SCIENCEWORKS

Colour Teacher Resources

Colour

See the world in a new light

MUSEUMS VICTORIA

VICTORIA State Government | CREATIVE VICTORIA

Torch Colour Mixing

Experiment with mixing colour and discover how our eyes and our brains see colour! In this hands-on science demonstration you can use classroom materials to make coloured torches and show how mixing red, green and blue light creates white light.

MATERIALS

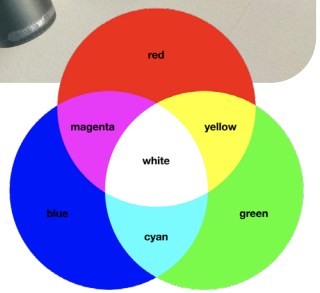
- 3 torches
- Cellophane (red, green and blue)
- Rubber bands or tape
- A3 white paper
- An opaque object
- Scissors
- A dark room
- Stencils

NOTICE

What colours do you create when you mix two primary colours together?

How can you make white light?

What coloured shadows do you create when you move an opaque object in front of the wall? Can you count the colours?



STEPS

Prepare your tools:
Cover each torch with a piece of cellophane and use a rubber band or tape to secure it. Make one red, one green, and one blue torch. Layer the cellophane a few times to make the colour more intense.

Set up:
Turn off the lights and block out any sunlight.

Set the three torches on the floor or on a table facing a blank white wall. Place the torches so all lights are all hitting the same spot on the wall.

Things to experiment with:

- Place an opaque object in front of the white wall. You should see 3 shadows in 3 new colours.
- Move the opaque object around, look at all the different coloured shadows that appear when you move the object!
- Make stencil shadows! This demonstration is best done with friends. Hold a stencil in front of a coloured torch. Can you work with friends to turn your shadow yellow, magenta, cyan or white?

WHATS HAPPENING

Red, green and blue are special colours, all the colours you can see on your TV or phone screen are made with just these three colours. When you mix two of these colours together, you create secondary colours. But when you mix all three colours together, we see white light!

So why do we see white light when we put red, blue and green light together? The science is all about our eyes and our brain! Inside our eyes we have light sensitive cells called cones that help us see colour. Most people have three types of cones... red, green and blue! When red light enters our eye, it stimulates the red cone, and our brain sees red. Green light stimulates the green cone, so we see green. And if there's an in-between colour, like yellow, it stimulates both the red and green cones, and our brain understands that colour must be yellow!

With just these three cones, our brain can detect all the millions of colours we can see, from periwinkle, to cobalt to hot pink. Because white light is made out of all the colours of the rainbow, it stimulates all three of our cones, which our brain interprets as white!

VIC CURRICULUM

Physical Science (5-6)
light can be produced from many sources; light travels in a straight path, can form shadows, and can be absorbed, transmitted, reflected or refracted by objects VC2S6U08

Science Inquiry (3-4)
observations can be used as a basis for posing questions to identify patterns and relationships, and to predict the outcomes of investigations VC2S4I01

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ADDITIONAL INFORMATION

Video demonstration and instructions

Newton's Disc

Bring art and science together with a handmade Newton's Disc! In this activity create a colour wheel and a design a way to spin it really fast! What happens when you spin a rainbow? Follow along to find out!

MATERIALS

- white paper
- scissors
- ruler
- cardboard
- pencil
- coloured pencils or markers
- glue
- string

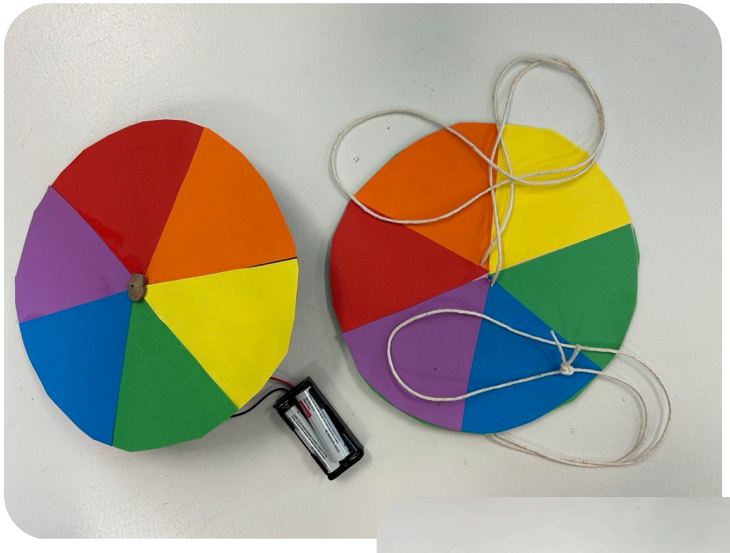
Extension:

