Crossflatts Science Curriculum- Physical Processes

Early Years Development Matters statements		Year 1 Seasonal Changes	Year 3 Light	Year 4 Sound	Year 5 Earth and Space	Year 6 Light
• Explore and talk about different forces they can feel. • Draw children's attention to forces. Suggestions: • how the water pushes up when they try to push a plastic boat under it • how they can stretch elastic, snap a twig, but cannot bend a metal rod • magnetic attraction and repulsion • Plan and introduce new vocabulary related to the exploration and encourage children to use it. • Explore the natural world around them. • Explore how things work. Provide mechanical equipment for children to play with and investigate. Suggestions: wind-up toys, pulleys, sets of cogs with pegs and boards.	**Vocabulary used *(clearly used in books and on Working walls)***	Weather (sunny, rainy, windy, snowy etc.), seasons (Winter, Summer, Spring, Autumn), sun, sunrise, sunset, day length	Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous	Sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation	Earth, Sun, Moon, (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune) spherical, solar system, rotates, star, orbit, planets, constellation	Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous straight lines, light rays.
	National Curriculum Objectives	1. changes across the four seasons 2. observe and describe weather associated with the seasons and how day length varies	1. recognise that they need light in order to see things and that dark is the absence of light 2. notice that light is reflected from surfaces 3. recognise that light from the sun can be dangerous and that there are ways to protect their eyes 4. 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	1. identify how sounds are made, associating some of them with something vibrating 2. recognise that vibrations from sounds travel through a medium to the ear 3. find patterns between the pitch of a sound and features of the object that produced it 4. find patterns between the volume of a sound and the strength of the vibrations that produced it recognise that sounds get fainter as the distance from the sound source increases	1. describe the movement of the Earth, and other planets, relative to the Sun in the solar system 2. describe the movement of the Moon relative to the Earth 3. describe the Sun, Earth and Moon as approximately spherical bodies use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky	1. recognise that light appears to travel in straight lines 2. 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 3. 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 4. use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them
	Knowledge Key Learning	In the UK, the day length is longest at mid-summer (about 16 hours) and gets shorter each day until mid-winter (about 8 hours) before getting longer again. The weather also changes with the seasons. In the UK, it is usually colder and rainier in Winter and hotter and dryer in the Summer. The change in weather causes many other changes; some examples are numbers of minibeasts found outside, seed and plant growth, leaves on trees and type of clothes worn by people.	- 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.	- A sound source produces vibrations which travel through a medium from the source to our ears. Different mediums such as solids, liquids and gases can carry sound but sound cannot travel through a vacuum (an area empty of matter). The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound. - The loudness (volume) of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. Therefore, sounds decrease in volume as you move away from the source. A sound insulator is a material which blocks sound effectively. Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds.	The Sun is a star. It is at the centre of our solar system. There are 8 planets (can choose to name them, but not essential). These travel around the Sun in fixed orbits. Earth takes 365¼ days to complete its orbit around the Sun. The Earth rotates (spins) on its axis every 24 hours. As Earth rotates half faces the Sun (here it is day) and half is facing away from the Sun (night). As the Earth rotates the Sun appears to move across the sky. The Moon orbits the Earth. It takes about 28 days to complete its orbit. The Sun, Earth and Moon are approximately spherical	- Light appears to travel in straight lines and we see objects when light from them goes into our eyes. The light may come directly from light sources but for other objects some light must be reflected from the object into our eyes for the object to be seen. Objects that block light (are not fully transparent) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object.
	Understanding at the expected standard	Describe seasonal changes and relate weather patterns and day length to seasons.	• Relate being able to see to the presence of light and describe how some objects reflect light. • Describe how and why our eyes should be protected from sunlight. • Explain how shadows are made. Describe how to change the size of a shadow.	Explain, with reference to vibrations, how an object makes a sound and describe the role of a medium in the transmission of sound. Describe the effect of moving further from the source of a sound.	Draw a diagram or use a model to describe planetary orbits and describe the Moon's orbit around the Earth. Describe the Sun, Earth & Moon as spheres. Use a diagram or model to explain why the Sun seems to travel across the sky, and what causes day and night.	Represent light using straight line ray diagrams and show how straight lines travel to the eye. Explain how we can see an object by referring to light travelling into the eye. Draw a diagram showing an object, shadow and light to relate object shape to shadow shape.

