Year 6 - Light Reading Booklet

Lesson Series:

1. How Light Travels
2. How We See
3. Shadows and Their Shapes
4. The Colour of Light
5. Making a Periscope

Name: _____

Class: _____

Lesson 1 - How Light travels

Light is an electromagnetic energy that travels in waves. It enables us to see the world around us. The human eye can detect this energy and using our senses, we can perceive and interact with our surroundings and also communicate with others.

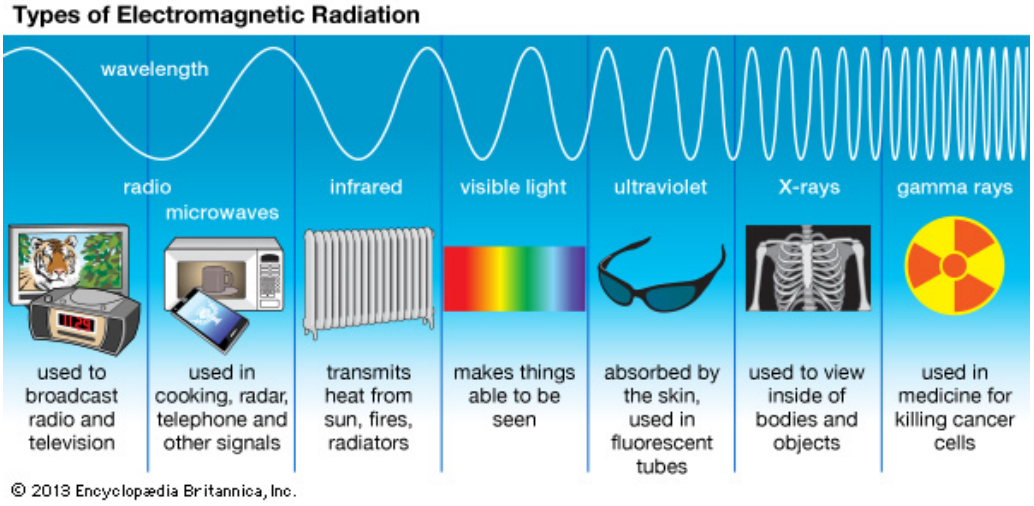
A source of light is anything that makes light, there can be natural light sources and artificial light sources (made by people). We can only see something if light from a source reflects off an object and then enters our eyes.

The speed of light is unbelievably fast, 300 million metres a second. It is believed by scientists like Einstein that nothing in the universe can travel faster than light. The sun is the most important source of light for life on earth, it provides light and warmth.

Light always travels in straight lines. It is because light travels in straight lines that shadows form when the light is blocked by an opaque object. Light only changes direction when it hits a boundary with a liquid or solid and slows down or speeds up a tiny bit. Darkness is the absence of light.

There are other kinds of energy in the same spectrum, or family, as light. The light that we can see is called visible light, and it is just a small part of the electromagnetic spectrum, 'light' is what we call the small part our eyes can detect. Higher frequency waves that we can't detect (see) with our eyes include x-rays. Lower frequency waves that we can't see include radio waves and microwaves. In the range that we can see, different frequencies appear as different colours.

Useful Link:
https://www.bbc.co.uk/bitesize/clips/zyntsbk



Light travels in a straight line from a light source. We can see this if we shine a torch across a dark room.

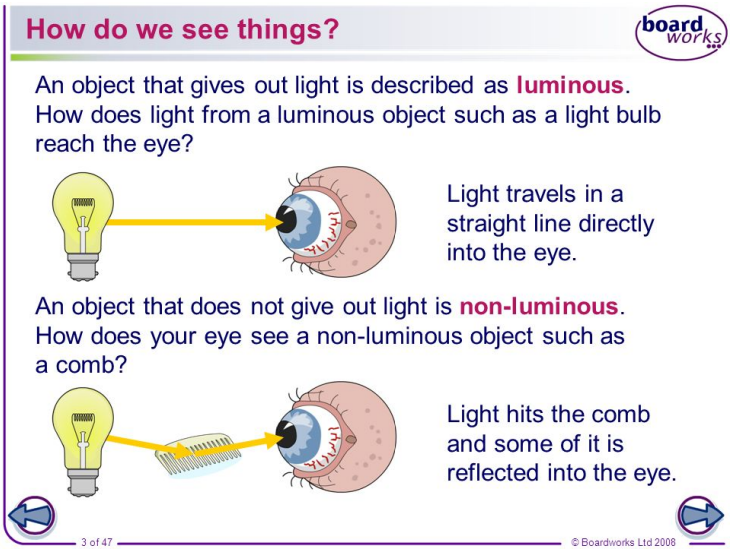
The Peace Tower in Iceland sends a high powered beam of light into the night sky.

