OpenUpScience

Issue 3

Welcome to OpenUpScience, the weekly magazine from Cambridge Science Centre. In this issue, we're thinking about light and we have games, experiments, quizzes, and challenges all about light to keep you busy while you're at home.

The world around you is full of different types of energy. Light is a kind of energy you can see with your eyes. It travels in straight lines, and it's fast, really fast.

The fastest humans can run at around 10 meters a second. A rocket blasting off from earth can travel at an awesome 79,000 meters per second. But the speed of light is an incredible 299,792,458 meters per second – making even a space rocket seem slow.

Find out more with the fun activities inside!

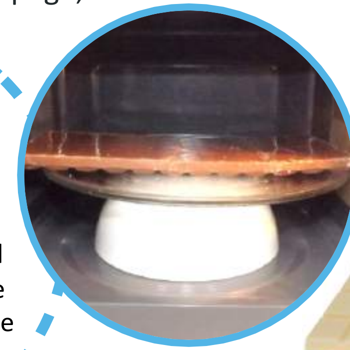
Spark, Ignite, Fuel, Illuminate

Chocolate at the speed of light!

Microwaves are a type of electromagnetic radiation, just like light, so they travel at the speed of light. Using some chocolate, a microwave oven, and the calculation on the next page, we can find out how fast light is!

What you'll need

- Microwave
- Ruler
- Calculator
- Microwave safe bowl
- Microwave safe plate
- Large bar of chocolate
- A helpful adult

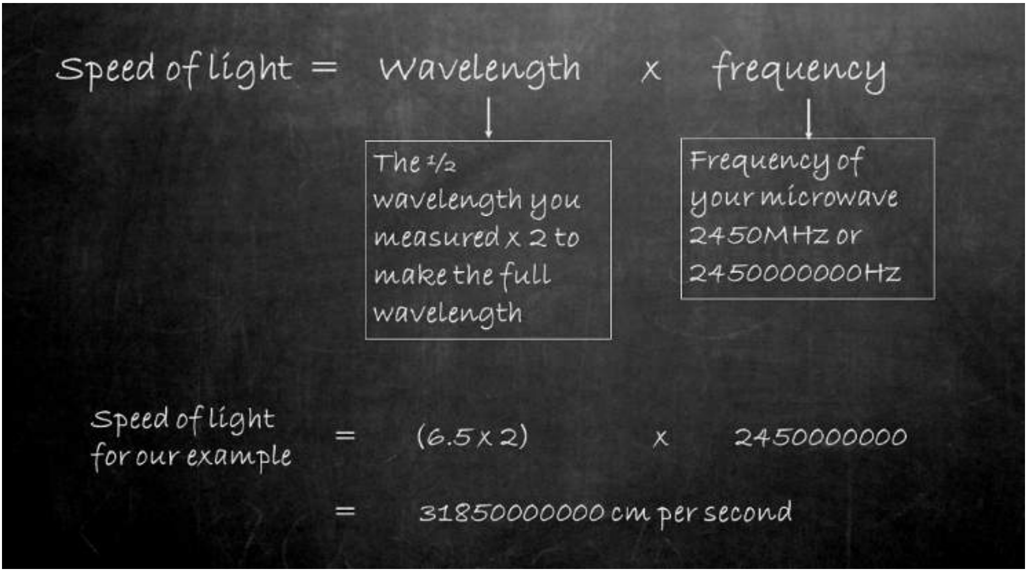


What to do

1. Gather your equipment, making sure you have permission to use the microwave.
2. Ask your helpful adult what the frequency of your microwave is. It may be on the label or in the manual. E.g. "Operating frequency 2450Mz".
3. Remove the turntable and roller ring, and cover the rotating part with the bowl and balance the plate on top.
4. Unwrap the chocolate and put it on a microwavable plate.
5. Microwave for around 30 seconds. Don't let it burn – burnt chocolate doesn't smell good!
6. You should have several melted spots on your chocolate bar. If not, return to the microwave for another 10 seconds until you do.
8. Pick a melted spot and measure from the middle to the middle of the nearest spot (HINT - It should be around 6cm).
9. The distance is half the wavelength – you can now calculate the speed of light. Use our example on the next page to help you.

More Chocolate at the speed of light!

