

## V. To see and to be seen?

Key Question: How does light travel and how do we see it?



Student name:

Class:

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## Activity 1 – How does light travel?

1. If you have ever seen the beam of light from a torch you probably have noticed how light travels. Look at the photos.



How do you think light travels?

2. Does a beam of light seem to bend around corners? Does light zigzag its way to an object?

- Do the following experiment. Take 3 the same format cards with a hole punched in the centre of each card.
  - Stand the cards up a few centimetres apart on a flat surface (line up the holes.).
  - Shine a flashlight from one end through all the holes.
3. Did the light travel through all the holes?

4. Move the middle card a little so the hole is not lined up. Shine a light through the holes. What happened?

5. What does this tell you about the path light travels?

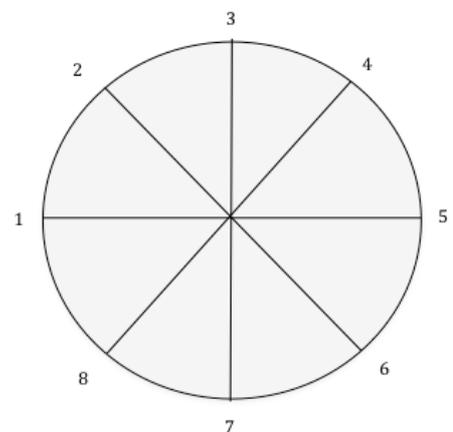
## Activity 2 – Light intensity around a candle or a bulb

You are going to observe how light travels. You will measure the light intensity around a light source.

- Place a candle or an electric bulb in the middle of a circle. Divide the circle as shown on the picture. You will record the light intensity at different points around the circle. There should be dark in your measurement area.
- Place €Sense with the light sensor at one on point of the circle, and point it at the candle.
- Measure the light intensity. Write the results in the table below.
- Move the light sensor one interval around the circle and repeat the measurement. Remember to keep the light sensor at the same circle to keep the distance the same from the candle.
- Repeat the measurement around the candle.



POINT	LIGHT INTENSITY
1	
2	
3	
4	
5	
6	
7	
8	



Measurement points around a circle

6. Is the light intensity the same at the same distance around the candle?  
How do you know?

7. Does light spreads out in all directions from a candle.  Yes  No

### Activity 3 – Seeing things

- 8.** Imagine you take a book and you close yourself in a dark place like a closed wardrobe. Can you read your book in such a place? Why?

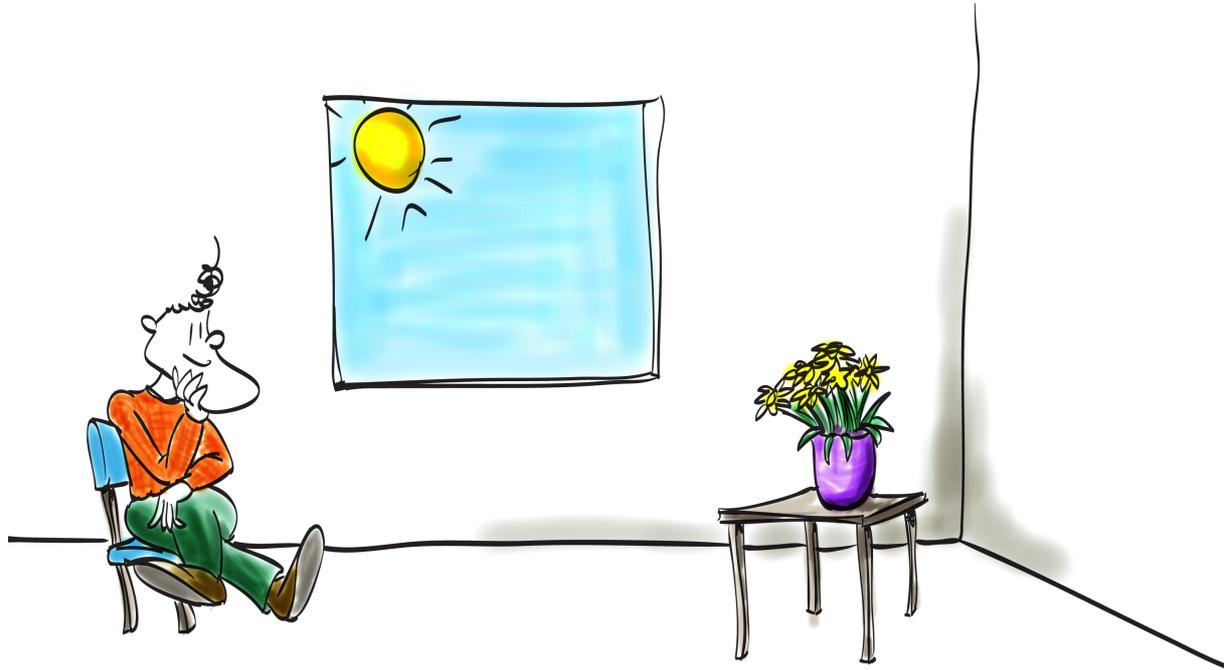
- 9.** Can your eyes see in the dark? Can the light sensor measure in the dark?

- 10.** What do you need to be able to see?

- 11.** Imagine now you sit in your room and read a book. How it is possible that you see your book. Does the book produce light?

- 12.** The book is not a light source. How you explain that you can “see” light coming from the paper? What happens to the path of light when it hits an object?

