



Science

Properties and Changes of Materials

Keeping Cool

Aim

- I can investigate thermal conductors and insulators.

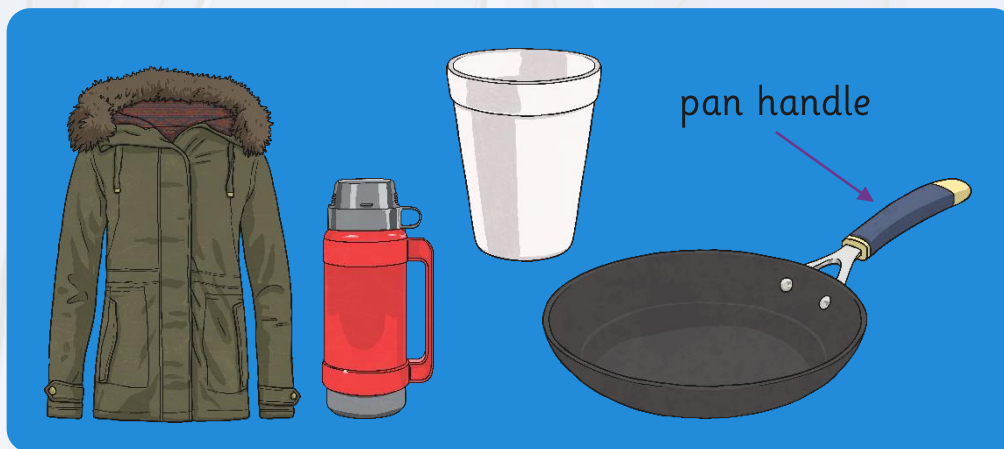
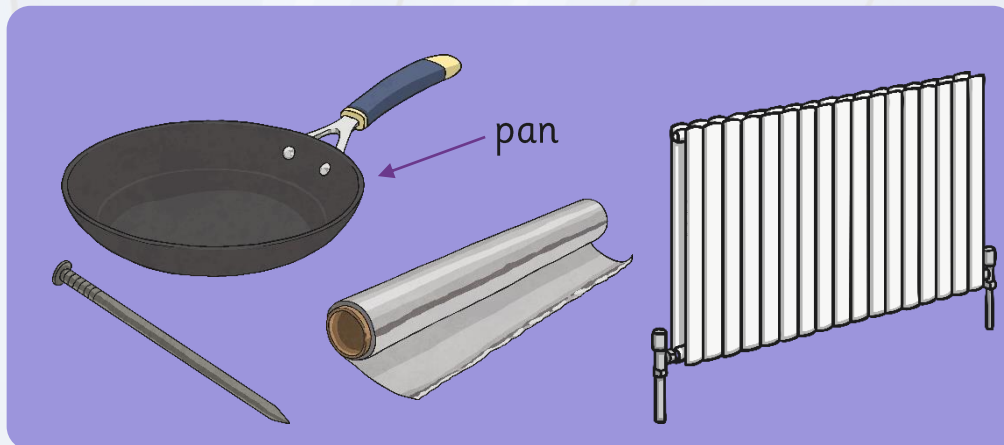
Success Criteria

- I can identify materials that are thermal conductors and insulators.
- I can explain what thermal conductors and insulators are.
- I can plan and carry out an investigation into thermal conductors and insulators.
- I can give reasons for the uses of thermal conductors and insulators.



