
Lesson 1 - What is Light?

By the end of this lesson you should:

- Understand the ray model of light

1. With your group brainstorm the question 'What is light?'

2. **Analyse.** Obtain a raybox and ensure that nothing is blocking the light by removing the cover. Turn the raybox on and observe how the light forms on a screen (a blank piece of paper will suffice) located some distance from the raybox. Observe what happens as you move the screen closer and further from the raybox.

3. **Analyse.** Now place the three slit filter in front of the raybox. Observe how the light emerges from the raybox? It may be useful to place a piece of white paper underneath the ray box in order to improve visibility.

4. **Describe.** Come up with a working model for how light behaves. In your model answer the following two questions. (a) In what path does light travel? (b) What happens to the brightness of light the further you get from the source.

Possible Ray Model of Light:

In order to validate a model you must make predictions with that model and then complete experiments to determine if the results confirm and refute your predictions. If the results disagree then the model needs to be improved.

5. **Test.** Using the projector as a light source create a shadow on the wall with some object. Using a diagram explain how the shadow is formed. Explain how the formation of a shadow on the wall verifies or disputes the prediction from your model in #4a, explain.

6. **Test.** Using a laser pointer and some chalk brushes determine if the light from this source obeys your model from #4a and #4b. Explain. [Pass the light from the laser pointer through a cloud of chalk dust created by beating the brushes together]

1	2	3	4	5
Manager:				
Speaker:				
Recorder:				

7. As a class.

The Ray Model of Light:

8. **Problem?** How does the fact that light does not lose energy as it travels rectify with the observations from #2?

1. We perceive how bright an object is by how many rays enter our eye.
2. Normal sources of light like a light bulb have light rays that diverge that is spread out in all directions.
3. Laser Light does not diverge but rather travels in a straight line at all times.

Using the three ideas above draw a diagram showing how rays emerge from a light bulb and a laser pointer below. How do these diagrams allow us to explain our observations from #2 and #6.

Normal Light Source

Laser Pointer

Some terminology will be used throughout this optics unit and are stated below.

Medium - This is the substance that the light is traveling through. So far your medium has been air.

Interface - This is the boundary where two mediums meet. For example the surface of a lake. At first the sunlight is traveling through the medium of air and then it begins to travel through the medium of water.

It is important to understand that what we described above is just as it says in the title 'A MODEL'. This model is useful for explaining how light behaves as it travels from one medium to another. There are other models of light as well and they are the wave model of light and the particle model of light. All of these models have their own usefulness in describing different phenomena, but this unit will focus only on the ray model (and a little of the wave model).

Now we want to take a moment and think about the composition of white light. White light is generally the light that we observe from any common light source like the sun, light bulbs, ray boxes etc. In order to closely examine white light we will use the simulation software PhET found [HERE](#). Select the Prism option on the home screen.

9. **Analyse.** Place the triangular prism directly in the path of the beam of light and then turn on the light by pressing the red button. This light source then emits a ray of red light. Describe how the ray behaves as it travels through the prism. Include a sketch of the simulation.

10. **Analyze.** Observe the effect of changing the colour of the light passing through the prism by alternating between red and purple light. How did their paths differ?

11. **Analyze.** Now change to white light. What happens with the emerging beam? What does this mean about the composition of white light?

12. **Explain.** Why do we only notice that white light is made up of all the colours after passing it through a prism, why do we not notice it in air?



13. Now add a lens in the path of the rainbow. Can you use the lens to turn the rainbow of colours back into white light? What does this mean if we mix all the colours of light together?