MORDA CE PRIMARY SCHOOL

Knowledge Organiser LIGHT (Including Colour): Year 5/6 Autumn 2nd Half 2022

Key Skills	Key enquiry questions
Year 5 / *Year 6* **Working Scientifically: Planning** Explore ideas and raise a range of relevant questions. Recognise which secondary sources are most useful and begin to recognise the difference between fact and opinion. Select and plan the most appropriate type of scientific enquiry for answering a scientific question. Decide which variables to measure change and keep the same Demonstrate how to change one factor (variable) whilst keeping others the same (control). Identify and use an appropriate unit to measure variables effectively. Explore ideas and raise a range of different kinds of relevant questions based on accurate scientific principles. Recognise and use the secondary sources that are most useful separating opinion from fact. Select and plan accurately the most appropriate type of scientific enquiry for answering scientific questions. Decide which variables to measure change and keep the same. Demonstrate how to change one factor (variable) whilst keeping others the same (control). Identify and use an appropriate unit to measure variables effectively. **Working Scientifically: Observation & Recording** Recognise when and how to set up comparative and fair tests and begin to explain which variables need to be controlled and why. Make decisions about what to observe, what measurements to use and how long to measure them for. Choose appropriate equipment to make measurements, using standard units of measure and simple scales accurately and with precision. Gather, record, classify and present a range of data in different ways. Record data and results using scientific diagrams and labels, classification keys, tables, and bar and line graphs. Recognise when and how to set up comparative and fair tests and clearly explain which variables need to be controlled and why.	**How do we see?** I can explain that light travels in straight lines from light sources to our eyes, and from light sources to objects and then to our eyes. **How do objects reflect light?** I can understand how mirrors reflect light and how they can help us see objects. **How does refraction change the direction in which light travels?** I can investigate how refraction changes the direction in which light travels. **How does a prism change a ray of light?** I can investigate how a prism changes a ray of light. **How do we see colours?** I can investigate how light enables us to see colours. **Why do shadows have the same shape as the object that casts them?** I can explain why shadows have the same shape as the object that casts them. **How can we change the size of a shadow?** I can investigate how moving an object changes the size of its shadow.

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Make independent and well-founded decisions about what to observe, what measurements to use and how long to measure them for.
Choose the most appropriate equipment (with a variety of intervals and units) to make measurements and explain how to use accurately and with precision.
Gather, record, classify and present data in a wide range of ways.
Use a wide range of methods to record data including line graphs, scientific diagrams, classification keys, scatter, bar and line graphs etc.

Working Scientifically: Conclusions

Decide how to record data from a choice of familiar approaches.
Use relevant scientific language to communicate findings and justify scientific ideas.
Look for different relationships in data and begin to identify evidence that refutes or supports ideas.
Make practical suggestions about how working methods could be improved.
Use results to identify when further tests and observations might be needed.
Make general statements such as: 'the hotter the water, the faster the sugar dissolves'

Decide in detail how to record data accurately from a choice of familiar approaches.
Use relevant scientific language and illustrations to discuss, communicate and justify findings and scientific ideas.
Look for a range of different relationships in data and begin to identify evidence that refutes or supports ideas.
Identify when tests need to be repeated in order to attain reliable results.
Use test results to make predictions and set up further comparative and fair tests.
Make increasingly measured general statements such as: 'As the temperature increases the mass of the sugar which can be dissolved increases.'

Light – N/C objectives

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

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- Explain that light can be broken into colours and that different colours of light can be combined to appear as a new colour.
- Use simple optical instruments.

Prior Learning:

- Recognise that they need light in order to see things and that dark is the absence of light. (Y3 - Light)
- • Notice that light is reflected from surfaces. (Y3 - Light)
- • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 - Light)
- • Recognise that shadows are formed when the light from a light source is blocked by an opaque object. (Y3 - Light)
- • Find patterns in the way that the size of shadows change. (Y3 - Light)
- • Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. (Y5 - Properties and changes of materials)

Potential Misconceptions:

- we see objects because light travels from our eyes to the object.

