

The Science of Rainbows!



SCIENCE FOR SCHOOLS

What is a rainbow?

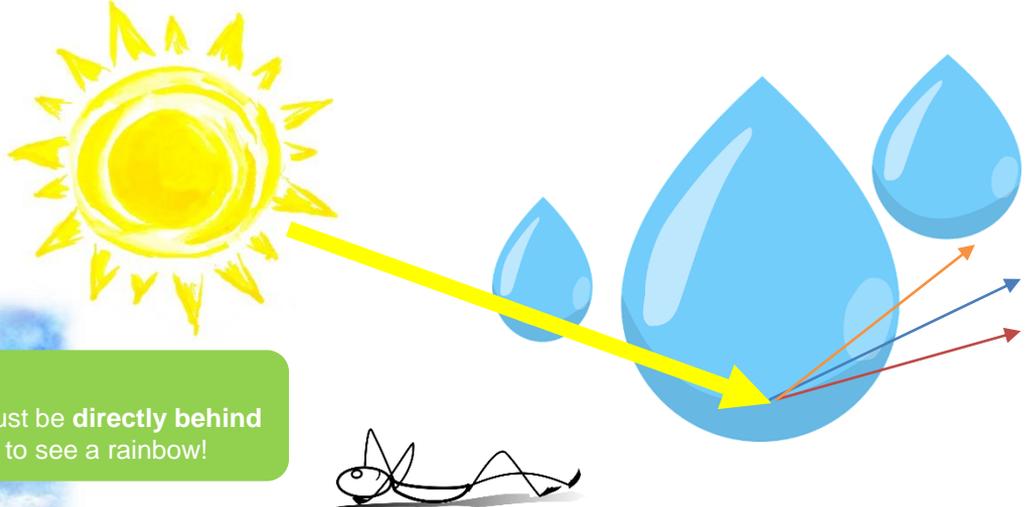
Rainbows are beautiful displays of colours which are formed when the sun's rays pass through water droplets – like rain.

Can you name all the colours of the rainbow? Colour them in below.
Clue: there are 7 that our eyes can see & there is a song to help you remember them – do you know the song!?

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What makes a rainbow?

When the sun shines through a rain droplet, it's bright light gets separated into many different **rays** of light – we see these different **rays** of light as different colours.



Fun fact!
The sun must be **directly** behind you for you to see a rainbow!



Next time you see a real rainbow, try and take a picture on a camera and Tweet it to Croda @crodaSTEM

ACTIVITY TIME!
Make your own rainbow...

1. Fill a clear glass with some water, place a small mirror at an angle at the back of the glass
2. Turn the lights off or place in a dark room
3. Shine a torch onto the mirror through the water & see what happens!

Ray – a beam of light

The Science of Farming!



SCIENCE FOR SCHOOLS

How do farmers make sure they grow lots of healthy crops each growing season?

What do crops need to grow?



Water



Sunlight



Nutrients

& the right temperature!



Water & nutrients are absorbed by the roots and transported up to the rest of the plant. The water and nutrients the plant needs must come from where they are planted.

Special mixtures of chemicals (**formulations**) are applied to crops by a farmer to make them grow even better. These mixtures can help to improve the **quality** of the farmers crops and can increase the amount of crops produced (**yield**).

A supermarket wouldn't want to sell a product with insect bites, or an apple which isn't shiny and brightly coloured!

The more crops produced, the better – more efficient use of our valuable farming land.

Most mixtures (**formulations**) are **absorbed** through the leaf in order for them to work – not through the roots like water & nutrients.

Problem!

The mixtures contain a lot of water – leaf surfaces are waxy and oily, they don't like water! (**hydrophobic**)

Solution...

Farmers add special oily chemicals to their mixtures which make them stick on the leaf better. This then allows the formulation to be absorbed by the plant.

ACTIVITY TIME!

Find a leaf from outside, add a droplet of water and a droplet of oil – what differences do you see?

- Which droplet is higher?
- Which droplet is most spread out?
- Which droplet sticks to the leaf easier?
- Think about the definition of hydrophobic!



Formulation – a mixture of materials, your shampoo is a formulation!
Absorbed – taken in by something
Hydrophobic – water hating (a phobia of water!), oil loving

The Science of Washing Up!



SCIENCE FOR SCHOOLS

Washing up liquid is a surfactant. Surfactants look like tadpoles. They have a head and a tail. A surfactant have water-loving and oil-loving regions.



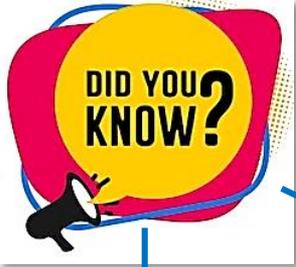
The **tail** combines with the greasy food stains on your pots and pans.

