Science Progression - Physics

Year 1	Splendid Skies Observe closely, using simple equipment. Identify and classify. Use their observations and ideas to suggest answers to questions.	Moon Zoom Perform simple tests Use their observations and ideas to suggest answers to questions
Substantive Knowledge	**Playing in the Wind** **What is Wind?** Wind is air that is moving. It is caused by the uneven heating of the Earth's surface by the sun. Wind can feel different depending on how strong it is. How We Can Feel the Wind Feeling the Wind: When we go outside on a windy day, we can feel the wind blow on our faces. **Experiencing Wind:** Flying Kites: Kites can soar high in the sky with the help of the wind. Blowing Windmills: Wind can make windmills spin! Holding Up Items: Coats: Hold out your coat to feel how the wind fills it up. Carrier Bags: Let a plastic bag fly in the wind. Cotton Sheets: A cotton sheet held up can billow beautifully in the wind. **Measuring Wind Speed** Anemometer: This is a tool that measures how fast the wind is blowing. Simple anemometers can be made with cups or plastic bags on a stick. The faster the wind blows, the faster the cups spin! **Endpoints** 1. Describe what wind is and how it can be felt in various ways. 2. Identify and explain at least two activities that can be done on a windy day. 3. Understand and explain how to use an anemometer to measure wind speed. 4. Share their observations and experiments with peers in a clear manner. **Shadow Play** **What is a Shadow?** A shadow is a dark shape that appears on a surface when an object blocks light. It is created when light from a source is obstructed by an object. **Light Sources** Natural Light Sources: The Sun is the main natural light source during the day. Artificial Light Sources: Light bulbs and torches that create shadows indoors. **How Shadows Work** Light from the source travels in straight lines. When it hits an object, some light is blocked, creating a shadow. The size and shape of a shadow depend on the position of the light source and the object. **Movement of Shadows** As the position of the light source changes (like the sun moving across the sky), the shadow of an object will also change in size and direction throughout the day. Shadows are longest early in the morning and late in the afternoon and shortest when the sun is highest in the sky. **Materials for Creating Shadows**	**Investigating Rockets** **What is a Balloon-Powered Rocket?** A balloon-powered rocket is a simple model that uses the force of air escaping from an inflated balloon to propel it along a string. **Key Vocabulary** Rocket: A device propelled by the release of gas. Air: A mixture of gases we breathe - nitrogen, oxygen, and more. Force: A push or pull on an object. Prediction: An educated guess about what might happen in an experiment. **Different Sizes and Shapes of Balloons** Small Balloon: Thin and compact, may not hold much air. Medium Balloon: Ideal for holding more air than a small balloon. Large Balloon: Can hold the most air, potentially allowing for a longer flight distance. **Endpoints** 1. Understand the concept of forces and motion through balloon rockets. 2. Make predictions based on their observations and knowledge about the balloons. 3. Collect data and discuss results collaboratively.

Play equipment: toys, blocks, or any solid objects.
Natural materials: plants or outdoor features (e.g. trees, benches).
Scientific equipment: a flashlight or lamp.

Endpoints

- Understand what shadows are and how they are formed.
- Describe how the sun's position affects the size and shape of shadows.
- Draw and record shadow lengths at regular intervals throughout the day.
- Use simple scientific vocabulary related to light and shadows.

Effects of the Sun

What are Thermo Beads and Light-Sensitive Papers?

Thermo Beads: Small beads that change colour when exposed to heat (temperature).
Light-Sensitive Papers: Papers that change colour when exposed to sunlight (light).

The Sun's Effects

The Sun gives off light and heat.
Light can help us see and can cause changes in materials, like light-sensitive paper.
Heat can warm up materials, causing changes in colour for thermo beads.

Observations to Make

In the Sun: What happens to the thermo beads and paper when they are in direct sunlight?
In the Shade: What happens to the thermo beads and paper when they are in a shadow or shaded area?
Discuss the differences in results between the two conditions.

Endpoints

- Understand what thermo beads and light-sensitive papers are.
- Observe and describe the reactions of these materials in sunlight and shade.
- Communicate the differences observed and suggest possible reasons for them.

Measuring Temperature

What is Temperature?

1. Temperature tells us how hot or cold something is.
2. We measure temperature in degrees (°C).
3. Thermometers are tools used to measure temperature.

Types of Thermometers

- Mercury Thermometer: Uses mercury to show temperature on a glass tube (not suitable for children).
- Digital Thermometer: Displays the temperature on a digital screen; safe and easy to read.

Understanding Scales

- Standard Measure: Degrees Celsius (°C).
- Non-standard Measure: Using everyday items (like fingers or objects) to compare temperature without precise measurement.

Reading Scales

- Look for the number where the liquid rises in the thermometer.
- Start from zero and count the degrees upwards.
- Make sure you understand the increments in between numbers.

Recording Data

- Create a simple chart to record the daily temperature.

	• Use pictures or symbols for non-standard measures (e.g., a sun for hot, a snowflake for cold). **Endpoints** • Use a thermometer safely to measure temperature. • Read and compare temperatures in degrees Celsius. • Create and interpret a simple chart displaying their recorded temperatures. • Understand how temperature can change over time (daily fluctuations). **Typical Weather** **What is Weather?** Weather describes the state of the atmosphere at a certain place and time. Key elements of weather include: Temperature: How hot or cold it is. Precipitation: Rain, snow, sleet, or hail. Wind: The movement of air, which can be gentle or strong. Cloudiness: The amount and type of clouds in the sky. **Types of Weather** Sunny: Clear skies and lots of sunshine. Cloudy: Overcast skies with many clouds. Rainy: Wet weather with falling rain. Snowy: Cold weather with falling snowflakes. Windy: Breezy conditions with noticeable air movement. **Seasons in England** Spring: March to May; milder temperatures, budding plants, longer days. Summer: June to August; warmest season, longer daylight hours. Autumn (Fall): September to November; cooler temperatures, leaves change colour. Winter: December to February; coldest season, shorter daylight hours. **Endpoints** 1. Identify and classify different types of weather. 2. Explain the typical weather associated with each season. 3. Record and interpret weather data over a set period. 4. Draw simple conclusions about local weather patterns and daylight hours.	
Disciplinary Knowledge	**Asking Questions** 1. What can we observe about the wind when we are outside? 2. How does the wind affect the things around us, like trees or kites? **Conducting Simple Experiments** • **Making Observations**: Notice how the wind affects different objects, such as leaves falling or kites flying. • **Using an Anemometer**: Create a simple version and take it outside to measure wind speed at different times. **Communicating Findings** • Share what you observed with friends or family. • Discuss how the wind can change throughout the day. **Scientific Skills** 1. **Observation**: Watching how shadows change shape and position. 2. **Measuring**: Using a ruler or tape measure to determine the length of shadows. 3. **Recording**: Drawing and noting observations at different times of the day. **Inquiry Skills** • **Predicting**: Guessing where shadows will be at different times throughout the day. • **Experimenting**: Using various objects to see how they affect the shadow's shape and length. • **Comparing**: Noticing differences in shadow lengths during morning versus afternoon.	**The Scientific Process** Question: How does the size of a balloon affect how far it travels? Prediction: Make a guess about which balloon will travel the furthest and why. Experiment: Release the balloons and measure how far each travels using a marking system. Observation: Watch how far each balloon goes and how quickly it travels. Conclusion: Discuss the results and reflect on your predictions.

