



# CHOCOLATE

Learning Objective:

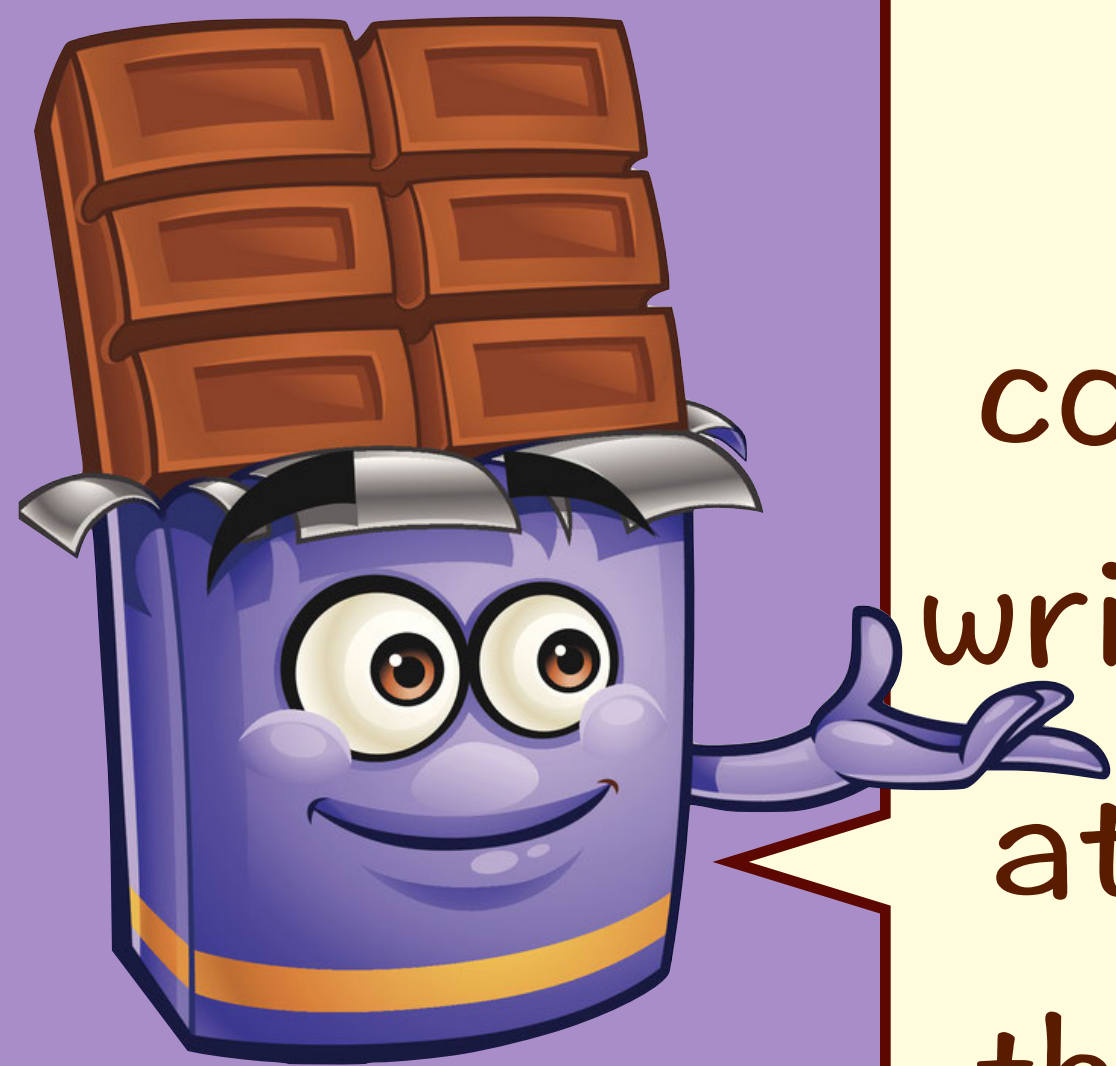
To know which materials are best at keeping liquids warm



