

Science & Technology Challenges

Investigate this picture...

- What would you use this invention for?
- What sort of materials have been used in its construction?
- Would you be interested in making this product and testing it out?



Let's build a tower!

What will I need?

- Bag of marshmallows
- Pasta or wooden skewers.

Your goal is to build the tallest tower you can without it falling over. It needs to be freestanding. That means it has to stand up without your support! You could even have a competition with your parents.

During the construction of your tower:

- How many wooden skewers/pasta sticks have you used in your tower?
- How many marshmallows have you used?
- How tall is your tower in centimeters?
- Are some shapes stronger than others?
- **Where else do you see these shapes?** used for strength?

Floating Ping-Pong balls

The brief:

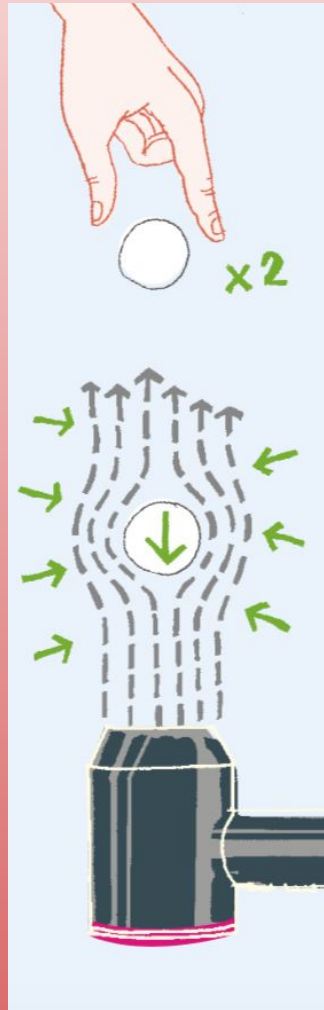
Make two ping-pong balls float in the air flow of a hair dryer at the same time, without hitting each other.

Materials:

- Two ping-pong balls
- A hairdryer (on cool setting)

How does it work?

Share your thoughts with someone at home. What causes the ping pong balls to remain where they are?



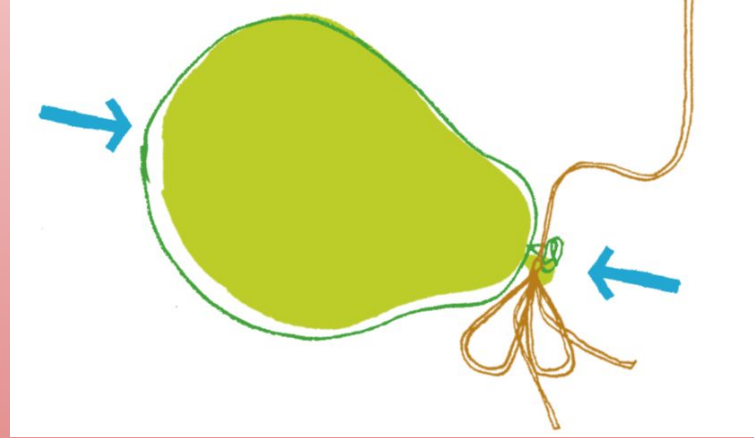
Balloon Kebabs

The brief:

Push a wooden skewer through a balloon without popping it, creating a “balloon kebab”

Materials:

- A balloon inflated until $\frac{3}{4}$ full
- A wooden skewer
- Oil.



How does it work?

Most of the balloon is stretched evenly, but there are two points where the rubber is least stretched. Can you find where these two points are? These two points have the lowest surface tension. Most of the balloon is under high tension, so attempting to push the skewer through any part of the balloon may make it pop.

Changing States

The brief:

Make an egg fit into a bottle without breaking it.

Materials:

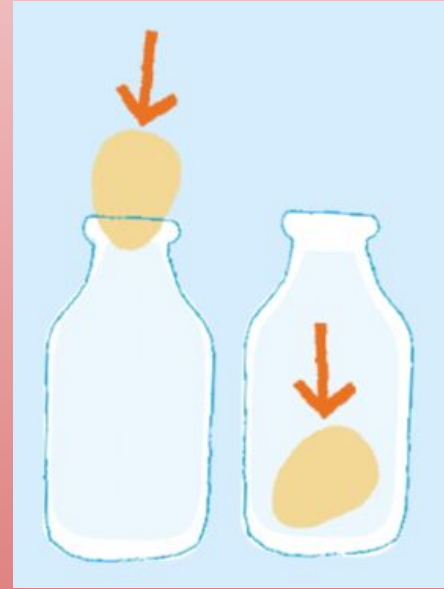
- An uncooked egg
- A bot of boiling water (with adult supervision)
- A glass of vinegar
- A wide-mouthed glass bottle

How does it work?

What causes the egg to shrink and slip into the bottle? Have a discussion with someone at home.

