Subject: Science	Unit Title: Light & Shadows	Year Group: 3	Half-Term: 5

National Curriculum Links:
(Link to TT statements)

- Recognise that they need light in order to see things, and that dark is the absence of light
- Notice that light is reflected from surfaces
- Recognise that light from the sun can be dangerous and that there are ways to protect their eyes
- Recognise that shadows are formed when the light from a light source is blocked by an opaque object
- Find patterns in the way that the size of shadows change

Precise Knowledge:
(*What is the child language knowledge that you want the children to know? Link to KARM cards/ classroom displays)*

We see objects because our eyes can sense light. Dark is the absence of light. We cannot see anything in complete darkness. Some objects, for example, the sun, light bulbs and candles are sources of light. Objects are easier to see if there is more light. Some surfaces reflect light. Objects are easier to see when there is less light if they are reflective.

The light from the sun can damage our eyes and therefore we should not look directly at the sun and can protect our eyes by wearing sunglasses or sunhats in bright light.

Shadows are formed on a surface when an opaque or translucent object is between a light source and the surface and blocks some of the light. The size of the shadow depends on the position of the source, object and surface.

Precise Skills:
(What is the child language skills that you want the children to be able to show?)

- Can describe how we see objects in light and can describe dark as the absence of light
- Can state that it is dangerous to view the sun directly and state precautions used to view the sun, for example in eclipses
- Can define transparent, translucent and opaque
- Can describe how shadows are formed
- Can describe patterns in visibility of different objects in different lighting conditions and predict which will be more or less visible as conditions change
- Can clearly explain, giving examples, that objects are not visible in complete darkness
- Can describe and demonstrate how shadows are formed by blocking light
- Can describe, demonstrate and make predictions about patterns in how shadows vary

Possible Misconceptions:
(Combat misconceptions early, plan ahead for potential errors in the classroom and analyse what misunderstandings may occur that could potentially prevent learners from fully grasping a concept)

Some children may think:

- we can still see even where there is an absence of any light
- our eyes 'get used to' the dark
- the moon and reflective surfaces are light sources
- a transparent object is a light source
- shadows contain details of the object, such as facial features on their own shadow

shadows result from objects giving off darkness.

Key Vocabulary *(Think about the link to KARM cards and classroom display)*	**Tier 1** *(everyday, commonly used)*	**Tier 2** *(academic, across topics and content)*	**Tier 3** *(subject specific)*

Prior Learning:
(What has gone before that links to this unit learning that needs reactivating prior to building to the new learning? KARM cards)

- Explore how things work. (Nursery – Light)
- Talk about the differences in materials and changes they notice. (Nursery – Light)
- Describe what they see, hear and feel whilst outside. (Reception – Light)
- Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)
- Describe the simple physical properties of a variety of everyday materials. (Y1 - Materials)

Future Learning:
(Where is this learning building to? Identify the next learning intentions so appropriate references can be made whilst teaching the unit.)

- Recognise that light appears to travel in straight lines. (Y6 - Light)
- 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. (Y6 - Light)
- 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. (Y6 - Light)
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. (Y6 - Light)

Linked Texts: *(Steps to Read, Guided Reading, Reading Spine)*	**LOTC Opportunities:**	**Potential Visits/Visitors**	**Education for a Connected World:** *(Online safety etc)*

Lesson Objective /Outcome	**Metacognition and Self-Regulated Learning**	**Questioning**	

Know/Show	Retrieval Practice	Instruction		Personal Development Connections
Lesson 1 Describe the differences between dark and light and how we need light to be able to see.	Light is a form of energy that travels in straight lines. Dark is the absence of light and we need light to be able to see.	Introduce the children to the topic by sharing the Light presentation. Discuss the key learning in the presentation and the meaning of any unfamiliar vocabulary. Ask the children to answer the questions on the Light question sheet to assess their initial understanding of the topic. Use the Light answer sheet as you discuss the children's answers and address any errors or misconceptions.		*(Highlight and annotate where appropriate)* Display opportunities/working wall SMSC (IN. CIA) BV EDI
Lesson 2 Use suitable vocabulary to talk or write about what they have done, what the purpose was and, with help, draw a simple conclusion based on evidence collected, beginning to identify next steps or improvements. Make increasingly careful observations, identifying similarities, differences and changes and making simple connections.	Results are information that has been discovered as part of an investigation. A conclusion is the answer to a question that uses the evidence collected. An observation involves looking closely at objects, materials and living things, which can be compared and grouped according to their features. Set up a carousel of activities associated with light around the classroom using the Light activities cut outs and Light activities teacher information as a guide. Provide the children with clipboards and the Light activities recording sheet to record their observations at each station. Bring them together and discuss each station, focusing on the involvement of light and their observations. Use the information provided on	Set up a carousel of activities associated with light around the classroom using the Light activities cut outs and Light activities teacher information as a guide. Provide the children with clipboards and the Light activities recording sheet to record their observations at each station. Bring them together and discuss each station, focusing on the involvement of light and their observations. Use the information provided on the Light activities teacher information to help the children understand their observations.		*(Highlight and annotate where appropriate)* Display opportunities/working wall SMSC (IN. CIA) BV EDI

