

Learn to Light:

Light and Dark Light is a form of energy. Light is made up of photons and travels in a straight line as a light wave. The strength of the light depends on how much energy the photons contain. Light sources are luminous objects that give off light, like the sun, torches, TVs, candles, fireworks and some animals. We need light to see and light sources allow us to see in the dark. Dark is the opposite of light - dark is the absence of light.



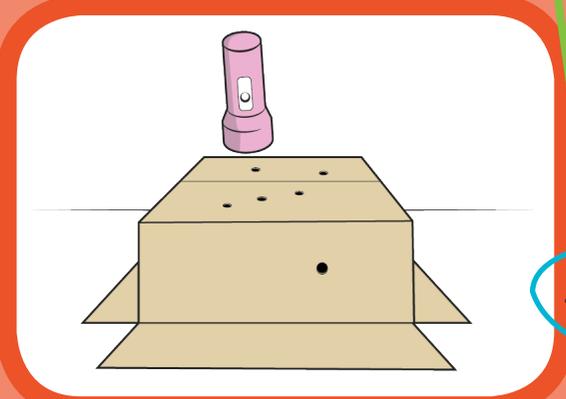
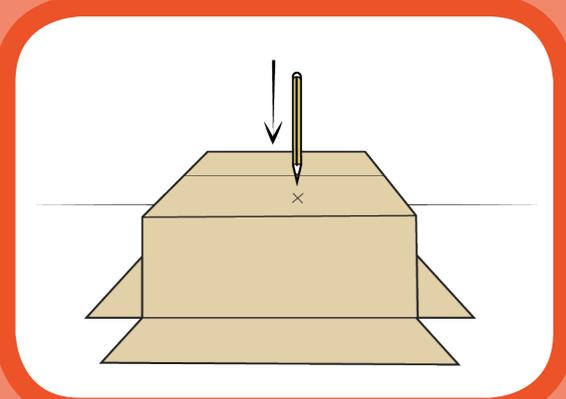
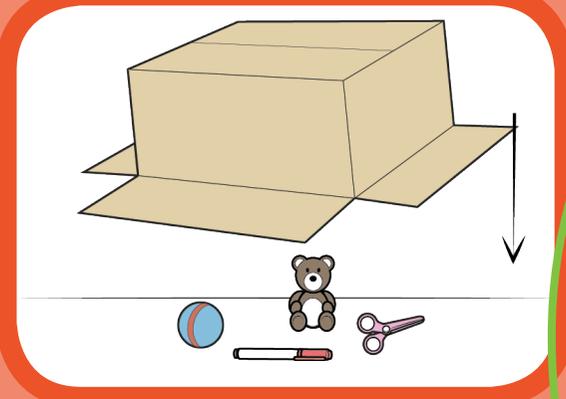
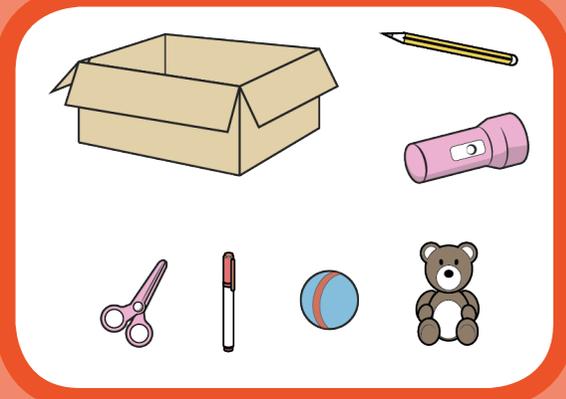
Experiment

Making a dark box

You will need:

A cardboard box, a sharp pencil, some objects from around the house, a torch

1. Turn your box face down on the table with any flaps folded out. What do you think it is like inside the box? Place your objects under the box.
2. Make a hole in the top of the box with a sharp pencil - what can you see through the hole? Make some more holes in the top - what can you see now? Try making holes in the side - can you see any of the objects?
3. Try shining a torch through one of the holes and looking through another - what can you see now?