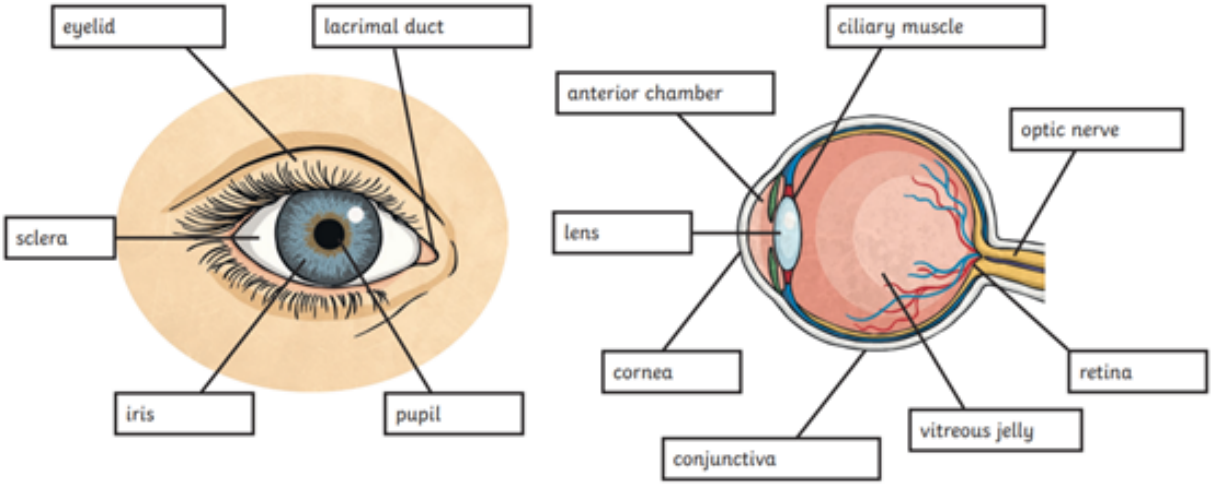
Lesson 2 - How we see

You see things because light bounces off them, and then enters your eyes. Rays of light pass through your cornea, a transparent covering on the outside of your eye. Next the light goes through the pupil, which is a hole in the middle of the iris (it looks black). The iris, the coloured part if the eye, is a circular muscle that makes the pupil wider or narrower. On a bright sunny day, the iris expands so the pupil gets smaller to let in less light. In a dark room, such as a theatre, the iris contracts so the pupil gets wider to let in more light.

The iris is an involuntary muscle – it works without you thinking about it. After light rays pass through the iris, they go through the lens which is a squidgy circular transparent disc, fatter in the middle. Muscles attached to the lens change its shape just a little bit, to help the lens focus. The lens focuses the light rays onto the surface at the back of the eyeball, called the retina. Inside the retina, light rays change into electrical signals. These signals travel along the optic nerve to your brain. The brain makes sense of the signals and recognises the images. It all happens so fast so you don't even notice.

