



Topic

3

Material changes

When we use materials to make things, we often need to change the material in some way to suit our purpose. In this topic you are going to learn that you can change materials by squashing, bending, twisting or stretching them. You are also going to explore what happens to materials when you heat or cool them, or when you put them in water.

3.1 Materials can change shape

We use **materials** to make things.
Look at all the objects in the pictures.

- 1 Say what material was used to make each thing.

Key words

- materials
- shape
- squash
- bend
- twist
- stretch



You can change the **shape** of some materials if you **squash**, **bend**, **twist** or **stretch** them.

- 2 Which of the materials in the pictures can be squashed?
- 3 Can you bend a wooden ruler?
- 4 Can you twist an elastic band?
- 5 What could you do to change the shape of the ball of paper?

Activities

- 1 Your teacher will give you some different materials. Work with your group to find out if you can squash, bend, twist or stretch each one. Record your findings in your Workbook (page 34).
- 2 What happens to a rubber band if you twist it and then let it go? Will the same thing happen if you twist a piece of paper?
- 3 Which of the materials do you think will stretch the most? What could you do to check your answer scientifically?

I have learned

- You can change the shape of some materials by squashing, bending, twisting or stretching them.

3.2 Squashing materials

When we **squash** something we are actually pushing the material together or squeezing it. Think about what happens when you sit on a soft cushion. Your weight squashes the cushion and it changes shape. When you squeeze a tube to make toothpaste or cream come out, you change the shape of the tube.



- 1 What is the potter doing?
- 2 What is making the clay change shape?
- 3 Can you squash the finished pots like this and change their shape? Why?



Activities

1 Make a list of things in your school or home that will change shape if you squash them. Tick the ones that will go back to their original shape when you stop squashing them.

2 Indira has a cricket ball and a tennis ball. Predict what will happen to the shape of each ball if she stands on it to squash it. Do your own test to find out if your prediction was correct.

3 Make a list of five materials. Write them in order from the easiest to squash to the most difficult to squash. Which is the squashest material? What could you do to find out?



I have learned

- When you squash something you push the material together.
- You can easily change the shape of soft materials by squashing them.

3.3 Does it bend?

Some materials **bend** easily. You can bend a drinking straw or a piece of card easily. We say these materials are **flexible**. The harder you push or pull these materials, the more they will bend. Too much bending can cause a material to break.

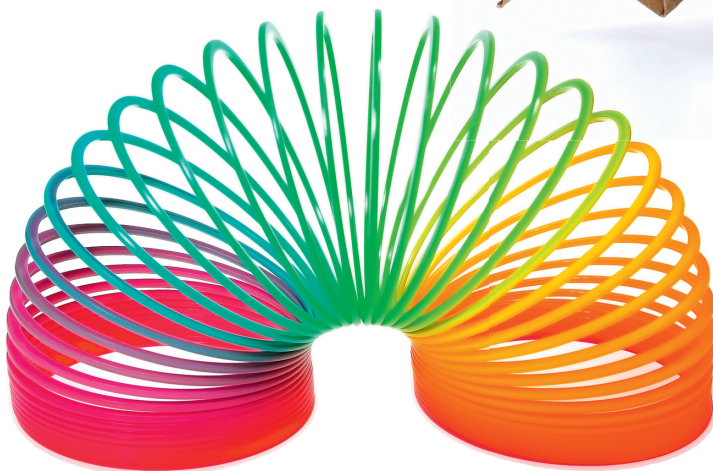
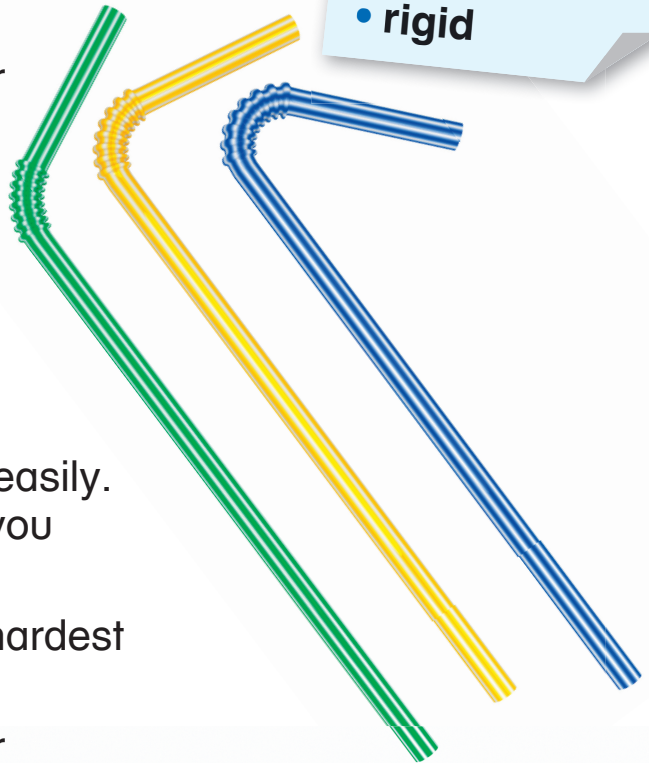
- 1 Find some other things in the classroom that you can bend easily. Make a list of five things that you could bend by hand.
- 2 Which of the materials is the hardest to bend? Why?