FUN FACTS

Light travels incredibly fast. Nothing can travel as fast as light. Light can travel up to 300,000 km per second (186,000 miles per second). Light travels faster than sound so that's why we see lightning before we hear the thunder.

Artists and photographers often use the contrast (difference) between light and dark to create striking images.



Plants use light energy to make their 'food'. The process is called 'photosynthesis'.

The moon does not give off light. The light we see is sunlight reflecting off the moon.

Findings

Can you see in the dark ?



What do you need to be able to see ?



Does having more light make it easier to see ?

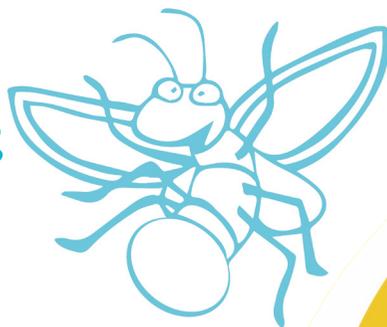


Learn to Light:

Conclusion Light lets us see things, light provides warmth and energy, light helps things to grow and animals to communicate with each other. Without light there would be no life on earth. Light from the sun can be used to help generate green (renewable) energy, called solar energy. The sun is the biggest light source. When the sun sets at night we often describe it as being dark, but it is rarely completely dark as there's always a little bit of light. This is why we can still see.

A firefly is a bioluminescent insect, which means it can make its own light. You might have even heard a firefly called a lightning bug.

The flashing part of a firefly is called a lantern. Can you colour in the lantern on the firefly...



CAN YOU FIND
These words?



Word search grid:

E	X	W	V						
T	S	A	R	T	N	O	C		
E	R	S	U	N	L	I	G	H	T
E	E	F	A	F	D	A	R	K	L
W	S	F	W	A	V	E	X	X	C
J	U	L	W	T	H	S	P	E	E
P	L	E	N	O	T	O	H	P	X
Q	L	C	E	J	E	N	E	R	G
J	T	N	U	G	L	A	M	P	I
A	G	O	W	A	R	M	T	H	M
D	S	O	U	R	C	E	L		
J	G	R	V						

SEE
DARK
LAMP
WAVE
SPEED
ENERGY
PHOTON
SOURCE
WARMTH
REFLECT
CONTRAST
SUNLIGHT

Which of
These ARE LIGHT
Sources?

Colour them in...



Table lamp



TV



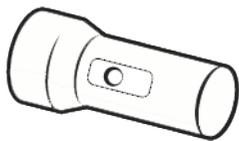
Sun



Owl



Fire



Torch



Moon

Draw a circle around the one you think is the brightest (the one which gives off the most light).

Grown-ups: A few other activities you can do... See how many different light sources you can find in your home; try turning each one on and discuss how the light emitted is different. Is it brighter or dimmer? Warmer or cooler? What shape is the beam? Treasure hunt in the dark; write down some words to do with light on white paper and stick up around a dark room or hide some treats. Set a challenge to find them all using just torch light.

Answers: FINDINGS - no, light, yes FIREFLY - the lantern is the last/tail section of the body LIGHT SOURCES - table lamp, TV, sun, torch, fire

Learn to Light:

Light Waves Light travels in a straight line as a light wave. Light can travel through empty space (a vacuum) unlike sound which needs a medium like air or water. Light will continue to travel in a straight line until it hits something or travels through one medium to another. When this happens light is absorbed, reflected (bounces off), scattered (bounces off in lots of directions), refracted (changes speed and direction) or transmitted (passes straight through).