	the Light activities teacher information to help the children understand their observations.			
Lesson 3 Gather and record findings in a variety of ways (diagrams, tables, charts and graphs) with increasing accuracy.	A light source produces light. A reflector reflects light. Light sources and reflectors can be natural, such as the Sun and Moon, or artificial, such as a light bulb or bike reflector. Data can be recorded and displayed in different ways, including tables, charts, graphs and labelled diagrams. Data can be used to provide evidence to answer questions.	Recap the difference between light sources and reflectors using the Light sources and reflectors presentation. Demonstrate the difference by putting a small number of light sources or reflectors, one at a time, in a sealed cardboard box with a small hole in the side. Light sources light up the inside of the box when viewed through the hole, and reflectors do not. Ask the children to have small group discussions, noting down sources and reflectors on whiteboards or paper. Encourage the children to share their examples and create a class table of light sources and reflectors on the IWB. Address any misconceptions if they arise. Share the Identifying light sources and reflectors presentation with the children and ask, 'Did you learn any new light sources and reflectors?' Add any new suggested light sources and reflectors to the class table. Encourage children to create a copy of the table in their science books or print the class table to stick in their books. To finish, discuss how light sources vary in intensity or brightness and how this variation can be useful, such as floodlights compared with nightlights.		*(Highlight and annotate where appropriate)* Display opportunities/working wall SMSC (IN. CIA) BV EDI
Lesson 4 Set up and carry out some simple, comparative and fair tests, making predictions for what might happen.	Tests can be set up and carried out by following or planning a set of instructions. A prediction is a best guess for what might happen in an investigation based on some prior knowledge.	Discuss the meaning of the words reflect, reflective and reflector, then ask the children to describe materials with reflective properties using their prior knowledge and experiences. Provide the children with the Reflective materials investigation and model how to carry out the method. As they work, encourage them to record and sort the materials into groups on		*(Highlight and annotate where appropriate)* Display opportunities/working wall SMSC (IN. CIA) BV EDI

Group and sort materials as being reflective or non-reflective.	Light can be reflected from different surfaces. Some surfaces are poor reflectors, such as some fabrics, while other surfaces are good reflectors, such as mirrors. Reflective materials are light in colour, shiny and smooth. Non-reflective materials are dark in colour, dull and rough.	the Reflective materials recording sheet. Consider any materials they find difficult to classify and work together to add them to one of the groups. After sorting, ask the children to look for similarities and differences between the two groups. Ask questions to direct their thinking, such as 'Are the reflective materials smooth or rough?' and 'Are the reflective materials a similar colour?' Encourage the children to complete the questions on their recording sheet and discuss the need for reflective materials in everyday life. **Useful link:** • The use of reflective materials for safety – BBC Bitesize		
Lesson 5 Make increasingly careful observations, identifying similarities, differences and changes and making simple connections.	An observation involves looking closely at objects, materials and living things, which can be compared and grouped according to their features.	Recap the information the children learned in the previous lesson about Sun safety, then explain that they will investigate whether cheaper sun cream brands are as protective as expensive brands, using cyanotype paper that is sensitive to sunlight. Provide children with the Sun cream investigation instructions and talk through the steps, modelling what they will do using a piece of normal paper rather than the light-sensitive cyanotype paper. Explain that because the cyanotype paper will change colour in the sunlight, they will need to quickly set up their investigations in a darkened room to limit exposure to light. Ask the children to carry out the investigation and encourage them to use their observations to answer the investigation question. At the end of the session, discuss their results and decide if cheaper brands of sun cream are as effective as expensive brands,		*(Highlight and annotate where appropriate)* Display opportunities/working wall SMSC (IN. CIA) BV EDI