Water-loving head

The **head** combines with the water from your tap.



By the head bonding with water and the tail bonding with your food grease, this means the dirt can be easily washed away, **leaving your dishes sparkling clean!**



Oil-loving tail



The scientific word for water-loving is **hydrophilic!**

The scientific word for oil-loving is **lipophilic!**

Try putting some water and some oil in a jam jar. Give it a shake. **What happens?** Now add some washing up liquid and give it another shake. **What happens now?** This is what happens when you wash your dishes!

Activity Time!



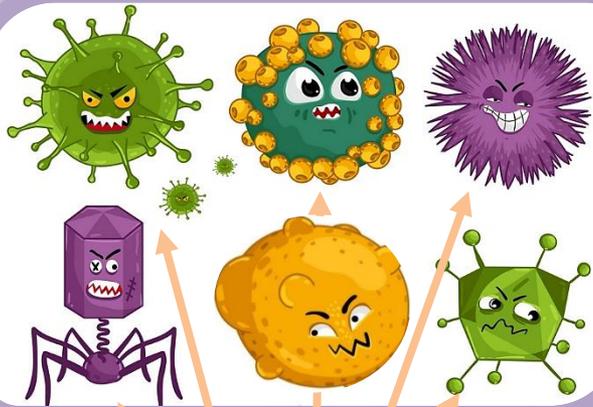
The Science of Viruses!

What is a virus ?

A virus is a **microorganism** which can infect living cells and cause **disease**.

Viruses are able to get into our body's cells, release their genes and hijack the control centre (nucleus), where it can duplicate its parts and form many copies of itself. They can enter our bodies via our airways or through open wounds!

Our body's very important **IMMUNE SYSTEM** can help to fight off viruses !

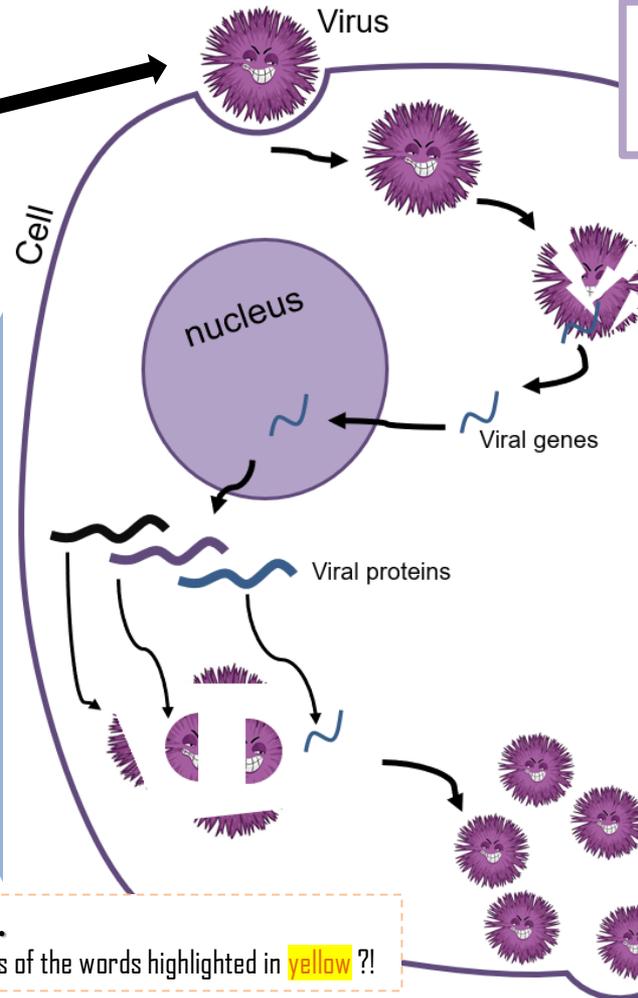


Viruses come in all different shapes and sizes !

(To name a few...)

Influenza, Ebola, Corona, Hepatitis

Can you name at least 3 more?



How to protect yourself from viruses?

By...

- Washing your hands often with soap
- Covering your sneezes or coughs
- Avoid touching your face
- Protect others by staying at home if you feel ill
- **Vaccinations**

Challenge time...

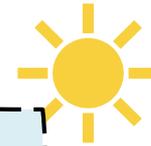
Can you find the definitions of the words highlighted in **yellow** ?!

Off to infect more cells !

The Science of Your Skin!



SCIENCE FOR SCHOOLS



Your skin is made up of primarily three layers, each with a different function!