Sorting Materials

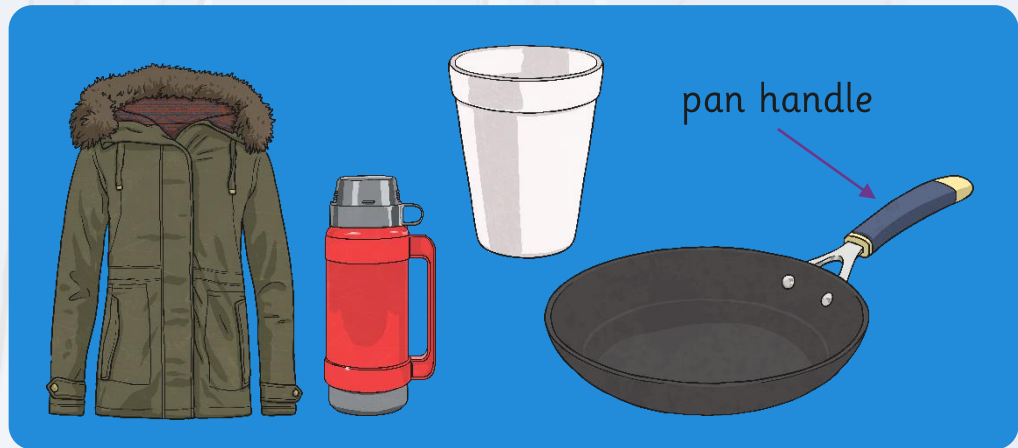
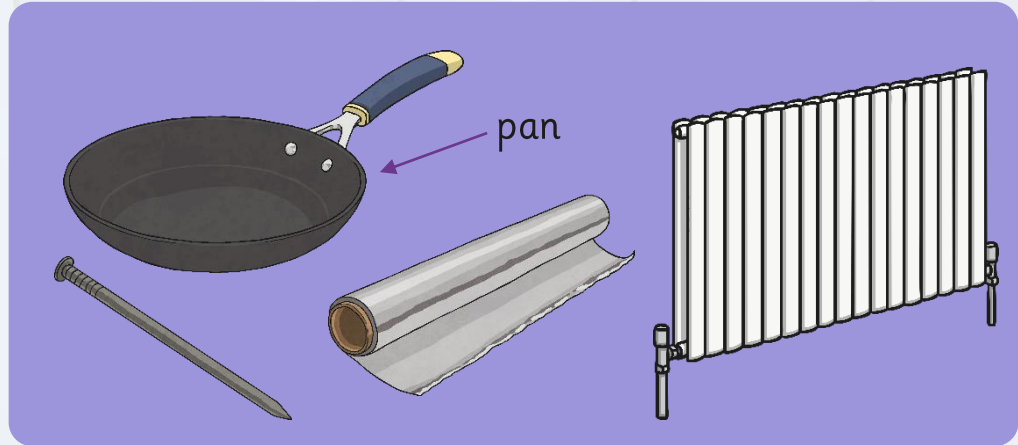
Mason has sorted these materials into two groups.





Sorting Materials

Can you identify the two groups that he has sorted them into?



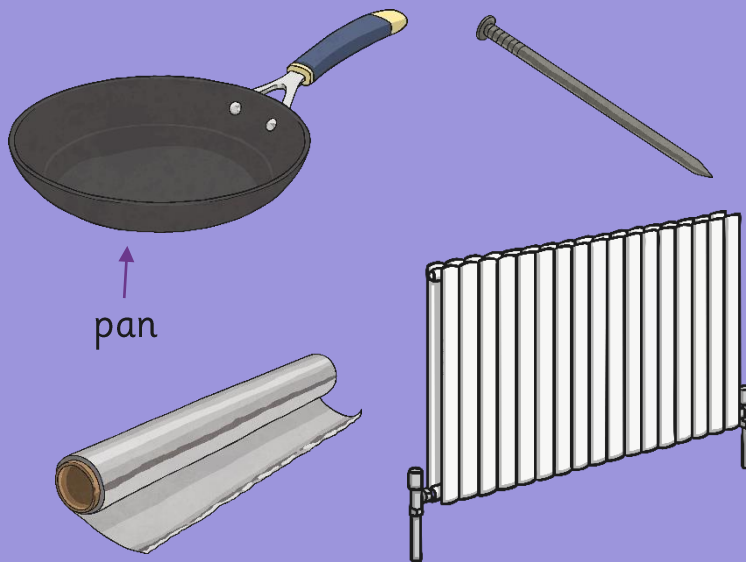


Sorting Materials

Did you figure it out?