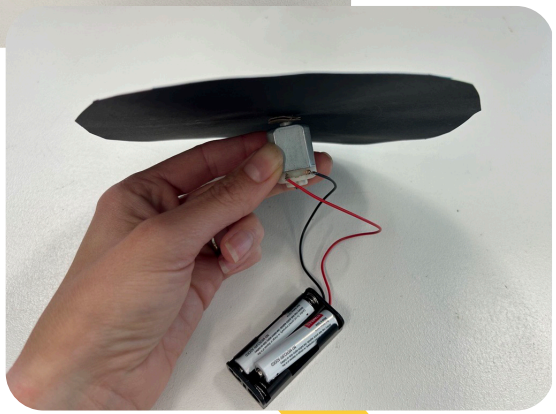
- battery pack
- DC toy motor
- 2 AAA batteries

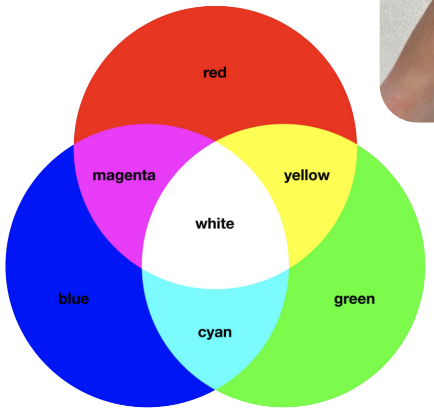
NOTICE

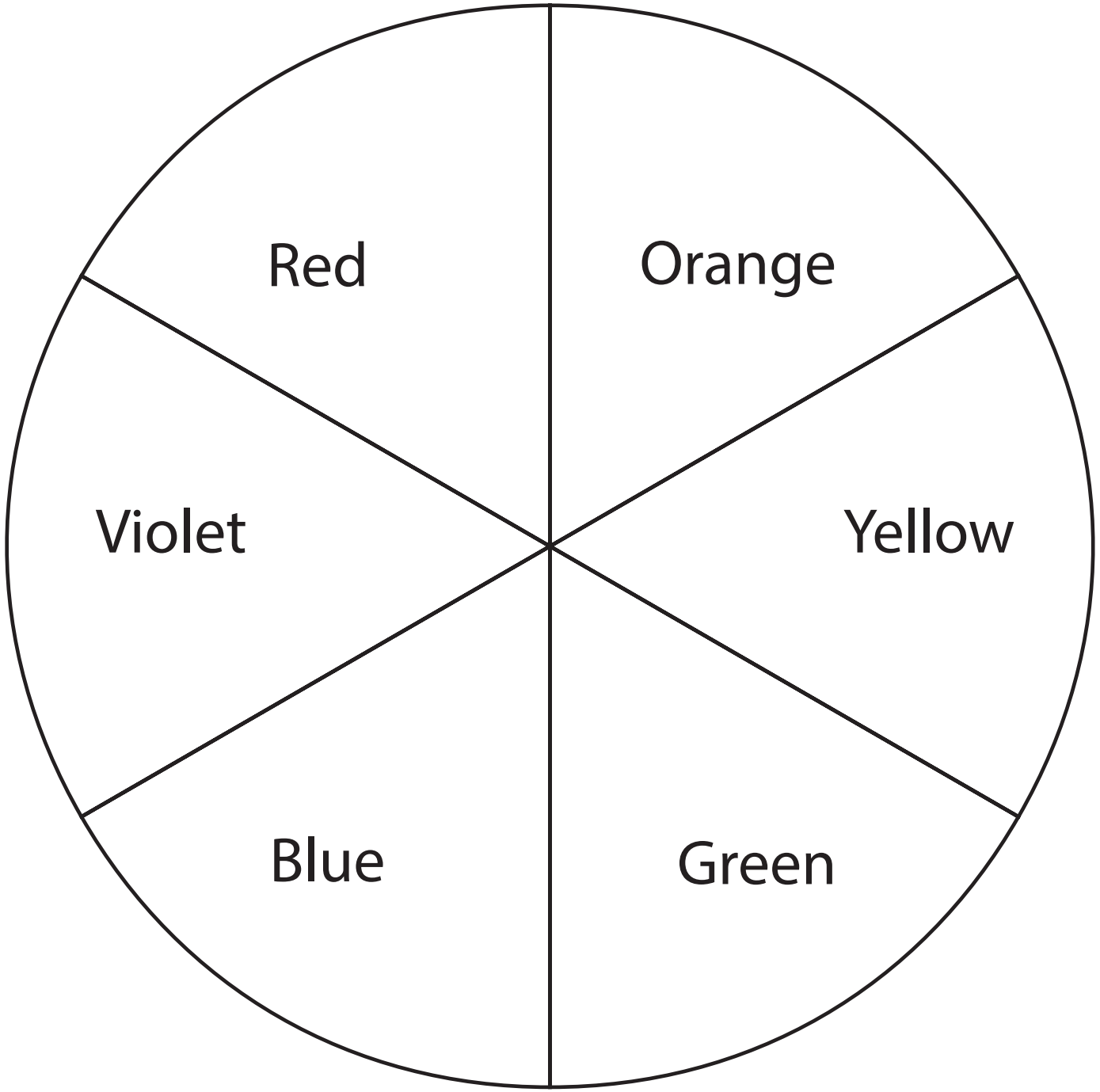
What happens when you spin the wheel really fast? What colour do you see?