You cannot bend a glass plate or a brick. Materials that cannot be bent are called **rigid** materials.

- 3 Find three rigid materials at your school.
- 4 What will happen if you try to bend them?

Key words

- bend
- flexible
- rigid



Metal is a hard material, but it can be bent.

5 Why has the nail bent?

6 What shapes have the metal pipes been bent into?



Activities

1 Study a paper clip. Write a set of instructions for making a paper clip from a straight piece of wire. You can add diagrams if you want to.

2 Try to change the shape of a paper clip to make a circle of wire. How many other shapes can you make?

3 Investigate how many times you can bend a paper clip wire before it breaks.

I have learned

- You can change the shape of some materials by bending them.
- Flexible materials can bend. Rigid materials do not bend.

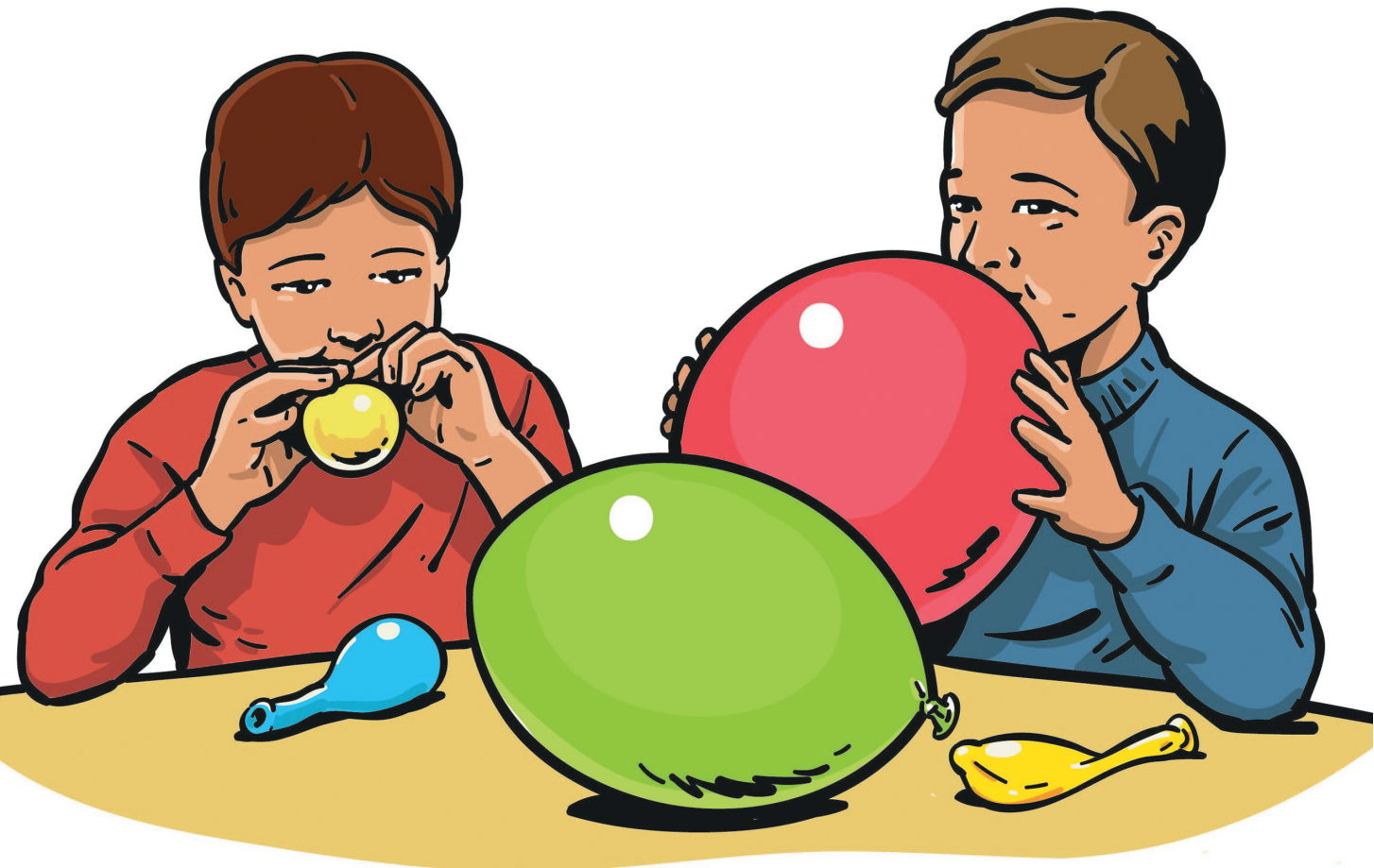
Key words

- stretch
- twist
- elastic

3.4 Twisting and stretching

When you **stretch** something, you are pulling the material apart. When you stretch it and turn it at the same time, you **twist** the material. If the material goes back to its original shape when you stop stretching or twisting it, we say the material is **elastic**.

- 1 What happens to a balloon as you blow air into it?
- 2 What makes the balloon stretch?
- 3 What happens if you let the air out of a balloon?



▼ The person in this photograph is twisting the cloth to get rid of the water.



- 4 Show how you would twist a piece of cloth.

I have learned

- You can change the shape of some materials by stretching or twisting them.

Activities

- 1 Shape some modelling clay by stretching it. What shapes can you make? Draw the shapes that you make.

- 2 Make a pencil shape out of the clay. Stretch your shape by pulling gently on both ends. What is the longest pencil shape you can make without breaking it? Record the results in your Workbook. (page 39)

- 3 Make a fat pencil shape out of the clay. Predict how many times you will be able to twist the shape before it breaks. Test your prediction and record your results in your Workbook. What do you think will happen if you start with a fatter or a thinner shape?

Key words

- heated
- melt

3.5 Heating materials

When materials are **heated** they become hot.
Some materials change when they are heated.

Clay pots and bricks get hard when they are heated.