Useful link:
https://www.bbc.co.uk/programmes/p0118jbj





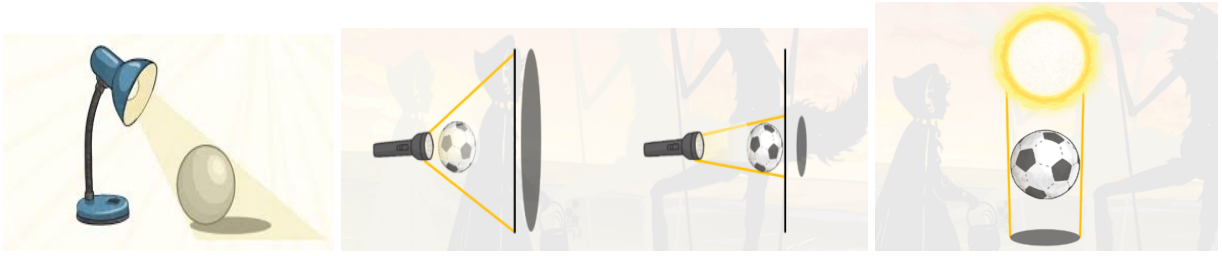
Lesson 3 - Shadows and their shapes

Shadows are created when the path of light is blocked by an object. Shadows can change depending on the position of the light source. The closer to the light source an object is, the bigger the shadow will be. This is because the object blocks more of the light. The further away from the light source an object is, the smaller the shadow will be. This is because the object blocks less of the light. When the light source moves, the shadow will change. When the light source is directly above the object, the shadow will be directly underneath. When the light source is to one side of the object, the shadow will appear on the opposite side. The shadow will also be longer. An object that does not let light through is called opaque. An object that allows light to pass through is called transparent. An object that allows some light to pass through it is called translucent.

Useful Links

https://www.bbc.co.uk/bitesize/clips/z8vfb9q

https://www.bbc.co.uk/bitesize/clips/z6fnvcw

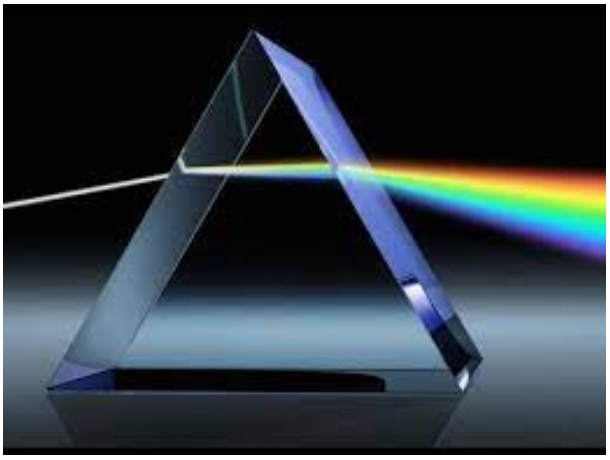


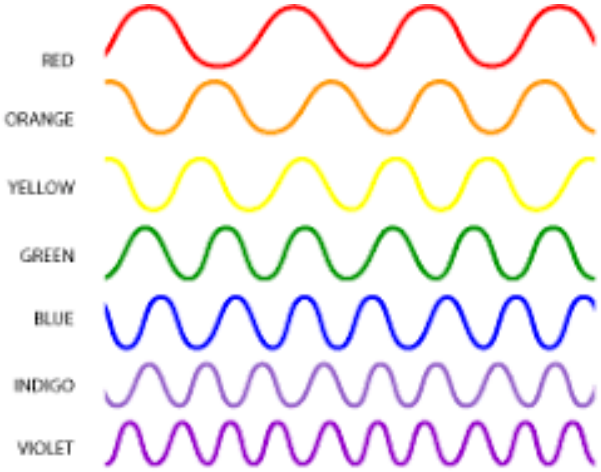
Lesson 4 - The colour of light

We call the light that comes from the sun white light, but it is actually made up of all the colours of the rainbow. The light we see is actually part of a large spectrum of light, of which only a small part is visible to the human eye. We can see the different colours white light is made up of by separating them using an object called a prism. A prism slows down light travelling through it, bending it and splitting it into its different component colours – with red bending least, and violet bending most. We say the light is refracted through the prism.

The different frequencies of light (different colours) are slowed down by different amounts by the glass, so they all take slightly different paths and become separated so we can see each colour. Each colour ray still travels in a straight line, slowing it down just makes it change direction. Rainbows form because the light slows down as it meets the droplets of water and the light is refracted, or split into its colours.

Useful link:
https://www.bbc.co.uk/bitesize/topics/zw982hv/articles/zcj73k7





Lesson 5 - Making a periscope

A periscope is a device that utilises light and mirrors to allow the viewer to look into it and see an image. A periscope has angled mirrors that reflect the image down the tube of the periscope. Sophisticated periscopes on submarines use very complicated lenses and mirrors. Soldiers in the trenches in WW1 and WW2 also used periscopes to see over the tops of the trenches.

