Welwyn St. Mary's Progression Ladder for Science 2

	Electricity	Forces	Light and sound	Materials
Reception	Know electricity can be dangerous Explore a range of battery powered devices	Observe and describe movements they and objects make	Know that it is dangerous to look at the sun Relate their sense of sight to their eyes Relate their sense of hearing to their ears	Make observations of common objects Make very simplistic observations of materials Arrange materials into groups Identify when changes occur e.g. when food is cooked
Year 1				**Everyday Materials** Name some common materials Name some common objects around the school and home **Distinguish between an object and the material from which it is made** Name materials which have lots of different uses (e.g. paper- wrapping paper, tissue paper, writing paper, birthday card) Identify some naturally occurring materials: wood, rock, water Identify some man-made materials: glass, metal, plastic **Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock** Describe objects that are made from lots of different materials Names objects that are sometimes made from different materials (e.g. spoons- plastic, wooden, metal) Make observations of common objects and the different materials they are made of Communicate these observations using descriptive words (e.g. bendy, rough, hard) Identify some properties of materials (e.g. see through, waterproof, absorbent) **Describe the simple physical properties of a variety of everyday materials** Make predictions about which materials will float and sink **Compare and group together a variety of everyday materials on the basis of their simple physical properties (both visible and non-visible)** Explain why people started using plastic bags rather than paper bags
Year 2				**Use of Everyday Materials** Identify uses of some common materials Give a reason why a material is suitable for its job

				Recognise that some materials will have more than one property which increases its suitability for its purpose (e.g. glass is transparent, rigid and weatherproof) **Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses** Suggest several reasons why a material may or may not be suitable for a particular purpose Explain why one material may be more suitable for a purpose than another by discussing properties Explain why plastics cause problems in the oceans Explain the importance of reusing and recycling plastic Describe how swimsuits have changed over time and how the fabric is now more suitable Describe how scientists have invented new materials (e.g. Macintosh, Dunlop) Identify materials that can be easily changed with force Identify materials that cannot be easily changed with force Describe pushes and pulls needed to change a material as big or small **Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching** Describe changes in shapes as a result of the action of pushes, pulls and twists Explain why some materials change shape when a force acts (i.e. push, pull, twist, stretch) as a result of their properties
Year 3		**<u>Forces and Magnets</u>** Recognise that pushes and pulls are forces Recognise that a force acts in a particular direction Observe the movements, shape and direction of objects when forces act on them Describe how to make a familiar object start moving by pushing or pulling Describe how to use pushes and pulls to make familiar objects speed up, slow down, change direction or shape Produce annotated drawings showing the direction of force needed to make an object move Identify friction as a force Observe and explore how friction affects the movement of objects Describe some ways in which friction between solid surfaces can be increased or decreased **Compare how things move on different surfaces** Observe how magnets attract or repel each other and attract some materials and not others Classify materials as magnetic or non-magnetic	**<u>Light and Shadows</u>** Name a number of light sources, including the sun Describe and compare some light sources State that light sources are seen when light from them enters the eyes **Recognise that light from the sun can be dangerous and that there are ways to protect their eyes** Recognise that they cannot see in the dark Recognise that light travels from a source **Recognise that they need light in order to see things and that dark is the absence of light** Explain that places are dark because there is no light and a light source is needed to help us see in such places **Notice that light is reflected from surfaces** State that reflections can be seen in shiny surfaces Makes generalisations about shiny surfaces (e.g. smooth) Demonstrate light travelling using a torch and record light bouncing off a mirror	**<u>Rocks, Fossils and Soil</u>** Observe the characteristics of a variety of rocks Name and describe the characteristics of several rocks Identify fossils in rocks Classify rocks from the evidence of investigations Explain that rocks are used for different purposes dependent on their physical properties Explain that different types of rock react differently to physical forces (e.g. water, rubbing) **Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties** Understand that there are rocks under the Earths' surface Relate the simple physical properties of some rocks to their formation Explain why certain rocks are used for different purposes and why some rocks could be used for these jobs for example: • Marble- kitchen worktops or statues

