



University
of Basel

Swiss Nanoscience Institute



Fun with melting ice

Ice melting in water is an everyday phenomenon that we are all familiar with. Today we're going to take a closer look at this process, and have some fun with melting ice.

What you'll need

- water
- food dye (you could also use ink or watercolors)
- an ice cube tray
- a tall glass
- a thermometer (ideally a long waterproof thermometer, but an electronic forehead thermometer works too). You can still do the experiment even if you don't have a thermometer.

Instructions

- Color the water with food dye and pour it into an ice cube tray. Put the tray in the freezer.
- Once the ice cubes have frozen solid, fill a tall glass with lukewarm water and add one of the colored ice cubes. Carefully watch what happens.
- Next, fill the glass with hot water and add another ice cube. Watch what happens.
- Now fill the glass with cold water and watch what happens when you add the ice cube.



- Finally, fill the glass with hot water once again and add several ice cubes at once. Then use the thermometer to measure the temperature at the top and at the bottom of the glass (on the outside if you have a forehead thermometer, or in the water if you have a long waterproof thermometer).



What you will see

- The ice cubes melt in the water. You can watch the food dye flowing towards the bottom of the glass along with the cold water from the ice cube. In hot water, the ice cube melts faster than in cold water.
- When you melt several ice cubes in hot water, the temperature at the top of the glass will be somewhat higher than at the bottom – even though the ice was floating at the top of the glass, and melted there.



How it works

The cold water from the melting ice cubes is heavier than the warm water in the glass, so it sinks to the bottom.

When water is heated, the particles move around faster and faster, taking up more space. As a result, a given volume of hot water contains fewer particles, making hot water less dense – and therefore lighter – than cold

water.

If you'd like to know more:



Most substances increase in density the colder they get. This applies to water as well – although only down to a temperature of 4°C. At 4°C, the water particles are as close together as they can be. In other words, at this temperature water reaches its maximum density.

If it gets any colder, ice begins to form – the water changes to the solid state – and the water particles arrange themselves in a crystal lattice structure, taking

up more space once again. In this state, a given volume contains fewer water particles, so the ice has a lower density than liquid water. This is why ice floats rather than sinking.

This phenomenon is known as the density anomaly of water, and is very important for creatures that live in standing bodies of water. When a lake freezes over in winter, the ice floats on the surface. Beneath it is the heavier water, which still has a temperature of 4°C. As long as the lake is deep enough, it doesn't freeze entirely, allowing plants and animals to survive.