Mason has sorted the materials into thermal conductors and insulators.

Thermal Conductors



Thermal Insulators



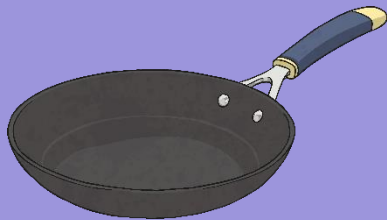
Thermal Conductors and Insulators

Thermal Conductors

Heat can travel easily through thermal conductors.

Metals are good thermal conductors, as they allow heat to move through them.

Thermal conductors are used to make items that need heat to travel through them, like a pan or a radiator.



Thermal Insulators

Thermal insulators do not let heat travel through them easily.

Some fabrics, wood and plastics are good thermal insulators.

Thermal insulators can keep heat out or in. For example, a vacuum flask stops heat from the air travelling through to the food or drink inside, keeping it cool. A coat stops the heat from your body travelling through to the air outside, keeping you warm.

Did you know?

Heat always travels from a warmer area to a cooler one.

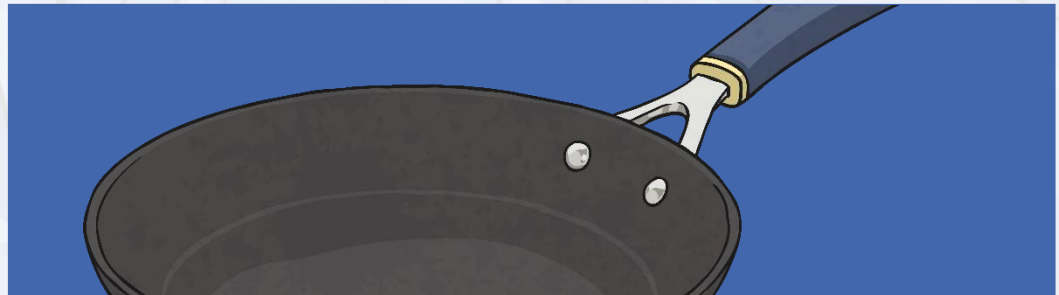
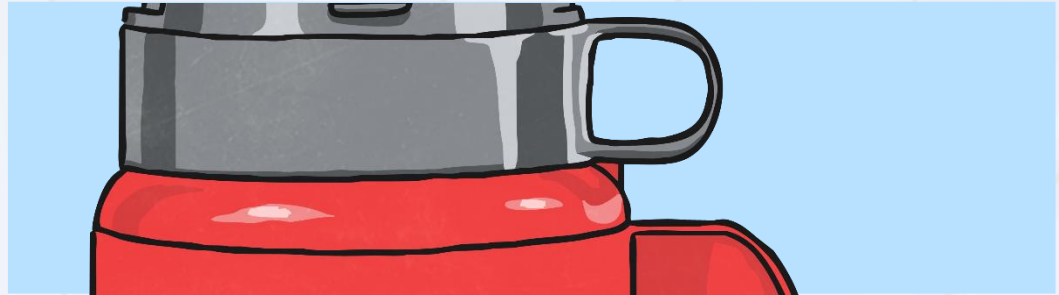
Thermal Conductors and Insulators



Try this quiz to test your understanding of thermal conductors and insulators.



Click the play button to begin!



Design a New Lunch Box

The Brilliant Bags Company want to make a new lunch box for children to bring their packed lunches to school in.

Food will be stored in the lunch box for quite a long time – probably all morning.

They want to make sure the lunch box keeps the children's lunches cool and fresh, so they need to think about the best material to use to make the inner lining of the lunch box.



Design a New Lunch Box



The company want you to help them choose the best material for the inner lining of the lunch box.

