Science remote learning

Note for parents

What does the PowerPoint contain?

Below is body of work based on our science topic – **Materials and Change**

The topic is meant to be covered over a two week period

Pages 3-18 consists of the key learning.

The other pages are optional extras, but if completed, they will help broaden and deepen understanding of the topic.

Important:

There are many video links on the pages below.

The children just need to click the correct images in order to watch them.

The videos are meant to help the children to learn independently; however, given the nature of the topic, and the concepts it deals with, some assistance may be required at times.

What they'll need:

- Pencil
- Paper
- Computer
- Internet access
- Colouring pencils
- Any materials required for the experiments and activities they choose to do

Hello fourth class!!

Hope you're all doing well during these challenging times. All the teachers are thinking of you and look forward to seeing you again soon.

For the next couple of weeks in SESE, we will be focusing on science.

We will be looking at the wonderful world of **materials** and how they change…..

Hang on!

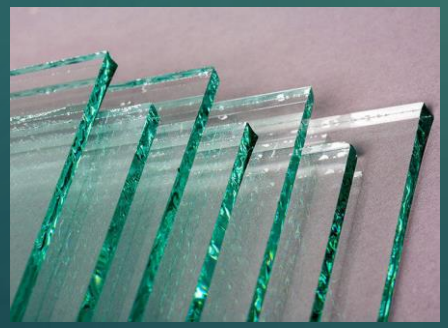
What's a **material**?

Click on the picture of plastic and glass to see where these materials come from and how they're made!!

We are surrounded by materials.

Every physical thing in our world is made of some material.

Wood, glass, metal, stone and plastic are all examples of materials; and there are many, many more such as **rubber**, **ceramics** and **fabrics.** The list goes on…



We use materials to make useful objects that help us in our daily lives.

metal

fabric

glass

plastic

wood

rubber

brick

sponge

Can you match the materials with the everyday objects??

But think for a moment, are all materials the same?

Why do we build our houses out of brick and not paper?

That's easy, my friend. We don't build houses out of paper because paper is light and absorbent: If it was windy, the house would simply blow away; Or if it rained, the paper would absorb too much water and collapse.
We use bricks because they are strong and water-resistant - much better for houses.

So materials **are** different. They have different qualities or **properties**, to use science language.

Click Einstein to watch a short story that shows why it's important to think about the materials you use to build a house!!

rigid

unable to be bent or forced out of shape

Stone is rigid.

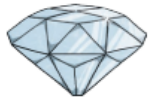
transparent

can be seen through

This glass is transparent.

hard

not easily broken or pierced



A hard diamond.

squashy

easily crushed or squeezed

The play dough is squashy.

smooth

an even and regular surface

Some smooth pebbles.

flexible

able to bend

A flexible spring.

rough

uneven, irregular surface

The log has rough bark.

absorbent

able to soak up liquid

The sponge is absorbent.

bumpy

uneven, raised patches

This shell is bumpy.

opaque

cannot be seen through

She is hidden by the opaque screen.

elastic

springs back once stretched

An elastic band.

shiny

reflects light, smooth surface

A shiny silver spoon.

dull

lacking shine or brightness

The moth's wings are dull.

brittle

hard, but may break easily

The glass is brittle.

translucent

allowing some light to pass through

The screen is translucent.

soft

not firm to the touch

The kitten has soft fur.

waterproof

repels water and liquids

A waterproof coat.

conductor

lets heat, electricity or sound to pass through it

Some metals are conductors of electricity.

Look at the list of properties and their definitions above. Which of them could you use to best describe the following objects?

1) A metal fork 2) a plastic bag 3) a carpet 4) a glass

Some of the properties of paper is that it is light and flexible, which means that it is perfect for making things like paper airplanes and origami.

Why don't you take a little break and try making some fun things with paper.

Just click the videos to follow along.

The top plane is called the Arrowhead. It flies around 100 feet.

The planes are harder to make but it'll be worth it!

