	Solid	What happened?	Temperature at the end of the experiment (°C)
A	magnesium		
B	magnesium		
C	magnesium		
A	marble chip		
B	marble chip		
C	marble chip		

Considering your results

I think the most hazardous acid was _____

The least hazardous acid was _____

I could tell this because _____

_____

_____

observing, considering

Activity #2 What Hazard?

Cut out the boxes on this sheet.
Match the warning symbol to the hazard, and find the correct example.
Stick the correct sets on the next page.

knowledge

Hazard:
flammable

Example:
concentrated
sulphuric acid

Example:
dilute sulphuric acid

Hazard:
irritant

Hazard:
toxic

Example:
petrol

Example:
mercury

Hazard:
corrosive

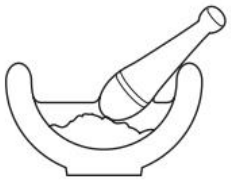
Investigation #3 Red Cabbage Indicator

Part 1: Making the indicator

Apparatus

- **Pestle and mortar**
- **Red cabbage leaves**
- **Hot water**
- **Filter paper and a filter funnel**
- **Boiling tube or conical flask**

Method



1 Put some red cabbage leaves into the mortar.

2 Add a little hot water.

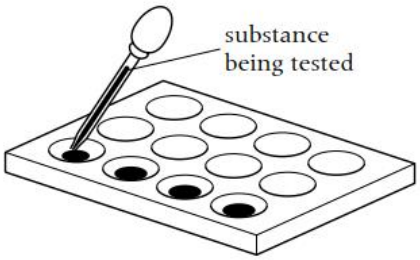
3 Grind up the leaves so that you get as much of the colour out as possible.

4 Filter the mixture and collect the liquid in a tube or flask.

Part 2: Using your indicator

Apparatus

- **Red cabbage juice**
- **Spotting tile**
- **Dropping pipette**
- **Substances to test**