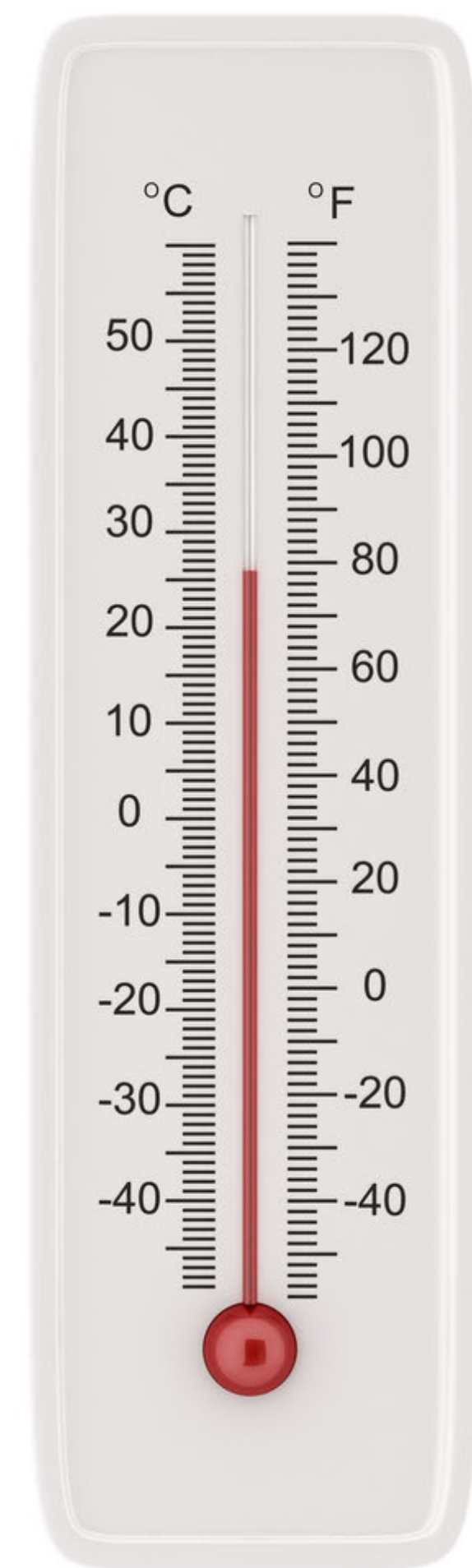
What is  
temperature?

Think, pair, then share your ideas.





Temperature is a measure of how hot or cold something is. There are different scales to measure temperature with, but the most common is degrees Celsius, which is written like this:  $^{\circ}\text{C}$ . The temperature at which water boils is  $100^{\circ}\text{C}$ , and the temperature at which it freezes is  $0^{\circ}\text{C}$ .



This is a thermometer which has two different scales to measure temperature with – Celsius ( $^{\circ}\text{C}$ ) and Fahrenheit ( $^{\circ}\text{F}$ ).



What do you think would happen to the temperature of the hot liquid if it was left in this room for one hour?

Yum! Hot chocolate!



Think, pair, then share your ideas.