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				Explain with reference to a particular object how the pitch and volume of the sound can be changed.		
	Understanding at greater depth	• Recognise changes within seasons as well as between seasons. Make and test predictions relating to changing day length and weather patterns.	• Recognise that vision involves light travelling to the eyes. • Recognise that some surfaces are better at reflecting light than others and explain why sunlight can be dangerous and how types of protection works. • Suggest how light is travelling to form a shadow and relate position of an object and position of a screen to the size of the shadow.	Group sound-making objects in terms of how they make sounds. Compare the effectiveness of different media in terms of their ability to transmit sound. Explain with reference to examples how sounds get fainter as the distance from the source increases. Identify generic features that cause the pitch and volume of a note to be changed.	Identify that the further out a planet is, the longer its orbit is around the Sun. Relate the Moon's orbit of the Earth to the Earth's orbit of the Sun. Recognise that many heavenly bodies are approximately spherical. Explain the effect of a planet in the solar system rotating at a different	Recognise that even when light changes in direction, the path is still continuous. Draw diagrams using straight lines showing light reflecting off objects and into the eye. Refer to the idea that some objects may be better reflectors than others. Use a diagram to explain that although a shadow is the same shape as the object, it may not be the same size.
	Working scientifically skills	• Observe, describe and compare using simple science words • Ask science questions • Collect evidence to answer some questions • Test out ideas with help • Talk about what might happen and what they found out	• Describe using Key Stage 2 scientific vocabulary. • Group and order observations giving scientific reasons • Ask scientific questions and use information/collect data to answer them • Predict what might happen and begin to explain why using everyday ideas • Plan a fair test with help • Explain observations using cause and effect • Talk about observations/results and begin to use scientific facts to explain them • Communicate findings in a variety of ways	• Collect evidence/find information to test out an idea/prediction or answer a question • Predict what might happen and begin to explain why using everyday ideas and scientific facts/ideas • Measure in standard units • Select equipment, with help • Plan ways to test out their own/someone else's ideas • Set up a fair test and explain why it is important to do so • Draw tables and bar charts to record observations/data • Explain observations/results using cause and effects and scientific facts and ideas	• Draw tables, bar charts and simple line graphs to record observations/data • Interpret and predict from bar charts and line graphs • Explain observations/results using cause and effects and scientific facts and ideas • Explain what the evidence show and whether it supports any predictions • Identify trends and patterns in data and explain using scientific facts and ideas • Begin to identify scientific evidence that has been used to support or refute ideas or arguments	• Collect evidence/information/data to test out an idea/prediction or answer a question from a wide range of sources • Measure precisely in standard units • Select the most suitable equipment for the task • Plan ways to test out their own/someone else's ideas • Independently set up and carry out fair tests • Choose the most appropriate way to record and present results • Explain observations/results using cause and effects and scientific facts and ideas • Explain what the evidence shows and whether it supports any predictions
	Maths in science reference	• 1.4	• 3.4	4.1	5.2a 5.2b	6.3

	Year 3 **Forces and magnets**	**Year 4** **Electricity**	**Year 5** **Forces**	**Year 6** **Electricity**
Vocabulary used ***(clearly used in books and on Working walls)***	Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole	Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol N.B. Children in year 4 do not ned to use standard symbols as this is taught in year 6	Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears	Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage NB Children do not need to understand what voltage is but will use volts and voltage to describe different batteries. The words cells and batteries are now used interchangeably
NC Objectives	1. compare how things move on different surfaces 2. notice that some forces need contact between two objects, but magnetic forces can act at a distance	1. identify common appliances that run on electricity 2. construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers	1. explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object	1. associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit

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	3. observe how magnets attract or repel each other and attract some materials and not others 4. 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 5. describe magnets as having two poles 6. predict whether two magnets will attract or repel each other, depending on which poles are facing	3. 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 4. recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit recognise some common conductors and insulators, and associate metals with being good conductors	2. identify the effects of air resistance, water resistance and friction, that act between moving surfaces 3. recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect	2. 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 3. use recognised symbols when representing a simple circuit in a diagram
Knowledge	- A force is a push or a pull. When an object moves on a surface, the texture of the surface and the object affect how it moves. It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes. - A magnet attracts magnetic material. Iron and nickel and other materials containing these e.g. stainless steel, are magnetic. The strongest parts of a magnet are the poles. Magnets have two poles – a north pole and a south pole. If two like poles e.g. two north poles, are brought together they will push away from each other – repel. If two unlike poles e.g. a north and south, are brought together they will pull together – attract. For some forces to act there must be contact e.g. a hand opening a door, the wind pushing the trees. Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts.	- Many household devices and appliances run on electricity. Some plug in to the mains and others run on batteries. - An electrical circuit consists of a cell or battery connected to a component using wires. If there is a break in the circuit, a loose connection or a short circuit the component will not work. - A switch can be added to the circuit to turn the component on and off. - Metals are good conductors so they can be used as wires in a circuit. Non-metallic solids are insulators except for graphite (pencil lead). Water, if not completely pure, also conducts electricity	- A force causes an object to start moving, stop moving, speed up, slow down or change direction. Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall. - Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water or the air and water may be moving over a stationary object. A mechanism is a device that allows a small force to be increased to a larger force. The pay back is that it requires a greater movement. The small force moves a long distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover. Pulleys, levers and gears are all mechanisms, also known as simple machines.	- Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound. If you use a battery with a higher voltage, the same thing happens. Adding more bulbs to a circuit will make each bulb less bright. Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter. Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, motors or buzzers will then turn off as well. You can use recognised circuit symbols to draw simple circuit diagrams.
Understanding at the expected standard	• Compare how an object, such as a toy car, will move on different surfaces. • Recognise the difference between contact and contact forces. • Describe how magnets attract or repel each other, and attract magnetic materials. • Group materials on the basis of testing for being magnetic. • Describe and identify the poles of a magnet. • Predict outcomes of a particular arrangement of magnets.	• List examples of appliances that run on electricity. • Construct a simple circuit and name its components and predict whether a particular arrangement of components will result in a bulb lighting. • Sort materials into conductors and insulators, identifying metals as conductors. • Predict how the operation of a switch will affect bulbs lighting.	• Explain that gravity causes objects to fall towards Earth. • Describe how motion may be resisted by air resistance, water resistance or friction. • Describe how some devices may turn a smaller force into a larger one.	• Explain how number and voltage of cells affects the lamp or buzzer. • Explain the use of switches, how bulbs can be made brighter and buzzers made louder. • Represent a circuit that has been constructed using symbols.
Understanding at greater depth	• Predict how an object will move on other surfaces and suggest why. • Explore how magnetic attraction and repulsion are affected by distance. • Explore whether some magnets are stronger than others. • Identify some applications of magnets and magnetic materials. • Explore the similarities and differences between the two poles. • Apply ideas about the interaction of magnets to contexts such as toys.	• Compare and contrast appliances that run on mains electricity with those that run on batteries. • Identify the functions of components within a circuit. • Investigate graphite as a conductor and relate to other materials. • Explain why certain arrangements will not result in the bulb lighting and how altering the location of a switch affects the operation of the circuit.	• Recognise that gravity acts between all masses, e.g. the Sun and the Earth. • Identify ways in which forces that oppose motion may be useful (e.g. bicycle handlebar grips) or a nuisance (e.g. bicycle chain). • Explain, with reference to everyday contexts, why a force multiplier might be useful.	• Relate the number or voltage of cells to the number and operation of bulbs or buzzers that can be run from them. • Explain the effect of changing the order of the components in a circuit. • Design circuits using symbols.
Working scientifically skills	• Observe, describe and compare using Key Stage 2 scientific vocabulary • Group and order observations giving scientific reasons • Predict what might happen and begin to explain why using everyday ideas	• Collect evidence/find information to test out an idea/prediction or answer a question • Predict what might happen and begin to explain why using everyday ideas and scientific facts/ideas • Draw tables and bar charts to record observations/data	• Measure precisely in standard units • Select the most suitable equipment for the task • Plan ways to test out their own/someone else's ideas • Set up and carry out fair tests • Repeat observations and measurements	• Select the most suitable equipment for the task • Plan ways to test out their own/someone else's ideas • Independently set up and carry out fair tests

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	• Explain observations using cause and effect • Communicate findings in a variety of ways	• Explain observations/results using cause and effects and scientific facts and ideas • Explain what the evidence shows and whether it supports any predictions • Identify and explain simple trends and patterns in results	• Explain observations/results using cause and effects and scientific facts and ideas • Explain what the evidence show and whether it supports any predictions • Identify trends and patterns in data and explain using scientific facts and ideas	• Observe, describe and compare in careful detail using the correct language • Explain what the evidence shows and whether it supports any predictions • Identify trends and patterns in data that do not fit and explain using scientific facts and ideas
Maths in science reference	3.2	4.4	5.4	6.3