	Scientific Skills • **Observation:** Carefully watching changes in materials over time. • **Comparison:** Noting the differences and similarities between results from sunlight and shade. • **Hypothesis:** Making predictions about what might happen based on prior knowledge. • **Communication:** Sharing findings and ideas with classmates. **Observing** • Daily observation of temperature using a thermometer. • Note the highest temperature and lowest temperature of the day. **Comparing** • Compare the recorded temperatures from different days. • Discuss reasons why temperatures might change (e.g., weather conditions). **Analysing** • Look for patterns in the temperature data. • Ask questions like: "Which day was the hottest?" and "How did it feel outside?". **Communicating** • Share findings through a simple report or presentation. • Use charts to visually show temperature trends over the week. **Collecting Weather Data** 1. Students can collect weather data daily, noting: a. Temperature (hot, warm, cool, cold) b. Weather type (sunny, rainy, cloudy, etc.) c. Windy conditions (none, mild, strong) 2. Use a simple chart or table to record their findings. **Analysing Weather Data** • After a period of data collection (e.g., two weeks), students can: ○ Count how many times each type of weather occurred. ○ Identify which type of weather was most common. ○ Discuss any patterns seen in the weather over the days. **Drawing Conclusions** • Use the gathered data to form conclusions: ○ What was the most common type of weather in this season? ○ How did the weather change over the course of the data collected? ○ How do these changes relate to expected seasonal weather?	
Useful Websites	• Science Kids - Shadows • BBC Bitesize - Light and Shadows • National STEM Centre - Teaching Resources • BBC Bitesize Science - Light and Heat • The Science of Light: Exploratorium • National Geographic Kids – Sun and Light • BBC Bitesize - Measuring Temperature • National Geographic Kids - What is Temperature? • Education Scotland - Thermometer Activity • STEM Learning - Practical Activities for Measuring Temperature • Met Office - Weather Explained • BBC Bitesize - Weather • National Geographic Kids - Weather	• BBC Bitesize - Science • The Royal Society - Science Learning • Science Buddies - Balloon Rocket

Year 2	Land Ahoy! Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.
Substantive Knowledge	**Making Boats** **What is Floating?** Definition of Floating: Floating occurs when an object is on the surface of a liquid and stays there without sinking. Density: An important property that determines whether an object floats. If an object is less dense than the liquid, it will float; if it is more dense, it will sink. **The Role of Shape** Shape and Floating: The shape of an object can affect its ability to float. For example, flat shapes may float better than round ones because they displace more water. Volume and surface area: A larger surface area can help distribute weight better and make it easier to float. **Plasticine Properties** Plasticine: A type of modelling clay that can be easily reshaped. Malleable: Plasticine can be squashed, squeezed, and bent into different shapes, making it perfect for this experiment. **Endpoint** 1. Understand the concept of floating and sinking. 2. Experiment with different shapes and relate the concept of density to their findings. 3. Record and communicate their results clearly. 4. Develop skills in hypothesising and drawing conclusions from their observations.
Disciplinary Knowledge	**Scientific Inquiry Process** Question Raising: What shapes of plasticine can float? Hypothesis Formation: Predict which shapes might float better than others. Experimentation: Initial test: Place a lump of plasticine in water to check if it floats. Mould different shapes (sausage, flat, cup) and test each in the water. Observation & Recording: Note down which shapes float and which sink. Conclusion: Discuss the results and reflect on why some shapes floated better than others. **Data Recording** Experiment Log: Create a table to record the different shapes created and whether they floated or sank. Visual Representation: Draw or take photos of each shape and mark if it floats or sinks.
Useful Websites	• BBC Bitesize Science: Floating and Sinking • Primary Science Teaching Trust: Inquiry-Based Learning • Science Kids: Science Experiments

Year 3	Road Trip USA! Ask relevant questions and using different types of scientific enquiries to answer them. Identify common appliances that run on electricity. Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. Gather, record, classify and present data in a variety of ways to help in answering questions. Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. Recognise some common conductors and insulators, and associate metals with being good conductors.	Playlist Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. Find patterns between the volume of a sound and the strength of the vibrations that produced it. Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. Use straightforward scientific evidence to answer questions or to support their findings. Identify how sounds are made, associating some of them with something vibrating. Recognise that vibrations from sounds travel through a medium to the ear. Ask relevant questions and using different types of scientific enquiries to answer them. Identify differences, similarities or changes related to simple scientific ideas and processes. Recognise that sounds get fainter as the distance from the sound source increases.
Substantive Knowledge	**Electrical Amenities** **Appliances in a Luxury Hotel Room:** Television: Runs on electricity for entertainment. Fridge: Runs on electricity to keep drinks and food cold. Air Conditioning: Runs on electricity to control the room temperature. **Appliances Useful for Camping:** Torch: Useful for lighting in the dark, can be battery-powered. Portable Stove: Used for cooking outdoors, can be fuelled by gas. Solar-powered Charger: Charges devices using sunlight. **Endpoints** 1. Differentiate between appliances that run on electricity and those that do not. 2. Compare and contrast amenities in a luxury hotel room with camping appliances. 3. Create a camping catalogue displaying adapted camping appliances with details. **Lights!** **Circuit Terminology:** Circuit: A closed loop through which an electrical current flow. Conductor: A material that allows electricity to flow through it easily. Insulator: A material that does not allow electricity to flow through it. Switch: A device used to open or close a circuit. **Describing Circuits:** Closed Circuit: When there is a complete path for the current to flow, and the lamp lights up. Open Circuit: When there is a break in the path, and the lamp does not light up. Connecting in Series: When components are connected one after the other in a circuit. Connecting in Parallel: When components have separate branches in a circuit. **Endpoints** 1. Identify components in a simple circuit (lamp, battery, wires). 2. Predict which circuit will light a lamp. 3. Explain the flow of electricity in a circuit. 4. Use correct terminology to describe components and processes in a circuit. **Illuminated Models** **Understanding Electricity:** Electricity is a form of energy that powers lights and appliances. Electricity flows in a circuit, which is a closed loop made up of wires, a power source (battery), and a load (lamp).	**Various Volumes** **Introduction to Sound** **What is Sound?** Sound is a type of energy made by vibrations. When an object vibrates, it causes the air around it to move and this creates sound waves that travel to our ears. **How We Hear Sound** Sound travels in waves, and when these waves reach our ears, they vibrate our eardrums. Our brain then interprets these vibrations as different sounds. **Endpoints** • Understand what sound is and how it travels. • Define and explain decibels as a measurement of sound. • Use a sound meter to accurately measure and compare different sounds. • Record findings in a clear table and represent data using graphs. • Communicate results effectively, explaining which sounds are louder and why. **Make Vibrations** **Examples of Creating Sound** **Drum Skin with Rice** How to Create the Sound: Gently tap the drum skin, causing it to vibrate. What Happens: The vibrations move through the drum skin, making it ripple and create sound waves. The rice grains jump and dance, showing us where the vibrations are strongest. **Elastic Band Over an Empty Tub** How to Create the Sound: Pluck the elastic band, which is stretched over a tub. What Happens: As you pluck, the band vibrates back and forth. This motion creates a rich, twangy sound, like a musical string, while the tub amplifies the sound, making it echo. **Vibrating Tuning Fork in Water** How to Create the Sound: Strike the tuning fork on a surface and place it in water. What Happens: The tuning fork vibrates, producing a clear ping that disturbs the water. You will see little ripples and splashes as the vibrations affect the surface of the water. **Ruler Clamped to a Table** How to Create the Sound: Tap one end of a ruler that is clamped to a table. What Happens: Tapping the ruler sends vibrations through the ruler and into the table, creating a short, sharp sound as the other end flaps up and down. **Endpoints** 1. Identify and describe how sound is produced using vibrations in different materials. 2. Demonstrate through practical activities how vibrations create sound. 3. Explain in simple terms how sound travels through different mediums. 4. Use descriptive vocabulary to explain various sounds produced in their experiments. **The Human Ear** **1. Outer Ear** Pinna: The visible part of the ear that collects sound waves and directs them into the ear canal. Ear Canal: A tube that carries sound waves to the eardrum.