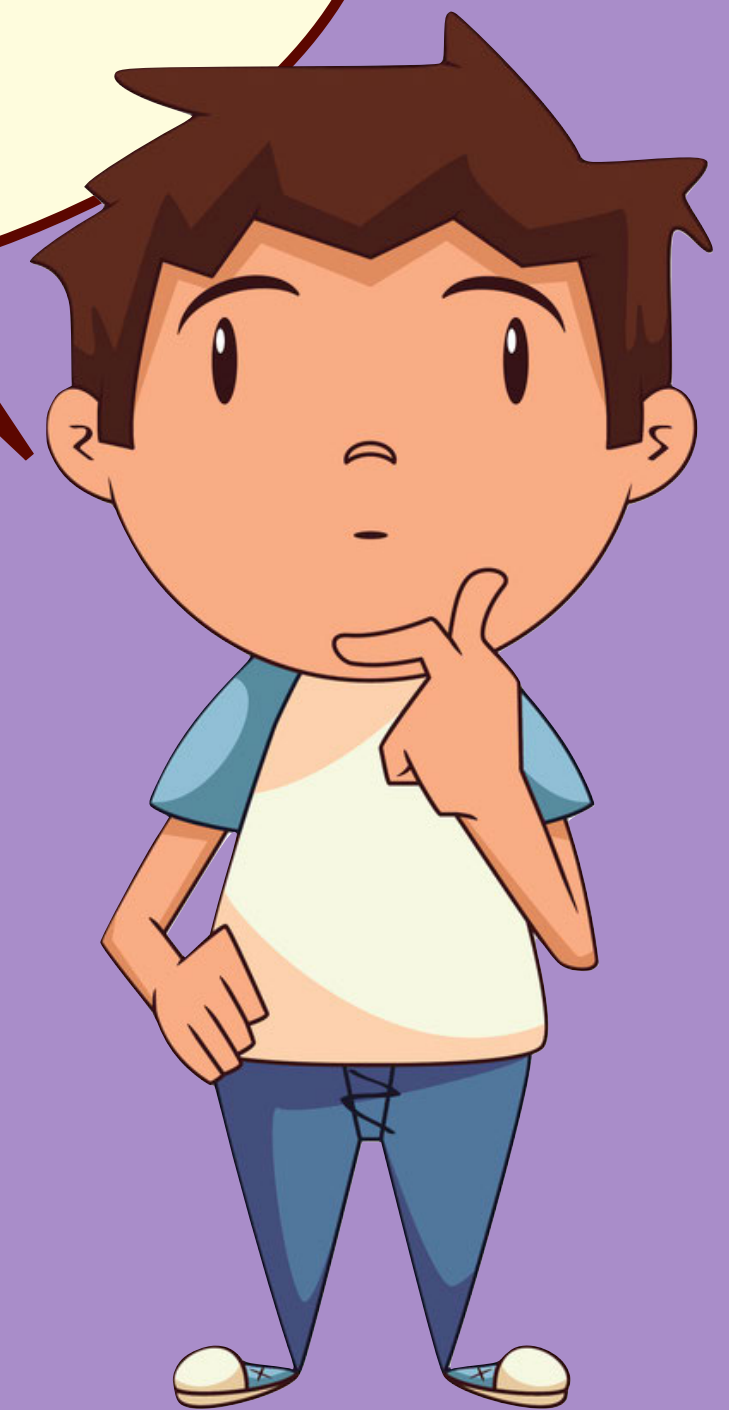


Who do you agree with? Why?

I think the temperature will stay the same.

I think the temperature will increase.

I think the temperature will drop.







Heat always travels from warmer to cooler places. It is likely that your room is cooler than the drink, so the temperature of the liquid will drop until it is the same temperature as its surroundings.

Is there any way we could stop this loss of heat from happening, or at least slow it down?



Think, pair, then share your ideas.





One way that we could do this is to wrap some material around the container that the liquid is in.



Bubble Wrap



Tin Foil



Cardboard



Cling Film



Cotton Wool

How could we carry out an investigation to compare which of these materials keeps the liquid warm the longest?



Think, pair then share your ideas.





Here's one suggestion... we could measure the temperature of the liquid every five minutes for half an hour, and then compare the results of the different materials.

We also need to make sure that we are conducting a **fair test** – this means that we only change what we are testing, and keep everything else the same.

What will we change? What will we keep the same?



Think, pair, then share your ideas.



In order to make it a fair test, we will change the type of material we wrap around the container. Everything else must stay the same...

The size of each piece of material.



