

What happens when... Hot and cold air meet?

This activity is to aid students understanding of how different air masses interact and how this relates to weather patterns.

By conducting a simple experiment, students will observe the behaviour of warm and cold water, which simulates the interaction of warm and cold air masses in the atmosphere.



Time required
45-60 minutes

Objective: Students will learn about the difference in density between warm and cold air (using water in the experiment) and how these differences cause warm air to rise above cold air.

This concept will help with the understanding of the formation of weather fronts and the various weather conditions they bring.

Materials required:

- A large empty clear plastic food container (around 15×20cm or larger and at least 6cm deep)
- Ice cube tray
- Blue and red food colouring
- Warm and cold water
- Sheet of plain white paper



Method

- 01** Mix some cold water with a few drops of blue food colouring and fill your ice cube tray. Place it in the freezer for a few hours until you have blue ice cubes.
- 02** Fill your food container about half full of warm tap water.
- 03** Place it on a table and prop up the sheet of white paper behind.

Hypothesis: Encourage the group to predict what they think will happen when the warm and cold water meet.

- 04** At one end of the container put in a few drops of red food colouring and at the other very gently place three of your blue ice cubes.
- 05** Without moving the container, watch through the side at what is happening. How are the two different colours moving?

What you should see

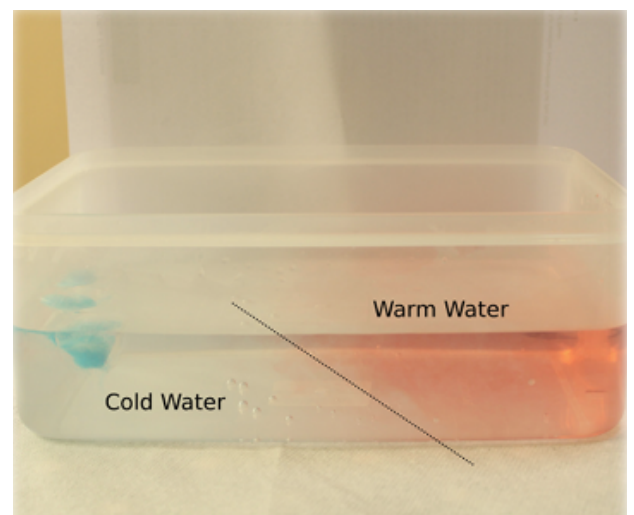
When warm water (coloured red) and cold water (coloured blue) are placed in the same container, the warm water will rise above the cold water, forming two distinct layers. This is because warm water is less dense than cold water.

After the experiment

Discuss with the group about the results.

Suggested questions:

- What did you observe?
- Why do you think the warm water rose and the cold water sank?
- How does this relate to weather patterns?



The science behind the experiment

Warm air (and warm red water) is less dense than cold air (and cold blue water), so the warm air rises above the cold. This is what happens at a weather front, for example, when warm air from tropical regions meets cold air from the Arctic, the warm air rises above the cold air.

Additional experiments or parameters to your experiment:

- Using different temperatures of water to see how it affects the movement.
- Add salt to the cold water to see how it changes the density and behaviour.

Met Office real work examples

Radiosondes

Weather balloons, or radiosondes, measure meteorological variables with height, such as air pressure, wind speed, humidity, and temperature. This data helps meteorologists understand the vertical structure of the atmosphere and predict weather change.

[Find out more about radiosondes here.](#)



Shipping forecast

The UK shipping forecast is an example of how air masses and weather fronts are used to predict weather conditions at sea. Forecasters use data collected on air pressure, wind speed, and temperature to create accurate forecasts for mariners.

[Find out more about the shipping forecast here.](#)



Want to learn more about weather fronts and how to read a synoptic chart?

Take a look at the links below:

- [Air masses](#)
- [Weather fronts](#)
- [How to read a synoptic chart](#)

The Met Office provides free education content to support young people aged 5-18 to be prepared for the effects of weather and climate change on them and their communities. Find out more at www.metoffice.gov.uk/schools

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