The lining will need to stop heat getting through from the air to the cool food inside.

Will the lining need to be a good thermal conductor or a good thermal insulator?

Conductor

Insulator

Design a New Lunch Box

You will need to find the best thermal insulator for the inner lining of the lunch box. Thermal conductors will let heat through and make the food warm up quickly.

Thermal insulators will stop the heat getting through and keep the food cool for longer. You will need to set up a comparative investigation to test the different materials to see if they conduct heat or insulate from it.



Testing Materials



Can you test the thermal conductivity of the different materials?

You can use the following equipment:

containers



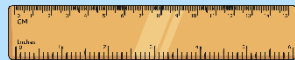
thermometers



ice cubes



rulers



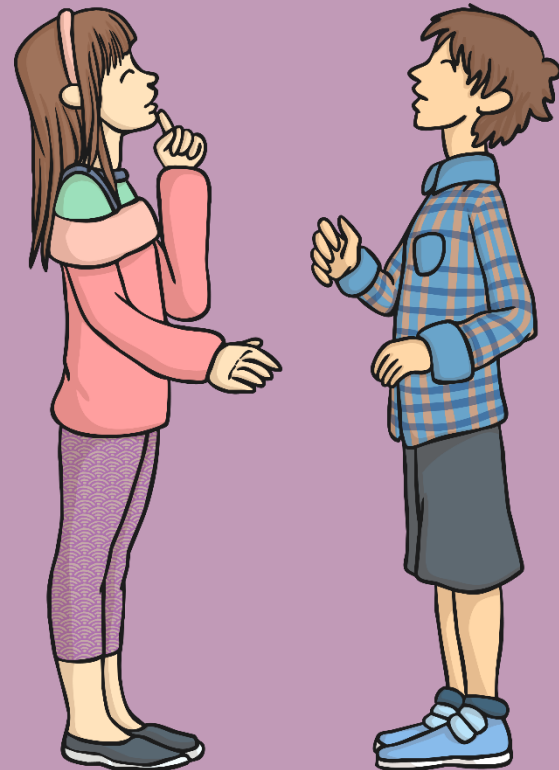
stopwatches



different materials



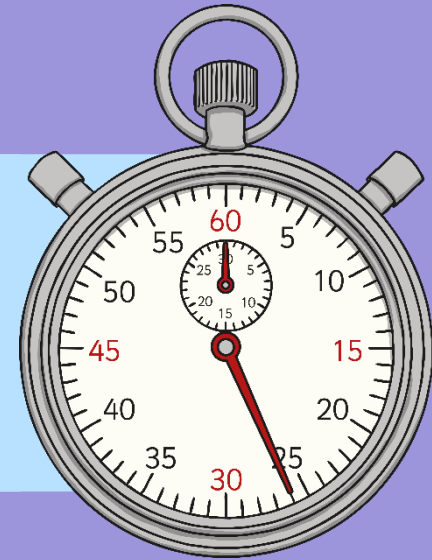
Talk to your partner about your ideas.



Testing Materials

You could wrap the different materials around the containers, and then fill them with the ice cubes.

By checking the temperature of the containers at intervals of time, you will be able to see which materials allow heat from the surroundings through easily. These materials will cause the ice to melt quicker. They are thermal conductors



Any material which stops heat from the outside getting through will keep the ice cubes solid for longer. These materials are thermal insulators.

Identifying the Variables

When setting up investigations, scientists have to consider the variables of each experiment. A variable is any factor or condition that will change or can be changed in the investigation.

There are three types of variables:

Independent

The independent variable is the thing that the scientist purposefully changes or alters throughout the investigation.

Dependent

The dependent variable is the thing that is measured or observed, and changes as a result of the changes to the independent variable.