Video about World record paper plane

Atoms and Molecules

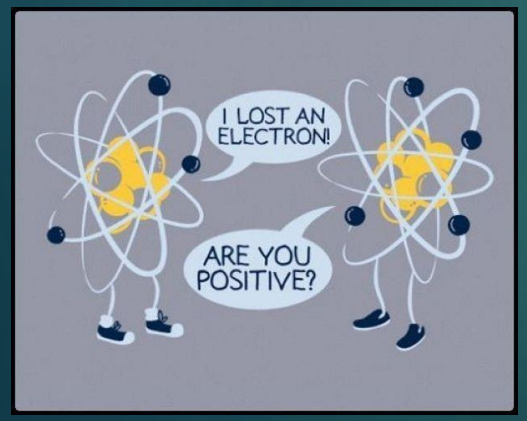
Welcome back!!

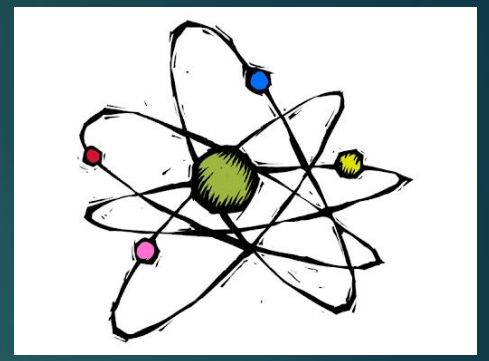
All materials are made up of tiny, tiny particles called **atoms** and **molecules**.

Just as a house is made up of lots of bricks joined together. Materials are made up of atoms, millions and millions and millions of them joined together.

Atoms are so small that millions of them would fit on the full stop at the end of this sentence. A single grain of sand contains millions and millions of atoms.

When atoms combine together, they form molecules.





How small is an atom?

Click the picture of the atom above to find out. Don't worry if don't understand everything: you just need to remember that they are really small.

Materials and how they change

Materials do not always stay the same – they can change.

An ice-lolly is mainly made of frozen water(ice), but what happens if you hold an ice-lolly for too long?

That's right; It melts, becoming softer and runnier!

But why? What changes it?

The heat from your hand or from the sun melts the ice, changing it into a liquid, water.

But what happens when you heat water? Like, for example, in a kettle?

Click the picture of the kettle to watch a short video.

What do you notice coming out of the top of kettle?

That's right, steam! Water, when it's boiled, turns into a gas, which we like to call steam.

So materials (what scientists call) matter, can change.

States of Matter – solid, liquid and gas

So water can come in three forms. It can be ice (what scientists call a solid), or It can be water (what they call a liquid) or steam (which is a gas).

Solid, **liquid** and **gas** – the **three sates of matter**.

Or, more simply, the three ways stuff can appear to us in the world

But why is water sometimes a solid, at other times a liquid or gas??

And what exactly are solid, liquids and gases?

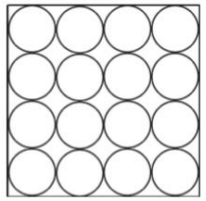
Yes, yes, I'm getting to that! Have patience!!

Why don't you click me to watch a video. It may help answer your questions.

States of Matter – solid, liquid and gas

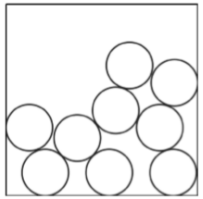
Solid

A solid is a material with a definite shape. It will not change shape unless force is applied to it. The tiny pieces, or particles, in solids are stuck very closely together.



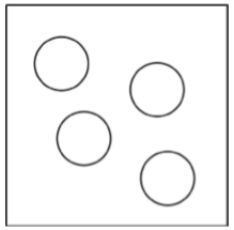
Liquid

A liquid is a material that can flow and change shape to fit a container into which it is poured. The particles are close together but move around each other easily.



Gas

A gas has no definite shape. It spreads out to fit any space. The particles in gas move quickly, spreading out in different directions.



Click the hot air balloon to watch a helpful video

So **heat** or **temperature** can change matter from solids to liquid, liquids to gas, and back again.

But....

