



This resource pack was created by Dr Rebecca Wilson
www.drrebeccawilson.co.uk

Equipment per set

NIR camera, spectral glasses, emission tubes

Instructions for Spectroscopy

Introduce the **electromagnetic spectrum** [see image] and the concept that we can use different part of the EM spectrum to gather compositional information and physical properties [See image Milky Way image].

Activity 1: Visible light

Instructions: Put spectral glasses on and look at a light

What happens: You see rainbows

How it works: The glasses act as tiny prisms, splitting the light into its visible components [see EM spectrum image].

Activity 2: Emission Spectra

Instructions: Look at a white light with the spectroscope then compare it to looking at the emission tube with the spectroscope.

What happens: When looking at white light you will see a continuous visible light spectrum in the spectroscope, where all colours blend. When you look at the emission tube, you will see some horizontal lines are brighter in colour.

How it works: White light exhibits a continuous spectrum of all the wavelengths of visible light uninterrupted. The emission tubes are filled with gas, that are then subject to a voltage. Electrons in the gas gain energy and are promoted to an orbital of higher energy. When they lose energy they drop down to their original orbital - emitting a photon. This is why the emission tube glows, when switched on. When viewing the hot gas in the emission tube with the spectroscope, you can see the emission lines characteristic to that gas [see image of spectroscopy].

Activity 3: NIR camera

Instructions: Switch on the IR light, can we see it? View it with the NIR camera. Allow participants to view themselves in the NIR. Show the camera case on the screen.

What happens: We can not see the light, the camera can. We appear in greyscale in the camera. The camera case looks black in the visible and is light grey and black in the NIR.

How it works: We can only see in the visible and are not able to see in the NIR. Some animals like can though (i.e. the Mantis Shrimp). The camera can only see in the NIR, it detects the light. Materials of different composition reflect NIR by different amounts giving rise to light greys and black colours. The camera case is made from 2 different materials, hence is two colours in the NIR.



This resource pack was created by Dr Rebecca Wilson
www.drrebeccawilson.co.uk

Activity 4: X-rays

Instructions: Tape/glue the image of the hand over the image of the hand xray (all the right way up. Place the image on a table. Hold up the image to a white light and look “through” the paper.

What happens: When you look at the image on the table you see a hand. When you hold the image up to a white light you will see the hand bones (like an x-ray).

How it works: When viewing the image on the table visible light (analogous to the x-rays) reflects off the material enabling us to view the image of the hand. When held up to the white light, some of the material absorbs the light and some of the material reflects the light – in the same way x-rays do when an x-ray is taken. As a result we can see only the bones i.e. the xray image.