

DOUBLE GLAZE YOUR DRINK

We're often urged to double glaze our windows to save energy and lower heating costs, but does it make a big difference? In true Bang style, try this experiment and find out for yourself.

These notes accompany the hands-on video guide and detailed explanation and safety tips at: bbc.co.uk/bang/handson

Safety: Children may need an adult to help them cut the plastic bottles safely. Be careful with hot water.

- WHAT:**
- Two empty 1 litre plastic drinks bottles
 - An empty 2 litre plastic drinks bottle
 - Some sharp scissors
 - Two identical glasses or paper cups – anything without a handle that is narrow enough to fit inside the smaller bottle
 - A jug
 - Hot water from the tap
 - A thermometer, or, ideally, two thermometer strips that you can buy at chemists and big supermarkets and some sticky tape

HOW: Carefully cut the tops off the two 1 litre plastic drinks bottles (children may need an adult to help with this). You should be able to turn the remaining bottom sections of the plastic drinks bottles upside down so that they completely cover the glasses or paper cups you've chosen.

Carefully cut the top off the 2 litre drinks bottle so that the remaining bottom section is slightly taller than the two 1 litre containers you've just cut.

If you have strip thermometers, tape the ends of them so that they're held firmly against the sides of the two glasses – one on each, at about the same height.

Fill your mixing jug with hot water from the tap (but be careful – it doesn't need to be dangerously hot!). Fill both glasses with exactly the same amount of the water from the mixing jug. This will ensure that they both start at the same temperature.

Pop one of the 1 litre bottle bottoms over each of the two glasses, and over one of them, also put the bottom of the 2 litre bottle. It should fit over quite



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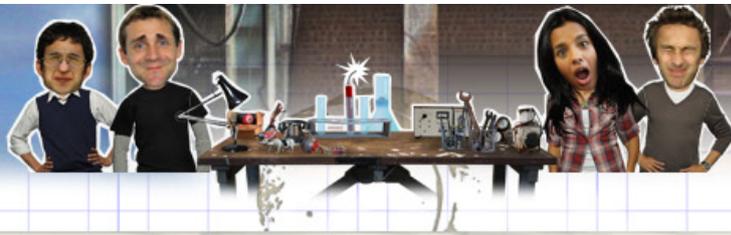


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comfortably, leaving a small air gap between the inner and outer layers of plastic. This creates your 'double glazing' on one glass, whilst your other is 'single glazed'.

If you're using a thermometer which you need to dip in the water, then use this to measure the temperature of each glass at the start, and then every minute or two for the next 10 minutes.

If you're using the strip thermometers you may need to wait a few minutes for the temperature to display if your water is really hot. But when it starts to cool down, the temperatures should start to appear, and will change as the two glasses cool.

WHY:

The temperature of the water in each glass should drop slowly as they cool down, but the water in the glass under the two plastic bottles ('double glazing') should cool more slowly than that under just one ('single glazing').

Windows used to be made from a single sheet of glass, but now we are all being asked to replace these with double or even triple glazing. Double glazing consists of two sheets of glass with a gap between the two, and they can prevent much more heat from escaping from the house. The reason that double glazing is much better at insulating is partly due to the gap between the sheets. Air, along with other gases often used in the space between the sheets, is a good insulator - heat doesn't travel through it very easily. The air gap between the two plastic bottles in this experiment works the same way, helping insulate the hot water and slow down the cooling process.

You can use this set-up to experiment with other ways of keeping heat in your house. Try replacing the second plastic bottle with a winter hat. This is like adding insulation to your roof space - does it slow down the cooling process? Try cutting a hole in one of the plastic bottles - this is a bit like leaving a window open in your house. Does it make the water cool down faster? What else can you think of trying out?



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