EASY SCIENCE

A world full of colour

Colour is a very important part of our lives. Colours help identify many plants and animals. We expect lemons to be yellow, for example, and tomatoes to be red. Some living things even have their particular colours attached to their names: green or black mambas, yellow-billed kites, blue cranes, violets, and many others.

Colour also plays a big part in our enjoyment of food. Do you think that blue mashed potatoes would taste better than white ones? Would you be happy to bite into a dark green chicken leg?

We expect things to be certain colours. But what makes us see colour in the first place? To answer this question, try this experiment. Look closely at the colours of the clothes you are wearing. Now, go into a dark room and look at your clothes again. Can you still see the colours? Can you see that we need light to see colours?

Our eyes have special structures in them, called cones, that enable us to see the colours around us. The colour message goes from the cones to our brains. We both see and understand that a carrot is orange, for example.

The colours we see are part of what is called the visible (because we can see it) light spectrum.

Spectrum

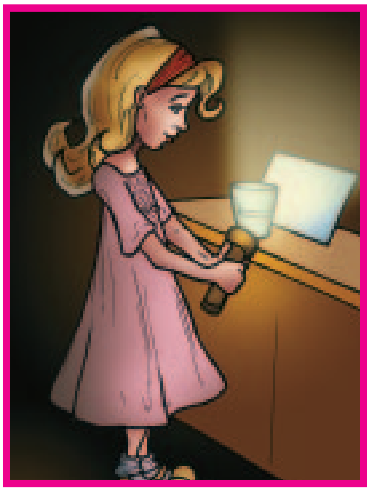
When you see a rainbow in the sky, you are seeing a spectrum. A spectrum is made when white light traveling through the air is slowed down by going through a clear material such as glass, water or plastic. This "slowing down" causes the white light to break into the colours of the spectrum.

Red light is slowed down the least when this happens, and violet light the most.

The colours of rainbows from sunlight are always in the same order. The first letters of the colours of the visible light spectrum spell out ROY G BIV. These letters stand for the colours red, orange, yellow, green, blue, indigo and violet.

Make a rainbow

Would you like to discover the colours in a beam of light? Even though the beam looks plain white, the different colours are always there. They are just waiting to be found out.



You will need:

- A clear plastic cup
- Water
- Torch
- Food colour (red, green and blue)
- White poster board
- A dark room
- Crayons
- A ruler
- Your science notebook

Fill the cup until it is almost full of water. Make a screen by folding the poster board in half and standing it up like a tent. Put the cup of water at the edge of the table, but be careful not to knock it over! Move the screen so that it is about 8 cm from the base of the cup on the table.

Turn on the torch and darken the room completely. Shine the torch from below through the side of the plastic sup at the angle show in the picture.

Change the angle of the torch slightly until you see a band of colour on the screen. What colours do you see? Make a copy of your colour band on a piece of paper or in your science notebook with crayons or markers. Label each colour.

Now experiment with the way you hold the flashlight. If you move the torch towards the table, what happens to the bands of colour? Try moving the torch back to where you first held it and watch the colour band. What happens? Write down your observations. What could the water be doing to the beam of light to cause the colours to appear?

Now try doing the experiment using red water in the cup. Add three drops of the red food colouring to the water, and make a colour band on the screen using red water. What colours do you see now? Write down your observation.

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EasyScience is produced by the South African Agency for Science and Technology Advancement (SAASTA), an operational unit of the National Research Foundation. SAASTA's mission is to promote the public understanding, appreciation and engagement with science and technology among all South Africans.
Visit the website: www.saasta.ac.za for more information.

SAASTA

Guess what will happen with the colour band if you use blue or green water. Test your predictions by using first blue, then green food colouring to change the colour of the water. Start with fresh water each time! Record your observations.

Was the water really necessary to make the colour band? Try the experiment with an empty cup and see if a colour band forms on the screen. What part does water play in the experiment?

Note: The colours from an electric light, such as your torch, are not quite the same as the colours inside a sunbeam. Electric light has less blue and less violet than sunlight.

There's more to colour than red, yellow and blue

You know there are many more colours than red, yellow and blue. How can you make some of these colours? Experiment and see!