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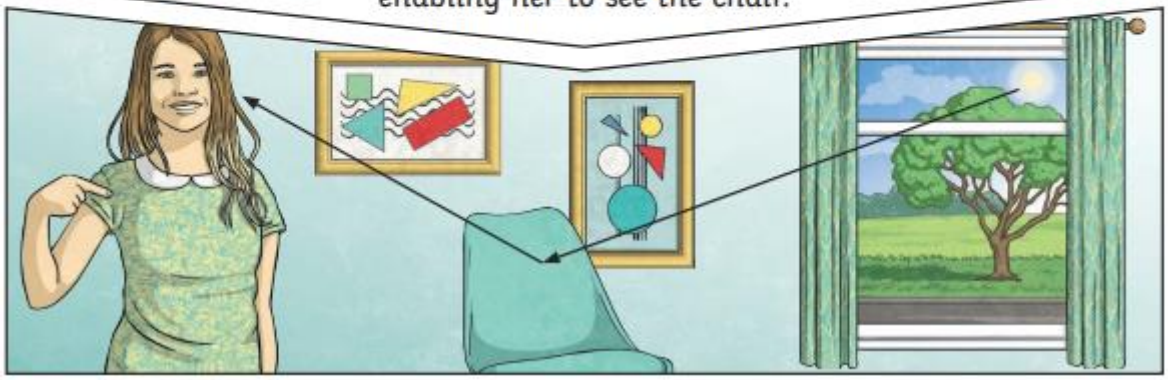
Key Vocabulary	
light	A form of energy that travels in a wave from a source.
light source	An object that makes its own light.
reflection	Reflection is when light bounces off a surface, changing the direction of a ray of light.
incident ray	A ray of light that hits a surface.
reflected ray	A ray of light that has bounced back after hitting a surface.
the law of reflection	The law states that the angle of the incident ray is equal to the angle of the reflected ray.

Key Knowledge

We need light to be able to see things. Light waves travel out from sources of light in straight lines. These lines are often called rays or beams of light.

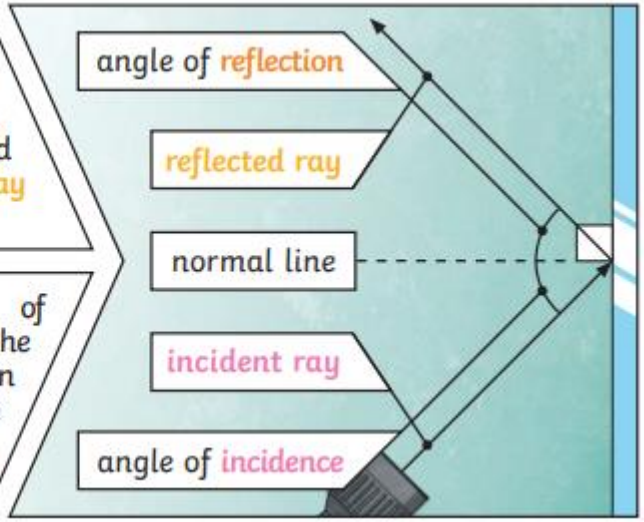
Light from the sun travels in a straight line and hits the chair. The light ray is then reflected off the chair and travels in a straight line to the girl's eye, enabling her to see the chair.



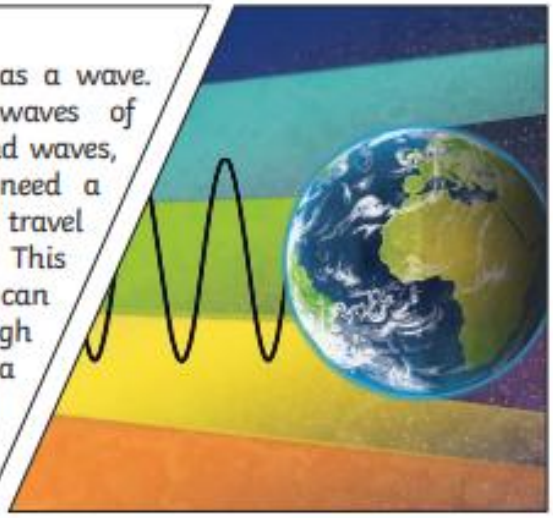
The law of reflection states that the angle of incidence is equal to the angle of reflection. Whenever light is reflected from a surface, it obeys this law.