		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 the difference between a magnet and a magnetic material **Notice that some forces need contact between two objects, but magnetic forces can act at a distance** Describe what happens when some materials are put near a magnet Recall that magnets have a north and a south pole **Describe magnets as having two poles** Describe the direction of forces between magnets **Predict whether two magnets will attract or repel each other, depending on which poles are facing** Describe some everyday uses of magnets Explain that a compass works by lining up with the Earth's magnetic field Describe how lodestone was found to be a naturally occurring magnet and was used as the first compass for navigation	Identify suitable reflective clothing for travelling in the dark Explain that they cannot see shiny objects in the dark because there are no light sources Recognise that when light is blocked, a shadow is formed **Recognise that shadows are formed when the light from a light source is blocked by a solid object** Recognise that shadows are similar in shape to the objects forming them Make observations of changes in shadows Explain that shadows are formed when light from a source is blocked State that even transparent objects block some light and form shadows Describe the difference in shadows cast by opaque, translucent and transparent materials Explore how to make shadows of different shapes and sizes **Find patterns in the way that the size of shadows change** Use ideas about shadows to make predictions about the shadows formed by different objects or materials Describe how the length of a shadow changes throughout the day as the sun moves across the sky Describe how nocturnal animals are adapted to use what little light there is or their other senses in the dark (e.g. cats, aye-aye, lemurs) Describe how Percy Shaw invented cat's eyes and explain their importance to road safety	- Slate roof tiles - Granite walls Explain how a model (e.g. biscuits, chocolate bars) can be used to represent sedimentary, metamorphic and igneous rocks Explain why we might find lots of the same types of rock in one place **Describe in simple terms how fossils are formed when things that have lived are trapped within rock** Describe how Mary Anning discovered fossils Explain why we do not see the soft parts of animals in fossils Recognise that soil is a mixture of different materials and living things Recognise that soil contains dead plants and animals Recognise that there is rock under all surfaces and that soils come from rocks **Recognise that soils are made from rocks and organic matter**
Year 4	**<u>Circuits and Components</u>** **Identify common appliances that run on electricity** Identify mains operated and battery operated devices Describe some of the dangers associated with mains electricity Name some components of a simple electrical circuit Know that batteries are sources of electricity Recognise that for a circuit to work it must be complete Construct a working circuit **Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers** Make drawings of simple working circuits (pictorial only circuit symbols covered in year 6) Make circuits from drawings provided		**<u>Sound and Vibrations</u>** Recognise and describe many sounds and sound sources State that they hear sounds through their ears Recognise that when sounds are generated by objects, something moves or vibrates **Identify how sounds are made, associating some of them with something vibrating** Identify what is vibrating in a range of musical instruments Generalise that sounds are produced when objects vibrate Describe how sounds are generated by specific objects Suggest ways of producing sounds **Recognise that vibrations from sounds travel through a medium to the ear** Recognise that sounds travel through solids, water and air Explore how sound travels through a variety of materials Distinguish between pitch and volume (loudness) Describe differences in pitch and volume	**<u>Solids, Liquids and Gases</u>** Name some solids and liquids State that air is a gas State some differences between solids, liquids and gases Recognise everyday substances as mixtures of solids, liquids and/or gases Recognise that air is a material and that it is one of a range of gases which have important uses Recognise that gases flow from place to place Know that gases can be easily compressed Describe the differences between solids and liquids *Describe the behaviour and properties of gases* Compares simple solids and liquids (e.g. in terms of ease of squashing or pouring) **Compare and group materials together, according to whether they are solids, liquids or gases** *Make clear distinctions between the properties of solids, liquids and gases* *Explain why granular solids have some of the properties associated with liquids*

