

EXPANDING
GASESCHALLENGE
19

THE BRIEF

FIND OUT WHAT HAPPENS WHEN GASES ARE HEATED
UP OR COOLED DOWN.

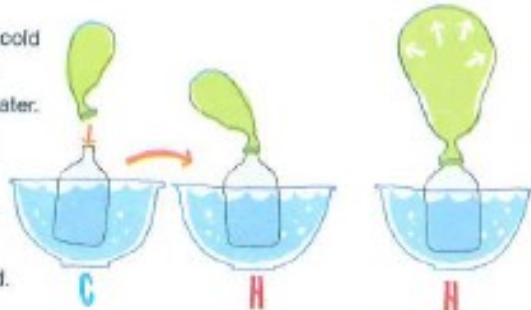
MATERIALS

Two bowls, cold water, hot water (with adult supervision), sturdy plastic bottle and a balloon.



THE METHOD

- 1 Fill two bowls – one with cold the other with hot water.
- 2 Put the bottle into cold water.
- 3 Fit a balloon to the neck of the bottle.
- 4 Now place the bottle into the hot water.
- 5 Watch the balloon expand.



HOW DOES IT WORK?

Gas expands when it is heated. This is known as Charles' Law. The rule is, if the pressure of a gas remains constant, the volume of the gas will increase as the temperature increases. So if the temperature increases, the gas takes up more space.

The principle was first formulated by the French physicist Jacques Alexandre Cesar Charles in 1787.

DESIGN
ICONS

STEAM ENGINES heat up air and allow it to expand in cylinders to drive wheels.



Challenge designed by:
David, senior mechanical engineer at Dyson

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TORNADO
IN A BOTTLECHALLENGE
20

THE BRIEF

CREATE A WATER VORTEX IN A BOTTLE.

MATERIALS

Water, a clear plastic bottle, glitter, washing up liquid.



THE METHOD

- 1 Fill the plastic bottle with water until it reaches around three quarters full.
- 2 Add a few drops of washing up liquid.
- 3 Sprinkle in a few pinches of glitter (this will make your tornado easier to see).
- 4 Put the cap on tightly.
- 5 Turn the bottle upside down and hold it by the neck. Quickly spin the bottle in a circular motion for a few seconds. Stop and look inside to see if you can see a mini tornado forming in the water. You might need to try it a few times before you get it working properly.



HOW DOES IT WORK?

The water is rapidly spinning around the center of the vortex due to centripetal force. This is an inward force directing an object or fluid such as water towards the center of its circular path.

DID YOU
KNOW
?

Vortexes found in nature include tornadoes, hurricanes and waterspouts.



Challenge designed by:
Adam, design engineer at Dyson

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