It is not always easy to say whether a material is a solid, liquid or gas. Some liquids are so thick that they seem like solids; and some solids pour like a liquid. Many gases have no colour so it is hard to see them.

Solid, liquid or gas?

Sort the cards into the correct categories

Answers on the last page

Solid	Liquid	Gas

soup

cola

wood

wool

cream

sugar

hot air

metal

ice lolly

ice

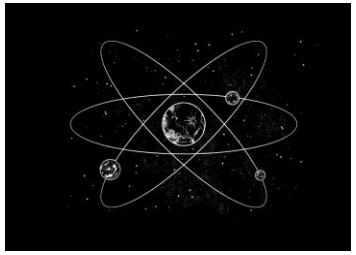
steam

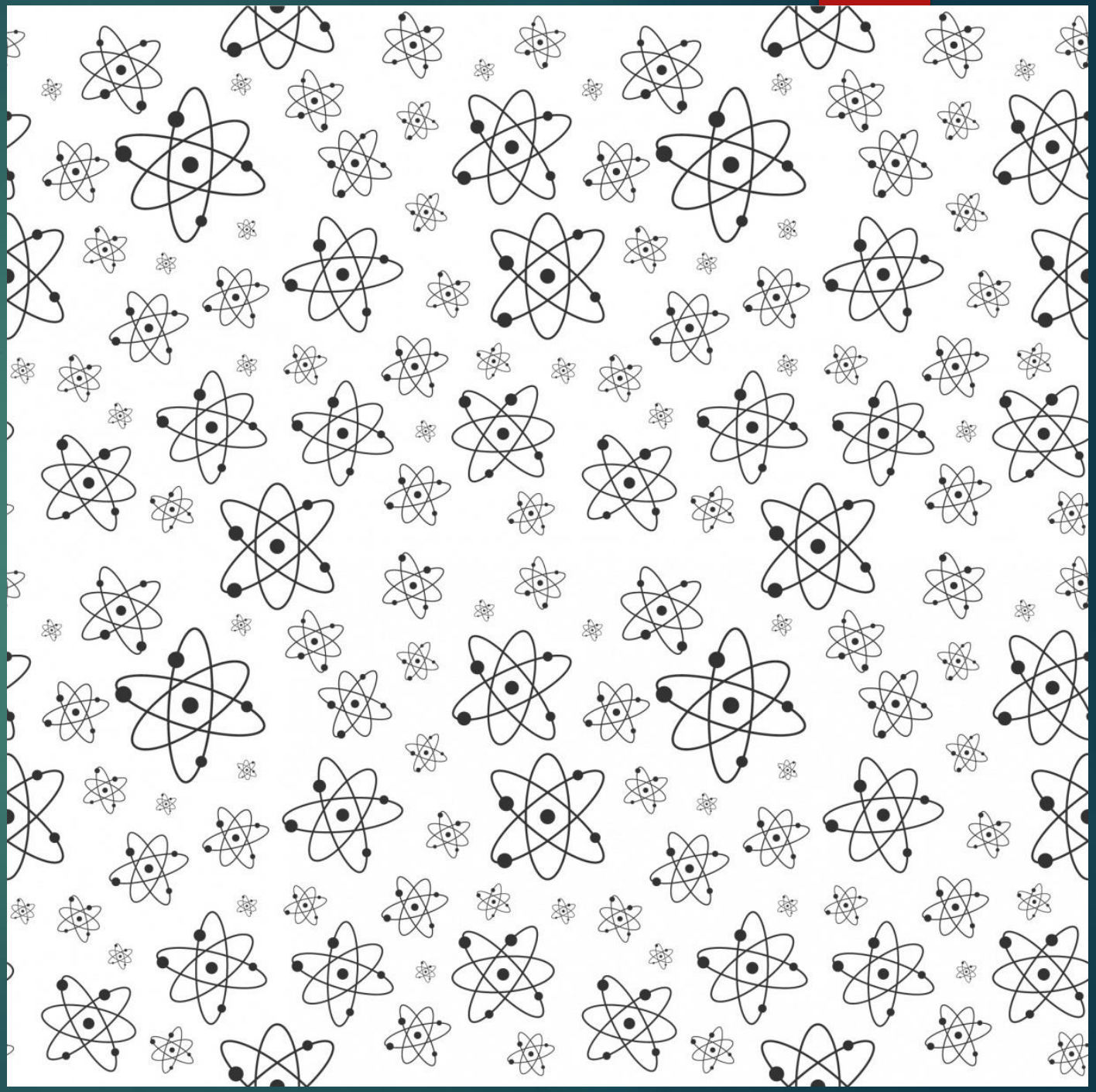
Why don't you take a break and create your own atom doodle art.

