BBC TERRIFIC SCIENTIFIC

Student Worksheet

Water
Investigating the Mpemba effect.

Water

Mpemba and the Ice Cream

One day in Tanzania, a boy called Erasto Bartholomeo Mpemba was at school. Their lesson that day was how to make ice cream (what a 'cool' lesson!). Before the mixture went into the freezer, it had to be boiled and cooled. Unfortunately Mpemba was running late. If he didn't get his ice cream mixture in the freezer quickly, there wouldn't be any space, but his was still boiling hot! Mpemba did what a lot of us would do – he shoved his mixture quickly in the freezer and hoped for the best. When he checked on his ice cream, Mpemba was very surprised!

In Science experiments, you can get a lot of different results and often they're surprising and not what you expected (or predicted) would happen. That doesn't make them wrong.

Try this experiment and see what results you get!

Which water do you think will freeze quicker, warm or cold?

Method

1. Predict which water you think will freeze more quickly, warm or cold, and write your prediction down on your ‘My Results sheet’.
2. On your first mini cup, write, ‘C’ (this stands for, ‘Cold’).
3. On your second mini cup, write, ‘W’ (this stands for, ‘Warm’).
4. Put the mini cups with, ‘W’ in the centre of the table.
5. Measure out 25ml of cold water into your mini cup marked ‘C’. Put all your group’s mini cups in your group tray (these will go into the freezer with the warm water).
6. Start your timer when the mini cups are put in the freezer.
7. After about 60 minutes, your teacher will give you one of the mini cups from the freezer. Record whether you have a ‘W’ or a ‘C’ container. Note down any changes to the water inside the mini cup and fill in your results sheet. (If you need to, empty out the mini cup into the clear plastic tray. This may help your observations).
8. You will be given another mini cup. Again, mark down any changes on your results table. Note the time each mini cup comes out of the freezer.
9. Keep recording the changes to the water until either the water has frozen solid or you run out of mini cups.

Results

Fill out your results on the sheet provided by your teacher.

Remember:

You can use a scale of 1 to 5 to describe how frozen the water in your mini cup is, where 1 is liquid water and 5 is completely frozen.

Conclusion

Did the warm and the cold water freeze at the same time?
Are the results what you expected?

Complete this sentence;

From my experiment I have found

What could you change in this experiment? Can you improve the experiment?

Complete the sentence;

From my experiment I have learnt

Remember:

Whatever your results were for your experiment, they weren't, 'wrong', they were results!

History

Mpemba may have noticed this effect back in 1963 but he wasn't the first to discover it.

Aristotle noticed that when water was previously warmed (perhaps by the sun) it often froze more quickly.

Francis Bacon noted that slightly tepid water freezes more easily than, 'utterly cold' water.

Descartes even wrote about it.

Many other people throughout history have noticed this effect and yet it was a schoolboy, who was told that his results were wrong, that has had the effect named after him. What will your effect be called?

Mpemba and the Ice Cream... (continued)

When it came to taking out his ice cream, Mpemba noticed that his had actually frozen more quickly than the ones that were cold to start with. Mpemba asked his teacher why this could be but they told him he was wrong and classmates laughed at him.

Ever since scientists have continues to examine the 'Mpemba Effect'. There are lots of different theories and new ideas, one day you may be able to unlock this mystery!