**Experiment Suggestions**

**Experiment 1: What colour is white light?**

In this experiment you’ll be investigating what colours are in white light and how this helps us see different colour objects.

**Equipment List**

* Diffraction grating
* Red LED light
* Coloured sweets
* Box

1. Shine your white LED light into the diffraction grating. How many colours can you see? What do you think this means about white light?

The colour of an object you see is affected by what colours it reflects and what colours it absorbs. A red object reflects **red** light and absorbs any **other colour.**

You now have to sort coloured sweets, based only on their colour. You’re going to do this using all three colour LED lights.

Inside your cardboard box are coloured sweets. You need to sort them by colour, into as many piles as you think there are colours. You only have 30 seconds and can only use the red LED.

How well did you do? What do you notice about the colours of the gummy bears?

**Experiment 2: Scattering Light**

As well as being reflected and absorbed light is scattered. You’re going to investigate how light is scattered in the human body.

**Equipment List**

* Laser pen
* Target
* Cuvettes (clear plastic containers)
* Water
* Milk

1. Start by shining the laser pen on to the target without anything in between.
2. Next shine it through a cuvette filled with water. Is the laser affected much?

Water only scatters light a little bit. We’ll now simulate human tissue using milk.

1. In a second cuvette filled ¾ up with water add 1 drop of milk. Shine the laser through on to the target. What happens as you add more milk to the cuvette? How many drops of milk does it take to stop the laser completely?

Why do you think we have to think about scattering when trying to shine light through the body?

**Experiment 3: The colour of blood**

You’re going to build a **model** of blood, looking at how it reflects and absorbs different colours of light.

In science, a model is a way of visualising something that is otherwise difficult to see. It’s never the exact same as the real thing, but it helps us to understand things that are normally very complex.

**Equipment List**

* A beaker (this represents part of our body, eg skull)
* Laser pointer (this is the light we can shine into the body to obtain information about what is happening inside it)
* Water (this represents tissue as body tissue is composed mainly of water)
* Red cordial (this represents HbO2)
* Blue food dye (this represents HHb)

1. Pour water into a beaker (so it fills up halfway) and shine the laser pointer through it. Does the laser pointer look ‘dimmer’ after it has passed through the water? Or does it look the same? Is water a strong or weak absorber of light?
2. Now add some red cordial to the beaker and shine the laser pointer through it. How does the laser pointer look after it has passed through this mixture?
3. Add a few drops of blue food dye to the beaker. What happens to the colour of the laser pointer?

**Experiment 4: What is metabolism?**

**Metabolism** is the process of converting food and oxygen into energy in your cells. Your brain uses more energy than any other organ in your body, so its ability to **metabolise** is extremely important.

You have four sets of coloured counters which each represent a different part of metabolism:

* RED - blood with oxygen (oxyhaemoglobin).
* BLUE - blood without oxygen (deoxyhaemoglobin).
* YELLOW - sugar (glucose).
* GREEN - energy (we normally can’t measure this directly).

In front of you is a **healthy** brain with blood vessels going in and out of it. It follows some simple rules:

1. It turns **1** red counter and **1** yellow counter into a green counter.
2. When a red counter is used up, it is replaced with a blue counter.
3. The brain needs to finish with at least 2 green counters to work properly.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **In** | | | | **Out** | | | | **Success?** |
| RED | BLUE | YELLOW | GREEN | RED | BLUE | YELLOW | GREEN |
| ***a)*** | 3 | 2 | 2 | 0 |  |  |  |  |  |
| ***b)*** | 1 | 4 | 1 | 0 |  |  |  |  |  |
| ***c)*** | 3 | 2 | 1 | 0 |  |  |  |  |  |

When your brain is working hard it needs **more energy**.

What counters are needed to produce **4** green counters?