The amount of liquid that is in each container.



The starting temperature of the liquid in each container.



The size of each container.



The location of the containers.

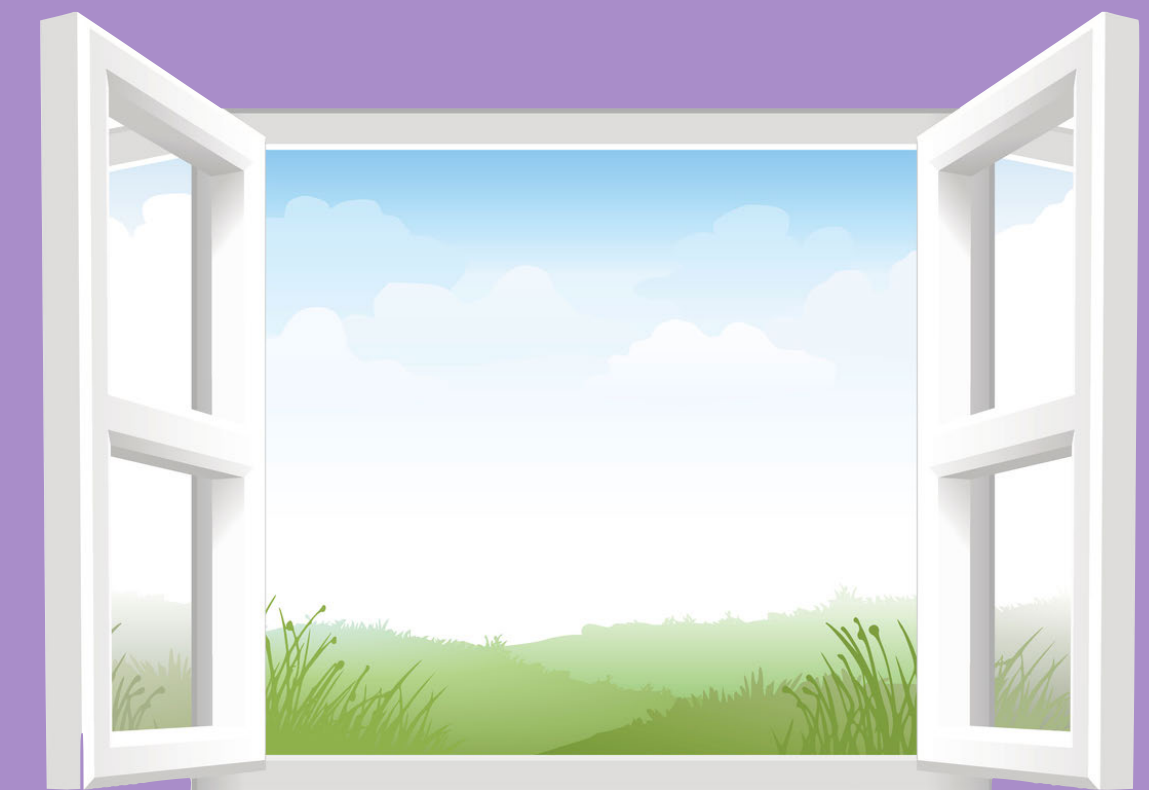


Why is it so important that it is a fair test?