- 1** Why do we need to heat clay pots and bricks before we can use them?



Bread dough gets bigger when it is left in a warm place.
When the dough is heated in an oven, it changes into bread and gets a hard crust.

- 2** Describe the dough in each picture. Say what has happened to make it change.
- 3** What will happen to the bread in picture **D** if the oven is too hot?

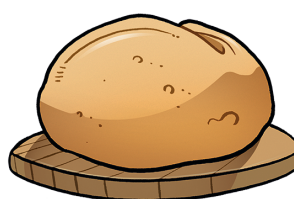
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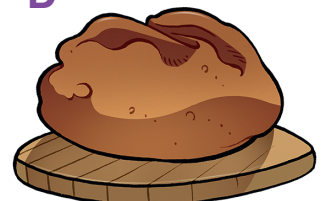
B



C



D



Some materials get softer or **melt** when they are heated.



- 4 Name two other materials that get soft or melt when they are heated.

Activities

- 1 Investigate what happens to a slice of bread when you heat it in a toaster or over a candle flame.
- 2 Compare a slice of bread with a slice of toast. How are they similar? How are they different?
- 3 Does the type of bread affect how long it takes to toast? Design an experiment to answer this question.

I have learned

- Some materials change when they are heated.
- Materials may get harder or softer when they are heated.
- Some materials melt when they are heated.

Key words

- cool
- solid

3.6 Cooling materials

When you **cool** materials they become colder. When you put water in the freezer it cools, gets harder and turns into **solid** ice. When you put soft margarine or butter into the fridge, or you put melting ice-cream back into the freezer, they cool down and get harder.

- 1 What happens to soft margarine or butter when you put it in the fridge?



- 2** Describe how you can change water into a solid block of ice.



- 3** What other melted materials change back to solids when you cool them?



Activities

- 1** Your teacher will give each group a block of chocolate. Discuss how you could change the shape of this block using only heating and cooling.
- 2** Carry out an investigation to change the block of chocolate into a different shape. Record your investigation on page 45 of your Workbook.
- 3** Look around your classroom. Where could you place melted chocolate to make it cool most quickly? Why is this place best for cooling?

I have learned

- Materials can be changed by cooling.
- Some melted materials can be changed back into solids by cooling them.

Key word

• dissolve

3.7 Where did it go?

Look at these pictures carefully.

1



I start with a glass of water.