Epidermis

The outer layer is composed of dead cells. These cells contain keratin, which makes the skin waterproof and tough.

Dermis

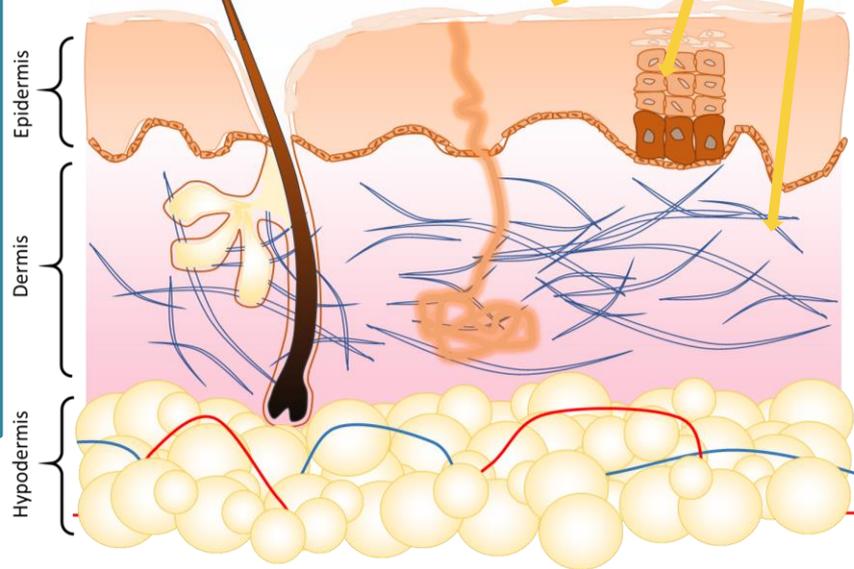
The middle layer contains proteins (collagen and fibres), nerve endings, hair follicles, and glands that produce sebum and sweat.

Hypodermis

The lowest level contains fat for insulation and blood vessels which help supply the upper layers with nutrients.

AGING.

As you age, the number of collagen and elastic fibres in your dermis decreases. Additionally, you lose fat from the tissue under your skin your skin becomes less elastic and begins to sag and wrinkle.



PIGMENTATION.

Your skin contains cells which produce melanin, a brown substance, that can absorb some of the Sun's harmful UV rays.



The darker your skin, the more melanin is present!

TAKING CARE OF YOUR SKIN...

- USE SUN CREAM
- DRINK LOTS OF WATER
- GET A GOOD NIGHTS SLEEP
- EAT PLENTY OF FRUIT AND VEGETABLES



YOUR BODY SHEDS

50,000

DEAD SKIN CELLS EVERY MINUTE!

ACTIVITY TIME: Senses Experiment

Carefully unbend a paperclip and form it into a "U."

Ask your friend/parent to close their eyes.

Gently press the two points of the "U" on different parts of their skin (legs, forehead, cheek, back etc.)

- Where do they feel both points? Where do they feel only one — even though there are two?

Give it a GO!



CRODA

The Science of Vaccines!

Our immune system helps to protect against diseases caused by pathogens (viruses, bacteria, parasites).

...BUT sometimes it needs help! **Vaccines** can do just that.

What goes inside a vaccine?

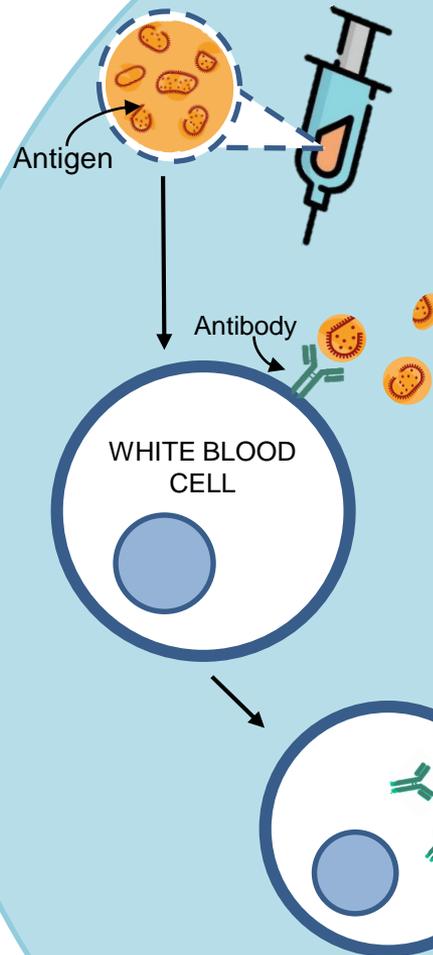
They contain weak/dead or parts of the pathogen (antigen), along with other chemicals that help make it powerful!