All you need to do is to do lots of drawings of atoms of different sizes on one page.

Use colour if you want.

Click the picture to watch a video on how to draw an atom.





Conductors and Insulators of Heat

Heat can travel or move through a solid by a process called **conduction.**

Materials that allow heat to pass easily through them are called **conductors**.

Materials that stop heat from passing through them are called **insulators**.

Click the saucepan to watch a video that helps to explain

The bottom of a saucepan is made of metal.
Metal is a good conductor so
Food can be heated up quickly.
The handle is made of plastic because
Plastic is a good insulator, which means
You won't burn your hand when cooking.

Of the materials above, which do you think is the best heat conductor and which is the best insulator?

Can you think of a way to test your ideas?

See the next page for an experiment you could carry out at home.

Investigation

Which Material Will Keep Your Drink Hot?

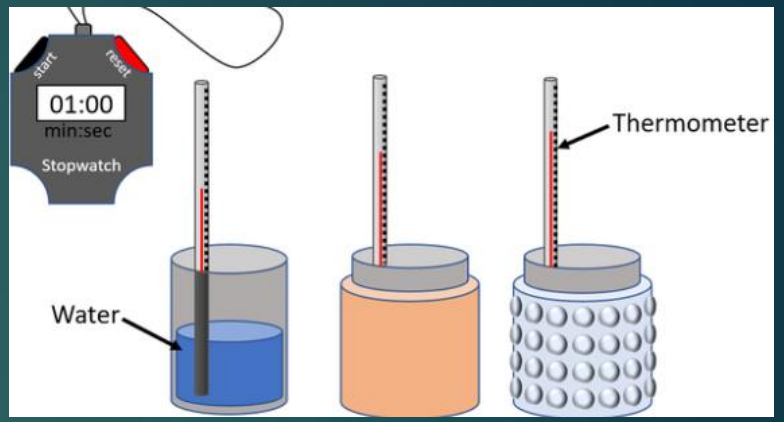
CAUTION: YOU MUST HAVE A ADULT WITH YOU WHEN DOING THE EXPERIMENT

You Will Need:

- a plastic cup
- a thermometer
- Newspaper
- Tinfoil
- woolly sock
- boiling water
- a stop-watch.

Method:

1. Pour the boiling water into one of the plastic cups. Place the thermometer in the cup and time how long the temperature takes to drop from 95 degrees Celsius to 70 degrees.
2. Record time taken.
3. Wrap the other 3 cups – one in newspaper, one in tin-foil and the other in the sock.
4. Repeat steps 1 and 2 for each of the wrapped cups.
5. Which cup kept the water warm the longest?



If for some reason you can't do the experiment at home, click the scientist below and you can watch a video version

Mixing Materials – solutions and suspensions

Changes can take place when materials are mixed with each other.

We see lots of mixtures around us everyday. Some of them are easy to spot, like when you pour milk into cereal.

Other mixtures are not so easy to spot. Sea water is a **solution**, a mixture of water and salt. Although you cannot see the salt it has not in fact disappeared; the salt has dissolved, which means that its become so small that we can't see it easily!!

A **suspension** is a mixture in which the materials do not dissolve, where they don't mix easily.

Investigate - Which materials mix well and which don't?