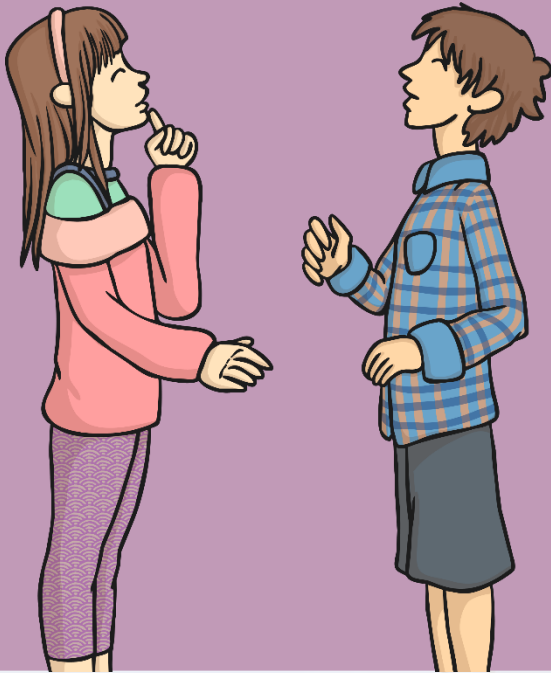
Controlled

All the other things in the investigation should remain the same throughout, and are called controlled variables.

Identifying the Variables



Think about the variables for the investigation you are going to do today. Talk to your partner about all the possible variables there are in this investigation into thermal conductors and insulators.



Some ideas include:

Type of container.

Type of thermometer.

Quantity of ice cubes.

Temperature of room.

Length of time.

Size of material.

Size of container.

Type of container.

Investigate



Set up your investigation to find the best material for the lunch box.

Record your results on your Investigating Materials Activity Sheet.

The image shows two overlapping activity sheets for a science investigation. The top sheet is titled 'Investigating Materials' and contains the following text:

Investigating Materials

You have been asked to help choose the best material for the inner lining of a lunch box to make sure that the Brilliant Bag Company's new lunch box keeps children's lunches cool and fresh until lunch time.

What materials will you test?

What material do you predict will be the best choice for your lunch box? Why?

What is the independent variable of your investigation? (Tip: This is the thing you will change in the investigation).

What is the dependent variable? (Tip: This is the thing that you observe or measure in your investigation).

What are the controlled variables? (Tip: These are the things that you keep the same in the investigation).

Variables
Type and size of box;
type of thermometer;
size and quality of ice cubes;
temperature of room;
length of time;
size and of materials;
type of material.

The bottom sheet is also titled 'Investigating Materials' and contains a table for recording results:

Record your results in the table below.

Starting state / temperature of contents	Temperature of contents after 5 minutes	Temperature of contents after 10 minutes	Temperature of contents after 15 minutes	Temperature of contents after 20 minutes

twinkl



Report Back



The brilliant Bags Company are looking forward to your report!

Come to a conclusion about which material would be best for them to use to make their new lunch box.

Use your Lunch Box Report Activity Sheet to explain which material you have chosen and why you have chosen it.

A worksheet titled 'Lunch Box Report' with a star icon in the top left corner. It includes a name field, a thank-you message from 'The Brilliant Bags Company', and sections for 'Material Chosen', 'Reason for this choice', and a word bank. At the bottom, there is a drawing of an open lunch box and a footer with the Twinkl logo and lesson information.

Lunch Box Report

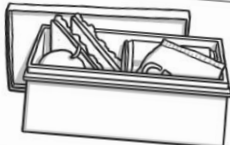
Thank you for completing an investigation to find the best material for us to use for the inner lining of our new lunch box. Please complete this report to inform the designers at our company of your choice, explaining your reasons.
The Brilliant Bags Company

Material Chosen: _____

Reason for this choice:

Use these words to help you:

conductor	insulator	heat	through	allows	temperature
water	fastest	slowest	cool	warm	



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Science Year 5 (Properties and Changes of Materials) Heating Cool Lesson 2



Aim



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Success Criteria

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