2



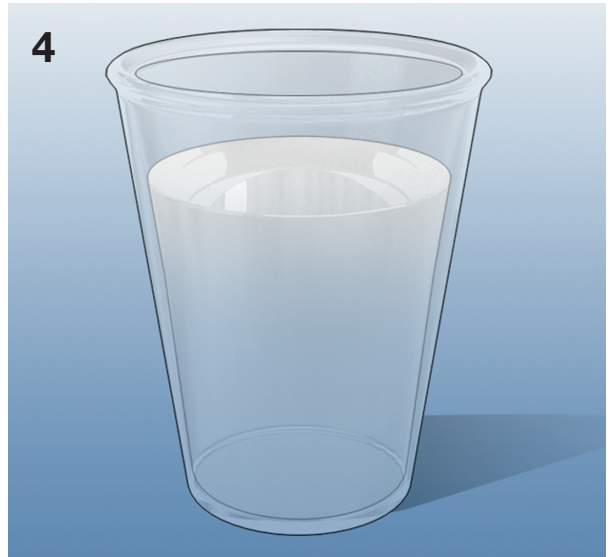
I add a teaspoon of sugar.

3



I stir the sugar and water.

4



The sugar seems to disappear.

- 1 Where has the sugar gone?
- 2 Why can you not see the sugar in the last picture?
- 3 Explain how you can tell that the sugar is still in the water.

When some solids, such as sugar or salt, are added to water, they seem to disappear. We say that they **dissolve** in the water. When a material dissolves in water we are left with clear liquid and you cannot see the solid in it.

4 Talk about why water that looks clean may not be safe for drinking.

Some solids do not dissolve in water. If you add sand to water and stir it, the sand will not dissolve. You can still see the sand grains in the water.

Activities

1 Predict which of these materials will dissolve in water.

leaf tea modelling clay
bath salts chalk powder
soap powder salt
sawdust jelly crystals

Record your ideas in a table like this one:

Dissolves in water	Does not dissolve in water

2 Create a diagram to show what happens when something dissolves in water.

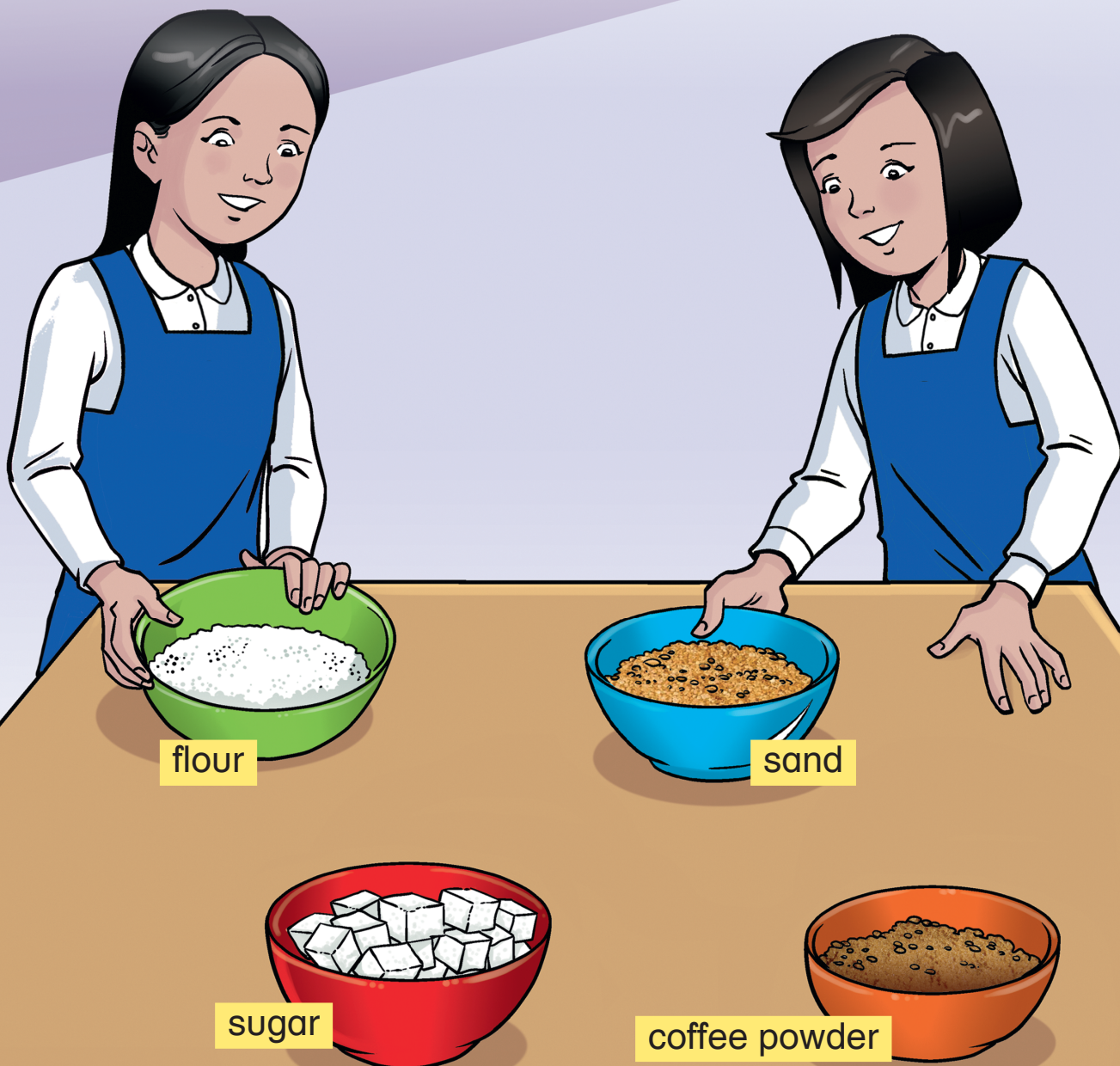
3 Make a poster to show the difference between dissolving and melting.