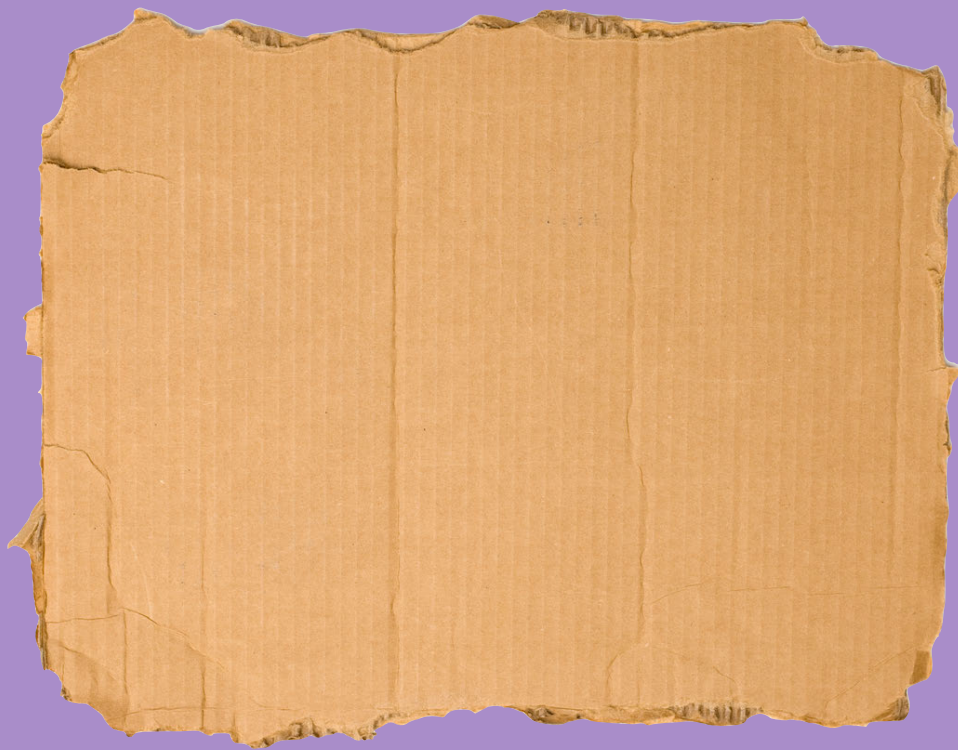


If one of the containers was next to a radiator and the other next to a window, the heat from the radiator would help to keep one warm, whilst a cold breeze from the window might cool the other one down faster. The results wouldn't be accurate and we wouldn't be able to compare the different materials fairly.





If we wrapped 3m of tin foil around one container, and wrapped 20cm of cardboard around another, you would not be able to compare the results fairly as you would be unable to tell if it was the material itself that was keeping the liquid warm, or the amount of material.







So, a fair test is important so that we can compare our results accurately, and be confident that our conclusions are correct.



Are you ready to investigate which material keeps hot drinks hot for the longest amount of time?



