COLOURS OF OBJECTS

- *Follow instructions in this worksheet, if you have difficulty understanding them, ask us.*
- *Write down both your partial and final results into the text and prepared graphs.*
- *If you want, you can record videos and take photos of conducted experiments, etc.*

The goal and idea of the experiment

You will explore the way shining light changes the perceived colours of objects.

Preparative task: RGB colour mixing

If you have done COLOUR MIXING, then you can skip this task and go to task 1 on the following page.

Photoreceptor cells

We have two types of photoreceptor (on light reacting) cells on retina – the cones and the rods.

We recognize 3 kinds of cones– L-cones most sensitive on yellowish green light ( ), M-cones most sensitive on green light ( ) and S-cones most sensitive on purple-blue light ( ).

When a photoreceptor cell absorbs light it sends a nerve signal to the brain that then calculates the colour and location of the light source.

We can obtain the whole colour spectrum by adding up differently intensive nerve signals from different cones from the same spot on the retina.

Procedure

1. Estimate and write down into the table bellow what the resulting mixed colour of given colours is going to be. After your estimations, use lamps to mix these lights and write down observed mixed colours.

Colour combinations	Estimated mixed colour	Observed mixed colour
Red + Green		
Red + Blue		
Green+ Blue		
Red+ Green + Blue		

Spectroscope is an optics device that diffracts transmitted light by its colour. Here, it looks like a foil in a little window. Place it closely to eyes for the best effect.

2. Turn off two lamps and turn on the *Smooth* mode on the third lamp and look at it through a spectroscope. Describe what you see.

We can work with light as if all colours composed of the basic colours. Different shades of colours can be obtained by changing the intensity of the basic colours.

Task 1: Colours of objects

Light can be absorbed by or reflected from objects (or it can be transmitted through them, but for this task the result will be the same as if the light was reflected).

1. Darken the room with the curtain, turn off the lights (if it's on) and turn off two lamps (if you haven't done so in the preparative task).

2. There is a sheet of paper with four coloured stripes on the shelf. Look at them and name their colours in different lights (the colours don't have to be extremely precise).

Stripe	Colour in red light	Colour in yellow light	Colour in green light	Colour in teal light	Colour in blue light	Colour in pink light
1						
2						
3						
4						

3. Try to estimate the colour of each line in white light based on the table above. Turn on the white light **after your estimates**.

Stripe	Estimated colour in white light	Observed colour in white light
1		
2		
3		
4		

4. Try to explain why the colour of balloons depends on the light that illuminated them. (Now you can open the curtain and turn on the lights.)

5. Explain why the red stripe appeared "black" in green, teal and blue light, but red in red, yellow and pink light.

6. Explain why stripe number 4 copied the colour of all lights.

Conclusion

Teal objects illuminated by green light will appear to be . If we shone with red light, they would appear to be .

Objects have the colour of the light they .