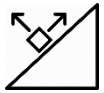
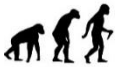
Science – Progression in knowledge:
Middlethorpe Primary Academy

Science – Subject Overview & Progression (biology, chemistry, physics)

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
EYFS	Seasonal Changes all through year **See UTW progression map**					
Year 1	Seasonal Changes and Everyday Materials 		Seasonal Changes and Plants 		 Seasonal Changes and Animals Including Humans	
Year 2	Use of Everyday Materials 	Animals Including Humans 		Plants and Living Things and their Habitats 		Use of Everyday Materials 
Year 3	Rocks 	Light and Sight 	Forces and Magnets 		Plants 	Animals Including Humans 
Year 4	Animals Including Humans 	States of Matter 	Electricity 		Living Things and their Habitats 	Sound 
Year 5	Properties and Changes of Materials 		Forces 	Earth and Space 	All living things and their habitats 	Animals including humans 
Year 6	Evolution and Inheritance 	Light 	Electricity 	Animals Including Humans 		Living Things and their habitats 

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	EYFS	KS1		LKS2		UKS2	
	Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Biology – Substantive Knowledge	**Understanding the world** • Explore the natural world around them. • Describe what they see, hear and feel whilst outside. • Recognise some environments that are different to the one in which they live. • Understand the effect of changing seasons on the natural world around them. • Explore the natural world around them, making observations and drawing pictures of animals and plants. • Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class. • Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	**Plants** • To be able to use the local environment throughout the year to explore and answer questions about plants growing in their habitat. • To be able to observe the growth of flowers and vegetables that they have planted. • To be able to identify common flowers and plant structures. • To be able to identify some common plants in the wild. • To be able to use magnifying glasses to compare and contrast familiar plants • To be able to draw diagrams showing the parts of different plants and trees • To be able to keep records of how plants have changed over time **Animals including Humans** • Identify and name a variety of common animals including fish, amphibians,	**Plants** • Observe and describe how seeds and bulbs grow into mature plants. • Find out and describe how plants need waters, light and a suitable temperature to grow and stay healthy. • Identify and name a variety of plants and animals in their habitats including microhabitats. • • **Animals including humans** • Notice that animals, including humans, have offspring which grow into adults. • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. **Living Things and their Habitats** • Explore and compare the differences between things that are living, dead, and things	**Plants** • To be able to compare the effect of different factors on plant growth, for example the amount of light, the amount of fertiliser. • To be able to observe the different stages of plant life cycles over a period of time to see how seeds are formed. • To be able to look for patterns in the structure of fruits that relate to how seeds are dispersed. • To be able to observe how water is transported in plants (e.g. by putting cut, white carnations in coloured water and observing how water travels up the stem. • To be able to explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. • Identify and describe the functions of different parts of flowering plants:	**Living things and their habitats** • To be able to use and make simple classification keys to explore, name and identify in their local and wider environment. • Recognise through research that living things can be grouped in a variety of ways. • Recognise that environments can change and that this can sometimes pose dangers to living things. **Animals including humans** • To be able to identify the different types of teeth in a human mouth and their simple functions. • To be able to suggest reasons for the differences between the teeth of carnivores and herbivores. • To be able to draw, label and describe the simple functions of basic parts of the human digestive system. • To be able to construct and	**Living things and their habitats** • To be able to observe and compare the life cycles of plants and animals in their local environment with other plants and animals from around the world (in rainforests, in the oceans, in desert areas and in prehistoric times). • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. • Describe the life process of reproduction in some plants and animals. • To be able to research the work of naturalists and animal behaviourists David Attenborough and Jane Goodall. **Animals including humans** • To be able to draw a timeline that indicates the stages in growth and development in humans to old age (they should learn about the changes	**Living things and their habitats** • Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. • Give reasons for classifying plants and animals based on specific characteristics. **Animals including humans** • Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. Describe the ways in which nutrients and water are transported within animals, including humans. **Evolution and Inheritance** • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the

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		reptiles bird and mammals. • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles bird and mammals inc pets). • Identify, name, draw and label the basic parts of a human body and say which part of the body is associated with each sense. •	that have never been alive • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other • Identify and name a variety of plants and animals in their habitats, including micro-habitats • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food	roots, stem/trunk leaves and flowers. **Animals including humans** • • To be able to identify and group animals with and without skeletons and observe and compare their movement. • To be able to explore ideas about what would happen if humans did not have skeletons. • To be able to compare and contrast the diets of different animals (including their pets) and decide ways of grouping them according to what they eat. • To be able to research different food groups and how they keep us healthy and design meals based on what they find out.	annotate a food chain. • To be able to explain the key features of a food chain (identifying producers, predators and prey).	experienced in puberty). • To be able to research the gestation periods of other animals and compare them with humans. • To be able to research how a baby changes physically as it grows and what it is able to do	Earth millions of years ago. • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