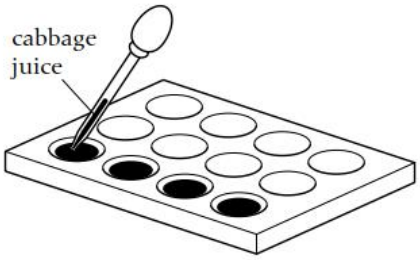
Method

1 Put one of the substances into a circle on the spotting tile. Write the name of the substance in a table.

2 Add a few drops of your cabbage juice.

3 Write the colour in your table.

4 Do this again with another substance.



Red Cabbage Indicator Results

Name of substance	Colour of red cabbage juice

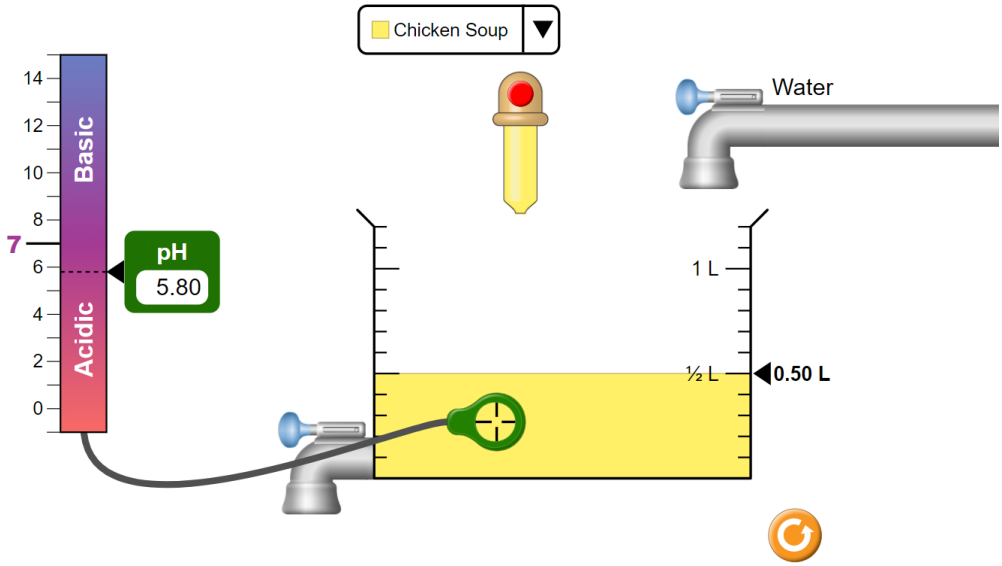
Considering your results/Conclusions

1. Write a list of all the things which made the cabbage juice turn red.

2. Make a list of all the things which made the cabbage juice turn blue or green.

3. Which of these lists contains all the acids?

Investigation #4: pH Scale Simulation Investigation



https://phet.colorado.edu/sims/html/ph-scale/latest/ph-scale_en.html

Part 1: Acid or alkali?

Use the simulation to test each substance by placing the pH sensor in the substance in the tank (as shown above). Select substances from the dropdown list.

Decide if the substance is an acid or an alkali.

Part 2: Effect of adding water on strength of acids & bases

a) Start with battery acid (0.50L). Record the pH value in the table on the next page. Pull the blue tap out to the left and exactly add 0.1L of water & remeasure pH. Record this value in the table.

Repeat for extra 0.1L volumes of water until you reach 1.2L. Each time record the new pH in the table.

b) Start with drain cleaner (0.50L). Record the pH value in the table on the next page. Add 0.1L of water & remeasure pH. Record this value in the table.

Repeat for extra 0.1L volumes of water until you reach 1.2L. Each time record the new pH in the table.

Write a conclusion about the effect of adding water to a strong acid (battery acid) and to a strong alkali (drain cleaner).

RESULTS: pH Scale Simulation Investigation

Part 1.

Substance	pH value	Acid	Alkali
Drain cleaner			
Hand soap			
Blood			
Spit			
Milk			
Chicken soup			
Coffee			
Orange juice			
Soda pop			
Vomit			
Battery acid			

Part 2.

Substance	Measured pH value						
	Volume of water added (L)						
	0	0.1	0.2	0.3	0.4	0.5	0.6
Battery acid							
Drain cleaner							

Conclusion:

Adding water to an acid causes it pH value to …….. making it a …… acid.

Adding water to an alkali causes it pH value to …….. making it …… alkali.

Activity 3: Alkalis in the Home Poster (20 points)

Make a display showing examples of alkalis that you use in your home.

You could:
- draw pictures showing the different uses
- use labels from cans, jars and bottles
- cut out pictures from magazine adverts
- use computer graphics.

Some examples of products containing alkalis that you could use in your display are:
toothpaste, oven cleaner, soda crystals, any products containing ammonia (e.g. kitchen cleaners or hair perming lotion), many indigestion remedies (e.g. milk of magnesia)