When submarines were first built, they had a problem in that they needed to come to the surface of the water in order that the crew could see outside or above the vessel. Simon Lake, an American inventor, had worked on creating a successful submarine. He was one of the first people to design a device which later became the periscope. Other scientists and engineers later improved the device, including Sir Howard Grubb who also made telescopes.

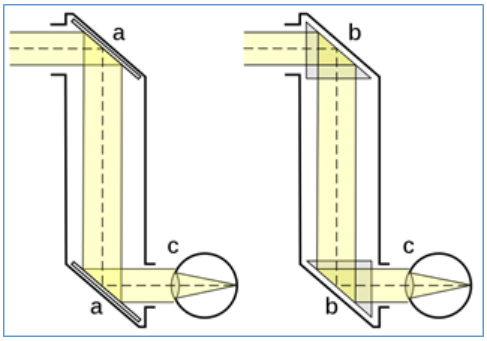


Diagram of a periscope

Simon Lake

Sir Howard Grubb

Science
PKC

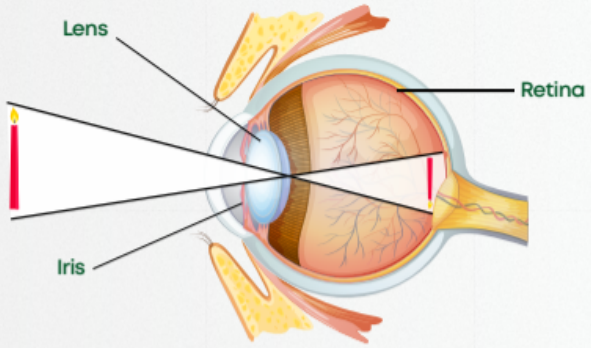
Light

PKC

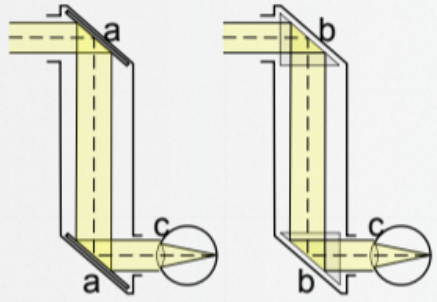
KEY VOCABULARY

Light	Light is a **source of illumination, it allows us to see**. There are natural and artificial sources of light on earth. The sun is a natural source of light that supports life on earth
Speed of light	The speed of light is believed to be **the fastest speed at which anything in the universe can travel**, approximately 650 million miles per hour. Scientists use the speed of light when calculating vast distances in space
Mirror	A **surface which reflects a clear image**. Archaeologists have found mirrors made from polished stone dating back over 6000 years. The Ancient Egyptians used polished copper to create mirrors
Shade	A **dark patch where light has been blocked.** Shade is darker and cooler than areas exposed to direct sunlight
Reflection	The **return of light from a surface**. Some materials absorb light, but others reflect it
Prism	A wedge shaped object which **can split white light into a rainbow spectrum of colours**. Scientists call the splitting of light 'dispersion'

CROSS SECTION OF HUMAN EYE

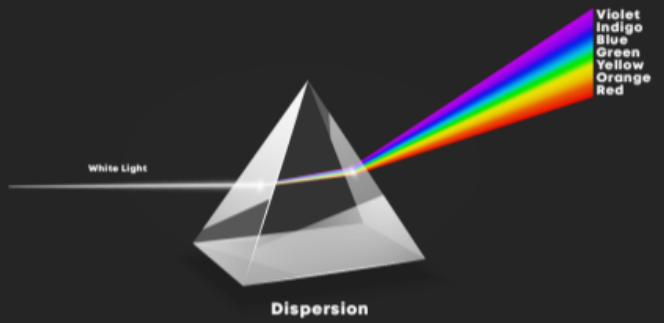


Light is essential for our eyes to see



A Periscope – a device that uses reflection of light to allow the user to see something that is out of their line of sight.

At A, the mirrors are tilted 45° and at B the light reflects from the mirrors travelling down the Periscope. At C, the image can be seen by the user



A prism can split white light into rainbow colours