Microwaves travel at the speed of light, and we can work out how fast that is using the frequency of our microwave and the wavelength that we measured on the chocolate:

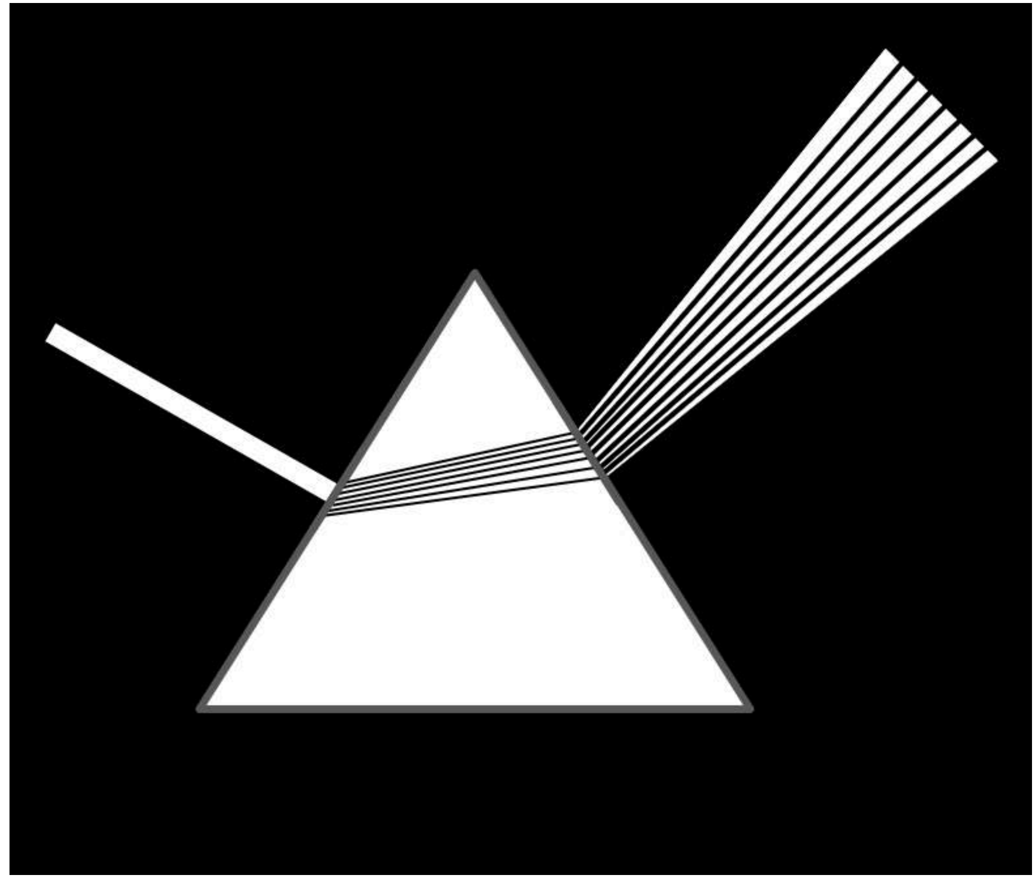


When you've done your calculation – let us know your answer! We'd love to know how you got on.

Isaac Newton studied light and noticed that white light was split into different colours as it hit a glass prism: Red, Orange, Yellow, Green, Blue, Indigo, and Violet
The same thing happens when we see a rainbow.

Colour me a rainbow

Can you colour this picture in to show what happens when light hits a prism?



What happens to naughty light rays?

They go to prism.

Shadow Theatre

Make a shadow puppet theatre and have fun putting on a show!

What you'll need

- A helpful adult
- A large box
- A large sheet of white paper
- A lamp
- Straws, the longer the better
- Black card
- Scissors
- Sellotape
- Tissue paper
- A pencil

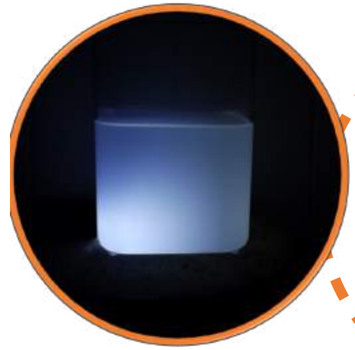
Shadows are made by blocking light. Light travels in straight lines and if something solid gets in the way, it blocks the light and a shadow forms behind the object.

What to do

1. Gather your kit.
2. Fold the top and bottom flaps of the box inwards.
3. Using the Sellotape, tape the large piece of paper over the front of the box.
4. Draw the puppets you would like to use on the black card.
5. Cut out your puppet.
6. Tape a straw to the back of your puppet.
7. With an adult, position the lamp so it shines through the back of your theatre. Make sure the lamp is not so close that it could burn the box.
8. Move your puppet in front of the light and behind the theatre. Look at the theatre from the front and you will see your shadow puppet.

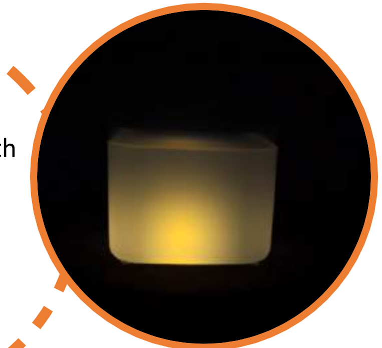
Fiery Skies

Using just a few household objects - and some milk - you can mimic what happens in the sky and demonstrate why the sky is blue and sunsets are red.