How does a vaccine work?

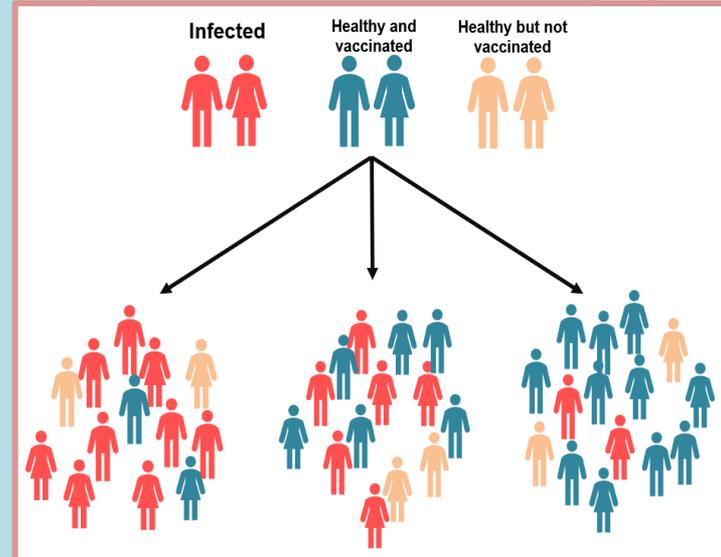
Vaccines trick the body into thinking there is an actual infection.

The body produces an immune response by stimulating white blood cells to create antibodies + memory cells.

If the real pathogen enters, the body can recognise it quicker and fight it off without any risk of you getting the disease!



Herd immunity is important!



When most people are vaccinated, the spread of the disease is controlled..



The Science of a Bubble Bath!

Bubbles are made when soap and water are mixed together to form a thin skin which traps air inside.

BUT WHY NOT TRY IT YOURSELF?

To make more bubbles in a bath

- Add some water to the bath.
- Pour the bubble bath slowly into the running water. The faster the water runs the more air and the more bubbles.
- Swish your hand through the water under the tap to make even more bubbles.

You can see a rainbow in a bubble because it separates light into different wavelengths (see our science of rainbows to learn more!)

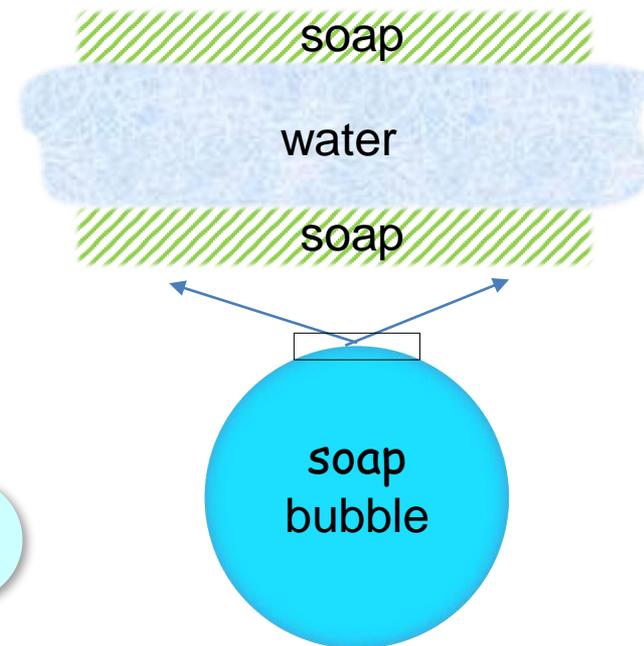
The thin skin around a bubble is like a sandwich with two thin layers of soap as bread with a layer of water between them as the sandwich filling.



The water and soap sandwich helps to keep the bubble's shape and trap the air inside.

Did You Know

A layer of bubbles on the top of your bath traps the heat in the bath water so your bath stays hotter for longer!



The Science of Cars!



SCIENCE FOR SCHOOLS

Let's get into gear and learn about cars!

Today, cars are used all over the world and they come in all different sizes, makes and models. Have you ever opened the bonnet of your car? What do you see inside?

That's right – the engine!



Fun Fact!

There are over 1 billion cars on the roads across the world!