	Components of a Circuit: Battery: Provides the energy for the circuit to work. Lamp: Emits light when electricity passes through. Switch: Controls the flow of electricity by opening or closing the circuit. **Endpoints** 1. Create a detailed design plan for the illuminated model including labelled circuit diagrams. 2. Construct the physical model of the chosen US icon using appropriate materials. 3. Incorporate inner circuits into the model, positioning lamps strategically. 4. Add an accessible switch to control the lighting within the model. 5. Demonstrate an understanding of basic electrical circuit concepts in the context of the project. **Conductors and Insulators** **Electrical Conductor:** An electrical conductor is a material that allows electricity to flow through it easily. Examples of electrical conductors include metals like copper, aluminium, and gold. **Electrical Insulator:** An electrical insulator is a material that does not allow electricity to flow through it easily. Examples of electrical insulators include rubber, plastic, and glass. **Completing the Circuit:** To complete a circuit, you need to connect a source of electricity (e.g., a battery) with an electrical conductor to allow the flow of electricity and produce light in an LED lamp. **Endpoint** 1. Confidently differentiate between electrical conductors and insulators using household items. 2. Develop critical thinking skills by predicting and testing the conductivity of various materials.	**2. Middle Ear** Eardrum (Tympanic Membrane): A thin membrane that vibrates when sound waves hit it. This vibration is the first step in our hearing process. Ossicles: Three tiny bones (malleus, incus, and stapes) that amplify the vibrations from the eardrum. Malleus (Hammer): The first ossicle that connects to the eardrum. Incus (Anvil): The middle ossicle that passes vibrations from the malleus to the stapes. Stapes (Stirrup): The last ossicle that transfers vibrations to the inner ear. **3. Inner Ear** Cochlea: A spiral-shaped structure filled with fluid. It converts sound vibrations into signals that the brain can understand. Auditory Nerve: Carries those signals from the cochlea to the brain. **Endpoints** 1. Identify and label the main parts of the human ear. 2. Explain the process of how sound travels through the ear. 3. Understand the role of each part in hearing. 4. Illustrate the ear with correct terminology. **Exploring Pitch** **Types of Sounds** High Sounds: Sound produced by a quick vibration (e.g., a whistle). Low Sounds: Sound produced by a slow vibration (e.g., a drum). **Pitch** Definition: Pitch refers to how high or low a sound is. It is determined by the frequency of the sound waves. **Comparing Pitch** Higher Pitch: Sounds that have a frequency above another sound (e.g., a flute is higher than a tuba). Lower Pitch: Sounds with a frequency below another sound (e.g., a double bass is lower than a violin). **Endpoints** 1. Identify and describe sounds as high or low. 2. Compare pitches and describe them as higher or lower than others. 3. Utilize elastic bands to demonstrate and explain how the length, thickness, and tightness affect the pitch of the sound produced. **Testing Our Hearing** **Distance and Hearing** Distance: The distance from the sound source affects whether we can hear it. As we move away, the sound waves lose energy, and eventually, the sound fades away. Patterns in Hearing: We will investigate if sounds that are twice as loud can be heard at twice the distance. **Hearing Ability** Individual Differences: Not everyone has the same hearing ability. Some people may have better hearing than others due to different factors such as age, health, and noise exposure. **Endpoints** • Understand how sound travels and the concept of volume. • Conduct a scientific experiment and collect accurate data. • Analyse data to identify patterns and draw conclusions about sound and distance. • Appreciate differences in individual hearing abilities and how they affect results.
Disciplinary Knowledge	**Identifying Electricity-Run Appliances:** Discussing the purpose of appliances in a luxury hotel room. Understanding the need for electricity to power certain appliances. Comparing Camping Appliances: Exploring how camping appliances differ from those in a hotel room. Recognising the adaptability of appliances for outdoor use. **Understanding circuits:** A circuit is a closed loop or pathway through which electricity can flow. Predicting outcomes: Observing the components in a circuit can help predict whether a lamp will light up. Conducting experiments: Testing the circuits with different setups to validate predictions.	**Scientific Investigation Skills:** **Asking Questions:** What sounds can we hear around us? How loud are these sounds? **Planning Investigations:** Decide how to measure and record sound levels – which sounds to measure and how. **Recording Data:** Use tables, graphs, or charts to organise and present sound level data clearly. **Analysing Results:** Compare sound levels, look for patterns, and understand how different sounds affect our environment. **Understanding Sound Waves** Sound travels through air as waves, which can be observed with materials that respond to sound. The type of sound produced varies based on the materials and techniques used. **Hands-On Investigation** Experiment: Each method can be experimented with to observe and describe the vibrations and sounds produced directly.