I'll give you a clue. It has something to do with a change in temperature.

Think you can solve it?



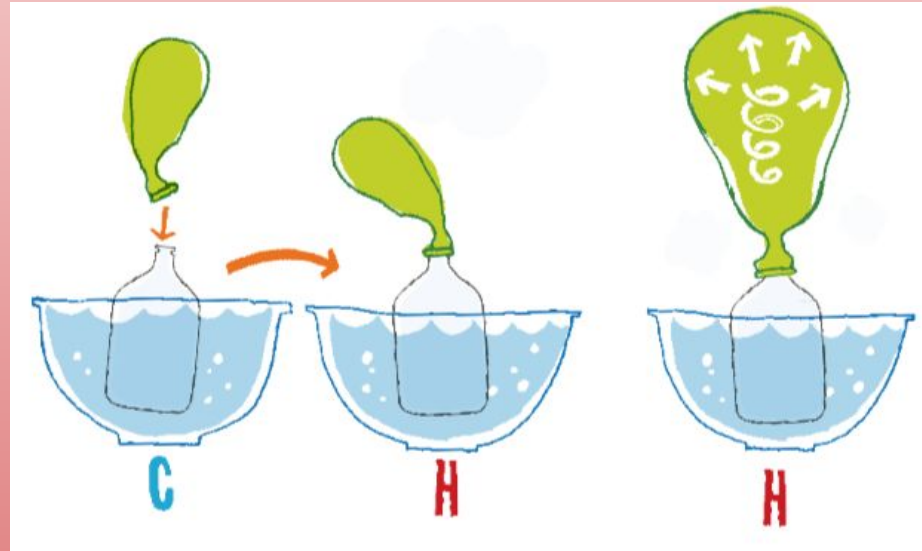
Expanding Gasses

The brief:

Find out what happens when gases are heated up or cooled down.

Materials:

- Two bowls
- Cold water, hot water (with adult supervision)
- A sturdy plastic bottle
- A balloon



How does it work?

Why does the balloon expand? Have a discussion with someone at home. This experiment is similar to a hot air balloon.

Density of liquids

The brief:

Layer different liquids in a tube and discover how and why they settle in a certain order.

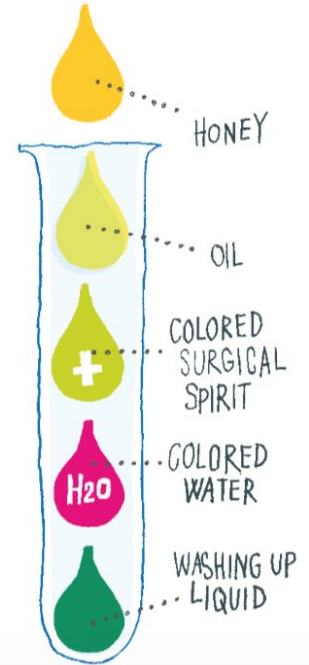
Materials:

- A tall glass or bottle.
- Honey
- Oil
- Rubbing alcohol
- Water
- Dish soap
- Two shades of food colouring.

How does it work?

We encourage you to predict which order the liquids will settle in. The layers may be slightly mixed at first so give it time to separate.

Have a conversation at home. What have you discovered? What would happen if you put these liquids into the glass in a different order? Would you get the same result?



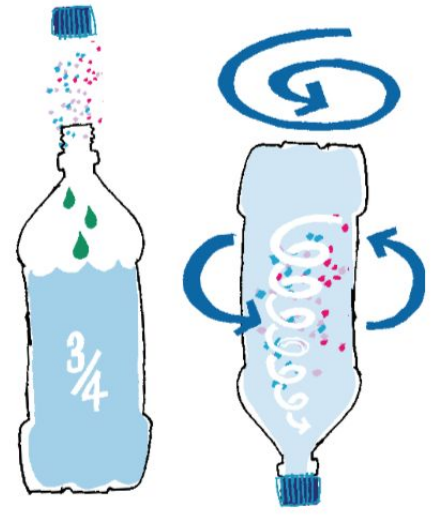
Tornado in a bottle

The brief:

Create a water vortex in a bottle

Materials:

- Water
- A clear bottle (glass or plastic)
- Glitter
- Dish soap.



How does it work?

Was your experiment a success or did you need to adapt it slightly? What did you find most interesting about this experiment? How are you creating the tornado and what forces are at play during this experiment?

Volcano in a bottle

The brief:

Create a volcanic eruption simulation in a bottle.

Materials:

- 10 ml of dish soap
- 100 ml of warm water
- 400 ml of white vinegar
- Food colouring (just a few drops)
- Baking soda slurry
- Empty 1.5 litre soda bottle



How does it work?

Share your thoughts with someone at home. What is causes the baking soda, vinegar and dish soap to react in this way? Does the amount of vinegar change the eruption? Does the amount of water change the eruption? Does the amount of baking soda change the eruption?