National Curriculum Objectives:
(Statutory Requirements)

a) recognise that light appears to travel in straight lines
b) use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye
c) explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes
d) use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them

Experimental and investigative work focuses on:

Planning an investigation:	**Obtaining and evaluating evidence:**
1. Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.	2. Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. 3. Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. 4. Using test results to make predictions to set up further comparative and fair tests. 5. Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. 6. Identifying scientific evidence that has been used to support or refute ideas or arguments.

Most children will:

- Recognise that light travels in straight lines.
- Describe how light enables us to see.
- Understand reflection as light bouncing off a surface.
- Identify some effects of refraction.
- Identify the visible spectrum.
- Explore colours using light.
- Recognise that Isaac Newton discovered information about light and colour.
- Explain that objects block light to form shadows.
- Predict what will happen in an investigation.
- Make observations.

Some will progress less and will:

- Explain how light travels to enable us to see.
- Understand that all objects reflect light.
- Identify the angles of incidence and reflection.
- Understand refraction as light bending or changing direction.
- Explain how a prism allows us to see the visible spectrum.
- Understand that colours are a result of light reflecting off an object.
- Explain Isaac Newton's experiments about light and colour.
- Understand how shadows change size.
- Understand that shadows are the same shape as the object that casts them.
- Make observations and conclusions.
- Be able to answer questions based on their learning.

Others will progress further and will also:

- Explain how light enables us to see an object reflected in a mirror.
- Recognise that the angles of incidence and reflection are equal.
- Explain how light is refracted as it travels through glass or water.
- Recognise that the colours of the visible spectrum have different wavelengths.
- Understand how filters reflect or absorb different colours of light.
- Recognise how Isaac Newton used proof to support his ideas about light and colour.
- Set up reliable and accurate investigations.
- Make and explain predictions.
- Make and record accurate observations.
- Use scientific language to explain their findings.
- Be able to ask and answer questions based on their learning using scientific language.

Key vocabulary:

Previously taught: vertebrate, invertebrate, survival, senses, feeding, digest, absorb, breathing, skeleton, habitat, environment, reproduce
New: Adaptations, generations, inherit, breeding, Darwin, evolve (change), evolution, environmental change, population, survival of the fittest

Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
1	To explain that light travels in straight lines from light sources to our eyes, and from light sources to objects and then to our eyes.	**Where Does Light Come From?** Ask the children to recap their understanding of light by discussing the questions on the flipchart. Gather some responses, and discuss light sources and objects which appear to be light sources, such as the Moon, as well as how light travels. Look for children who have a good recall of their previous learning. **How Does Light Help Us See?** Use the flipchart to explain what light is, and how it travels. Explain how light rays travel in a straight line from a light source, reflect off an object and into our eyes, enabling us to see the object. Address any misconceptions or issues raised. Ask children to describe how light is travelling to enable them to see some objects around them.	**Model It!** Ask the children to work in groups to create a human model to show how light enables us to see. They should use yellow wool to symbolise a ray of light, and have two members of their group act as a light source and an object. They need to hold the wool to demonstrate how the light travels from the source to the object and then their eyes. Allow the children to present their human models to the rest of the class. Children could have one member of their group act as a mirror, and show how light reflected from the object is then reflected from the mirror to the other group members' eyes. **The Light Learning Lab:** For this challenge, the children should work in a groups to produce an educational programme for children all about how light enables us to see. They should use the differentiated Light Learning Lab Activity Sheet to plan their programme. They may want to use pictures or diagrams, or even props to support their explanations in the programme. Encourage them to get into character as scientists! If possible, you could allow them to film their programmes, or act them out to the class when	**I can demonstrate that light travels in a straight line.** **I can create a model to show how light travels from a light source to our eyes, or to an object and then our eyes.** **I can explain how we see things.**	Length of yellow wool

			they are complete. Look for children who are able to articulate their understanding of how light travels to enable us to see.		
Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
2	To understand how mirrors reflect light, and how they can help us see objects.	**How Is Light Reflected?** Stick the four Reflection Explanations around the classroom. Explain that only one of the explanations is accurate. Ask the children to travel round the classroom to read the explanations, and decide which one is the correct one. Ask them to vote by writing the number of their choice on a small piece of paper. Reveal the answer on the flipchart and go through the explanation, addressing any misconceptions. Look for children who have a clear understanding of reflection. **Angles of Incidence and Reflection:** Use the Lesson Presentation to explain what the angles of incidence and reflection are, and that they are always equal. Ask the children to prove this law by carrying out the activity described on the flipchart, providing adult support where needed.	**Seeing Reflections:** Explain how light reflecting from a mirror enables us to see an image using the flipchart. Ask children to explain how light is travelling in order to allow the boy on the flipchart to see the computer behind a wall. **Make a Periscope:** Explain what a periscope is using the Lesson Presentation. Ask children to use the instructions on the differentiated Periscope Activity Sheet and the Periscope Templates Activity Sheet to make a periscope using a cereal box and two mirrors.	I can explain how light is reflected. I can measure the angles of incidence and reflection. I can use my understanding of reflection to create a working periscope. I can explain how the periscope allows me to see objects I would not usually be able to see.	Modelling clay A mirror White paper Small piece of card Scissors A torch Protractors A cereal box Sticky tape
Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
3	To investigate how refraction changes the direction in which light travels.	**Refraction Riddle:** Show children the photo of a straw in a glass of water on the flipchart. Ask them to discuss what is happening, then introduce the concept cartoon showing a group of children talking about their ideas. Ask the children to speak to their partner about which explanation they agree with and why. What Is Refraction? Show children the short film about refraction to demonstrate some examples of refraction. Explain refraction using the	**Refraction Investigations**: Explain to the children that they will be carrying out two different investigations to explore refraction. (You may want to split the class in half so that each half does one investigation, then swap over). **Amazing Arrow:** The first investigation asks children to draw a horizontal arrow on a small piece of paper, and hold it behind a glass of water. They should use their differentiated Amazing Arrow Activity Sheet to make a prediction before carrying out the investigation and recording their observations and conclusion. (The arrow should appear to change direction.) Look for children who use the fact that	I can understand how light is refracted. I can investigate the effects of refraction. I can understand the way refraction alters the direction of light.	Small piece of paper (sticky notes are ideal) Glass (or transparent plastic cup) of water Jug Saucer