You will need:

- Three clear jars or glasses, labeled 1, 2 and 3, half-filled with water
- Red, yellow and blue food colouring
- Crayons or non-toxic markers
- White paper towels
- Several flat toothpicks

WARNING! This job can get messy. Be sure to cover the surface you work on with paper towels and to wipe up spills immediately to stop any stains. Also rinse the glasses and sink thoroughly and wash your hands well after you have finished.

Place the three jars or glasses in a row on a double thickness of paper towels. Number them 1, 2 and 3. Draw a colour mix chart like the one shown.

Add two drops of red food colour to jar 1, two drops of yellow to jar 2, and two drops of blue to jar 3. Gently swirl each jar to mix the colour with the water. Record the colour of the water in the first row - called ONE COLOUR - of your chart.

Now, add two drops of yellow food colour to the water in jar 1, two drops of blue colour to jar 2, and two drops of red colour to jar 3. Swirl each jar again, and record the colours in the chart in the 2 COLOUR row.

Next, add two drops of the blue food colour to jar 1, two drops of red colour to jar 2, and two drops of yellow to jar 3. Swirl all three jars again, and record the colours in the chart in the 3 COLOURS row.

Did you notice anything special about the final colour in each jar? Did the order in which you added all three colours make any difference in the colour?
Keep these mixed colours for the next experiment.

Break it up!

Would you like to separate these colours again? Let's first try to separate the colours contained in the ink of dark blue and black felt-tipped pens.
You will need:

- Water
- Dark blue and black felt-tipped pens
- A large, clean jar with a lid (like a large chutney jar)
- Paper coffee filters or white paper towels
- A ruler and scissors

Pour about one centimetre of water into the jar. Measure the height of the jar. Ad about 5 cm to this measured height. Now cut four strips of paper towel or coffee filter to this measurement. Each strip should be about $2\frac{1}{2}$ cm wide. Cut a point at one end of the strip as shown.

Using the black pen, make a large dot of ink $2\frac{1}{2}$ cm up from the point of one of the strips. Repeat this with the blue pen and the second strip. Let the dots dry. Place these strips carefully in the jar so that the point of each strip is in the water. The water should not cover the dots, though.

Bend the end of each strip over the pencil across the top of the bottle. Have a close look at what happens to the dots of

COLOUR MIX CHART

	Cup 1	Cup 2	Cup 3
1 Colour	red = red	yellow =	blue =
2 Colours	red + yellow =	yellow + blue =	blue + red =
3 Colours	red + yellow + blue =	yellow + blue + red =	blue + red + yellow =

colour as the water moves up (by means of capillary action) the strips of paper. Write down what you see.
When the ink has traveled up to the pencil, remove the strips and place them on a paper towel.

What did you find about the black and blue inks? Did you expect this? Repeating this experiment, try to break up into their original colours the mixtures you made in the previous activity.

Spinning colours

Would you like to mix the colours of light? Then make this colour wheel.

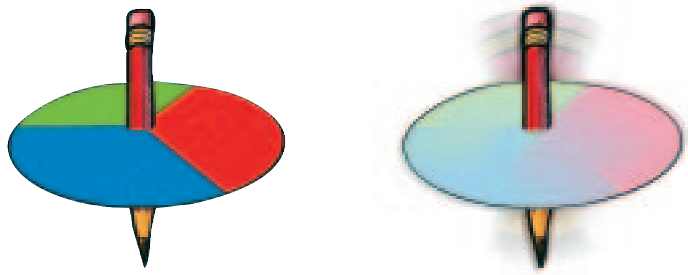
You will need:

- Red, blue, green and black crayons or non-toxic markers
- Blunt scissors
- Pencil
- Rubber band
- Stiff white paper or cardboard

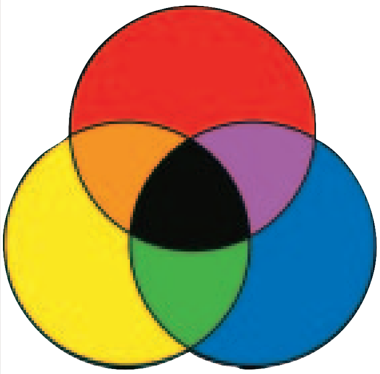
Use a small plate or coffee tin and trace its shape onto your white card with the black crayon or marker. Ask an adult to help you divide the circle into three equal parts. Colour one part of the circle red, one part blue and the third green, cut the circle out.

