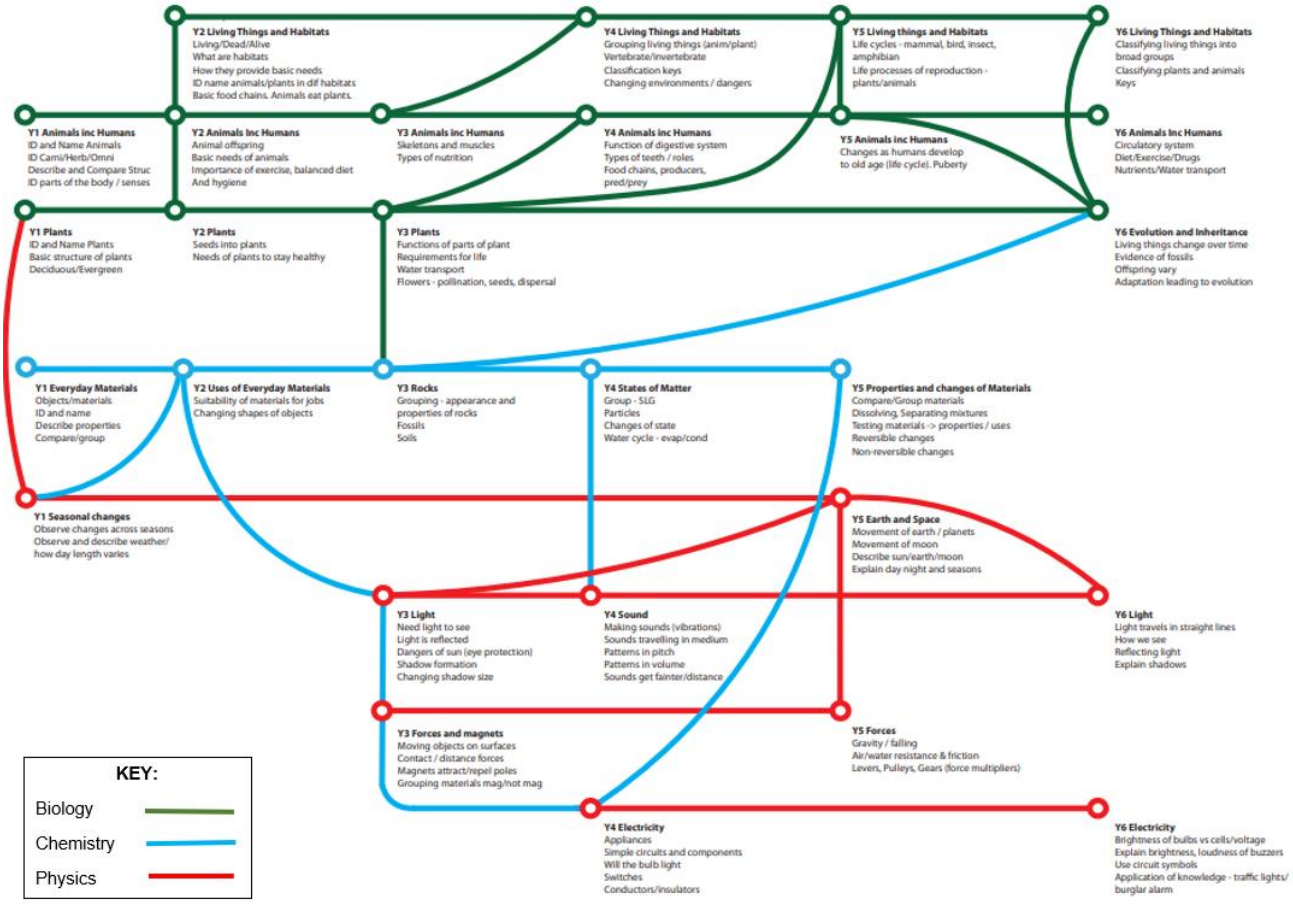
DANE ROYD SCHOOL

Progression of Knowledge Route Map



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Cycle 1: (2023-2024)

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
KS1	BIOLOGY Living things Y2 Qbs.	BIOLOGY Living things Y2 Qbs.	BIOLOGY Animals including humans Y2 Qbs.	CHEMISTRY (Uses of) Everyday Materials Y2 Qbs.	BIOLOGY Plants Y2 Qbs.	STEM
LKS2	PHYSICS Forces & Magnets Y3 Qbs.	BIOLOGY Living things Y4 Qbs.	BIOLOGY Animals including humans Y3 Qbs.	CHEMISTRY Rocks Y3 Qbs.	PHYSICS Sound Y4 Qbs.	STEM
UKS2	PHYSICS Forces & Magnets Y5 Qbs.	BIOLOGY Living things Y5 Qbs.	BIOLOGY Animals including humans Y5 Qbs.	CHEMISTRY Properties and Changes of Materials Y5 Qbs.	PHYSICS Earth & Space Y5 Qbs.	STEM

Cycle 2: (2024-2025)

