STEM
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How to make a rainbow: colour and refraction

What is a rainbow?

A rainbow is an arc of coloured light that occurs when light from the sun is reflected through droplets of water. The sun must be behind the observer, and droplets of water from the rain in front of the observer. The sun's light reflects in the rain droplets and refracts back to the human eye, dispersing the light to reveal the colours of the spectrum.

The colours in the rainbow are always in the same order:
Red, Orange, Yellow, Green, Blue, Indigo, Violet

Making a model rainbow

If it is a bright sunny day head outside:

You will need

- A water hose

Method

1. Make sure the sun is behind you.
2. Turn the hose on.
3. Put your finger over the nozzle of the water hose to create a mist that can be fired in to the air.
4. Look into the mist to see a rainbow.

You could also use a spray bottle filled with water and set it to mist to make the rainbow.

To create a rainbow inside:

You will need

- A darkened room
- A torch as the light source
- A glass of water
- A small mirror taped to the side of the glass and half submerged in the water
- A white wall or white paper to reflect the rainbow onto

Method

1. Turn the torch on.
2. Shine the torch on the mirror aiming to reflect off the mirror just under the water level.
3. A rainbow should appear on the wall or paper.

If you want to make your own rainbow:

You will need

- A CD
- A soft cloth
- A light source

Method

1. Wipe the CD to make sure it is not too dusty.
2. Hold the CD, label side down under a light or in front of a window.
3. Look at the CD and see the rainbow, and then move the CD to see how the colours move.
4. Reflecting a torch light off a CD in a darkened room will show the complete circle of the rainbow.
5. There are ridges in the material the CD is made from. This reflects and then refracts the light.

Did you know?

- Rainbows are best seen early in the morning or later in the afternoon after rain when the sun is lower in the sky.
- Rainbows form a complete circle but only half can be seen by the human eye because of the horizon.
- Double rainbows occur when the light is reflected twice off the back of a raindrop. The colours in the second rainbow are always inverted. It is always dimmer as it has been reflected twice.

Check out some more interesting facts and photos about rainbows and visible light:

- Rainbows (Atmospheric Optics)
  www.atoptics.co.uk/bows.htm
- Wavelengths of visible light (NASA)
  www.missionscience.nasa.gov/ems/09_visiblelight.html