	Understanding circuits: A circuit is a complete loop through which electricity can flow. Components of a circuit include a power source (battery), conductive materials (wires), and output devices (lamps). Components of a circuit: Power source: Provides electrical energy (e.g., battery). Input device: Switches the circuit on and off. Output device: Converts electrical energy into light (e.g., lamp). Circuit design: Planning the layout of components in a circuit diagram. Positioning lamps in the model to ensure even illumination. Including a switch for easy access to control the circuit. Safety measures: Ensuring wires are insulated and not frayed. Supervising the use of batteries and electrical components. Reporting any defective equipment to the teacher. **Predicting Conductivity** Before testing, students will predict whether a household item will conduct electricity based on their understanding of conductors and insulators. Recording and Grouping: Students will record their results in a table, categorising items as 'conductors' or 'insulators' based on their performance in completing the circuit. Discussion: Students will discuss the similarities and differences between items that act as conductors and insulators, drawing conclusions from their experiments.	Observe: Note how vibrations differ in appearance and sound quality based on each method. **Conducting Observations** How they feel vibrations when sound is loud. The differences between high sounds (like a whistle) and low sounds (like a drum) in terms of pitch. **Scientific Inquiry:** Make predictions about how changes to the elastic band will affect sound. Conduct simple experiments and gather data from your observations. Draw conclusions based on your findings. **Hypothesis:** Before starting the experiment, we will create a hypothesis about how volume might affect the distance we can hear the music. **Experiment:** Play music at a consistent volume. Walk in a straight line away from the music until you can no longer hear it. Measure the distance travelled in metres. Data Collection: Record your distances in a table format for analysis. **Data Analysis** Look for Patterns: After gathering data, we will compare distances to see if there are patterns. Does a louder sound travel further? Do all class members have similar results? **Discussion:** Analyse your results. Can a sound that is twice as loud be heard at twice the distance? Explain any differences you observe between class members' results.
Useful Websites	• Central Park Luxury Hotels • Appliances Direct • Go Outdoors • BBC Bitesize - Simple Circuits • Science Museum - Electricity and Circuits • BBC Bitesize - How Electricity Works • Science Kids - Electrical Circuits • National Geographic Kids - US Landmarks • BBC Bitesize - Conductors and Insulators • Science Kids - Electricity Conductors and Insulators	• BBC Bitesize: Sound • National Geographic: Sound Waves • Science Kids - The Science of Sound • National Geographic Kids - Sound • BBC Bitesize Science - The Ear • National Geographic Kids - The Human Ear • Kid's Health - How Your Ears Work

Year 4	Mighty Metals Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. Identify differences, similarities or changes related to simple scientific ideas and processes. Notice that some forces need contact between two objects, but magnetic forces can act at a distance. Set up simple practical enquiries, comparative and fair tests. Compare how things move on different surfaces. Gather, record, classify and present data in a variety of ways to help in answering questions. Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. Observe how magnets attract or repel each other and attract some materials and not others. Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials Describe magnets as having two poles. Predict whether two magnets will attract or repel each other, depending on which poles are facing.
Substantive Knowledge	**Sorting and Classifying** **Key Forces** Push: A force applied in a direction away from the object. Example: Pushing a swing. Pull: A force applied towards the object. Example: Pulling a slide down to sit on it. Gravity: The force that pulls everything towards the Earth. It makes objects fall. Example: A child sliding down a slide. Friction: The force that opposes motion between two surfaces. It slows things down. Example: The friction between slide and a child's clothes. **Endpoints** 1. Understand key concepts of forces: push, pull, gravity, and friction. 2. Identify and classify various playground apparatus based on the forces they require. 3. Discuss how and why forces affect the movement of various pieces of playground equipment. **Slip and Slide** **Friction:** The resistance that one surface or object encounters when moving over another. It can slow down objects. **Sliding Speed:** The rate at which an object moves down a slide. It can vary depending on the material in contact with the object. **Surface Texture:** Smooth Surfaces: Have less friction, allowing objects to slide faster. Rough Surfaces: Have more friction, causing objects to slide slower. **Materials:** Various materials can affect friction differently. Common materials include: Plastic Cloth Rubber Paper Metal **Endpoint** 1. Understand how different materials affect sliding speed. 2. Identify the relationship between surface texture and friction. 3. Conduct a simple scientific experiment using fair testing methods. 4. Record, analyse, and present data in a clear format. **Magnetic Object Hunt** **What is Magnetism?** Magnet: An object that can attract or repel certain materials like iron, nickel, and cobalt. Magnetic Objects: Items made from materials that can be attracted to a magnet. Non-Magnetic Objects: Items made from materials that cannot be attracted to a magnet (e.g., wood, glass, plastic). **Endpoint** 1. Identify and list 20 magnetic objects from around the school. 2. Explain what each object is made from and its properties. 3. Present your findings clearly in tables or charts. 4. Understand the science behind magnets and magnetic materials. **Investigating Magnets** Force Meter: A tool used to measure the force exerted by a magnet in newtons (N). Average Force: The sum of all measured forces divided by the number of measurements taken. North or South?

Endpoints

1. Successfully measure and record the strength of different magnets.
2. Calculate the average force of each magnet accurately.
3. Communicate results clearly, using tables and conclusions drawn from data.

North and South

Every magnet has two poles: the North Pole and the South Pole.
Opposite poles attract each other (North attracts South), while like poles repel each other (North repels North and South repels South).

Types of Magnets

Bar Magnets: Rectangular shape; used for demonstrating basic magnetic properties.
Horseshoe Magnets: U-shaped magnets; provide a stronger magnetic field, ideal for exploring magnetic poles.
Other Magnet Shapes: Include disc magnets, cylinder magnets, and ring magnets; each shape exhibits unique magnetic properties.

Magnetic Fields

A magnetic field is the area around a magnet where magnetic forces can be felt.
The pattern of the magnetic field can be visualised using iron filings or ferrofluid.

Endpoints

1. Identify and label the north and south poles of different magnets accurately.
2. Observe, describe, and compare the patterns formed by various magnets using iron filings and/or ferrofluid.
3. Use appropriate scientific vocabulary when discussing their observations and findings.

Time for a Fair Test

Fair Test: A fair test is an experiment where only one variable is changed at a time while all other conditions remain the same. This ensures that the results are valid and reliable.

Variables:

Independent Variables: The factors that you change in the experiment.
Length of the ramp (e.g., 1 metre, 2 metres, 3 metres)
Angle of the ramp (e.g., 30°, 45°, 60°)
Material of the ramp (e.g., wood, plastic, metal)
Dependent Variable: The factor that you measure in the experiment.
Distance the cart travels when released from the ramp.
Controlled Variables: Factors that must be kept the same to ensure a fair test.
The weight of the cart
The surface on which the cart lands
Starting position of the cart (always released from the same height)

Endpoints

1. Understand the concept of a fair test and its importance in scientific experiments.
2. Identify and explain independent, dependent, and controlled variables.
3. Conduct an experiment methodically, ensuring that conditions remain consistent.
4. Collect, record, and present data visually (e.g., using charts or tables).
5. Draw conclusions based on evidence gathered through experimentation.

