Substantive Physics Knowledge Progression (Opportunities to Learn the Concept and Revisit)					
Threshold Concepts			EYFS	KS1	KS2
Energy	Potential	Chemical			**Energy and Sound** To know that energy can be stored in chemicals and released when it is needed. To know that acid is an energy store. To know that the acid in fruit can be converted to electrical energy.
		Elastic		***From Chemistry - Changing Materials** To know that elasticity is a property of some materials. ***From Chemistry - Mixtures and Potions** To know that stretchiness is elasticity	**Energy and Sound** To know that elastic potential is a type of stored energy.
		Gravitational			**Energy and Sound** To know that gravitational energy is a type of stored energy. To know that items that are higher have more gravitational potential energy than those lower down.
	Kinetic	Thermal			**Energy and Sound** To know that metals are good conductors of heat (thermal energy). To know that a good conductor of heat will move it quickly from one place to another.
		Electrical		**Toys – An Introduction to Physics** To know how to light a bulb using a battery, wires and a bulb. To know that the bulb will only light if all the wires are connected in a circle.	**Electricity** To know the names of some common appliances which use electricity. To know that electricity is a form of kinetic energy and is the flow (movement) of electrons around a circuit. To know that a circuit must be a complete loop for the electrons to flow. To know what the following components are and their respective symbols: cells, batteries, wires, bulbs, switches and buzzers.

					To know that a switch stops the flow of electrons and therefore stops a component from working. To know that adding more bulbs to a circuit reduces the brightness of the bulbs. To know that adding more buzzers to a circuit reduces the loudness. To know that adding more cells to a circuit increases the energy to the circuit and the effects of this can be brighter bulbs or louder buzzers. To know that circuits can be represented by diagrams using universal symbols. ***From Chemistry of Matter** To know that metals are good conductors of electricity and plastics are good insulators of electricity.
		Sound			**Energy and Sound (& Electricity if required)** To know that sounds can be made from something vibrating. To know that sound travels in waves through the medium (air, solids, water) to the ear. To know that pitch is how high/low a sound is. To know that volume (amplitude) is how loud a sound is. To know that the strength of vibrations are related to the amplitude of the sound. To know that sounds get fainter the further away you are because they spread out so less energy from the original sound makes it to you.
		Light		***From Our Living Earth (Bio)** To know that we cast shadows by blocking the light from the sun. To know that our shadows change size depending on the position of the sun/torch. ***From Habitats and Seasonal Changes (Bio)** To know that the Earth spins. To know that when the UK faces the sun it is our daytime.	**Energy and Sound** To know that movement is a type of kinetic energy. **Light** To know that is a form of energy. To know that it travels in waves. To know that the size of the wave is related to the colour of light in visible light. To know that there are some forms of light that are not visible such as microwaves and UV rays. To know that some types of light are dangerous for example UV light from the sun can damage your eyes. To know how to protect their eyes/skin from the sun.

				To know that when the UK is facing away from the sun it is our night time. To know that the seasons depend on the Earth's tilt. To know that summer occurs when the UK is tilted towards the sun.	To know that light appears to travel in straight lines. To know that objects which block light cast shadows. To know that shadows change size depending on their relative position from the light source and this is due to light travelling in straight lines. To know that light is reflected off surfaces. To know that light is made up of all the colours of the rainbow. To know that the colours we see are because that is the wavelength of light which is reflected, the rest are absorbed. To know that we see things because light travels from a source straight to our eye, or it is reflected from an object into our eyes. To know the basic structure of the eye. **Forces** To know that light travels from the sun to the Earth.
		Movement			**Energy and Sound** To know that movement is a type of kinetic energy.
Forces	**Mechanisms**			**Toys – An Introduction to Physics** To know that some toys use mechanisms to work.	***From DT Ancient Greeks** To know that pulleys and levers are used to lift heavy objects using a smaller force. **Forces** To know that gears allow a smaller force to have a greater effect.
	Gravity			**Toys – An Introduction to Physics** To know that gravity is a force that pulls us down towards Earth.	**Forces** To know that Earth's gravity acts upon objects and they will fall towards the Earth unless another force acts upon them. To know that the sun has a greater gravitational pull that the Earth. To know that the planets in the solar system are pulled by the sun's gravity and are in orbit of the sun. To know that the moon is pulled by the Earth's gravity and is in orbit of the Earth.
	Pushes and Pulls		**Toys, Pushes and Pulls** To know that pushes and pulls are forces.	**Toys – An Introduction to Physics**	**Forces** To know who Isaac Newton was and be familiar with his laws of Physics:

			To know that pushes and pulls cause objects to move or stop moving. To be able to demonstrate pushes and pulls.	• Newton's 1st law tells us that an object won't change its motion unless acted upon by a force. • Newton's 2nd law tells us that heavier objects need a larger force to move them. (F=ma) • Newton's 3rd law tells us that for every action there is an equal and opposite reaction.
	Friction		**Toys – An Introduction to Physics** To know that toy cars won't travel as far when travelling down a rough ramp compared to a smooth ramp.	**Forces** To know that friction is a force which acts against the direction of movement. To know that friction is a type of resistance which acts between a surface and the object moving. To know that friction is greater between rough surfaces than between smooth surfaces. To know that air resistance is a type of friction. To know that air resistance acts upon objects in the opposite direction to their movement. To know that aerodynamic objects are shaped to reduce the effects of air resistance. To know that water resistance is a type of friction. **Electricity (& Energy and Sound)** To know that a resistor slows the electron flow in a circuit by converting some electrical energy to heat. To know that resistors act as electrical friction.
	Magnetism		**Toys – An Introduction to Physics** To know that magnets can be used in games such as fishing games.	**Forces** To know that there is an invisible field surrounding magnets which can affect some metals and other magnets. To know that magnets can act at a distance. To know that magnets have 2 poles – north and south. To know that north is attracted to south – opposite poles are attracted. To know that north and north repel and south and south repel – like poles repel. **Electricity** To know that an electrical current can generate a magnetic field.

				***From Chemistry of Matter** To know that magnets only attract some metals.
	Pressure			**Forces** To know that air pushes down upon us. To know that air has weight. To know that removing air creates a vacuum.
Space	**Earth and Sun**		***From Biology – Seasons and Habitats** To know that the earth travels around the sun. To know that the Earth rotates and half will be facing the sun while the other half faces away from the sun. To know that it is day time for the half facing the sun and night time for the other half.	**Light** To know that the earth spins and this makes the sun appear to move across the sky. To know that the position of the sun in the sky relates to the time of day. **Forces** To know that the Earth orbits the sun. **Geology** To know that the Earth is approximately a sphere.
	Moon			**Forces** To know that the moon orbits the sun. **Light** To know that the moon reflects light from the sun and the amount depends on the obstruction from the Earth.
	Solar System			**Forces** To know the planets in our solar system and their order in distance from the sun – Mercury, Venus, Earth, Mars, Jupitar, Saturn, Uranus, Neptune (Pluto as a dwarf planet)