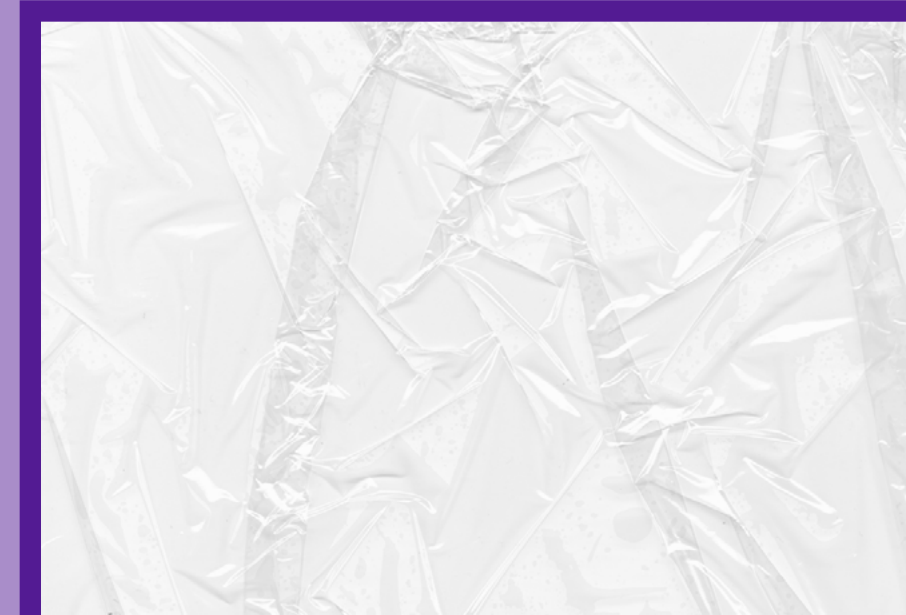
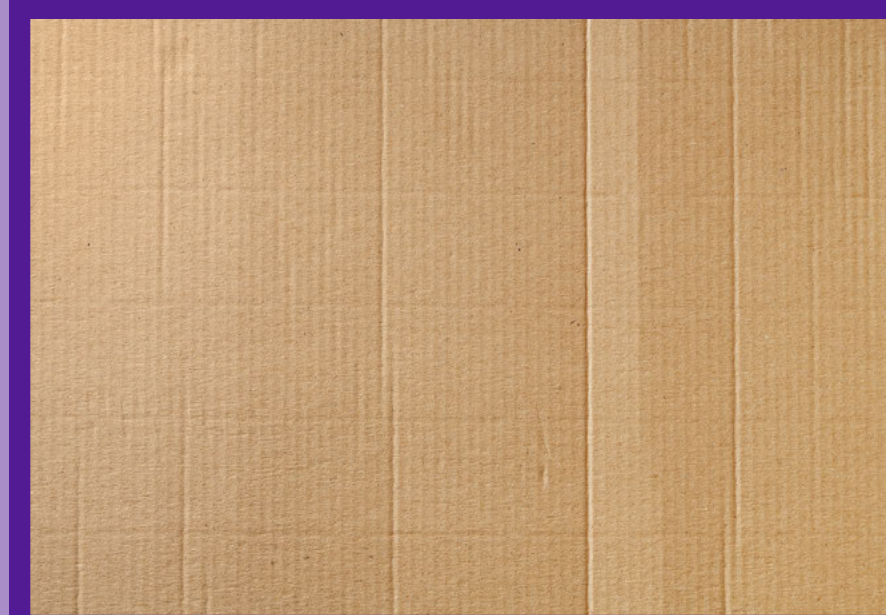


## Plenary:



A material that does not let heat move through it easily is called a thermal insulator.

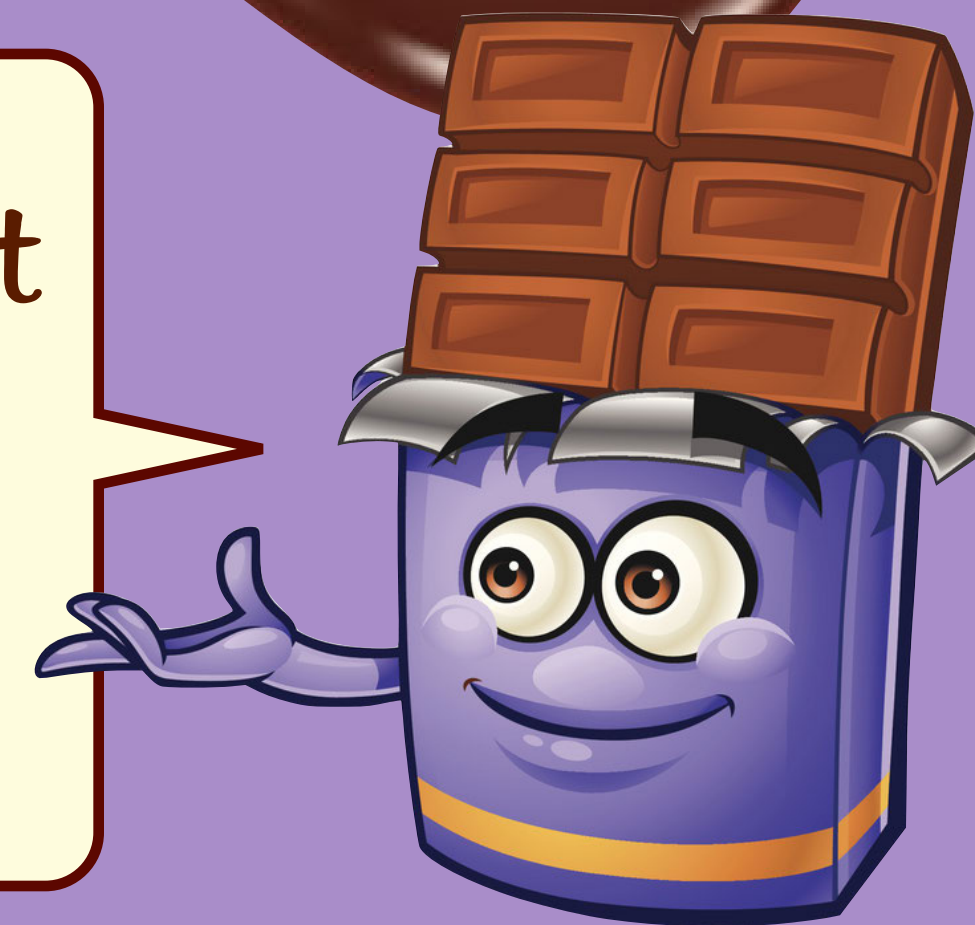
Which of your materials was the best thermal insulator? Which was the worst? Why do you think this was?



