

Questacon at HOME

Activity Sheet – Colour Mixing

Colour Mixing

Background

White light is a mixture of all the colours in the rainbow. When you look at red paint, red light is being reflected back into your eyes, while all the other colours of the rainbow have been absorbed by the paint. If you mix this red paint together with green paint, it will probably look dark brown. This is subtractive colour mixing, because as we add different coloured paints, more of the rainbow is being absorbed. Instead, if you mix red and green coloured lights together, it will probably look yellow! This is called additive colour mixing, because we are mixing different colours of light back together. In this activity, we will explore all the different ways we can mix colours together.

Materials

Some coloured pigments to explore subtractive mixing, for example:

- Coloured markers/pencils/textas
- Food dyes added to water
- Coloured play-doh
- Coloured paints

Some materials to explore additive mixing, for example:

- Coloured LED lights
- Torches shone through a coloured filter:
 - Multiple layers of sticky tape marked with textas
 - Cellophane
 - Water coloured with food dye

Safety

Be wary of light sources heating up and turn them off if they become hot to touch. Do not look directly into any light sources.

Supervision is recommended at all times for young experimenters.

Procedure

1. Explore subtractive colour mixing by combining different coloured markers/dyes/paints/play-doh. What colours are created when these colours are mixed together?
2. Explore additive colour mixing by shining coloured lights at the same spot. What colours are created this time?



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Tips and Tricks

- Make sure young experimenters are dressed ready to make a mess and are not in a space where they might accidentally spill paint or coloured water on something important.

Science is all about curiosity! If you don't know the answer- you have created an opportunity to learn something new!

What's the Science?

The cells in our eyes that detect colour are called cones. Cones can detect three different colours – red, green and blue (RGB). Every colour we see is a combination of these three primary colours. The secondary colours of light: cyan, magenta and yellow (CMY), occur when two of the cones are stimulated at the same time. White light is perceived when all three cones are stimulated at once.

Additive Colour mixing: Different wavelengths of light can add together to give us the perception of a new, brighter colour. This only happens if there are multiple sources of light. Smart phone screens combine lights of each of the three primary colours (RGB) to create all the colours we see.

Subtractive Colour Mixing: When light hits an object, some of the wavelengths get absorbed and others are reflected. As different coloured pigments are mixed, they absorb more of the original light and less reaches our eyes. This explains why mixing all different colours of paint together will create darker colours. Printers use bright secondary-coloured inks (CMY) that are mixed in this way to create darker colours (e.g. RGB)!

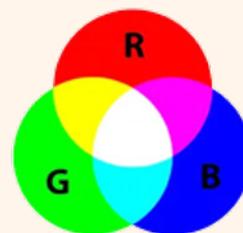
What questions should I ask?

- What colour is created when mixing blue and red light? What about blue and red paint? Why is the outcome different?
- What colour light is shining onto an object? What colour is reflected back?
- What colours are being absorbed?
- Do you think a television screen uses additive or subtractive colour mixing?
- If a green leaf is green because green light is reflected off it, is it still a green leaf when there is no green light?
- There are wavelengths of light that we cannot see but other animals can.
- What if there are more colours than green reflecting off this that we can't see, is the leaf still green?

What's next?

- Turn off the lights and shine a coloured torch on different colourful objects.
- What happens when a red torch shines on yellow paper? Does it still look yellow?
- Can you make white light using coloured torches? What about black?

Additive



Subtractive