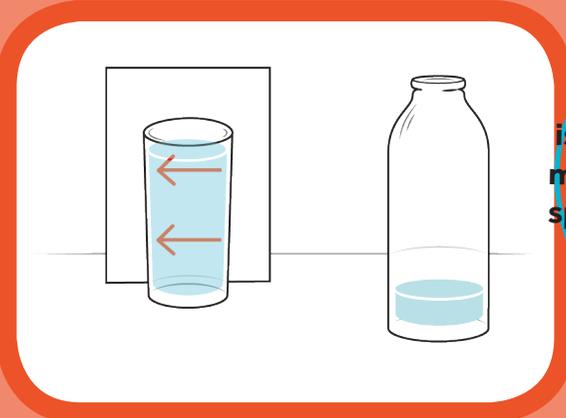
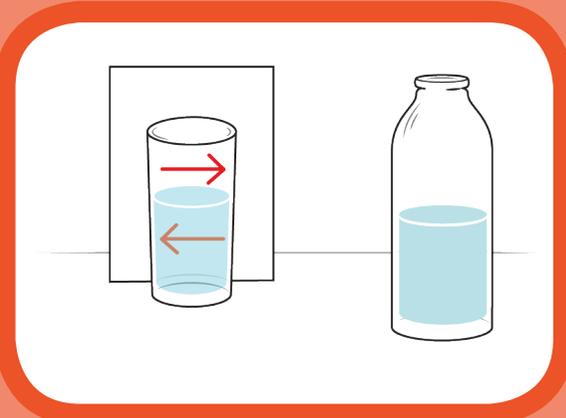
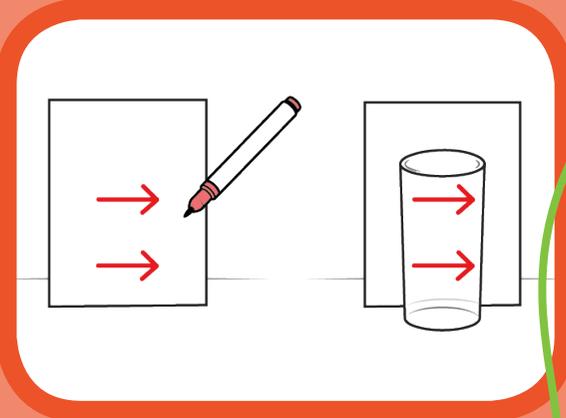
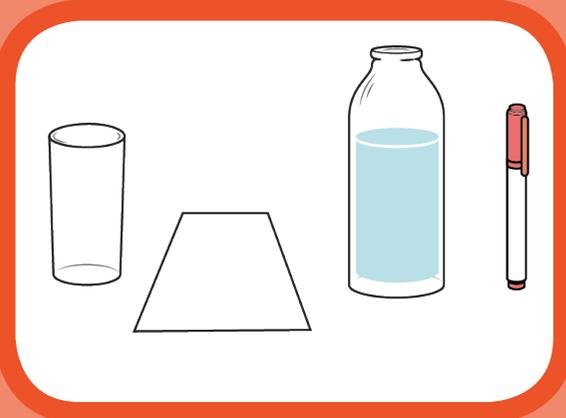
Experiment

Optical Illusion

You will need:

A clear glass, some water, a piece of paper/card, a pen

1. Draw two arrows one above the other, with both arrows pointing to the right of your card. Place the card behind your glass so you can see the arrows through the side of the glass.
2. Half fill the glass with water or until it covers the first arrow. What do you notice?
3. Now fill the glass to the top with water so the second arrow is covered. What has changed this time?



FUN FACTS

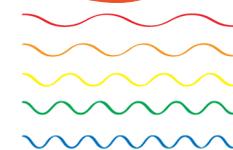
Light takes about 8 minutes and 20 seconds to reach the Earth from the Sun. When we see the Sun, we are seeing what it looked like over 8 minutes ago.

The speed of light equals 300,000 km/second. Nothing else travels faster than light, not even sound!



A light-year is how astronomers measure distance in space. It's defined by how far a beam of light travels in one year – a distance of six trillion miles.