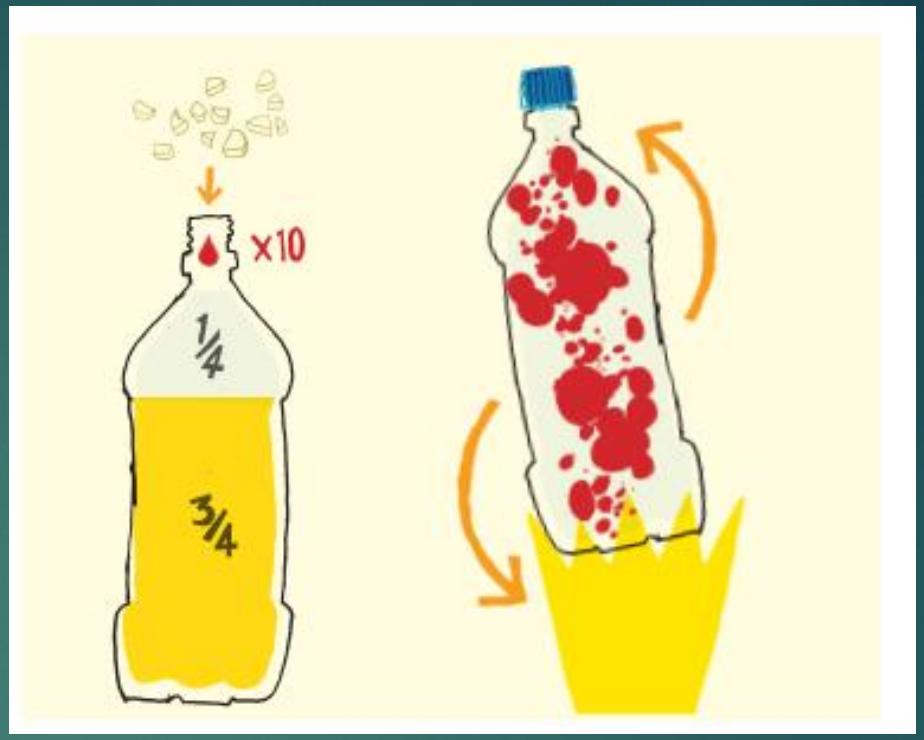
Get four off the same glasses. Half fill each with water. In the first, put a tea-spoon of water; in the second, put a teaspoon of salt, in the third , put a teaspoon of sand or soil; in the last, put a tea-spoon of cooking oil. Leave them for 15 minutes.

What do you notice??

When you are finished your experiment, click me to watch a video that will help explain some things

(Don't worry too much about any big words!!)

HOW TO MAKE A LAVA LAMP



The brief

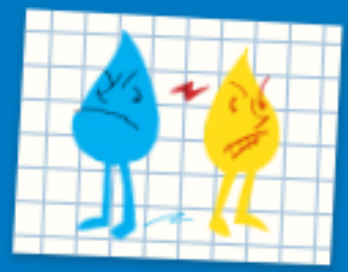
Make your own lava lamp.

The method

1. Fill the empty bottle ¾ full with vegetable oil.
2. Top it off with water and about 10 drops of food colouring.
3. Break an Alka-Seltzer® tablet into pieces, and add pieces of the tablet to the bottle. The mixture will bubble.
4. Put the cap on and gently tip the bottle back and forth. This will cause the tiny droplets of coloured water moving around inside the oil to join together, making bigger blobs. Do not shake the bottle.
5. Shine a torch into the bottle from underneath, illuminating the bubbles.

Materials

- Empty water bottle
- A large bottle of vegetable oil
- Food colouring
- Alka-Seltzer® tablets (with adult supervision)
- Water
- A torch



How does it work?

Oil is hydrophobic – it will not mix with water – even if you try to really shake the bottle. The Alka-Seltzer® tablet reacts with the water to make tiny bubbles of carbon dioxide which are lighter than water. They attach themselves to the blobs of coloured water, causing them to float to the surface. When the bubbles pop, the coloured blobs sink back to the bottom of the bottle.

Extra Experiments and Challenges

NON-NEWTONIAN FLUID

The brief

Create a liquid that turns into a solid when tapped.

