Science and Engineering cards 19th February

How many of these Challenges can you complete?

Tweet or Upload to Teams and let us know how you got on.

Good Luck!

CHALLENGE CARDS

40 engineering and science challenges from the engineers at Dyson.

THE JAMES DYSON FOUNDATION

Please note that the activities contained here in are intended for children ages seven and above. Adult supervision is recommended for all projects.

SCIENCE CHALLENGE 03

FLOATING PING-PONG BALLS

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SCIENCE CHALLENGE 03

FLOATING PING-PONG BALLS

Designed by Alex,
Design engineer at Dyson

The brief

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

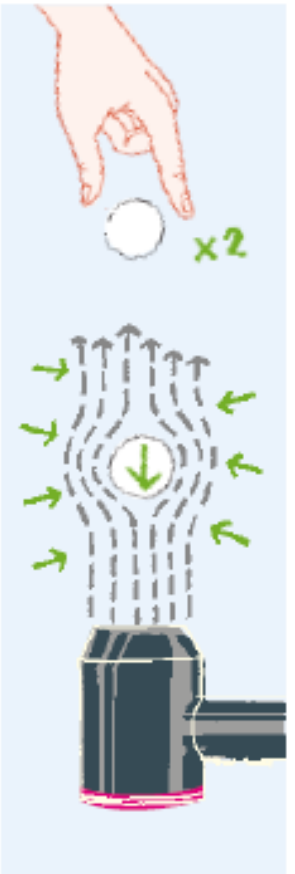
Materials

Two ping-pong balls

A hairdryer (on cool setting)

The method

1. Switch on your hairdryer, making sure it is on the cool setting.
2. Hold it with the nozzle pointing upwards.
3. Place one of the ping-pong balls into the stream of air.
4. Try and place another ball into the same stream of air – on top of the first ball.



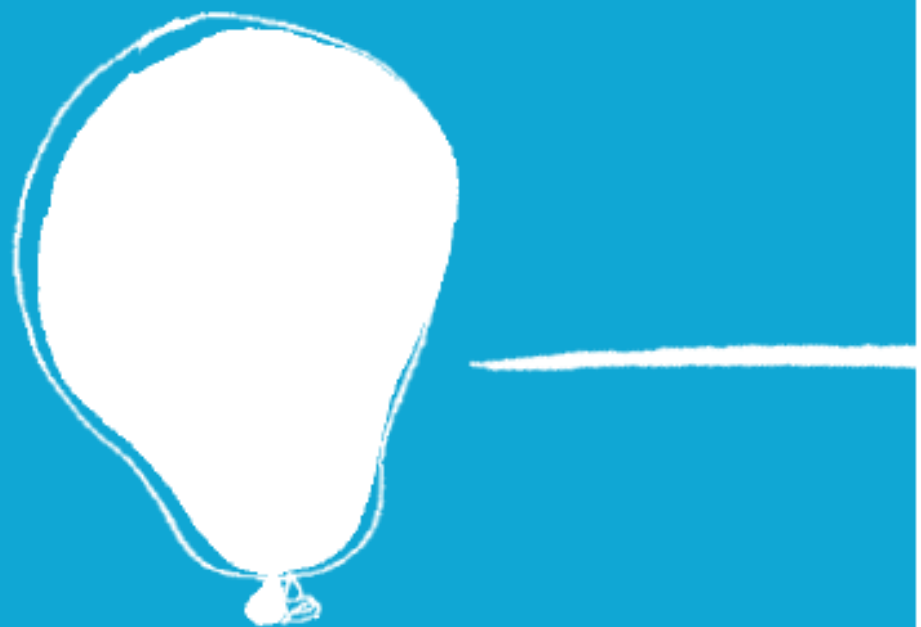
How does it work?

The hair dryer produces a high velocity stream of air with low pressure. The surrounding air is at a higher pressure which keeps the ball inside the stream. When the upward force of the air equals the weight of the ping-pong ball the ball is said to be in 'equilibrium'.

The theory at work here is Bernoulli's principle. This is an equation linking air pressure, velocity and density with particle weight.

SCIENCE CHALLENGE 04

BALLOON KEBABS



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BALLOON KEBABS

Designed by Phil,
Design engineer at Dyson

The brief

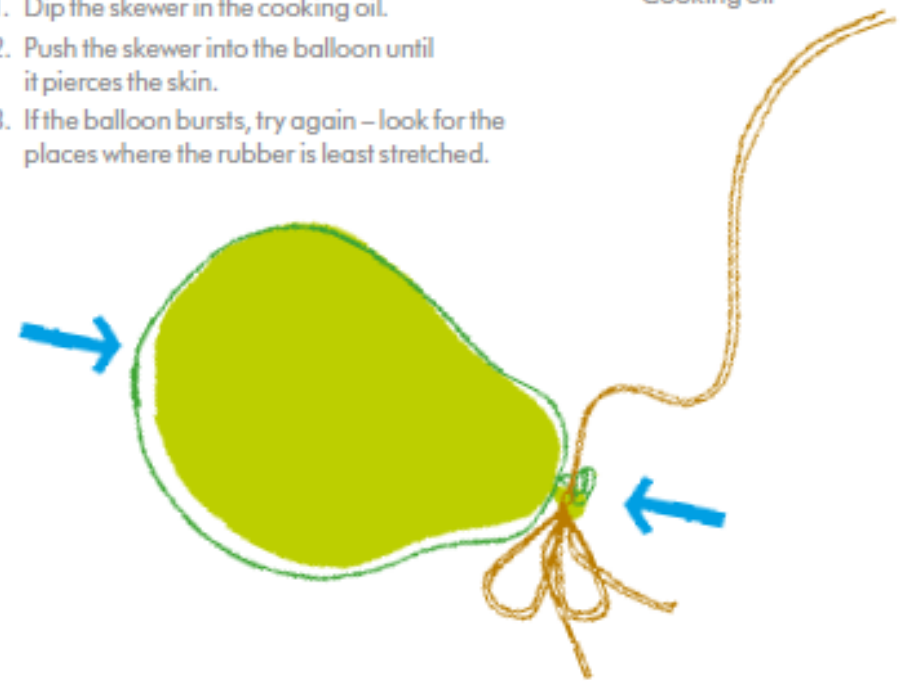
Push a wooden skewer through a balloon without popping it, creating a "balloon kebab".