Each colour of light in the rainbow has a different length of 'wave'.



Findings

What changed when you added the water ?



If you look from the side what can you see ?



What happens when you drink the water and put the glass back ?



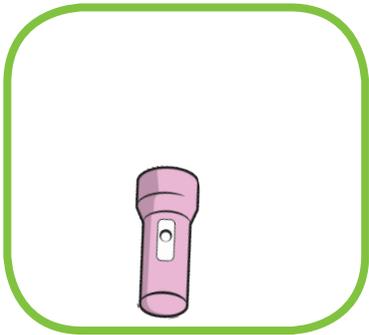
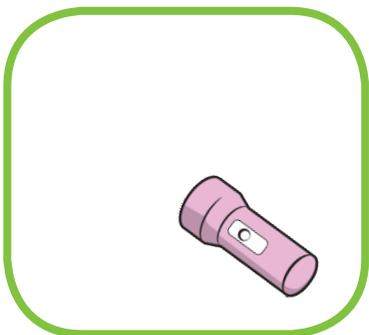
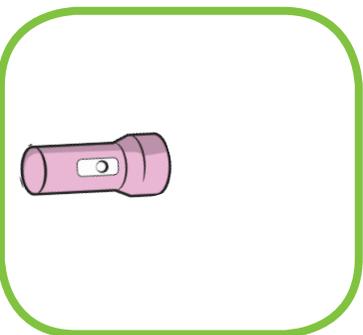
What moves faster than anything else in the world?

Learn to Light:

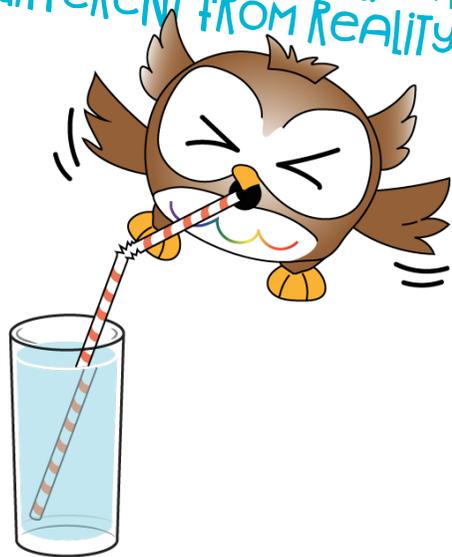
Conclusion Light can travel through air, water and transparent materials/ objects. If a material is transparent it means light can completely pass through it. Some materials only let some light through - we call these materials translucent or semi-transparent. Materials that let no light through are called opaque. Light travels at different speeds through different mediums and materials.

How does light travel?

Draw how the light will travel from each torch...

