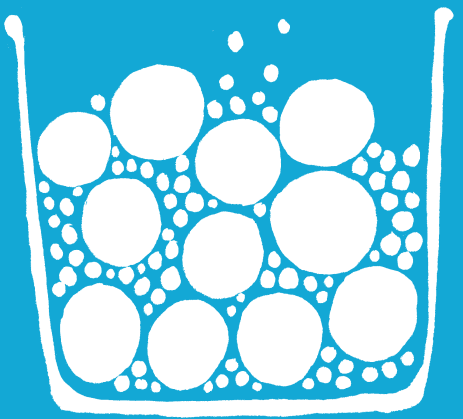
SCIENCE
CHALLENGE

12

100+100=192?



THE
JAMES
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FOUNDATION

100+100=192?

SCIENCE CHALLENGE 12

Designed by Chloe,
Research engineer at Dyson

The brief

Add water to ethanol and find out why it doesn't add up.

The method

1. Measure out exactly 100ml of water and 100ml of ethanol.
2. Add the two solutions together in the large measuring cylinder and look at the measurements.
3. You would expect the resulting solution to measure exactly 200ml, however it should actually give a volume of around 192ml.

Top tip

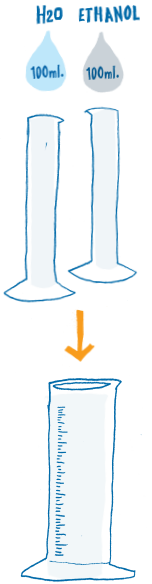
When measuring the liquids, practice your lab skills and get down to eye level to measure to the meniscus. Make sure you get every last drop, and monitor your mixture to see if any gas is given off.

Materials

100ml of water

100ml of ethanol (with adult supervision)

Three measuring cylinders – two smaller to measure out the liquids, and one larger to mix and read off the resulting volume.



How does it work?

When mixed together, the combined molecules fit together better than when they are alone, so they take up less space. It's similar to what happens when you mix a litre of sand and a litre of rocks. What's more, the OH- component of the ethanol and the H+ of the water molecules are attracted to each other - creating hydrogen bonds. These bonds create a tight molecular formation, reducing the volume of the combined liquids.