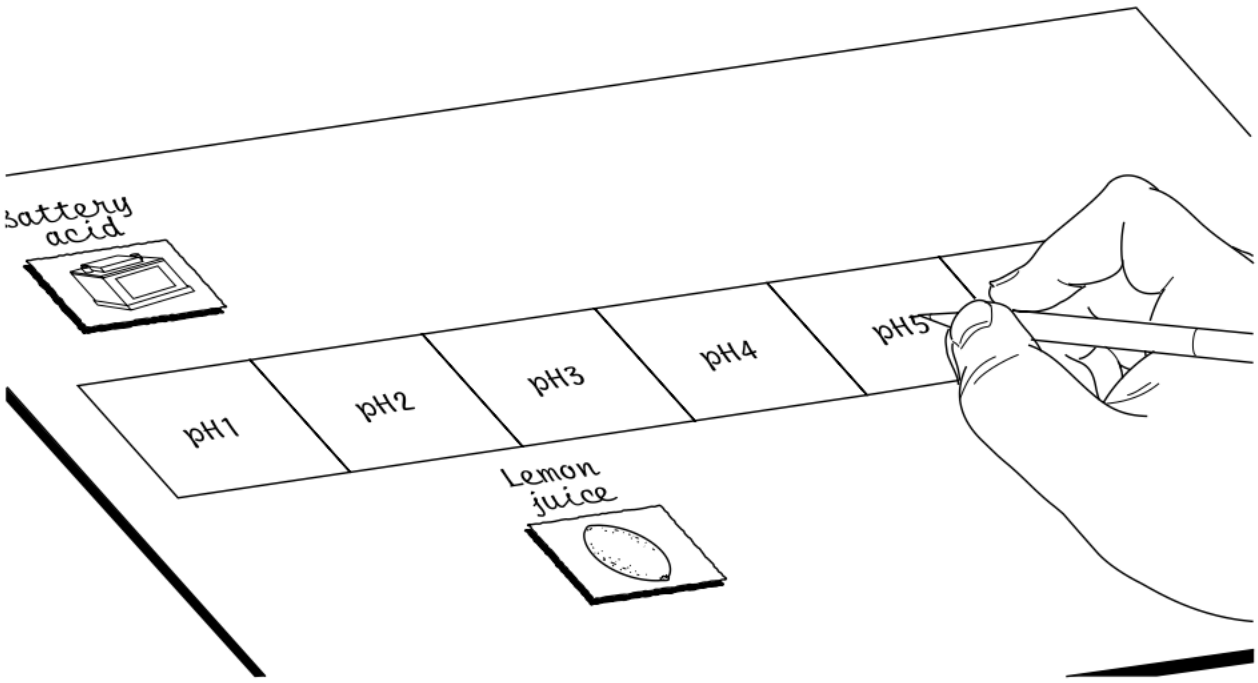
Activity 4: Making a pH Chart

Use the whole of a piece of paper to draw the pH scale running from 1 to 14.

Add the colours to show how universal indicator would change colour.

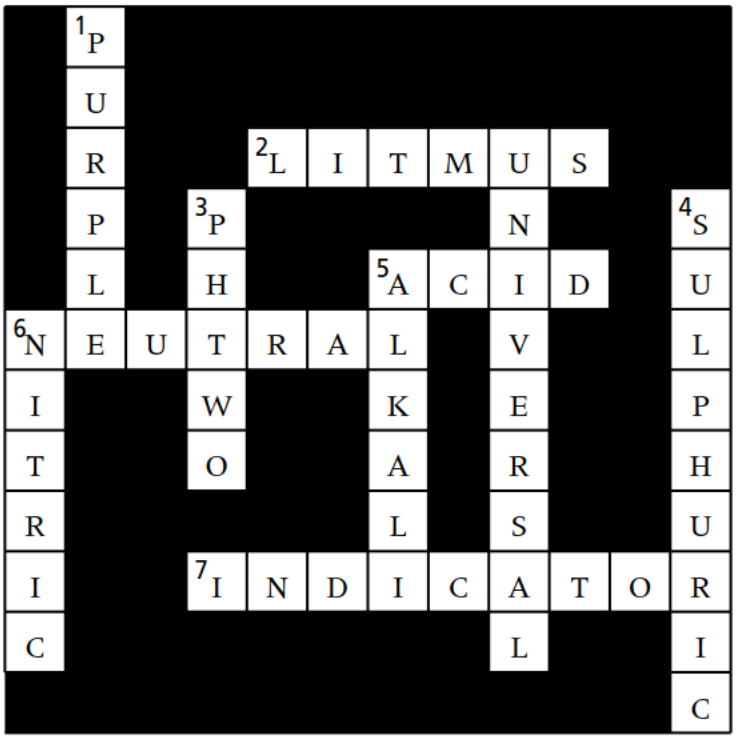
Label the chart by drawing arrows from each substance to the correct pH number. You may be able to draw pictures or find photos in a magazine that you could cut out and stick onto your chart.