	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 Are methodical in tracing faults in simple circuits Describe the effect of making and breaking one of the contacts on a circuit Explain why some circuits work and others do not **Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit** Describe how switches work Construct a home-made switch Identify materials as conductors or insulators Construct simple circuits and use them to test whether materials are electrical conductors or insulators **Recognise some common conductors and insulators, and associate metals with being good conductors** Relate knowledge about metals and non-metals to their use in electrical appliances Describe the use of conductors and insulators in components including connecting wires Identify playdough and graphite as non-metal conductors and explain why this is unusual		**Find patterns between the pitch of a sound and features of the object that produced it** Know that altering vibrations alters the pitch or volume Describe ways in which the pitch of a sound made by a particular instrument or vibrating object can be raised or lowered Generalise the effects of changes on sound (e.g. the tighter the tension the higher the pitch) Explore how to vary the pitch and volume of sounds from a variety of objects or instruments **Find patterns between the volume of a sound and the strength of the vibrations that produced it** Suggest how to change the loudness of the sounds produced by a range of musical instruments **Recognise that sounds get fainter as the distance from the sound source increases** Describe what they observe when they move further away from a source of sound Group instruments independently by the way sounds are produced Identify suitable materials to use for sound insulation Recognise that sound can be reflected from a surface which can cause an echo Describe how some animals use echo-location	*Explain why some substances are hard to classify as solids, liquids and gases (e.g. whipped cream, mousse, mayonnaise, muddy water, fizzy drinks, cornflour and water)* Observe what happens to a variety of materials when they are heated (e.g. chocolate, ice cream, butter, water) Identify a wide range of contexts in which changes of state take place describe a few examples where these changes occur Recognise that for a substance to be detected by smell, some of it must be in the gas state **Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)** *Compare the boiling point of different liquids* State that ice, water and steam are the same material Identify the processes of melting, freezing, evaporation and condensation Describe what happens to water when it is heated and cooled Recognise that these processes can be reversed Describe how when ice melts it turns to liquid and how when water freezes it becomes ice Describe how these processes can be reversed Describe how liquids evaporate to form gases and how gases condense to form liquids Sequence the changes that happen in the water cycle Describe the water cycle in terms of these processes Explain the relationship between liquids and solids in terms of melting and freezing Explain the relationship between liquids and gases in terms of evaporation and condensation **Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature** Know that temperature can affect the rate of evaporation or condensation Describe the effect of temperature on evaporation Explain how changing conditions affects processes such as evaporation and condensation Identify a range of contexts in which changes take place (e.g. evaporation of puddles in the school playground or from clothes on a washing line, condensation in the bathroom) Explore the effect of salt on ice Explain why salt is put on the roads in winter

Year 5		**<u>Earth and Space</u>** Identify and name the components of the solar system (i.e. Sun, Moon, Earth and other planets) Locate the Sun, Earth and other planets in the solar system Recognise that the Earth and other planets orbit the Sun Recall that the Earth takes one year to orbit the Sun Recall that the Earth rotates on its' axis and this takes one day **Describe the movement of the Earth, and other planets, relative to the Sun in the solar system** Use simple physical models to explain effects that are caused by the movement of the Earth Recognise that the Moon orbits the Earth Explain that gravity is a force of attraction and it is what holds the planets in orbit around the Sun and the Moon in orbit around the Earth **Describe the movement of the Moon relative to the Earth** Explain that the changes in the appearance of the Moon over a period of 28 days arise from the Moon orbiting the Earth once every 28 days **Describe the Sun, Earth and Moon as approximately spherical bodies** Recognise that the Earth, Sun and Moon are spherical and support this with some evidence Recognise that it is daylight in the part of the Earth facing the Sun Recall that a shadow from the Sun changes over the course of a day Explore and describe how a shadow from the Sun changes over the course of a day Explain in terms of the rotation of the Earth why shadows change and the Sun appears to move across the sky during the course of the day **Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky** Explain why it is night time in Australia when it is day time in England Explain how ideas about the solar system have changed over time **<u>Forces</u>** Identify weight as a force Identify that force is measured in Newtons Name simple forces such as gravity, friction and air resistance		**<u>Changes of Materials</u>** Observe and explore the properties of materials (e.g. hardness, transparency, magnetism, electrical and thermal conductivity) Identify some materials that are good thermal insulators and some everyday uses of these Recognise that metals are both good thermal and good electrical conductors Suggest why particular materials are used for different jobs depending on their properties **Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets** **Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic** *Describe the properties of new materials (e.g. aerogel, silly putty, wrinkle-free cotton)* *Explain why some materials are good thermal insulators* Recognise that salt or sugar dissolves in water but sand won't Name some materials that will and some that will not dissolve in water Recognise that although it is not possible to see a dissolved solid, it remains in the solution Describe melting and dissolving and give everyday examples of each *Describe the difference between melting and dissolving* Identify and explore factors that affect the rate at which a solid dissolves Recognise that an undissolved solid can be separated from a liquid by filtering Recognise that a solid can be recovered from a solution by evaporation Describe the properties of mixtures which can be separated by filtration Describe some methods that are used to separate simple mixtures Explain that when solids dissolve they break up so small they can pass through the holes in the filter paper **Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution** Use knowledge about how a specific mixture can be separated to suggest ways in which other similar mixtures might be separated **Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating**