Magnificent Metals

Common Metals and Their Properties

Iron
Properties: Strong, durable, magnetic, rusts.
Uses: Construction, tools, automotive parts.

Brass
Properties: Copper and zinc alloy, corrosion-resistant, gold-like appearance.
Uses: Musical instruments, plumbing, decorative items.

Copper
Properties: Excellent conductor, malleable, develops patina.
Uses: Electrical wiring, plumbing, cookware.

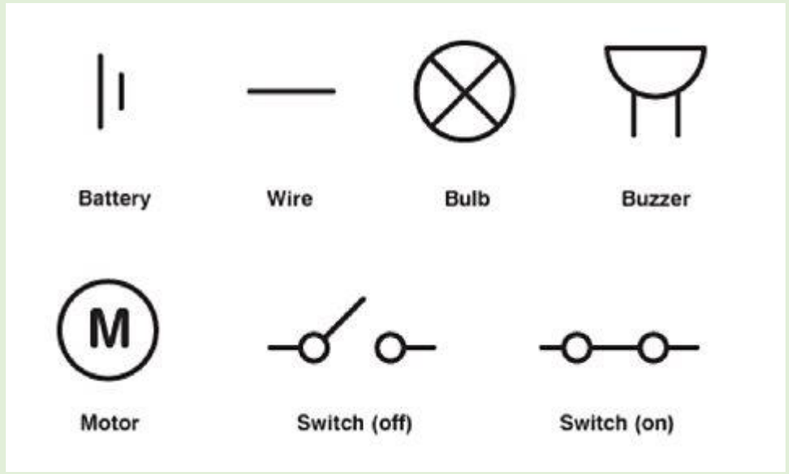
Mercury
Properties: Liquid at room temperature, high density, toxic.
Uses: Thermometers, barometers, electrical switches.

Aluminium
Properties: Lightweight, corrosion-resistant, strong.
Uses: Packaging, aircraft, construction.

Gold
Properties: Malleable, does not tarnish, valuable.
Uses: Jewellery, electronics, awards.

	Silver Properties: Highly conductive, resistant to corrosion, lustrous. Uses: Jewellery, photography, electronics. **Tin** Properties: Soft, malleable, corrosion-resistant. Uses: Coating for cans, soldering, toys. **Lead** Properties: Dense, soft, toxic. Uses: Batteries, radiation shielding, formerly in paints. **Endpoints** 1. Identify different types of metals and their common properties. 2. Describe various uses of metals based on their properties. 3. Conduct simple investigations to observe properties of materials. 4. Discuss the importance of choosing appropriate materials for specific tasks.
Disciplinary Knowledge	**Sorting and Classifying Forces** Contact Forces: Forces that occur when objects touch each other. Examples from playground apparatus include push and pull actions. Non-contact Forces: Forces that occur without direct contact. Gravity fits into this category, influencing how everything interacts on the playground. **Exploring Motion** Why does a roundabout slow down when it is no longer pushed? The roundabout begins to slow down due to friction between it and the ground. Friction opposes motion and, without the continuous push, the energy starts to dissipate, making it lose speed. What would happen if a slide were horizontal? If a slide were horizontal, gravity would not help the child slide down as gravity pulls directly down, not sideways. Thus, it is likely the child would not slide unless an additional force (like a push) were provided **Scientific Method** Ask a Question: How do different materials affect the speed of an object sliding down a slide? Make a Hypothesis: Predict which material will allow the object to slide the fastest and why. Conduct an Experiment: Set up a fair test to investigate your hypothesis. Collect Data: Measure the time it takes for the object to slide down with different materials. Analyse Results: Compare the times and evaluate your hypothesis. Draw Conclusions: Summarise what you learned about the materials and their effects on sliding speed. **Fair Testing** To ensure a fair test: Use the same object each time. Use a slide with a consistent incline. Make sure the length of the slide is the same. Conduct each test under similar conditions. **Collaboration:** Work in pairs or small groups. Share ideas and help each other. **Observation:** Carefully look around the school for different objects that may be magnetic. **Research**: Use the internet and books to find out what materials the objects are made from. **Data Collection:** Collect and organise your findings using tables or charts. Endpoint **Hypothesis:** Formulate a prediction about which magnet will be the strongest before testing. **Experiment Design**: Plan how to conduct the experiment fairly, including ensuring that you use the same distance from the magnetic material each time. **Data Collection**: Record results in a table to make analysis easier. **Calculation**: Learn how to find the average force by adding all the measured forces and dividing by the number of measurements. **Scientific Inquiry Skills** Investigating: Conduct experiments using different magnets and iron filings to observe patterns. Comparing: Look at different magnet shapes and how they affect the magnetic field patterns formed. Describing: Use scientific vocabulary to explain findings and describe observations. **Observational Skills** Record the observations made with careful attention to detail. Note how the different shapes of magnets affect the distribution of iron filings. **Hypothesis Formation:** Students will predict how the chosen independent variable will affect the distance travelled by the cart. For example, they might hypothesise that "a steeper ramp will make the cart travel further." **Data Collection:** Students will need to measure the distance travelled using a ruler or tape measure and record their results accurately. **Analysis:** After conducting the experiment, students will compare their results to see which ramp conditions allowed the cart to travel the furthest.

	Conclusions: Students will draw conclusions based on their data, reflecting on their hypothesis and suggesting improvements for future experiments **Observation:** Look at the appearance, colour, and texture of metals. **Testing:** Use simple tests to see how metals conduct heat and electricity. **Research:** Use reliable sources (books, websites) to gather information about metals. **Class Discussion:** Share findings and experiences with different metals, considering their properties and uses.
Useful Websites	• BBC Bitesize - Forces and Motion • Primary Homework Help - Forces • Science Kids - Forces and Motion • Primary Science - Investigations • Touching on Magnets - BBC Bitesize • What are Magnets? - Science Kids • National Geographic Kids - Magnets • BBC Bitesize - Forces and Magnets • National Geographic Kids - Magnets • Science Kids - Magnet Experiments • BBC Bitesize Science: Forces and Motion • Science Buddies: Fair Testing • Primary Science Teaching Trust: Investigative Science • BBC Bitesize - Materials • National Geographic Kids - Materials • Science Direct - Metals and Their Properties • Primary Resources - Teaching Resources for Metals