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	Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Chemistry – Substantive Knowledge	**Creating with materials** • Safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function. • Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter	**Materials** • Distinguish between an object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. • Describe the simple physical properties of a variety of everyday materials. • Compare and group together a variety of everyday materials on the basis of their simple physical properties. •	**Materials** • To be able to compare the uses of everyday materials in and around school with materials found in other places. • To be able to compare materials found at home, on the way to school, in school and in stories. • To be able to identify and classify the uses of different materials. • To be able to record and make observations of the uses of different materials. • To be able to discuss the uses of different everyday materials • To find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	**Rocks** • To be able to observe rocks, including those used in buildings and gravestones, • To be able to exploring how and why they might have changed over time. • To be able to use a hands lens or microscope to help them identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. • To be able to research and discuss the different kinds of living things whose fossils are found in sedimentary rock • To be able to explore how fossils are formed. • To be able to explore different soils and investigate similarities and differences between them • To recognise that soils are made from rocks and organic matter	**States of matter** • Compare and group materials together, according to whether they are solids, liquids or gases. . • 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). • • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature	**Properties and changes of materials** • 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. • Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. • Demonstrate that dissolving, mixing and changes of state are reversible changes. • Explain that some changes result in the formation of new materials, and that this kind of	

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						change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	

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Physics – Substantive Knowledge	**The Natural World** • Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	**Seasonal Changes** • Observe changes across the four seasons. • Observe and describe weather associated with the seasons and how day length varies		**Light** • Recognise that they need light in order to see things, and that dark is the absence of light. • To be able to explore what happens when light reflects off a mirror or other reflective surfaces (use mirrors to investigate how light behaves). • To be able to express and articulate why it is important to protect their eyes from bright lights and the sun. • To be able to look for, and measure, shadows, and find out how they are formed when light source is blocked by an opaque object • To be able to look for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes. **Forces and magnets** • Notice that some forces need contact between two objects, but	**Electricity** • 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. • Recognise some common conductors and insulators, and associate metals with being good conductors. **Sound** • Identify how sounds are made, associating some of them with something vibrating.	**Earth and space** • Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. • Describe the movement of the Moon relative to the Earth. • 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. **Forces** • Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. • Describe the movement of the Moon relative to the Earth. • 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	• **Light** • To be able to work scientifically to design and make a periscope using the idea that light travels in straight lines • To be able to scientifically explain how a periscope works • To be able to investigate the relationship between light sources, objects and shadows by using shadow puppets. • To be able to investigate/research looking at a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters (they do not need to explain why these phenomena occur). • To be able to decide where to place rear-view mirrors on cars **Electricity** • To be able to systematically identify the effect of changing one

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				magnetic forces can act at a distance. • 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.	• Recognise that vibrations from sounds travel through a medium to the ear. • Find patterns between the pitch of a sound and features of the object that produced it. • 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.	movement of the Sun across the sky.	component at a time in a circuit. • To be able to design and make a set of traffic lights, a burglar alarm or some other useful circuit. • 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. • Use recognised symbols when representing a simple circuit in a diagram.

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Asking Questions and Carrying Out Fair and Comparative Tests	Children explore the natural world and objects in the environment. They learn to understand questions such as 'why' questions and they begin to ask their own questions about the world around them. Children can: • explore how things work. • explore different materials freely, in order to develop their ideas about how to use them and what to make. • explore the natural world around them, making observations and drawing pictures of animals and plants. • understand 'why' questions, like: "Why do you think the caterpillar got so fat?" • ask questions to find out more and to check they understand what has been said to them.	**Asking simple questions and recognising that they can be answered in different ways.** *While exploring the world, the children develop their ability to ask questions (such as what something is, how things are similar and different, the ways things work, which alternative is better, how things change and how they happen). Where appropriate, they answer these questions.* • The children answer questions developed with the teacher often through a scenario. • The children are involved in planning how to use resources provided to answer the questions using different types of enquiry, helping them to recognise that there are different ways in which questions can be answered. **Performing simple tests.** The children use practical resources provided to gather evidence to answer questions generated by themselves or the teacher. They carry out: tests to classify; comparative tests; pattern seeking enquiries; and make observations over time.		**Asking relevant questions and using different types of scientific enquiries to answer them. Setting up simple practical enquiries, comparative and fair tests.** The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions. • The children answer questions posed by the teacher. • Given a range of resources, the children decide for themselves how to gather evidence to answer the question. They recognise when secondary sources can be used to answer questions that cannot be answered through practical work. They identify the type of enquiry that they have chosen to answer their question. **Setting up simple practical enquiries, comparative and fair tests.** • The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. • They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking. **Explanatory Note.** A comparative test is performed by changing a variable that is qualitative e.g. the type of material, shape of the parachute. This leads to a ranked outcome. A fair test is performed by changing a variable that is quantitative e.g. the thickness of the material or the area of the canopy. This leads to establishing a causative relationship.		**Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Using test results to make predictions to set up further comparative and fair tests.** Children can: • with growing independence, raise their own relevant questions about the world around them in response to a range of scientific experiences or involve asking further questions based on their developed understanding following an enquiry. • with increasing independence, make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions and justify this choice. • explore and talk about their ideas, raising different kinds of scientific questions; They recognise how secondary sources can be used to answer questions that cannot be answered through practical work. • ask their own questions about scientific phenomena; • make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them; • plan, set up and carry out comparative and fair tests to answer questions, including recognising and controlling variables where necessary; • use their test results to identify when further tests and observations may be needed; • use test results to make predictions for further tests.