The method

1. Add the corn starch to the bowl.
2. Add water slowly to the mixture, stirring in one tablespoon at a time, until all of the powder is wet.
3. Continue to add water until the corn starch acts like a liquid when you stir it slowly – but when you tap it with your finger it becomes hard.
4. Scoop the mixture into your hand and slowly work it into a ball.
5. As long as you keep pressure on it by rubbing it between your hands, it stays solid. Stop rubbing, and it melts into a puddle in your palm.

Materials

60g corn starch

60ml water

A spoon

A bowl for mixing

Design icons

Sir Isaac Newton described how 'normal' liquids or fluids behave. He observed that their viscosity only changes with variations in temperature or pressure. In non-Newtonian fluids their viscosity also depends on the force applied to the liquid.

How does it work?

When you mix cornflour with water, the large cornflour particles remain suspended in the liquid. When you stir the mixture slowly it acts like a liquid because the suspended particles have time to move past each other. When you put sudden stress on the mixture, the water quickly flows out of the area but the particles do not have enough time to move out of the way – making the mixture act like a solid.

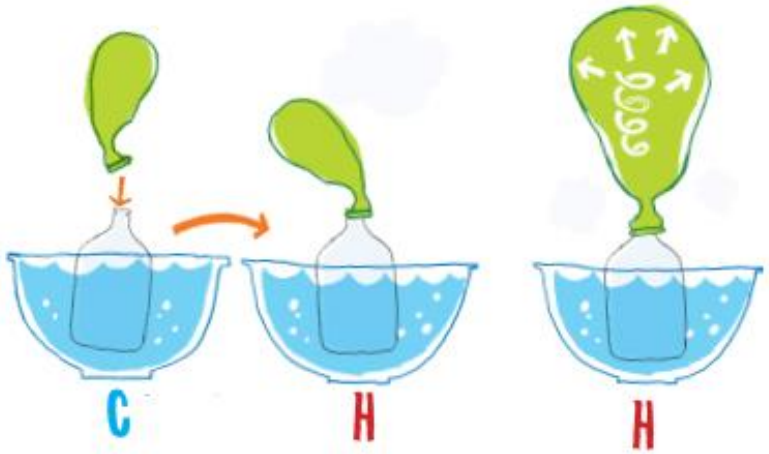
EXPANDING GASES

The brief

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

The method

1. Fill two bowls – one with cold water 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.



Materials

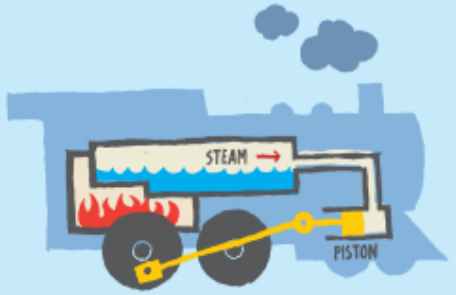
- Two bowls
- Cold water, hot water (with adult supervision)
- A sturdy plastic bottle
- A balloon

How does it work?

Gas expands when it is heated. 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. This is known as Charles' Law. 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.



CHANGING STATES

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 washing up liquid.