Think, pair, then share your answers.



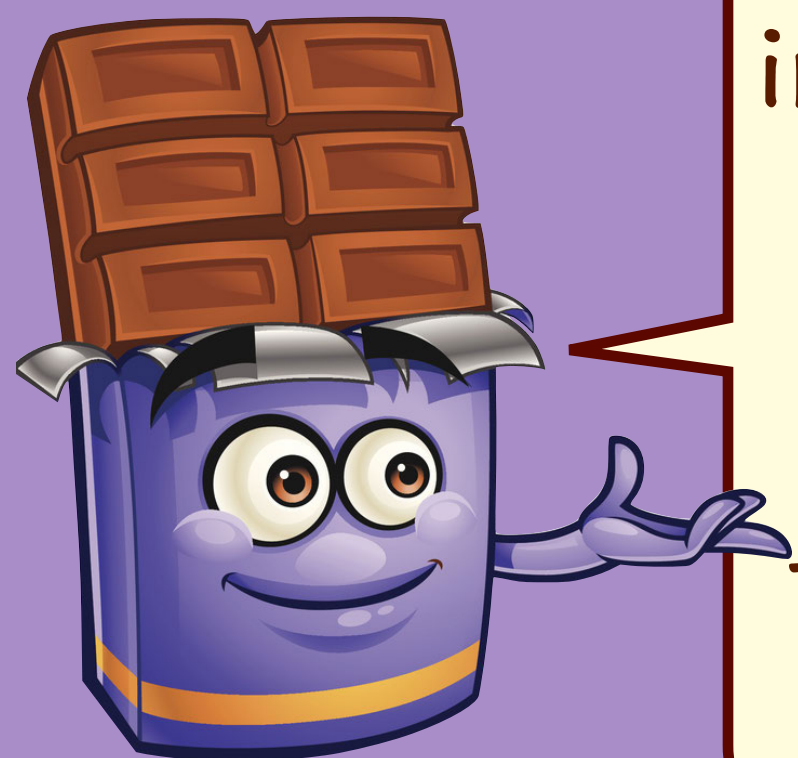
Thermal insulators are not only good at keeping heat in, like with our hot drink, but they can also be good at keeping heat out too.



Which of these objects are keeping heat in, and which are keeping heat out?







Wool is a good thermal insulator. Woollen hats, scarves and gloves help to stop our body heat from escaping into the cold air. They help to keep the heat in.



Wood and plastic are good thermal insulators too. Here, the wooden spoon and the plastic pan handle are keeping the heat out – they are stopping the heat from travelling from the metal pan to the woman's hand.