Materials

- A balloon inflated until ¾ full
- A wooden skewer
- Cooking oil

The method

1. Dip the skewer in the cooking oil.
2. Push the skewer into the balloon until it pierces the skin.
3. If the balloon bursts, try again – look for the places where the rubber is least stretched.



How does it work?

Most of the balloon is stretched evenly, but there are two points where the rubber is least stretched. The tied section and the darker patch at the opposite side of the balloon have the lowest surface tension. Most of the balloon is under high tension, so attempting to push the skewer through just makes the balloon pop. At the low tension sections it is possible to make a small hole without breaking the overall surface of the balloon.

ENGINEERING CHALLENGE 03

SPAGHETTI BRIDGES

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SPAGHETTI BRIDGES

Designed by Kristian,
Design engineer at Dyson

The brief

Construct a free standing bridge out of spaghetti, strong enough to support a 250g bag of sugar.

The method

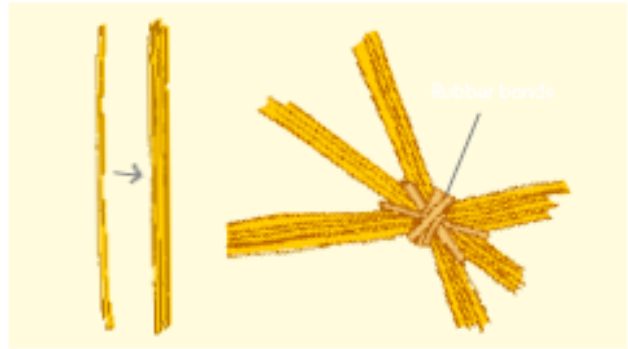
Think about bracing strands together for strength. Some shapes are better at absorbing loads – triangles are particularly strong. Rubber bands make for good junctions.

Top tip

Be patient. Through trial and error, you'll become proficient at working with spaghetti.

Materials

- Spaghetti
- Small rubber bands or bag ties
- Sticky tape
- 250g bag of sugar



How does it work?

Bridges manage two important forces: compression and tension – pushing and pulling. Too much of either and they buckle or snap.

Design icons

Why not take inspiration from these iconic bridge designs?

ENGINEERING CHALLENGE 04

STRONG AS A DRINKING STRAW

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ENGINEERING CHALLENGE 04

STRONG AS A DRINKING STRAW

Designed by Phil,
Design engineer at Dyson

The brief

Use a drinking straw to pierce through a raw potato.

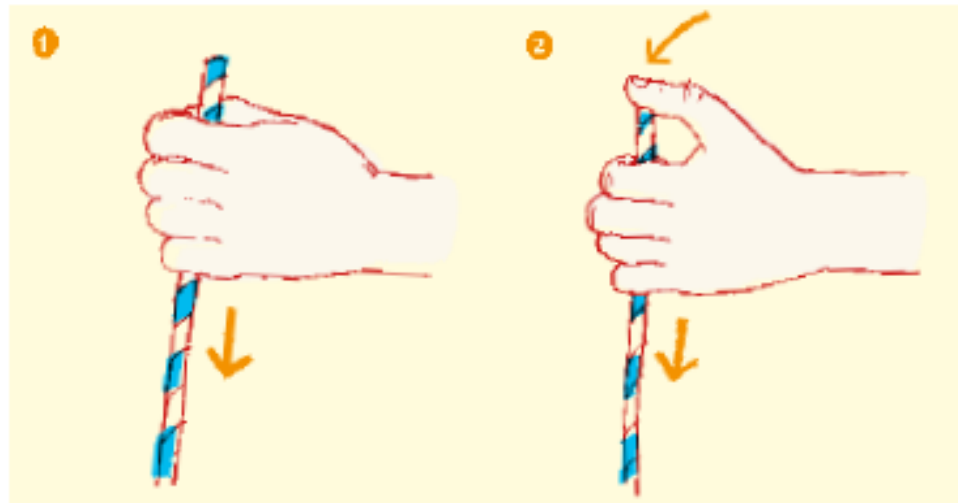
Materials

Two stiff drinking straws

A firm, raw potato

The method

1. Hold the straw by its sides, without covering the hole at the top and try quickly stabbing the potato.
2. Repeat the experiment with a new straw but this time place your thumb over the top, covering the hole.



How does it work?

Covering the top of the straw with your thumb traps air inside, forcing it to compress as you stab the straw through the potato skin. This creates enough rigidity within the straw to pierce the potato.