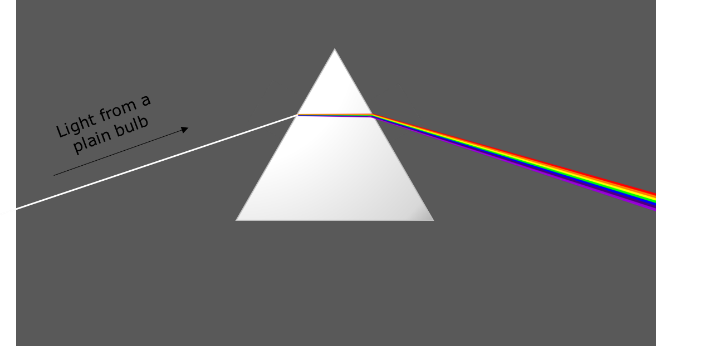
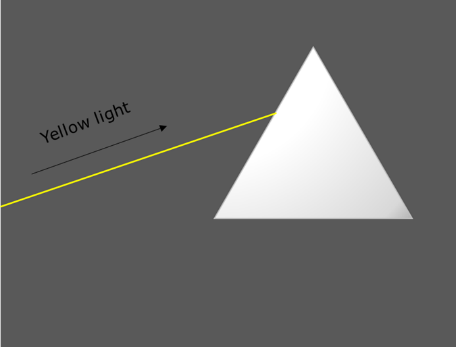
**Yellow light**

A plain light bulb makes light a similar colour to daylight.

A glass prism can split this light into the colours of a rainbow.

**Predict**

What will happen if **yellow** light is shone at the prism?

**Explain**

Why do you think this will happen?

|  |
| --- |
| **Carry out the investigation** |

**Observe**

Complete and label the diagram

to show what you see.

**Explain**

Were your prediction and explanation correct?

If not, can you explain what you observed?

*Physics > Big idea PSL: Sound, light and waves > Topic PSL2: How we see > Key concept PSL2.2: Seeing in colour*

|  |
| --- |
| **Response activity** |
| **Yellow light** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Daylight and sunlight are made from all the colours of the spectrum, which together we see as ‘white light’. |
| Observable learning outcome: | Explain how daylight / sunlight can be split into colours of the spectrum, whereas yellow light cannot. |
| Activity type: | Predict, explain, observe, explain - practical/demonstration |
| Key words: | Prism, spectrum |

This activity can help develop students’ understanding by addressing the sticking-points revealed by the following diagnostic question:

* Diagnostic question: Rainbow

**What does the research say?**

For a physicist, sunlight and daylight are both examples of white light. Each consists of all the colours of the spectrum which combine to be seen as white. Students often regard white light as ‘pure light’ that is free of any tinge. More than half of a sample of 13- to 16-year-olds (n=166) considered colour to be different to light and something that is added to light (Galili and Hazan, 2000).

When asked why red light is seen to come from a red filter, Zylbersztajn and Watts found that about half of a sample of 150 13-year-olds, who had recently been taught about colour, thought that white light was changed in some way by the filter and a sixth of the sample suggested the light had been dyed in some way (Driver et al., 1994; Zylbersztajn and Watts, 1982).

This activity builds on the understanding that a spectrum of colours can be made by passing white light through a prism, in order to challenge students to explain why the prism does not also split yellow light. To do this they need to apply the idea that white light is a mixture of several colours and yellow light is not (see guidance notes in the key concept: Seeing in colour). The results directly contradict predictions that can be made based on any persisting misunderstandings.

**Ways to use this activity**

Students should complete this activity in pairs or small groups, and the focus should be on the discussions. It is through the discussions that students can check their understanding and rehearse their explanations.

To begin, each group should discuss the activity and use their scientific understanding, firstly to predict *what* they think will happen, and then to explain *why* they think they are going to be right. If students in any group cannot agree, you may be able to direct them with some careful questioning.

Students now carry out the practical, or watch a demonstration. You will need to decide whether it is better for each group to carry out the practical and risk some unexpected observations, or to demonstrate the activity so that everyone *observes* the same thing.

After the practical each group should be given the opportunity to change, or improve their explanation. A good way to review your students’ thinking might be through a structured class discussion. You could ask several groups for their *explanations* and put these on the whiteboard. Then ask other groups to suggest which explanation is the most accurate and the most clearly expressed, and through careful questioning work up a clear ‘class explanation’.

A useful follow up is for individual students to then write down explanations in their own words – without reference to the class explanation on the board (i.e. cover it up).

*Differentiation*

The quality of the discussions can be improved with a careful selection of groups; or by allocating specific roles to students in the each group. For example, you may choose to select a student with strong prior knowledge as a scribe, and forbid them from contributing any of their own answers. They may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

**Equipment**

For each student/pair/group:

* lab pack (12V)
* ray lamp
* slit for ray lamp
* yellow filter for ray lamp
* 60o prism
* white screen

**Technician notes**

The yellow filter needs to fit into a slot in the ray lamp.

**Health and safety**

A visual check for loose wires and damaged plugs on the lab packs should be carried out.

The main dangers are from the use of mains electricity and the risk of dropping heavy lab packs.

Practical work should be carried out in accordance with local health and safety requirements, guidance from manufacturers and suppliers, and guidance available from CLEAPSS.

**Expected answers**

Yellow light passes through the prism. Its direction changes (it is refracted) and its colour stays the same.

Yellow is one of the colours found in the spectrum of light and it is not made up of any other colours. The prism ‘bends’ (refracts) different colours of light differently. This separates out any different colours that the light shone through the prism is made up of.

*The use of the word ‘bend’ needs to be clear. Light changes direction sharply at each surface of the prism; it does not bend in* a curve *through the prism.*

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

Images: Peter Fairhurst (UYSEG.

**References**

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Galili, I. and Hazan, A. (2000). Learners' knowledge in optics: interpretation, structure and analysis. *International Journal of Science Education,* 22(1)**,** 57-88.

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