Ask an adult to make a hole in the centre of the wheel, big enough for you to push the pencil through. Wind the rubber band on the end of the pencil sticking out above the wheel. This is to keep the wheel from spinning right off the pencil. Hold the other end of the pencil and spin the wheel!

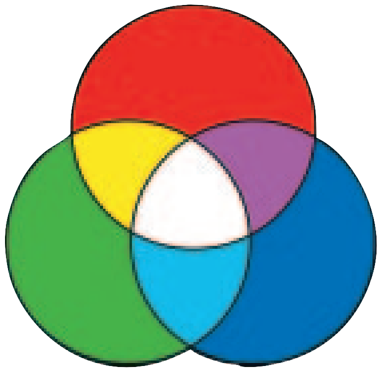
What happens to the different colours when you spin the wheel? Make another wheel using different colours. Can you get the same results as when you spin the red/green/blue wheel?



Mixing Colours



Left: When mixing pigments, the primary colours are yellow, blue, and red. All three together make black



Right: When mixing lights, the primary colours are red, green, and blue. All three together make white light.

Both chemists and physicists work with colour, but in different ways. A physicist can break white light into colours by slowing the light down, just as you have done in the first activity. A chemist can separate a coloured ink, such as a green ink, into its different colours by using chemicals and special paper, just as you have done now.

Cosmic Art Challenge

The winners of the Astronomy Month Cosmic Art Challenge, organised by SAASTA for the Department of Science and Technology, were recently announced. More than 4 500 young artists entered this competition to commemorate the opening of the new Southern African Large Telescope (SALT) in Sutherland on 10 November 2005. The overall winner was Hendrik de Beer (17) from Valhalla, Pretoria, with his artwork entitled 'The giant eye.'

Itumeleng Kgafela (16) from Hammanskraal was a runner-up with her entry called 'An African Universe'.

More information on the winners is available on **www.saasta.ac.za.**
More information on SALT is available on **www.salt.ac.za.**

I SEE SCIENCE

EASY SCIENCE

A PHOTOGRAPHIC COMPETITION TO CELEBRATE SOUTH AFRICAN SCIENCE

Show us how YOU experience SCIENCE & TECHNOLOGY. Capture its beauty and excitement on film. Show how it benefits our daily lives. The competition is open to all learners in grades 7 - 11 (in 2005).

ENTRY FORM

NAME & SURNAME ....

NAME OF YOUR SCHOOL ....

PROVINCE ....

IN WHAT GRADE ARE/WERE YOU IN 2005? ....

POSTAL ADDRESS ....

HOME TELEPHONE NUMBER ....

SCHOOL TELEPHONE NUMBER ....

SCHOOL FAX NUMBER ....

SIGNATURE ....

DEADLINE: 27 JANUARY 2006

HOW TO ENTER

1. Mail your entry to I SEE SCIENCE, SAASTA, P O Box 1758, Pretoria 0001 - OR
2. Hand deliver your entry to SAASTA, Didacta Building, 211 Skinner Street, Pretoria - OR
3. Enter digital images on CD or online, uploaded at: www.saasta.ac.za/sciencelens

PRIZES

The overall winner of the I SEE SCIENCE CATEGORY and his/her school will each receive a state-of-the-art digital camera to the value of R3 000.
Four runners-up will each receive a digital camera to the value of R1 500.

RULES

- You can enter digital images, transparencies or prints. Digital images should be JPEG or TIFF files in the highest possible resolution.
- Each entry must be accompanied by a separate, signed entry form.
- Any photograph that has won a prize in another major competition is not eligible.
- The organisers will appoint independent judges and their decision will be final.
- All entries must reach SAASTA by 27 January 2006. Winners will be notified in February 2006.
- Winning, commended and other short-listed photographs may be published in selected media without permission of the entrants or payment for such use.

YOU MAY MAKE COPIES OF THIS ENTRY FORM.

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