Year 5	Pharaohs Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in a circuit Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches Use recognised symbols when representing a simple circuit in a diagram
Substantive Knowledge	**Recognise Circuit Symbols** **Circuit:** A complete path through which electricity can flow. **Symbol**: A drawing or shape that represents something else. **Component**: A part of a circuit, like a battery or a bulb. **Electricity**: A form of energy that can light up bulbs, make sounds, or power devices.  Battery - A source of voltage that provides power to the circuit. Symbol: A long line and a short line, with the long line representing the positive terminal and the short line the negative terminal. Cell - A single unit that generates electricity. Multiple cells can be arranged to form a battery. Symbol: One long line and one short line or several connected in a series. Switch - Opens and closes the circuit, controlling the flow of electricity. Symbol: A break in the line with a small line representing the switch lever. Lamp - A light bulb that converts electrical energy into light. Symbol: A circle with a cross inside. Motor - Converts electrical energy into motion. Symbol: A circle with a "M" inside. Resistor - Limits the current flowing through the circuit. Symbol: A zigzag line. Wire - Connects the components of the circuit. Symbol: A straight line. **Endpoints** 1. Recognise and name common circuit symbols. 2. Draw simple circuit diagrams using the appropriate symbols. 3. Understand the function of basic electrical components (battery, switch, bulb, wire, buzzer). 4. Explain how to create a simple circuit using correct terminology. **Exploring Circuits** **Key Vocabulary** Circuit: A complete pathway through which electrical current can flow. Cell: A single unit that provides electrical energy; multiple cells can be connected to increase voltage. Voltage: The measure of electrical potential difference; a higher voltage can increase the energy supplied to components in a circuit.

	Brightness: The amount of light produced by a lamp; influenced by the number of cells and voltage in a circuit. Volume: The loudness of sound produced by a buzzer; affected by the number of cells and voltage in a circuit. **Key Concepts** Series Circuit: All components are connected in a single path. If one component fails, the entire circuit is broken. Parallel Circuit: Components are connected on separate branches. If one component fails, others can still function. Electrical Components: Includes cells (batteries), resistors, lamps, and buzzers. **Investigating Brightness and Volume** Increasing Cells in Series: Adding more cells increases the voltage, thus increasing the brightness of the lamp and the volume of the buzzer. Understanding Resistance: Different components resist the flow of electricity and can affect how much energy is available for brightness and volume. **Endpoints** 1. Explain how the number of cells in a circuit affects the brightness of a lamp and the volume of a buzzer. 2. Design and carry out experiments to investigate the relationship between voltage, cell number, brightness, and sound. 3. Record and interpret data, drawing conclusions based on their findings.
Disciplinary Knowledge	**How to Read Circuit Diagrams** Identify the components using their symbols. Follow the connection lines to see how electricity flows through the circuit. Determine whether the circuit is open or closed by observing any breaks in the lines. **Practical Skills** Creating Circuit Diagrams: Students will be asked to draw circuit diagrams using standard symbols to represent various components. Building Simple Circuits: Using battery packs, wires, switches, and lamps, students will physically construct circuits while referencing the symbols to understand their function. **Scientific Inquiry** Hypothesis Formation: Make predictions about how changing the number of cells will affect brightness and volume. Data Collection: Measure and record the brightness of the lamp using a light meter and the volume of the buzzer using a sound level meter. Analysis of Results: Compare data to evaluate the impact of the number and voltage of cells on brightness and volume. **Evaluation and Conclusions** Discuss how results align with initial hypotheses. Identify any anomalies or outliers in collected data. Consider real-world applications of circuit knowledge (e.g., designing lighting systems or alarm systems).
Useful Websites	• BBC Bitesize: Circuits • Education.com: Circuit Symbols • TeachEngineering: Circuit Symbol Game • PhET Interactive Simulations: Circuit Construction Kit • BBC Bitesize: Electricity • National Stem Centre: Circuits • Science Kids: Electricity

Year 6	Stargazers	Scream Machine
	Use test results to make predictions to set up further comparative and fair tests. Report and present 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. Identify scientific evidence that has been used to support or refute ideas or arguments. Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. Describe the Sun, Earth and Moon as approximately spherical bodies. Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. Describe the movement of the Moon relative to the Earth. Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. 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	Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. Use test results to make predictions to set up further comparative and fair tests. Report and present 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. Identify scientific evidence that has been used to support or refute ideas or arguments. Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.
Substantive Knowledge	**Order of the Planets** The eight planets in order from the sun are: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune. Terrestrial Planets (Rocky): Mercury, Venus, Earth, Mars. Jovian Planets (Gaseous): Jupiter, Saturn, Uranus, Neptune. Size and Scale **Endpoints** 1. Identify the order of the planets in the solar system. 2. Differentiate between terrestrial and Jovian planets. 3. Recall key characteristics of each planet. Day and Night **Size and Scale** **Sizes of Planets** Mercury: 4,880 km Venus: 12,104 km Earth: 12,742 km Mars: 6,779 km Jupiter: 139,820 km Saturn: 116,460 km Uranus: 50,724 km Neptune: 49,244 km **Distances from the Sun** Mercury: 57.9 million km Venus: 108.2 million km Earth: 149.6 million km Mars: 227.9 million km Jupiter: 778.5 million km Saturn: 1.4 billion km Uranus: 2.8 billion km Neptune: 4.5 billion km **Endpoints** 1. Understand the relative sizes of planets in the Solar System. 2. Apply the concept of scale to represent planetary sizes using spherical items. 3. Demonstrate knowledge of each planet's position in the Solar System.	**Theme Park Materials** **Roller Coaster** Visible Materials: Steel, plastic, rubber, wood Required Properties: Rigid: Maintains its shape under load. Strong: Can withstand the forces applied during operation. Smooth: Ensures a comfortable ride and reduces wear. **Log Flume** Visible Materials: Fibreglass, plastic, treated wood Required Properties: Buoyant: Must float on water and carry passengers. Waterproof: Must not allow water to seep through. Durable: Withstands exposure to water and weather elements. **Bumper Cars** Visible Materials: Steel, plastic, foam Required Properties: Flexible: Allows for impacts without breaking. Shock-absorbing: Reduces the force of collisions. Safe: Minimises injury risk to riders. **Endpoints** 1. Identify common materials used in theme park rides and their respective properties. 2. Understand the scientific method of investigation and apply it to material selection. 3. Conduct buoyancy tests and analyse data to make informed conclusions. **Centripetal Force** **What is Centripetal Force?** Definition: Centripetal force is the force that acts on an object moving in a circular path, directed towards the centre of the circle. Source of Centripetal Force: It can come from various sources, including tension (like in a swinging bucket), gravity, or friction. **Key Concepts**

Day and Night

Earth's Rotation

The Earth rotates on its axis from west to east.

This rotation takes approximately 24 hours to complete.

The side of the Earth facing the Sun experiences daylight, while the opposite side experiences night.

Sun as the Light Source

The Sun emits light in the form of sunlight.

The Earth orbits around the Sun, receiving varying amounts of sunlight throughout the year.

Day and Night Cycle

Daytime occurs when a specific location on Earth faces towards the Sun.

Night-time occurs when that location faces away from the Sun.

Day and night are caused by the Earth's rotation, not by the Sun moving around the Earth.

Endpoints

1. Explain how the Earth's rotation causes day and night.
2. Understand the role of the Sun as a light source in the day and night cycle.
3. Demonstrate the concept using a torch, globe, and sticker on the UK.