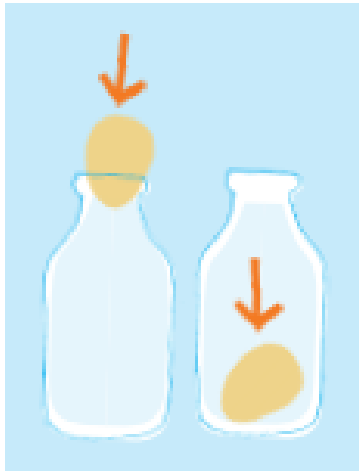
Materials

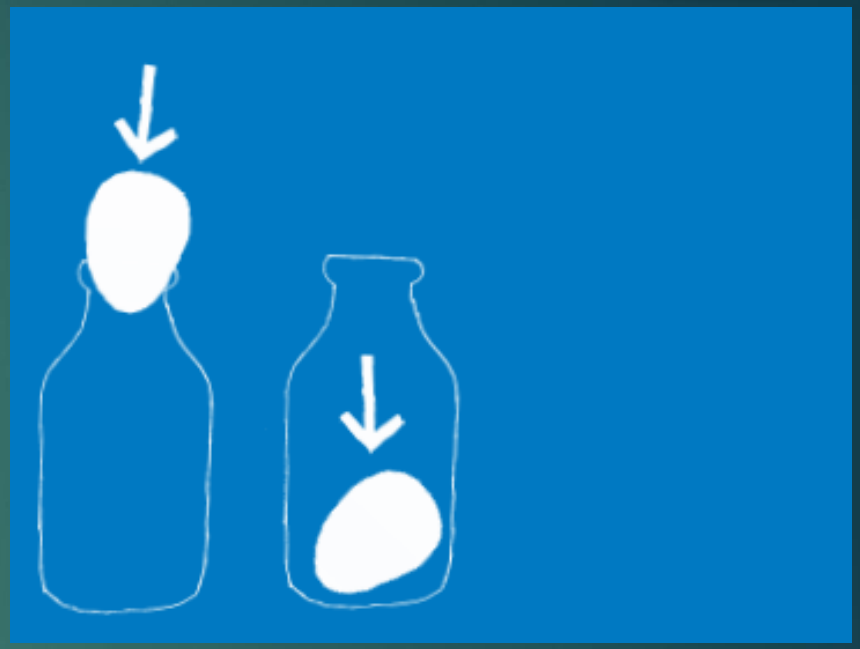
An uncooked egg

A pan of boiling water (with adult supervision)

A glass of vinegar

A wide-mouthed glass bottle



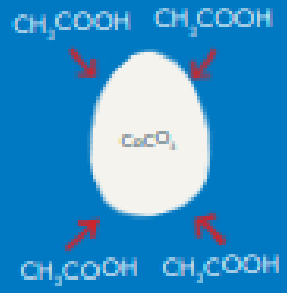


How does it work?

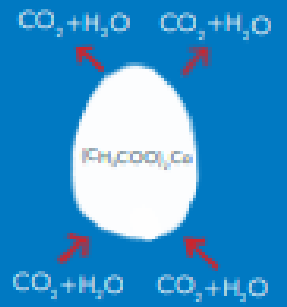
Eggs are rich in protein. When heat is applied, chemical bonds within the protein molecules are broken, and new bonds are formed between adjacent molecules. This creates a network of inter-connected proteins which causes the egg to go hard.

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

Before



After



BOAT POWERED BY A CHEMICAL REACTION

The brief

Build a boat powered by a chemical reaction.

The method

1. Tape the cork and ice lolly sticks together to form a triangle.
2. Tape the triangle to the middle of one side of the bottle.
3. Make a hole in the end of the bottle, at the opposite side to the triangle, so it will sit below the water.
4. Push the drinking straw through the hole so the end inside the bottle touches the inside wall.
5. Pour in vinegar and add bicarbonate of soda. Screw the bottle top back on tightly.
6. With a thumb covering the end of the drinking straw, shake the bottle.
7. Once the reaction starts, drop the boat in the water and watch it propel forward.

How does it work?

When the vinegar and bicarbonate of soda come into contact, a chemical reaction occurs and carbon dioxide is released. This causes pressure to build, gas to be forced down the straw and the boat to be propelled across the water.

Materials

- Small plastic bottle
- Sticky tape
- A cork
- Two ice lolly sticks
- Scissors (with adult supervision)
- A drinking straw
- Vinegar
- Bicarbonate of soda
- Somewhere to sail it – such as a bath tub or sink

Design icons

Rockets use a chemical reaction during lift off. Combining fuel and oxygen causes combustion and exhaust gases are released. These gases exit the engine nozzle at high speed and push the rocket skyward.

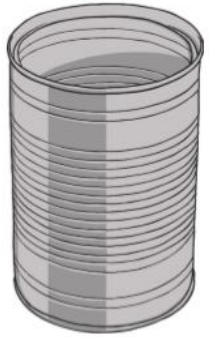
Solid

wood

ice

wool

sugar



metal

ice lolly

Liquid

cola

soup

cream

Gas

hot air

steam