# CHANGING STATES

SCIENCE CHALLENGE **01**

Designed by Charles,
Design engineer at Dyson

## The brief

Make an egg fit into a bottle without breaking it.

## The method

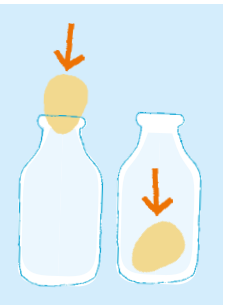
1. Submerge the egg in a glass of vinegar for two days: the shell will become rubbery.
2. Heat the bottle in hot water – remember to use gloves or a tea towel when handling it.
3. Rest the egg on the neck of the bottle.
4. As the air inside the bottle cools down, it will contract and suck the egg down.

## Top tip

Try lubricating the egg with cooking oil or dish soap.

## Materials

- An uncooked egg
- A pot of boiling water (with adult supervision)
- A glass of vinegar
- A wide-mouthed glass bottle

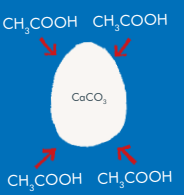


## How does it work?

Eggs are rich in protein. When heat is applied, chemical bonds within the protein molecules are broken, and new bonds are formed between adjacent molecules. This creates a network of inter-connected proteins which causes the egg to go hard.

Vinegar contains acetic acid ($CH_3COOH$) that dissolves the calcium carbonate ($CaCO_3$) shell but leaves behind the egg's springy membrane.

**Before**




**After**