Check out the attached video of a beam of white light through a prism. What colours do you see? Do these colours look familiar?








Red
Orange
Violet
Yellow
Blue
Green

STEPS

- Print and cut the colour wheel template
- Colour the rainbow into the sections of the pie: red, orange, yellow, green, blue, violet
- Cut out a circle from the cardboard that's the same size as the colour wheel and glue the colour wheel onto the cardboard

Option 1 (with string)

- Poke two holes in the center of the colour wheel, about 1cm apart and tread a string through both holes and tie it together. You'll want about 30cm of string on each side of the wheel.
- Hold the string on each end and spin the colour wheel so the string twists up. Then pull the string from both sides and watch as your wheel spins!

Option 2 (with a motor)

- Attach one wire of the battery pack to one of the motor terminals, do this again with the second wire. You should see the motor spinning. Pull out one of the batteries to turn it off.
- Poke 1 hole in the center of the colour wheel. Attach the motor to the colour wheel using glue and cardboard by making cardboard washers about 1cm in diameter and place on either side of the colour wheel. Use hot glue to adhere them together. Once dried, plug in both batteries and watch it spin!

Added STEAM challenges:

- Design a stand and mount to hold the colour wheel so your instrument can be free standing.
- Add an on/off switch to the circuit

WHAT'S HAPPENING

A Newton's disc is a colour wheel that spins! But why the spin? When we spin the colours of the rainbow really fast, we see white! Why do we see white? White light is a combination of all the colours of the rainbow. When we split white light, we see red, orange, yellow, green, blue and violet, this is the reason we see a rainbow when the sun comes out after a rain!

Newton created the Newton's disc to demonstrate how white light is made up of the colours of the rainbow. Every colour on the visible light spectrum is a different wavelength. We see colours because an object reflects that wavelength. A blue car is blue because it reflects a blue wavelength. When we put all the wavelengths of the rainbow together and spin it really fast we see white light, when we go slow, or stop the spinning the white light turns back into the colours of the rainbow.

VIC CURRICULUM

Physical Science (5-6)
light can be produced from many sources; light travels in a straight path, can form shadows, and can be absorbed, transmitted, reflected or refracted by objects VC2S6U08

Science Inquiry (3-4)
observations can be used as a basis for posing questions to identify patterns and relationships, and to predict the outcomes of investigations VC2S4I01

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ADDITIONAL INFORMATION

Check out this video to see white light through a prism

Colour Secret Messages

Hide a secret message using colours! In this activity, use different colours to disguise a message that is revealed with a coloured filter.

MATERIALS

White Paper

Coloured pencils, crayons or textas

Coloured Cellophane (red, green, blue)

NOTICE

Can you still read your message with different coloured cellophane (filters)? Which letters disappear? Do any turn a different colour or appear black?

Hold up your cellophane in front of your eyes and look around the room. Try putting two different colours of cellophane together and looking again.

STEPS

- Write a word or message on a piece of paper using a different colour for each letter.
- Place a piece of red cellophane over the drawing.
- Try again with a different colour of cellophane. Test what happens when you place two different colours of cellophane over your message.
- Once you have figured out which colours you can see through your different pieces of cellophane it's time to start writing a top-secret message or drawing.
- On a new piece of paper write your message in one colour. Scribble around it in different colours to distract anyone viewing your secret message.
- Give your drawing to someone you want to read your secret message with a piece of cellophane that will reveal the message.