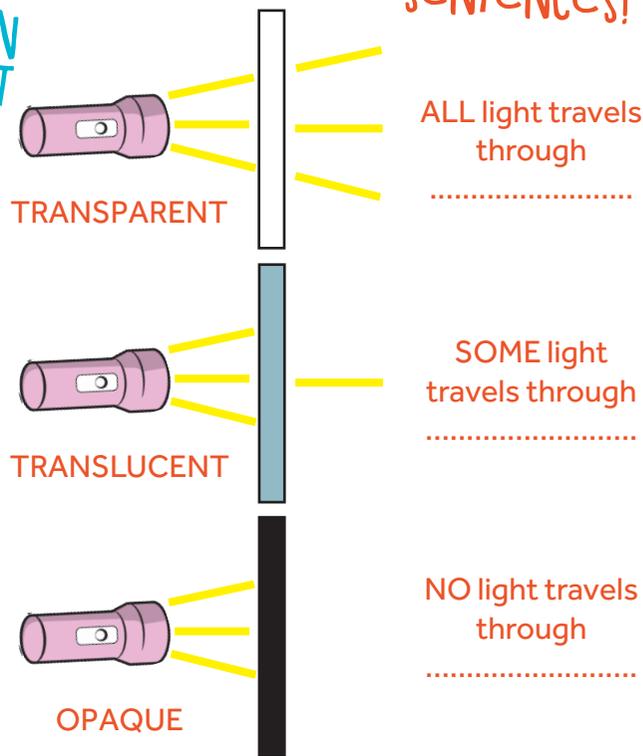


AN OPTICAL ILLUSION IS SOMETHING THAT PLAYS A TRICK ON YOUR VISION (YOUR EYES AND YOUR BRAIN). WHAT YOU SEE IS DIFFERENT FROM REALITY.



A straw in a glass of water looks like it is broken or bent because light travels more slowly through water than air... this is refraction. Put a straw in a glass of water and try looking at it from different angles. What do you see?

CAN YOU COMPLETE THE SENTENCES?



Using a torch test different materials in the house to find one of each and write them down.

Grown-ups: If you don't have time to search the house testing different materials and are looking for a one-stop shop for some quick examples of transparent, translucent and opaque materials then plastic wrap/cling film, baking paper and tin foil are good examples.

Answers: FINDINGS - the arrows look like they have changed direction, the arrows haven't changed direction, the arrows change back HOW LIGHT TRAVELS - in a straight line STRAW sometimes it looks broken and sometimes bent SENTENCES - examples would be: plastic wrap, baking paper, tin foil.

Learn to Light:



Vision We see things when light enters our eyes. The pupils in our eyes change size to let more light in when it's dark and less light in when it's bright. Too much light can damage our eyes, whilst too little light makes it hard to see. Not all objects give off light; we see most objects because light is reflected off their surface and into our eyes. Our eyes focus the light from an object to form an image of it at the back of our eye (the retina) and our brains then interpret the image as a vision.

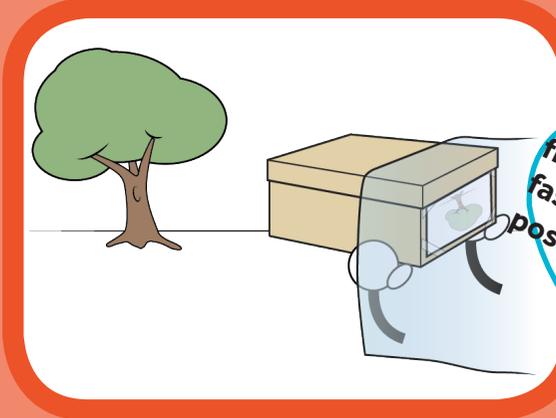
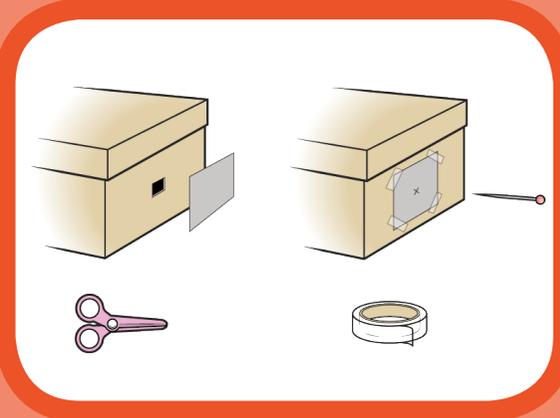
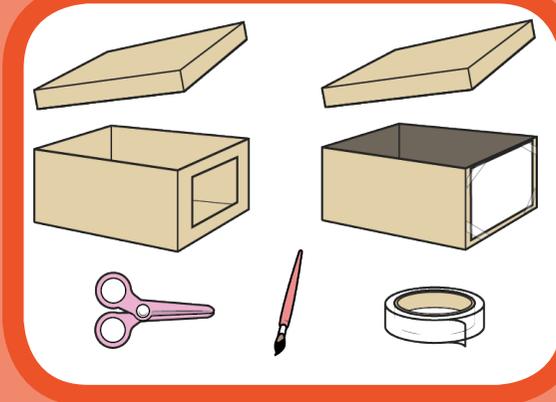
Experiment