**13.** The man can see the flowers on the table. Draw lines to show the direction in which the light is travelling.

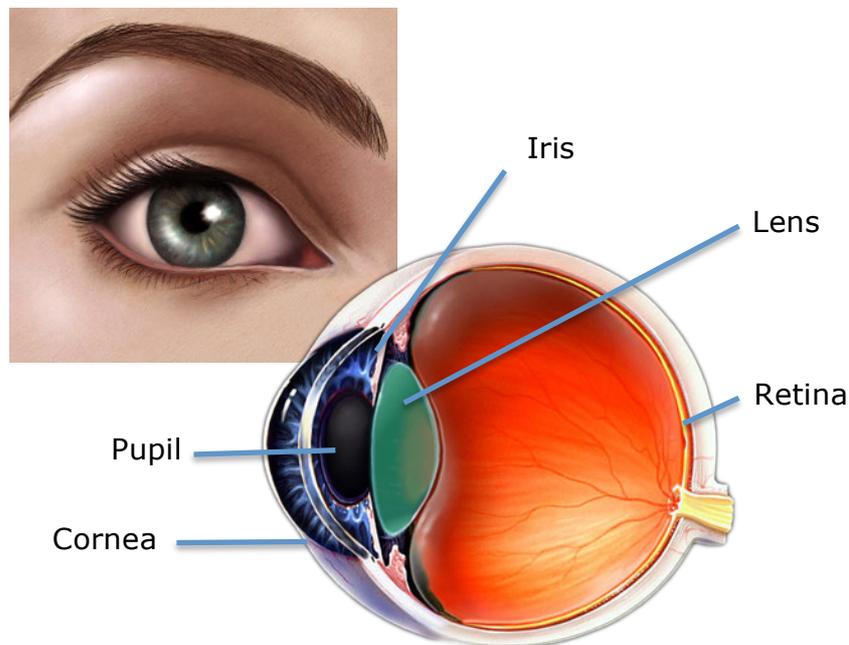


## Explanation: How do we see?

When light rays from light sources hit objects they bounce off. Light bounces off at many different directions and angles. The reflected light rays travel into your eyes, this is how you see. When we use a reading light the light reflects back from the objects we are looking at and into our eyes. When the light is off, no light reflects back to our eyes so we cannot see things.

Light enters the eye through the **cornea**, the see-through skin that covers the front of your eye. It is clear like glass and protects the eye. Light then passes through the **pupil**, the opening to the inside of the eye. The size of the pupil is controlled by the **iris**, the colored part of the eye. It gets very small in bright light, and bigger in low light.

The **lens** focuses light onto the retina. It changes shape to make sure that the 'picture' on the **retina** is as clear as possible. The light sensitive cells of the retina gather information about patterns of light and dark, colour and movement and send it through the optic nerve.



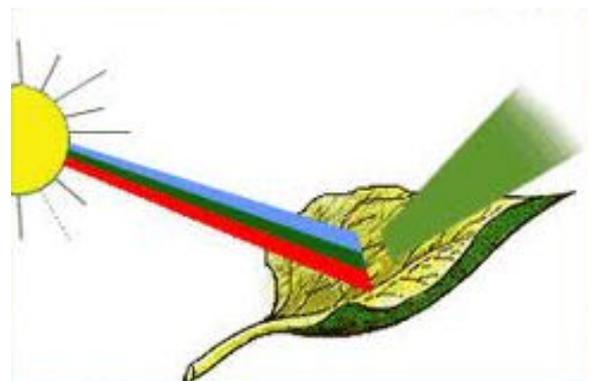
## How do we see colour?

Light, from most light sources, looks white, but actually contains all the colours; like colours in the rainbow.

If an object looks green, it is absorbing every colour except green, which is reflecting off it and entering your eyes.

If an object looks red, it is absorbing every colour except red, which, again, is reflecting off and entering your eyes.

If an object looks blue... *(You get the idea!)*



## Activity 4. Finding shapes with the light sensor

Your eyes can do more than only see light; they can also recognize shapes and colour. To explore how it feels to see only light, but not shapes and colour, try walking around the classroom with a tissue over your eyes. Try one or two layers.

- 14.** How well can you walk around? Can you avoid running into things? Can you locate your classmate? Can you locate windows? Can you locate the door? Can you see someone moving? Describe your experience when you walk with a tissue over your eyes.

Now you are going to play a game. Take a sheet of white paper. Draw a shape somewhere on it. Fill the shape with a solid dark colour. The shape should be at least as big as your hand. Your task will be to find the coloured shape on the paper only by searching with the light sensor. You are not allowed to look at the paper. In your game you will use the drawing of your classmate, and your classmate will use your drawing.



- Place the paper on your desk.
- Hold the light sensor and watch the screen. Your classmate will keep a piece of paper up so that you cannot see where the shape is.
- When you are ready start your measurement and look for the dark shape. As soon as you will find it say: "I found it!"  
Your classmate will confirm it this is true.
- Take turns in finding a shape.

**15.** Was it hard to find the shape?

Yes       No       Sometimes

**16.** What made it easy or hard?

**17.** How could you tell where the shape was from the light sensor measurements?

**18.** Did the color of the shape make a difference?

**19.** In your own words explain how do the sensor "see a shape".

## Questions

**A.** What is the difference between light from the Sun and light from the moon?

**B.** Explain why do we use reflectors or lampshades.

**C.** Based on your experiment, compare a light sensor with your eye? How is it different?