Facts about the Moon

What causes the phases of the moon?

The moon appears to have different shapes in the sky due to the sunlight reflecting off it.

The moon orbits the Earth, and the Sun illuminates different parts of the moon's surface as it moves.

Phases of the Moon

New Moon: The side of the moon facing the Earth is not illuminated by sunlight.

Waxing Crescent: A small portion (less than half) of the moon is illuminated, beginning after the New Moon.

First Quarter: Exactly half of the moon is illuminated in this phase.

Waxing Gibbous: More than half, but not all, of the moon is illuminated.

Full Moon: The entire face of the moon that is visible from Earth is illuminated.

Waning Gibbous: The moon is still more than half illuminated, but becoming less so.

Third Quarter: Half of the moon is illuminated, but on the opposite side from the First Quarter.

Waning Crescent: A small portion (less than half) of the moon is illuminated, nearing the New Moon once again.

Endpoints

1. Identify and describe each phase of the moon.
2. Explain why the moon appears to have different shapes over a month.
3. Create accurate models or diagrams of the moon's phases.

Investigating Gravity

Understanding Gravity

Gravity is a force that pulls objects towards the Earth.

Weight is the measure of the force of gravity acting on an object.

Weight is measured in newtons using force meters with different scales.

Objects fall to the ground due to the force of gravity acting on them.

Hypothesis on Weight and Dropping Speed

Hypothesis: The weight of an object may affect the speed at which it falls.

Investigate if objects of different weights, such as an orange and a grape, fall at different speeds.

Gravity is a constant force acting on all objects, regardless of their weight.

Other Forces Opposing Gravity

Air resistance is a force that opposes the downward movement of objects.

Radius of Circular Motion: The distance from the centre of the circle to the object moving in it.

Speed: The faster an object moves in a circular path, the greater the centripetal force required to keep it moving.

Gravity: This force acts downwards and affects the motion of objects completing vertical loops, such as roller coasters.

Endpoints

1. Understand how centripetal force works in conjunction with gravity and speed.
2. Explain the real-world applications of centripetal force, especially in roller coasters and theme park rides.
3. Engage in meaningful scientific dialogue about the importance of speed in creating centripetal force in vertical loops.

Loop the Loop

Why does the marble stay on the track?

The marble stays on the track due to centripetal force, which is generated by its velocity and the height from which it falls. The gravitational force pulls it down, while the speed keeps it moving in a curve.

What is the biggest diameter loop that the marble will travel around and still stay on?

This depends on the height from which the marble is released and its speed. Too large a loop may exceed the centripetal force needed, causing the marble to fall.

Endpoints

1. Explain how energy transfer and forces affect the marble's ability to complete the loop.
2. Predict the impact of changing variables on the marble's motion.
3. Work effectively in a team to conduct scientific experiments.
4. Present your findings clearly, with appropriate scientific language.

Investigating Pendulums

What is a Pendulum?

A pendulum consists of a weight (or bob) attached to a string or rod that swings back and forth under the influence of gravity. The swinging motion is known as oscillation.

Parts of a Pendulum

Bob: The weight at the end of the string.

String: The material connecting the bob to the pivot point (nail).

Pivot Point: The fixed point where the string is attached (e.g., the nail in the wall).

Key Concepts

Oscillation: The complete movement of the pendulum from its starting point to one extreme and back to the starting point.

Frequency: The number of oscillations made in one minute, measured in "swings per minute."

Weight: The mass added to the pendulum (e.g., slotted weights) that can affect the pendulum's motion.

Angle of Release: The initial angle at which the pendulum is pulled back to start swinging.

End Points

1. Demonstrate an understanding of how weight affects the motion of a pendulum.
2. Conduct a scientific experiment and understand the importance of fair testing.
3. Collect, record, and analyse data, drawing conclusions from their findings.
4. Communicate their results effectively, with clear reasoning for any patterns observed.

Investigating Pulleys

What is a Pulley?

A pulley is a simple machine that consists of a wheel on an axle or shaft.

A rope or cable runs along the groove on the wheel which helps lift loads.

Pulleys change the direction of force, enabling easier lifting.

The shape and size of objects can influence air resistance.

Objects with larger surface areas experience more air resistance, affecting their falling speed.

Endpoints

1. Describe the force of gravity and its effect on objects.
2. Use force meters to measure the force of gravity in Newtons.
3. Formulate hypotheses on how weight may affect the speed at which objects fall.
4. Conduct experiments using objects like oranges and grapes to test hypotheses.
5. Identify and explain other forces, such as air resistance, that influence the falling speed of objects.

Light – Earth Lesson

Light Travels in a Straight Line

Light is a form of energy that travels in straight lines.

When light encounters a surface, it can be reflected, absorbed, or transmitted.

Transparent Materials

Materials that allow light to pass through with minimal scattering are called transparent.

Examples: clear glass, water, and air.

Opaque Materials

Materials that do not allow light to pass through are called opaque.

Examples: wood, metal, and cardboard.

Translucent Materials

Materials that allow some light to pass through but scatter it in different directions are called translucent.

Examples: frosted glass, wax paper.

Light Reflects into the Eyes

When light is reflected off an object, it enters our eyes and forms an image.

This is how we see objects around us.

Endpoints

1. Understand that light travels in straight lines.
2. Identify and classify materials as transparent, opaque, or translucent.
3. Explain how light reflects into our eyes and enables us to see objects.

Light – Seeking Patterns

What is a Shadow?

A shadow is formed when an object blocks light. It is an area where light is obstructed, creating a darker region behind the object.

Why Do Shadows Have the Same Shape as the Objects that Cast Them?

Shadows have the same shape as the objects that cast them because light travels in straight lines. When an object blocks light, it creates a silhouette of the object on any surface behind it.

How Can Shadows be Changed?

Shadows can be changed by altering the position of the object, the light source, or the surface the shadow falls on.

Endpoints:

1. Explain how shadows are formed.
2. Demonstrate the relationship between the shape of objects and their shadows.
3. Investigate how the position of the light source affects the size and shape of shadows.
4. Explore how shadows can be changed by varying the distance of the light source from the object.

Light – Properties and Uses/Light – Phenomena

Reflection in Mirrors:

Endpoints

1. Understand the purpose and function of pulleys.
2. Be able to explain the mechanical advantage when using one or more pulleys.
3. Conduct a simple experiment to show how pulleys can lift heavy loads with less force.
4. Engage in discussions about real-world applications of pulleys.

Resisting Motion

Forces

Definition: A push or pull that can change the motion of an object.

Types: Contact forces (like friction) and non-contact forces (like gravity).

Air Resistance

Definition: A type of frictional force that acts against the motion of an object moving through air.

Factors Affecting Air Resistance:

Shape of the object

Surface area

Speed of the object

Water Resistance

Definition: A force that opposes the motion of an object through water.