		Recognise that more than one force can act on an object Draw force diagrams with arrows showing the direction of forces acting on an object Observe and explore the effect of several forces on objects Recognise that air resistance slows things down Recognise that friction can be useful or not useful **Identify the effects of air resistance, water resistance and friction, that act between moving surfaces** Describe some situations in which there is more than once force acting on an object Describe and explain the motion of some familiar objects in terms of several forces acting on them Identify forces on an object as either balanced or unbalanced Use the terms 'balanced' and unbalanced' when describing several forces on an object Explain that balanced forces on an object cause it to remain stationary or travel at the same speed Explain that unbalanced forces on an object cause it to speed up, change shape or slow down **Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object** Understand that air resistance is the frictional force of air on objects moving through it Describe some of the factors that increase friction between solid surfaces and increase air and water resistance Describe situations in which frictional forces are helpful as well as those in which frictional forces are unhelpful Compare the tread on bicycle tyres according to how much friction they need Identify streamlined objects and describe why they have been designed in this way (e.g. cycling helmets, formula 1 cars, dolphins) Explore the effects of levers, pulleys and gears **Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect** Describe how levers, pulleys and gears are used in everyday life (e.g. describe how having gears can make it easier to pedal a bike, how a bottle opener makes it easier to open a bottle lid) Explain how introducing gears onto bikes has changed cycling		Recognise that inks and dyes are often mixtures of different colours and these can be separated by chromatography Explain why ink or dye moves up the paper in chromatography Recognise that dissolving is a reversible change Recognise that some changes can be reversed and some cannot Recognise that changes of state are reversible Demonstrate that dissolving, mixing and changes of state are reversible changes Observe and explore a variety of chemical changes (e.g. burning) Identify whether some changes are reversible or not Recognise dissolving as reversible Classify some changes as reversible (e.g. dissolving) and others as irreversible (e.g. burning) Recognise that irreversible changes often make new and useful materials Recognise the hazards of burning materials Describe what happens when acid and bicarbonate of soda are mixed **Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda** Explain that in some cases the new materials made are gases and identify some evidence for the production of gases (e.g. vigorous bubbling)

Year 6	**<u>Electricity</u>** Know that the 'amount' of electricity (voltage) depends on the number of batteries Construct some working series circuits with specified components Recognise conventional circuit symbols **Use recognised symbols when representing a simple circuit in a diagram** Draw circuit diagrams and construct circuits from diagrams using conventional symbols Explore how to change the brightness of bulbs and the volume of a buzzer Describe ways of changing the brightness of a bulb in a circuit or the volume of a buzzer Compare different circuits (e.g. for brightness of bulb) Recall that the amount of electricity is measured in voltage **Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the 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** Explore the thickness of a wire in a circuit Describe the differences between wires usually used for circuits and fuse wires Describe what would happen if all the lights in a home were connected in the same circuit and one broke Explain the current in circuits using simple models and analogies (e.g. piped water, bicycle chain, children and sweets)		**<u>Light</u>** Explore how light travels using torches and periscopes **Recognise that light appears to travel in straight lines** Describe reflection as light 'bouncing off' objects Understand that in order to be seen, all non-luminous objects must reflect light Diagrammatically represent light from sources and bouncing off reflective surface using arrows **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** Draw diagrams to illustrate how light is travelling from the source to the eye **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** Describe a variety of ways of changing the size of the shadow produced by an object Describe the relationship between the size of a shadow and the distance between the light source and an object Diagrammatically represent the formation of shadows using arrow convention **Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them** Know that, when sunlight passes through some objects, coloured light is produced (for example in rainbows, soup bubbles and prisms) Describe how curved mirrors distort a reflection	