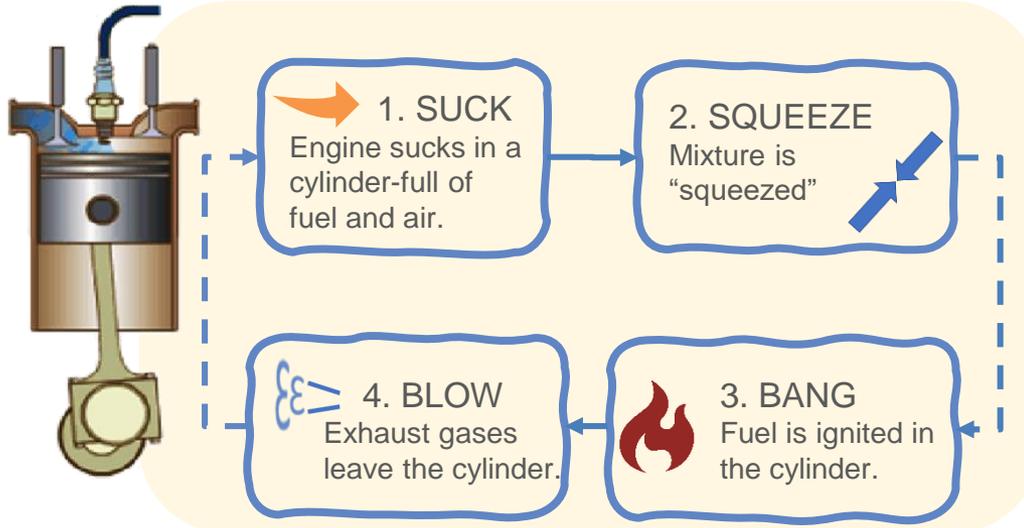
Did You Know?

Just over 85% of a car's material can be recycled?



The Internal Combustion Engine

Most cars use the internal combustion engine to burn fuel in the presence of air to create power, which makes the car move. Here's what happens:



Cars are made of a wide range of materials, such as:

- Steel
- Aluminium
- Glass
- Rubber
- Special fibres



Car engines need a special oil so that engine parts glide smoothly, and don't stick together!

Electric Cars



Electric cars are becoming very popular. These use electric motors to generate power.



The Science of Sun Creams!



SCIENCE FOR SCHOOLS

Why do we need to stay safe in the Sun?

A good sun cream should let visible light through but stop ultra violet rays.



The sun produces lots of rays. We can see some of them as colour but others can harm our skin like ultra violet rays.

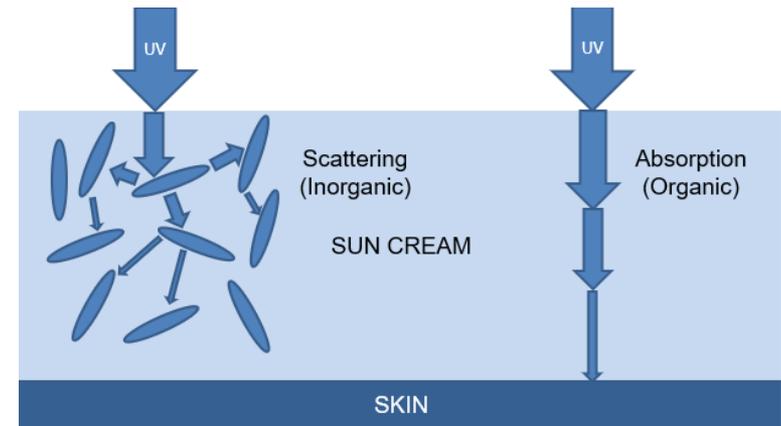
Ultra violet rays come in 3 types: UVA, UVB and UVC. UVC is absorbed by the ozone layer high up in the atmosphere. However, UVA and UVB can reach us and harm our skin. UVA can cause our skin to become wrinkly and UVB causes redness and burning on the top layer of skin. UVA and UVB can also cause cancer. This is why we need to wear sun cream if we are going outside in the Sun!

We can tell how much protection a sun cream gives us in 2 ways, the UVA star system and SPF. The UVA star system tells us how much UVA protection we get and SPF tells how much UVB protection we get. It's important to be protected from both!

UV filters are the ingredients in the sun screen that filter out UV rays.

There are 2 types:

Inorganic UV filters contain lots of little particles that scatter and absorb the UV rays to make them weaker. Organic UV filters absorb the UV rays as they pass through, weakening them before they hit the skin.



Give
it
a
go



- Find a piece of dark coloured construction paper.
- Cover your hands in a thin layer of sun cream and make some handprints on the paper.
- Place the paper outside on a sunny day and leave it.
- You should find that the colour fades on the sections of card without your handprints on!

Why do you think this happens? What happens if you make handprints using different SPF sun creams?

Make sure that you wear plenty of sun cream when doing any sort of activity outside!