When we see colour it is due to our brain detecting different combinations of light. We see the colour white when all of these colours are mixed together. Colours can vary thanks to reflected light, or light that bounces off something. White paper reflects all colors which is why it looks white to our eyes. Ink from textas or crayon wax reflect only one color.

Red texta ink absorbs blue and green light but allows red to reflect off of your paper and get picked up by your eyes. Like ink, your red cellophane filter also absorbs blue and green light. When you look at your paper through your red filter, the paper looks red because the filter only lets red through. When you drew with your blue or green colors, the ink absorbs the color red. No red light is absorbed by the filter, so you can see those colors through the filter and they'll almost look the same.

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ADDITIONAL INFORMATION

Video demonstration and instructions

Texta Chromatography

Did you know your black textas may be hiding other colours? We can use chromatography–the science of separating the different parts of a mixture to check this out. We will be using a process called capillary action to draw inks and water up some paper to investigate colour. Using this process you can then produce a beautiful rainbow design!

MATERIALS

- absorbent paper such a coffee filter or a piece of paper towel
- scissors
- water
- a black texta or whiteboard marker but not a permanent marker
- a tall glass or container
- a clip or peg

NOTICE

Watch the water slowly creeping up the paper and notice what happens as the black ink starts to move up the paper. Is the ink still black?

Once the ink has made its way to the top of the paper strip, How many colours can you see? Did any colours travel farther than the others?

STEPS

- Cut a strip of paper towel or coffee filter around 2cm by 15cm
- Take your texta and draw a thick line about 3 or 4cm from the bottom of the paper.
- Put a small amount of water into your glass then place just the very bottom of the paper into it, making sure you don't put your texta line under the water.
- Fold the top of the paper over the top of your glass and secure it with your peg or clip.
- Wait until the ink has made its way to the top of the paper strip.

WHAT'S HAPPENING

Capillary action is the process that let us draw the water up the paper. Did you know that water molecules like to stick together? This means that as water travels up our paper, it drags other water molecules with it. The ink of our texta has water in it so the colour gets pulled up the paper, revealing the mix of colours that are used to make up your
black texta.

VIC CURRICULUM

Science as a Human Endeavour (3-4)
data from observations obtained through scientific inquiry can be used to develop explanations of natural phenomena
VC2S4H01

Visual Arts (3-4/5-6)
develop visual arts skills by experimenting with visual conventions, visual arts processes and materials
VC2AVA6D01

ADDITIONAL INFORMATION

Video demonstration and instructions

Fluoro Scavenger Hunt

See like a bee and discover the world of ultraviolet light! Use a UV torch to explore your world and find things that fluoresce.

MATERIALS

UV Torch (choose one that is 365nm for optimal fluorescence)

A few of the following:

Highlighters

A few different flowers (try gum blossoms if you can!)

Sodalite 'firestone' seashells

Black scratch paper

Lichen

Tonic Water

B vitamins (dissolved in water)

Ripe banana with spots

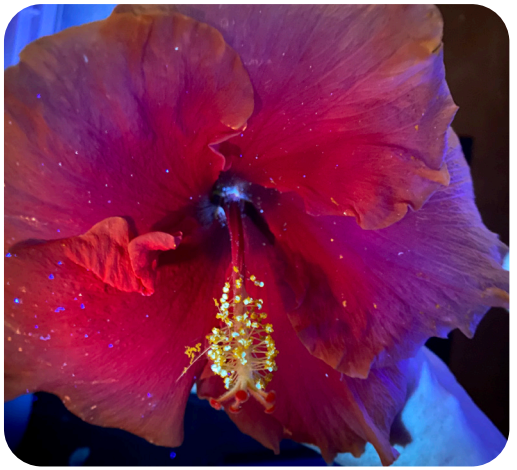
Petroleum Jelly

NOTICE

Why do you think these materials glow under UV light?

What do you notice about the natural materials VS the man-made materials?

Can you work as a team to find something that glows in every colour of the rainbow?



STEPS

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WHAT'S HAPPENING

Ultraviolet light is the same as visible light, just with slightly more energy. The photons in UV light are travelling at a slightly faster wavelength than those in violet light (hence the term 'ultra-violet').

When a photon hits a substance, it can be absorbed and then released again, producing a 'glow'. Because the glow is usually at a lower energy than the UV light going in, it glows in visible light that we can see with our eyes. This glow is called photoluminescence.

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