

Cartesian Diver

Learn about buoyancy!

Equipment

- A 2 litre plastic drinks bottle, with a lid
- A pipette



Method

1. Fill the 2 litre bottle to the very top with water.
2. Fill the pipette $\frac{1}{4}$ full with water (so that it will be light enough to float)
3. Put the pipette in the bottle, make sure it floats and then screw the bottle lid back on.



4. Squeeze the sides of the bottle. The pipette (known as the diver) sinks. Release your squeeze and it will float back up to the top.

How does it work?

Initially, the weight of the pipette is balanced by the weight of the water it is displacing (Archimedes principle). The air in the pipette compresses more easily than the water, and so when you squeeze the bottle, increasing the pressure, the air is compressed. At this point, water is pushed into the pipette, increasing its mass. The float sinks. When the bottle stops being squeezed the pressure is

decreased and the diver floats back to the surface.

Possible extension: turn it into a competition by adding a hook to the bottom of your float. Place something heavy with an upward hook at the bottom of the bottle. Can you anchor the float?

In the atmosphere, if air is forced to rise over something like a mountain, it will either end up more or less buoyant than the air around it – it will either carry on rising or sink back to the level it came from. If it carries on rising, you can get clouds.



Where can I find out more information?

For a video of the experiment please see here:

<http://www.stevespanglerscience.com/experiment/00000089>

http://en.wikipedia.org/wiki/Cartesian_diver and
<http://www.physics.org/tricks/cartesian-diver/>

An article about using Cartesian divers to teach physics:

<http://www.iop.org/EJ/abstract/0031-9120/42/5/004>

More about atmospheric stability:

http://metlink.org/pdf/teachers/iop_atmospheric_stability.pdf

Alternatively...

If you don't have a pipette, you could use some condiment sachets (eg tomato ketchup) or a ball point pen lid, weighted with paper clips or blue tack. Select a sachet that just floats/ add paper clips or blue tack to the pen lid until it just floats, open end down, and then carry on as above.