Factors Affecting Water Resistance:

Shape and size of the object

Density of the water

Friction

Definition: A force that opposes the motion of an object in contact with a surface.

Types of Friction:

Static (not moving)

Kinetic (sliding/pulling motion)

Endpoints

1. Explain the concepts of air resistance, water resistance, and friction using appropriate vocabulary.
2. Conduct experiments using the scientific method to explore how these forces affect different objects.
3. Present findings clearly, using diagrams, tables, or graphs to exhibit results.
4. Suggest further investigations or modifications to existing experiments.

	Light reflects off a mirror at the same angle it hits it, following the law of reflection. When light hits a plane mirror, it bounces off with the same angle but in the opposite direction. Convex mirrors bulge outwards and reflect light outwards, making objects appear smaller. Concave mirrors curve inwards and reflect light inwards, focusing it to a point. **Refraction in Lenses:** Concave lenses are thinner in the middle and cause light to diverge. Convex lenses are thicker in the middle and converge light to a focal point. Light changes speed and direction when passing through a lens. **Endpoints:** 1. Explain the concept of reflection and refraction of light. 2. Identify different types of mirrors and lenses. Understand how light behaves when reflecting off mirrors and passing through lenses.	
Disciplinary Knowledge	**Observation**: Describing the characteristics of each planet **Classification:** Differentiating between terrestrial and jovian planets **Sequence:** Understanding the order of planets from the Sun **Comparative Analysis**: Contrasting the features of rocky and gaseous planets **Researching Planet Sizes:** Use provided data table to gather information on the size of each planet in the Solar System. Compare the sizes and diameters of different planets. Selecting Spherical Items: Select different items to represent each planet based on their sizes and scales. Justify the choice for each planet. Comparing Decisions: Discuss and compare the choices made by different groups. Provide reasons for why certain items best represent specific planets. Placing Planets at Correct Distances: Measure out and place the planets at the correct distances from the Sun according to the numerical data provided. **Observations:** Use a bright light (e.g. LED torch) to represent the Sun. Place a sticker on the UK on the globe to depict the starting point. Rotate the globe on its axis to simulate the Earth's rotation. **Demonstrations:** Show how day and night occur as the Earth rotates. Explain why different parts of the Earth experience day and night at the same time. **Observations and Recording** Students will observe the moon's phases over a period of time, recording their observations in a moon diary. They will note the changes in shape and illumination of the moon each night. Models and Diagrams Students will create models or diagrams to represent the different phases of the moon. Using these models, they will be able to explain why the moon appears differently throughout the month. Compare and Contrast Students will compare and contrast the phases of the moon, noticing patterns and differences. They will also explore how the moon's phases relate to the position of the Earth, moon, and sun.	**Scientific Investigation Process** Identify the Question: What materials are suitable for building a log flume vessel based on buoyancy? Hypothesis Formation: Formulate an educated guess on which materials will float best. Experiment Design: Select a variety of materials (e.g., plastics, wood, metals) to test. Create a water tank (or use a large container) to perform the buoyancy tests. Data Collection: Record the outcomes for each material tested—whether they float or sink, and their stability while floating. Analysis: Compare results against the expected properties and decide which materials are best suited for a log flume vessel. Conclusion: Reflect on findings and make suggestions for the best material, explaining why it was chosen. **Skills Developed** Observation Skills: Noticing changes in water movement. Hypothesis Formation: Predicting outcomes based on speed changes in the swing. Measurement: Understanding and measuring force applications in real-life. **Scientific Method Steps** Ask a Question: What happens to the water when I change the speed of the swing? Conduct an Experiment: Fill the bucket with water and swing it. Analyze Results: Discuss observations about water and speed changes. Draw Conclusions: Relate the experiment to concepts of centripetal force. **Hypothesis Development** Formulate a hypothesis about the height needed for the marble to complete the loop. **Variables** Independent Variables: Height of drop, size of loop. Dependent Variable: Whether the marble completes the loop. Controlled Variables: Type of marble, angle of the drop, materials of the track. **Data Collection** Create a table to record heights, loop sizes, and outcomes. **Data Collection** Trial 1: Record the number of swings with the initial weight. Trial 2: Repeat the measurement to ensure accuracy and reliability. Trial 3: Add additional weight and repeat the measurements.

	Measuring Weight: Use force meters with different scales to measure the weight of objects in newtons. Experimental Design: Design fair tests by controlling variables that could affect outcomes. Data Analysis: Interpret data to draw conclusions about the relationship between weight and speed of falling objects. Properties of Materials: Understanding how different materials interact with light will help us classify them as transparent, opaque, or translucent. **Direction of Light:** Learning about how light travels in a straight line will help us understand how we see objects in our environment. **Reflection**: Exploring how light reflects off surfaces and into our eyes will deepen our understanding of vision and sight. **Scientific Explanation:** When light hits an object, it cannot pass through, creating an area of darkness behind the object, known as a shadow. The shape of the object determines the shape of the shadow.	Average Calculation: Add the three trials for each weight and divide by three to find the average number of swings. **Investigation Skills** Hypothesis: Students will hypothesize how many pulleys they think will be needed to lift a heavy object with less force. Experimentation: Students will use broom handles and rope to create different pulley systems and test which one works best. **Observational Skills** Students will record observations regarding: The amount of force used with varying numbers of pulleys. The efficiency of each pulley system based on how easy it is to lift the load. **Hypothesis Formation** Predict outcomes based on scientific concepts. **Data Collection** Systematically record measurements and observations. Use tables and graphs for clarity. **Analysis of Results** Compare results against hypotheses. Discuss factors that may have impacted the outcome. **Evaluation** Reflect on the investigation process. Identify potential improvements or further investigations.
Useful Websites	• NASA Solar System Exploration • BBC Bitesize - The Solar System • National Geographic Kids - Planets • Royal Observatory Greenwich - The Solar System • BBC Bitesize - Phases of the Moon • NASA - Moon Phases • BBC Bitesize - Forces and Gravity • Science Learning Hub - Gravity • BBC Bitesize - Light • Exploratorium - Light Reflection • Science Kids - Transparent, Translucent, Opaque • BBC Bitesize - Light and Reflection • The Royal Institution - Light and Optics	• Royal Society of Chemistry - Materials Science • Primary Resources for Science Experiments • BBC Bitesize - Forces and Motion • STEM Learning - Investigating Materials • Science Buddies - Centripetal Force • BBC Bitesize - Forces • How Stuff Works - Centripetal Force • BBC Bitesize - Pendulums • The Royal Society - Why Pendulums Work • Science Buddies - Pendulum Project Guide • BBC Bitesize: Simple Machines • Science for Kids: Pulleys • NASA Climate Kids: Simple Machines • Science Buddies - Air Resistance • NASA - Understanding Forces • National Curriculum Resources