Making a pinhole viewer

You will need: A shoe box, a piece of tracing/baking paper, a pin, scissors, tin foil, tape and black paint

1. Cut a large oblong hole at one end of the box and cover with tracing paper. Paint (or line with paper) the inside of the box black.
2. Cut a smaller opening at the other end of the box and cover with tin foil. Using a pin carefully pierce a hole in the centre.
3. Cover yourself and the box with a thick blanket leaving just the tin foil end of the box poking out. Point it at an object and look at the tracing paper screen to see the image.*

*Make sure light is only entering through the pinhole, so tape up any gaps and use a thick enough blanket.



FUN FACTS

During World War II the RAF started a myth that carrots helped their pilots see in the dark. Eating carrots won't enable you to see in the dark but they do contain vitamin A which keeps your eyes healthy.

Cats eyes glow in the dark because the back of their eyes act like a mirror. This helps reflect and absorb more light making it easier for them to see at night.



The saying 'in the blink of an eye' comes from the fact that the eye's fastest muscle in our body is the fastest to blink up to 5 times a second.

Newborn babies see upside down until their brain learns to turn the image the right way up.



Findings What can you see and what is unusual about the image ?

What happens if you cover the pinhole ?

What happens if you make the pinhole a little bigger ?

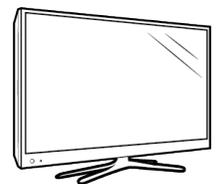
I'm closed at night, I give you sight, what am I?

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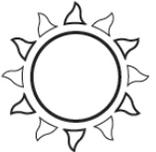
Conclusion We need light to see. Light travels in a straight line from an object and into our eye where the image appears upside down - our brain then flips the image the right way up. The more light the easier it is to see. Some people are afraid of the dark, especially at bedtime, but it's very rarely completely dark in our bedrooms. When we change from a light space to a darker space it just takes a few seconds for our eyes to adjust and let more light in so we can see again.

How do we see these objects?

Draw a line to show how the light reaches our eyes...



How does inquisitive owl see the TV?



How does inquisitive owl see the football?

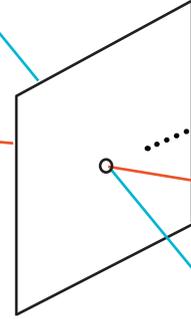


How does inquisitive owl see the tree?

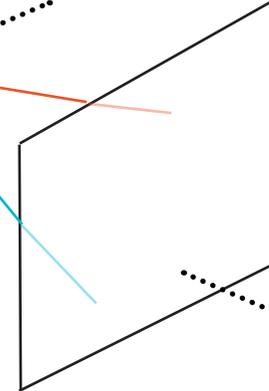
Which way up will

The image be?

Draw the image...



Pinhole



Image



OWLS ARE NOCTURNAL AND HUNT FOR FOOD AT NIGHT. They have big eyes to help them see in dim light. They can see a mouse moving over 15 meters away by just the light of a candle.



Bright Light



Dim Light

Get a mirror and look at your eyes, then close the curtains and turn the light off. Wait for 30 seconds, then turn the light back on and look at your eyes again - do they look different?

Grown-ups: If you have / buy some photographic paper then you can easily convert your pinhole viewer into a pinhole camera and take real photos with it. Another quick activity to show how vision also helps us to keep our balance: try standing on one leg with your eyes open then try again with your eyes closed - it's much harder to keep your balance when your eyes are closed.

Answers: FINDINGS - an image, it's upside down, the image disappears RIDDLE - an eye HOW DO WE SEE - tv>eye, sun >football>eye, torch>tree>eye IMAGE - draw the owl upside down NOCTURNAL - your pupils change size.