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Making Observations and Taking Measurements.	Children explore the natural work and objects in the environment. Children can: • Explore how things work • Describe what they see, hear, feel whilst outside. • Talk about differences between materials and changes they notice. • Understand the effect of changing seasons on the natural world around them. • Explore the natural world around them, making observations and drawing pictures of animals and plants.	**Observing closely, using simple equipment.** Children can: • Children explore the world around them. They make careful observations to support identification, comparison and noticing change. • They use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations. • They begin to take measurements, initially by comparisons, then using non-standard units.		**Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.** Children can: • Make systematic and careful observations; • Observe changes over time; • Use a range of equipment, measuring length, time, temperature and capacity. • Ask their own questions about what they observe; • Where appropriate, take accurate measurements using standard units using a range of equipment.		**Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.** • The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale. • • During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value).

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Identifying, classifying, recording and presenting data	Children compare objects and measurements in their environment. Children can: • Compare sizes, weights etc. using gesture and language – 'bigger/little/smaller', 'high/low', 'tall', 'heavy'. • Make comparisons between objects relating to size, length, weight and capacity. • Compare quantities using language: 'more than', 'fewer than'. • Compare length, weight and capacity.	**Identifying and classifying.** **Gathering and recording data to help in answering questions.** • Children use their observations and testing to compare objects, materials and living things. • They sort and group these things, identifying their own criteria for sorting. • They use simple secondary sources (such as identification sheets) to name living things. They describe the characteristics they used to identify a living thing. **The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing**. • They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs. • They classify using simple prepared tables and sorting rings.		**Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions. Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.** • Talk about criteria for grouping, sorting and classifying. • Group and classify things; • Collect data from their own observations and measurements; • Present data in a variety of ways to help in answering questions; • Use, read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge; • Record observations using photographs, videos, pictures, labelled diagrams or writing. • Record findings using scientific language and measurements including tables, tally charts, bar charts (• Record classification findings using tables, Venn diagrams, Carroll diagrams • • Children are supported to present the same data in different ways in order to help with answering the question. Using straightforward scientific evidence to answer questions or to support their findings		**Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.** • The children decide how to record and present evidence. • They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. • They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. • They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys. • Children present the same data in different ways in order to help with answering the question.	

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Drawing conclusion, noticing patterns and presenting findings	Children identify and construct patterns in their environment. Children can: • Notice patterns and arrange things in patterns. • Talk about and identify the patterns around them. For example: stripes on clothes, designs on rugs and wallpaper. Use informal language like 'pointy', 'spotty', 'blobs', etc. Extend and create ABAB patterns – stick, leaf, stick, leaf. Notice and correct and error in a repeating pattern. • Continue, copy and create repeating patterns.	**Using their observations and ideas to suggest answers to questions.** Children can: • Notice links between cause and effect with support; • Begin to notice patterns and relationships with support; • Begin to draw simple conclusions; • Identify and discuss differences between their results; • Use simple and scientific language; • Read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge at key stage 1; • Talk about their findings to a variety of audiences in a variety of ways. Data Handling (Y2) • Interpret and construct simple pictograms, tally charts, block diagrams and simple tables. • Ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity. • Ask and answer questions about totalling and comparing categorical data.		**Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.** • They draw conclusions based on their evidence and current subject knowledge. • They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry. • Children use their evidence to suggest values for different items tested using the same method e.g. the distance travelled by a car on an additional surface. • Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry. **Reporting on finding from enquiries, including oral and written explanations, displays or presentations of results and conclusions.** • They communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary. Data Handling (Y3) • Interpret and present data using bar charts, pictograms and tables. • Use simple scales (for example, 2, 5, 10 units per cm) in pictograms and bar charts with increasing accuracy. Data Handling (Y4) • Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs.		**Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations.** • In their conclusions, children: identify causal relationships and patterns in the natural world from their evidence; identify results that do not fit the overall pattern; and explain their findings using their subject knowledge. • They evaluate, for example, the choice of method used, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources used. • They identify any limitations that reduce the trust they have in their data. • They communicate their findings to an audience using relevant scientific language and illustrations. Data Handling (Year 5) • Present and interpret information in a line graph • Present and interpret information in a table, including timetables. Data Handling (Year 6) • Interpret and construct pie charts and line graphs • Know when it is appropriate to find the mean of a data set.	

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Using Scientific Evidence and Secondary Sources of Information				**Identifying differences, similarities or changes related to simple scientific ideas and processes. Using straightforward scientific evidence to answer questions or to support their findings.** • Children interpret their data to generate simple comparative statements based on their evidence. • They begin to identify naturally occurring patterns and causal relationships. • Recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations.		**Identifying scientific evidence that has been used to support or refute ideas or arguments.** • Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer. • They talk about how their scientific ideas change due to new evidence that they have gathered. • They talk about how new discoveries change scientific understanding. •