What you'll need

- A clear container with flat, parallel sides
- Water
- Milk
- Torch
- Somewhere dark



What to do

1. Gather your kit and fill the container with water.
2. Shine the torch through the water and see what happens. You might see an occasional glint as the light is reflected off a dust particle, but probably not much else.
3. Add a small amount of milk and try again - look at the container from the side, across the beam of the torch. The water will have a slight blue tint to it. You may find it easier to see if the room is dark.
4. Turn around and look at the torch head on. You will be able to see the yellow/orange/red "sunset" through the milky water. Again it will probably be more dramatic in a dark room.

What is happening?

Light travels in straight lines until it reaches something that changes its direction (deflects it). Light will bounce off particles of dust, ice or water in the air. Light will also bounce off milk when mixed into water.

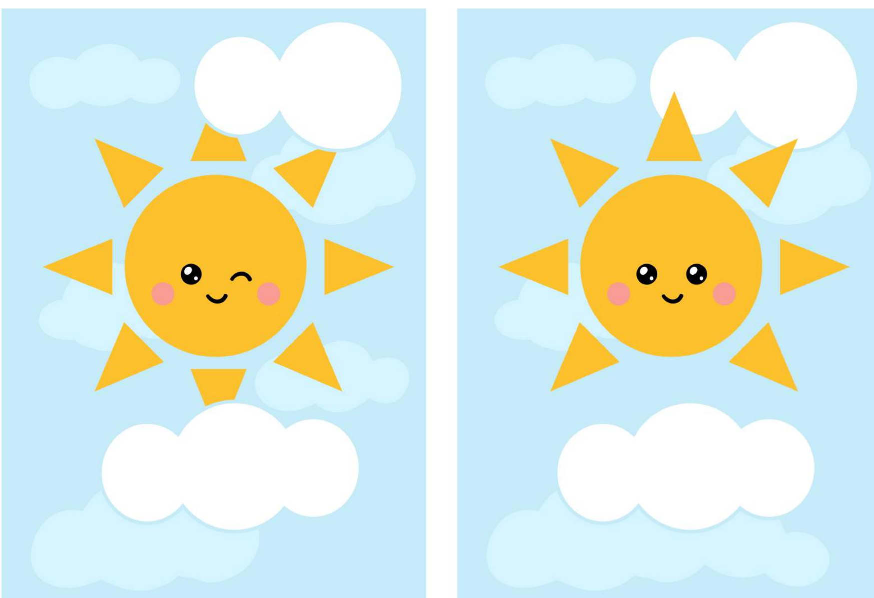
Different colours will bounce of the dust or milk in different ways. How much the colour is scattered depends on its wavelength. Colours with short wavelengths bounce and scatter more than colours with long wavelengths.

Blue has a short wavelength, so scatters more than red, which has a long wavelength. In the middle of the day, the sun shines directly down on us. At sunrise or sunset, the sun shines at an angle and has to go through more air to get to us. The more air the light has to go through, the more the blue colour gets bounced around. So, the colour that gets to your eyes is red, which doesn't get bounced away.

That's why sunrises and sunsets are a beautiful red colour.

Spot the difference!

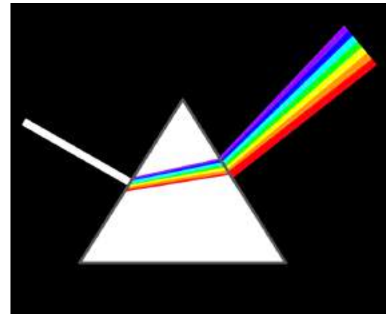
There are 5 differences between these sunny pictures – can you spot them all?



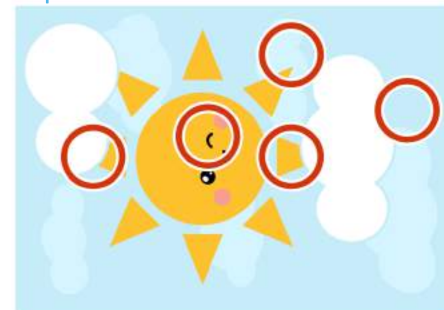
This Week's Challenge

Can you bend light or make it change direction?
Let us know how you change the direction of light and send us a picture (if you can) to OpenUpScience@cambridgesciencecentre.org

Colour a rainbow - solution



Spot the difference - solution



Next Issue: Feathery Fossils

Will your view of the ancient world change?

Hey!

If you have a question about this week's theme, send it to us. We'll answer some of your questions in Science@6, 6 pm, Monday on YouTube.

Send us things! - OpenUpScience@cambridgesciencecentre.org

Help us improve OpenUpScience! Let us know what you think: link.cambridgesciencecentre.org/feedbackissue3

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