I have learned

- Some materials dissolve when you mix them with water.
- You cannot see dissolved materials in the water.

3.8 Investigate dissolving

You are going to do a **test** to find out which materials dissolve in water.



Before you do your investigation, answer these questions in your group.

- 1** What are you trying to find out by doing this test?
- 2** What do you think will happen?
- 3** What will you need to carry out your investigation?
- 4** What steps will you follow in your investigation?
- 5** What will you keep the same?
- 6** What will you change?
- 7** How will you record your findings?

Activities

- 1** Collect the items you need and carry out your test. Record your findings in your Workbook (pages 47–48).
- 2** Choose one of the materials that dissolved in water. Find out how much of the material you can dissolve in one container of water.
- 3** Does the temperature of the water affect how a material dissolves? What could you do to find out?

I have learned

- Scientists do tests to find out how different materials behave when you mix them with water.
- In a fair test we change one thing and keep all the other things the same so we can compare the results.

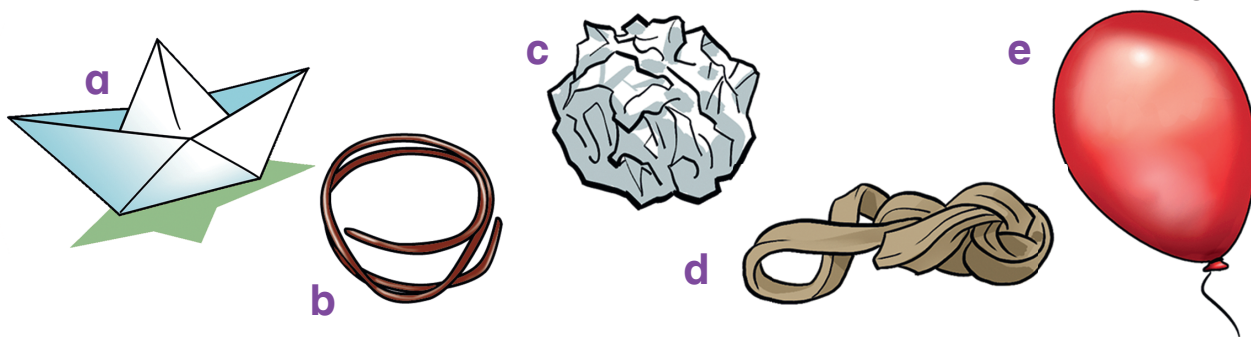
Looking back Topic 3

In this topic you have learned

- You can change the shapes of some materials by squashing, bending, twisting or stretching them.
- Some materials change when you heat them.
- Heating materials can make them get harder or it can make them get softer and melt.
- Some materials change when you cool them.
- Cooling melted materials can make them harder. Freezing water makes it turn to solid ice.
- Some materials can dissolve in water.
- When materials dissolve in water they seem to disappear and you cannot see them in the water even though they are still there.

How well do you remember?

1 Describe how the shape of these materials have been changed.



2 What will happen to butter if you leave it in the sun?

3 Why is it difficult to spread butter that has been in the fridge?

4 Complete these sentences.

a If you mix sugar with water it will ...

b You know the sugar has dissolved when ...

c If you mix sand with water it will ...