

Physics Unit: Light Misconceptions

What some pupils think	Notes....
Light is not necessary for vision; it is possible to see in the dark.	Light is necessary for vision. It is impossible to see in total darkness.
Only smooth, shiny objects like mirrors reflect light; dull and rough objects do not reflect light.	Dull objects do reflect light, otherwise we would not be able to see them. Smooth surfaces produce regular reflection while rough surfaces produce scattered, diffused or irregular reflection.
Light travels from the source to both the observer and the object, but there is no link between the two.	Light travels from the source to the object; the object reflects the light from the source into the eyes of the observer; the receptor cells in the observer's retinas detect the light and send the signals to the brain.
Shadow is the presence of something that light allows us to see.	Shadow is the absence of light.
On light diagrams pupils often draw the light ray with the arrow going from the eyes to the object. Light travels from the eyes to the object	The images we see are made up of light reflected from the objects we look at. This light enters the eye through the cornea. The amount of light entering the eye is controlled by the pupil. When we draw diagrams the light comes from the light source, travels to the object (in straight lines) and is reflected into our eyes.
I am looking at something which is why I can see it	In order to see anything, we require the presence of light. Pupils find it difficult to grasp this as they think that when they go to sleep at night it is dark and they can still see things. This is because there is light getting into their room and reflecting off objects. In the absence of light, we cannot see anything.
Opaque surfaces give out colour or 'darkness'	Colours are seen as we have specialised cells in the eye and the cones help detect colours. When we look at objects and see them in colour it is because we are seeing all the light that reflects off that object. A red object reflects red light and absorbs the other colours of the spectrum; this is why the object appears as red. In dim light the cones are less sensitive so it is harder to perceive colour in the darkness.
Primary colours of light are often confused with the primary colours of paint	Primary colours of light are red, green and blue. When these colours are mixed together you get white light. Red and green light makes yellow light, Red and blue makes magenta and blue and green light makes cyan. If you mixed the primary colours of paint you would get a dark brown colour.
Pupils can be confused by the idea that light travels in straight lines	Shadows are evidence of light travelling in straight lines. In an atmosphere that is a bit dusty, we can see light travelling in straight lines. If light didn't travel in straight lines it would be able to curve and travel around opaque objects; it would not be blocked, so a shadow would not form.
Light needs air to travel	The speed of light is experimentally constant: it is independent of the source or detector or the direction in which it travels. Light can travel in the vacuum of space. If it didn't then light would never reach the Earth. Light can travel indefinitely, as long as it doesn't get absorbed by something. (Due to the expansion of the universe the light wave will get stretched out along with the space it travels through, becoming lower in frequency and energy)
Sunlight is hot but visual light is not	Light itself is not hot; but it does carry energy which will increase the temperature of an object that absorbs the light. Light and heat radiation are both types of electromagnetic waves, the only difference being the amount

	of energy they carry. All types of EM emission heat objects, depending on how well that object absorbs light.
Everything reflects light but only if it's in the Sun	Objects will reflect light as long as there is a source of light/ illumination. This light can come from something natural like the sun or an artificial source like a lamp.
Light reflects off things if the angle is correct	Light reflects from a smooth surface at the same angle as it hits the surface. Rough surfaces diffuse the light and allow it to be seen from many different angles. A mirror illuminated by many parallel rays reflects them in only one direction, since its surface is very smooth
Water does not reflect or absorb light, but light can go through it	Water both reflects and refracts light. This means that as a light beam enters water, the speed of light is changed which alters its direction. When water is very still in a lake the reflection of the landscape is very good as the surface is very flat. The ripples in water cause the reflection to become distorted. Pure water does not absorb visible light which is why it appears colourless.
Light passes straight through transparent objects	If the transparent object is flat with parallel surfaces light will slow down and change direction as it enters the object but when it leaves it will change direction in the opposite direction but by the same amount. As a result the image coming out of the other side is undistorted. When light enters a material that is more dense than air, it will slow down and change direction, when it leaves it will speed up again and move in the opposite direction. This is called refraction.
Shadows are always black	If you have multiple sources of light, only when the object blocks light from all the coloured light sources would you get a black shadow. Most shadows appear grey/back because the light cannot make its way past the obstruction.
The moon emits light during the night	We can see the moon as the sunlight reflects off the surface of the moon into our eyes. Pupils find this difficult to understand as they think that at night when it is dark the Sun is no longer there. The moon does not emit light. It is however the 2 nd brightest object in the sky after the sun due to the amount of light it reflects