Substance	pH	Substance	pH
battery acid	1.0	mineral water	8.0
bee sting	3.5	oven cleaner	13.0
blood	7.5	skin	5.5
distilled water	6.0	tap water	7.0
egg white	9.0	toothpaste	9.5
fizzy drinks	4.5	vinegar	3.0
indigestion powder	8.5	washing up liquid	5.0
kitchen surface cleaner	11.0	washing powder	10.5
lemon juice	2.5	washing soda	11.5
milk	6.5	wasp sting	10.0

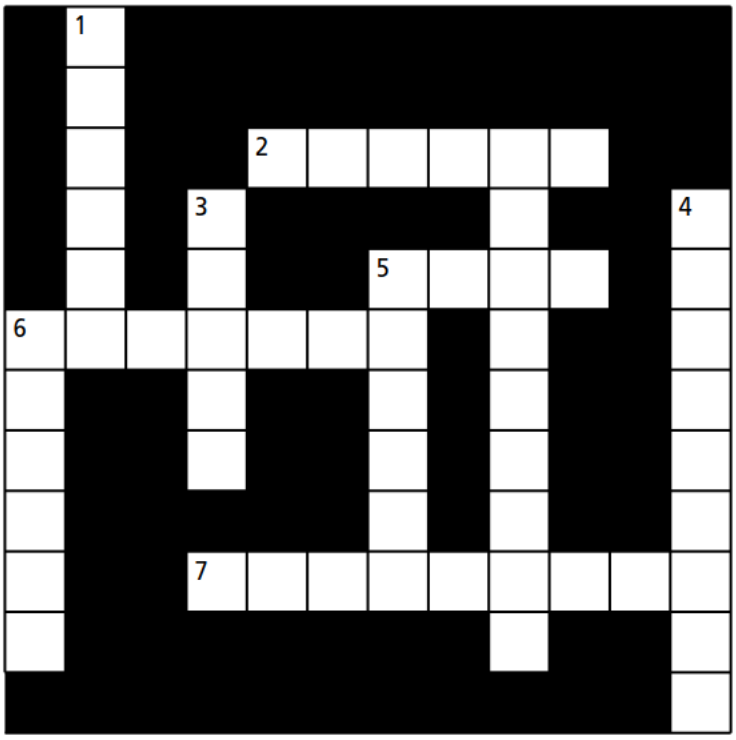


Reverseword

Here is a crossword grid with the answers already filled in. Write a clue for each word in your book.



You can fold the sheet along the dotted line and ask a friend or someone in your family to see if they can do your crossword on the blank grid below.



Summary Sheet

Acids and alkalis

Indicators are coloured dyes which often come from plants such as red cabbage and beetroot. **Acids** make indicators change colour. **Litmus** is an indicator which turns red in acids. Common acids include vinegar and lemon juice. Fizzy drinks, pickles and spicy sauces also contain acids. Stronger acids such as sulphuric and nitric acids can be more dangerous. Often they are **corrosive**.

Alkalis have a different effect on indicators to acids. Litmus turns blue in alkalis. Alkalis can also be corrosive. Weak alkalis include soap and toothpaste.

Bottles in the laboratory and tankers carrying chemicals on the road all have to carry hazard warning labels to show when there is a chemical hazard. Some of the common warning signs are:

toxic (poisonous)

harmful (irritant)

corrosive

flammable

The strengths of acids and alkalis can be measured on the **pH scale**, which runs from 1 to 14. pH numbers **1 to 6** are acids, **7** is neutral, and **8 to 14** are alkalis. You can find out the pH number using a **universal indicator**, or by using a pH meter.

strong acid			weak acid			neutral	weak alkali			strong alkali			
1	2	3	4	5	6	7	8	9	10	11	12	13	14

stomach acid — vinegar — skin — pure water — indigestion powders — washing powder — oven cleaner

lemon juice — fizzy drinks — milk — blood — toothpaste

Alkalis can cancel out acids, making them **neutral**.

Neutralising reactions can be important:

- in gardening and agriculture, to make sure the soil is the correct pH
- when dealing with insect stings and bites
- to control indigestion caused by excess acid in the stomach
- to keep foods such as jam at the correct pH.

Student Notes