The angle of reflection is the angle between the normal line and the reflected ray light.

The angle of incidence is the angle between the normal line and the incident ray of light.



Light travels as a wave. But unlike waves of water or sound waves, it does not need a medium to travel through. This means light can travel through a vacuum - a completely airless space.



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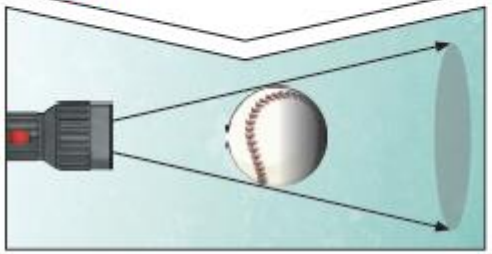
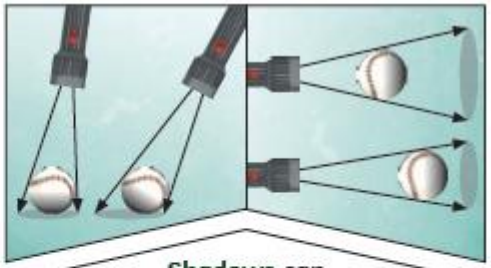
The spoon in this water looks as if it is bent. This is because light bends when it moves from air to water. When light bends in this way, it is called refraction.

Isaac Newton shone a light through a transparent prism, separating out light into the colours of the rainbow (red, orange, yellow, green, blue, indigo and violet) - the colours of the spectrum. All the colours together merge and make visible light.

A **shadow** is always the same shape as the object that casts it. This is because when an opaque object is in the path of light travelling from a light source, it will block the light rays that hit it, while the rest of the light can continue travelling.





Shadows can also be elongated or shortened depending on the angle of the light source. A **shadow** is also larger when the object is closer to the light source. This is because it blocks more of the light.

Assessment statements	By the end of this Unit…	
All children should be able to	Most children will be able to	Some children could be able to
• 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	• 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.	• 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

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Light (Including Colour)

How does light travel?

- Light is a beam of energy. It travels in wavelengths.
- We need light to be able to see things. Light travels in a straight line. These lines are often called rays or beams of light.
- Light is measured in wavelengths on the electromagnetic spectrum. This spectrum includes all the different types of light and other types of waves too.
- Refraction is when light waves bend after passing through different materials. This is because their speed is affected. For example, water makes light travel slower than when it travels through the air. This can make objects underwater appear bent.

How do we see colours?

- We see rainbows because the water droplets in the air cause the light to be split up into the colours it's made from - just like a prism.
- A prism is an object that can break up white light to show the different colours that it's made up of.
- Light is made up of all the colours mixed together. White light can be split up to reveal red, orange, yellow, green, blue, indigo and violet.
- Isaac Newton shone a light through a transparent prism, separating out light into the colours of the rainbow (red, orange, yellow, green, blue, indigo and violet) - the colours of the spectrum. All the colours together merge and make visible light
- Things appear a certain colour because it's the only colour that is reflected. For example, a red car is red because it absorbs all other colours except red. Black objects absorb all colours and white objects reflect all colours.

How can objects be seen?

- Light travels in a straight line, when it hits an object it is reflected in a straight line to the eye so the object can be seen
- The law of reflection states that the angle of incidence is equal to the angle of reflection. Whenever light is reflected from a surface, it obeys this law.
  - The angle of reflection is the angle between the normal line and the reflected ray light
  - The angle of incidence is the angle between the normal line and the incident ray of light

Why are shadows the same shape as the object that casts them?

- A shadow is the same shape as the object that casts it because when an opaque object is in the path of light travelling from a light source, it will block the light rays that hit it, while the rest of the light can continue travelling.
- Shadows can be elongated or shortened depending on the angle of the light source. A shadow is also larger when the object is closer to the light source. This is because it blocks more of the light.