		using their collected evidence. Ask them how they could use the cyanotype paper to test other forms of sun protection.		
Lesson 6 Make increasingly careful observations, identifying similarities, differences and changes and making simple connections.	A shadow is made when an object blocks the passage of light from a light source. A shadow is the same shape as the object that casts it because light travels in straight lines. Shadows always appear on the opposite side of the light source.	Take the children outside on a sunny day to find shadows of all shapes and sizes – big, long, wide, interesting and beautiful. Encourage children to take photos of shadows they observe. Back in the classroom, upload and share the photos, discussing what they can see and identifying the objects that made them. After sharing, discuss what a shadow is, based on their prior knowledge and observations, and address any misconceptions. Share the Shadows presentation to consolidate their understanding and see if they can guess the objects that made the shadows. Model how shadows are made using a torch or projector, blocking the light source with opaque objects. To check children's understanding of shadows, ask them to complete the Shadows question sheet and discuss their answers as a class. If time allows, take children back outside later in the day and see if the shadows have changed from earlier.		*(Highlight and annotate where appropriate)* Display opportunities/working wall SMSC (IN. CIA) BV EDI
Lesson 7 Explain, using words or diagrams, how shadows are formed when a light source is blocked by an opaque object.	Opaque objects cast dark shadows. Translucent objects cast lighter, blurry shadows. A shadow is formed when light from a light source, such as the Sun, is blocked by an object. Opaque objects cast dark shadows. Translucent objects cast pale shadows. Transparent objects cast very pale shadows.	Ask, 'Do all objects create shadows?' and encourage children to give you their initial thoughts. Ask, 'Do all objects create shadows?' and encourage children to give you their initial thoughts. Provide children with torches and a range of transparent, translucent and opaque objects or sheet materials. Direct them to explore making shadows with the equipment. Give them time to explore independently and provide whiteboards to record their observations. Display the Definitions poster and discuss the three words and their meanings. Then, discuss each object or material and ask		*(Highlight and annotate where appropriate)* Display opportunities/working wall SMSC (IN. CIA) BV EDI

		children to share their observations about whether they made a shadow, linking them to the materials' opaque, translucent or transparent properties. Encourage children to answer the questions on the Materials and shadows question sheet to consolidate and check their understanding. Ensure children recognise that transparent and translucent materials can still cast shadows, but they are paler than those cast by opaque objects. **Note:** If it is a sunny day, children could conduct their independent explorations outdoors.		
Lesson 8 Explain, using words or diagrams, how shadows are formed when a light source is blocked by an opaque object.	Shadows change when the light source or the object moves. For example, when a light source is lowered, shadows grow longer. A shadow is formed when light from a light source, such as the Sun, is blocked by an object. Opaque objects cast dark shadows. Translucent objects cast pale shadows. Transparent objects cast very pale shadows.	Provide children with torches and interesting opaque objects, then give them a copy of the Changes in shadows recording sheet. Read the sheet together and ensure they understand what it asks them to do. Allow them to work in pairs to independently answer the questions on the recording sheet and look for patterns in their data. After completing their sheets, bring the children together and share their observations. Ensure all children understand how shadows change in size, direction and darkness when the torch is in different locations.		*(Highlight and annotate where appropriate)* Display opportunities/working wall SMSC (IN. CIA) BV EDI
Lesson 9 Ask questions about the world around them and explain that they can be answered in different ways.	Questions can help us find out about the world and can be answered in different ways.	Share the Light, reflectors and shadows video that shows different examples and uses of light, reflectors and shadows. Use the video as a stimulus for children to ask questions about light, reflectors and shadows and model writing scientific questions that you could answer through observation or research. Some examples are given below. Give small groups of children time to think of and discuss their own	How do some animals produce light? Why do some animals produce light?	*(Highlight and annotate where appropriate)* Display opportunities/working wall SMSC (IN. CIA) BV EDI

		questions. Support them to refine their questions, if necessary. Model how to find the answer to one of their questions by observing or researching the answer using a wide range of age-appropriate information sources, including books and the internet. After finding the answer to their question, task children with creating a display version of their questions and answers.	What is a laser and how is it used? How do nocturnal animals see at night? What colour is a shadow? What colour is best to wear at night to be visible? Do clouds cast shadows? How does the Sun create light?	
End of Unit Assessment				
Essay	*(Provide the Assessment that will be used for the end of unit assessment – it may be a mix of the examples down the left-hand side – consider the age-range of the children)*			
Double-Page Spread				
End Outcome				
Clozed Passage				