		flipchart. Address any misconceptions.	refraction causes light to bend in their explanations. **Incredible Images:** For the second investigation, the children need to draw a small picture (or stick a small sticker) on a piece of paper. They should put a glass of water on top of the picture, then look at their picture through the side of the glass while slowly pouring water in. Once it is full, they should place a saucer on top. Again, they will make a prediction first, then describe their observations and make a conclusion using their differentiated Incredible Images Activity Sheet. Look for children who use the fact that refraction causes light to bend in their explanations. **What Happened?** Ask children to share their thoughts and conclusions. Explain how refraction caused the effects see in each investigation using the flipchart.		
Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
4	To investigate how a prism changes a ray of light to show the spectrum.	**What Colour Is Light?** Ask the children to think about what colour they believe light to be. Show them the pieces of coloured paper stuck around the classroom, and ask them to go to stand under or next to the one that is the colour of light. Tell them you will come back to this question at the end to see if their thoughts have changed. **Isaac Newton:** Explain who Isaac Newton was using the flipchart and introduce his investigation using a prism to alter a ray of light. **Prisms:** Explain what a prism is using the flipchart. Ask the children to recall their earlier work on refraction, and explain that a prism refracts light, causing it to bend. In pairs, children use a torch to shine a ray of light through a prism, holding a piece of white card in front of the refracted ray of light as it leaves the prism. They should see the light ray split into the colours of the spectrum.	**Rainbows:** Use the information on the flipchart to explain how their prism split the ray of light into the colours of the visible spectrum, and that these colours merge together to make what looks like white to our eyes. Also discuss ways to remember the colours of the spectrum. Address any misconceptions. **Newton's Colour Wheel:** Ask the children to make a colour wheel following the instructions on the differentiated Spectacular Spectrum Activity Sheet. Before they spin the colour wheels, they should predict what will happen. Afterwards, they should describe what they observed and explain why it happened. (The colour wheels should appear white as they spin.) Look for children who are able to explain that the colour wheel merges the colours together to make white light, the opposite of the prism, which refracted white light to show the separate colours **What Colour Is Light?** Ask the children to think back to the start of the lesson and what colour they believed light to be. Organise the class so that a roughly even number of children are standing at each colour of paper. Explain that this represents that light is made up of all these colours, and that they discovered this by using a prism to refract the white light.	I can understand how a prism affects a ray of light. I can explain what this tells us about the visible spectrum. I can describe what Isaac Newton discovered about light. I can make my own colour wheel and explain what it shows about light.	Seven pieces of paper in the colours of the rainbow and one white piece of paper stuck around the room Cardboard Colouring pens or pencils 1m length of string or yarn - 1 per child
Session	Learning	Introduction	Main activity	Application and review	Resources

	Objectives				
5	To investigate how light enables us to see colours.	**Newton's Discovery:** Ask the children to read the Fact Box on their differentiated Newton's Discovery Activity Sheet and answer the questions. (Mixed ability pairs). **Fun with Filters:** Introduce the filtering activity to the children using the flipchart. Ask them to predict what they will see when they look at the coloured counters or sweets though different coloured filters, filling in their ideas on their differentiated Fun with Filters Activity Sheet. When complete, they should look at their results to spot anything interesting, and form a conclusion.	**Filtering Facts:** Explain how we see colours and how filters work using the information and diagrams on the flipchart. Address any misconceptions. Ask the children to look again at their results, and discuss reliability and ways to check any ambiguous results. **Secret Messages**: Introduce the secret message challenge to children using the flipchart. Ask the children to follow the instructions on their differentiated Secret Message Activity Sheet to create their message, then swap with a partner. They should use filters to try to read each other's messages, then explain how this worked. Look for children who are able to explain how they created their secret message using their knowledge of how we see colour.	I can explain what Isaac Newton discovered about colour. I can investigate and understand how light enables us to see colours. I can use my knowledge of light and colour to create a secret message.	Coloured sweets such as Smarties or Skittles (if this is not possible, then coloured counters are ideal alternatives) Different coloured cellophane squares