

The Power of Pressure

In keeping with the theme of Science Week 2014, here are some activities to demonstrate the “power” of air pressure.

SCIENCE WEEK

9-16 NOVEMBER 2014

THE POWER OF SCIENCE

THE SYRINGE KETTLE

YOU WILL NEED

A plastic syringe, a small glass or beaker containing some warm water (“hand hot” from the hot tap), digital thermometer.

BASIC INSTRUCTIONS

Feel free to experiment!

1. Take note of the water temperature - we used water at 40°C approx. (If you don't have a thermometer, “hand hot” is usually $\frac{1}{4}$ boiling water mixed with $\frac{3}{4}$ cold water).
2. Draw some water into the syringe and let it settle - make sure there are no air bubbles.
3. Close the opening of the syringe tightly with your thumb.
4. Pull out the plunger of the syringe as strongly as you can, as far as you can.
5. Observe very closely what happens to the water - can you see the bubbles of the water boiling in the syringe.
6. Relax and empty the syringe, and repeat the process with varying amounts of water.



INVESTIGATE

- What happens if you try water at various temperatures?
- Does the volume of water drawn into the syringe matter?
- If you have a selection of syringe sizes, is there a “best” size to make the water boil?
- Can you re-design the set up so you can measure the temperature of the water in the syringe as you carry out the experiment?

WHAT IS HAPPENING?

Water in the kettle in our kitchens usually boils between 90°C and 100°C. If the pressure is reduced however, the water molecules begin to “boil” at a much lower temperature - boiling is visible when bubbles of water vapour are seen moving quickly in the liquid water.

The reduction in pressure reduced the BP (boiling point). (This is why mountaineers don't enjoy their cup of tea at the top of mountain - the lower air pressure means their kettles of water boil at a lower temp, affecting the taste of their cuppa!).

EXPLORE MORE...

So is the opposite true? What happens to BP when pressure is increased? Watch how a pressure cooker is used to sterilise equipment, and cook food quickly, in this animation <https://www.youtube.com/watch?v=TWV3FbgPPXo>