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
KS1	BIOLOGY Animals including humans Y1 Qbs.	BIOLOGY Plants Y1 Qbs.	BIOLOGY Animals including humans Y1 Qbs.	CHEMISTRY (Uses of) Everyday Materials Y1 Qbs.	PHYSICS Seasons Y1 Qbs.	STEM
LKS2	PHYSICS Electricity Y4 Qbs.	BIOLOGY Plants Y3 Qbs.	BIOLOGY Animals including humans Y4 Qbs.	CHEMISTRY States of Matter Y4 Qbs.	PHYSICS Light Y3 Qbs.	STEM
UKS2	PHYSICS Electricity Y6 Qbs.	BIOLOGY Living things Y6 Qbs.	BIOLOGY Animals including humans Y6 Qbs.	BIOLOGY Evolution & Inheritance Y6 Qbs.	PHYSICS Light Y6 Qbs.	STEM

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BIOLOGY – Living Things and their Habitats	
Nursery	Cycle A: Spr 2 - mother and baby animals (on the farm), Sum 1 - different habitats across the world and how animals vary. Cycle B: Spr 1 - native woodland creatures, Spr 2 - looking at different habitats and how animals vary, Sum 2 - minibeast habitats.

BIOLOGY – Living Things and their Habitats	
Reception	Aut 1 - Local animals that hibernate Aut 2 - Polar region animals Spr 1 - Under the sea animals including 'Recycle Station' plastic pollution activity Spr 2 - Observing (over time) frog, butterfly and chicken lifecycle Sum 1 - Extinct animals

BIOLOGY – Living Things and their Habitats (Local)	
Year 2 (a)	National Curriculum Statement: • Pupils should be taught to explore and compare the differences between things that are living, dead, and things that have never been alive • They can 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 • They can identify and name a variety of plants and animals in their habitats, including microhabitats • They can 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. Non-Statutory Guidance: • Pupils should be introduced to the idea that all living things have certain characteristics that are essential for keeping them alive and healthy. • They should raise and answer questions that help them to become familiar with the life processes that are common to all living things. Pupils should be introduced to the term's 'habitat' (a natural environment or home of a variety of plants and animals) and 'micro-habitat' (a very small habitat, for example for woodlice under stones, logs or leaf litter). • They should raise and answer questions about the local environment that help them to identify and study a variety of plants and animals within their habitat and observe how living things depend on each other, for example, plants serving as a source of food and shelter for animals. • Pupils should compare animals in familiar habitats with animals found in less familiar habitats, for example, on the seashore, in woodland, in the ocean, in the rainforest. • Pupils might **work scientifically** by: sorting and classifying things according to whether they are living, dead or were never alive, and recording their findings using charts. • They should describe how they decided where to place things, exploring questions for example: 'Is a flame alive? Is a deciduous tree dead in winter?' and talk about ways of answering their questions. • They could construct a simple food chain that includes humans (e.g. grass, cow, human). • They could describe the conditions in different habitats and micro-habitats (under log, on stony path, under bushes) and find out how the conditions affect the number and type(s) of plants and animals that live there. Substantive Knowledge: • I can compare the difference between living and non-living things. • I can describe some of the things that all living things have in common (MRS GREN - Movement, Respiration, Sensitivity, Growth, Reproduction, Excretion and Nutrition). • I can explain what a habitat is and why it is important. • I can identify features of a habitat.

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	• I can identify animals in their microhabitats. Disciplinary Knowledge: • I can sort into categories and explain my answer e.g. living, dead, never lived. • I can make detailed observations around school including; mapping habitat, features and wildlife. • I can design a garden habitat and label the plants and animals that could live there. Common Misconceptions: • Children may not fully understand that some of the food we eat used to be living animals that are now dead. Scientist Spotlight: Yorkshireman Bernard Kettlewell's Peppered Moth Experiments https://askabiologist.asu.edu/peppered-moths-game/index.html Cross Curricular Connections: Geography 'seaside' topic

BIOLOGY – Living Things and their Habitats (Rest of the World)	
Year 2 (b)	National Curriculum Statement: • Pupils should be taught to explore and compare the differences between things that are living, dead, and things that have never been alive • They can 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 • They can identify and name a variety of plants and animals in their habitats, including microhabitats • They can 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. Non-Statutory Guidance: • Pupils should be introduced to the idea that all living things have certain characteristics that are essential for keeping them alive and healthy. • They should raise and answer questions that help them to become familiar with the life processes that are common to all living things. Pupils should be introduced to the term's 'habitat' (a natural environment or home of a variety of plants and animals) and 'micro-habitat' (a very small habitat, for example for woodlice under stones, logs or leaf litter). • They should raise and answer questions about the local environment that help them to identify and study a variety of plants and animals within their habitat and observe how living things depend on each other, for example, plants serving as a source of food and shelter for animals. • Pupils should compare animals in familiar habitats with animals found in less familiar habitats, for example, on the seashore, in woodland, in the ocean, in the rainforest. • Pupils might **work scientifically** by: sorting and classifying things according to whether they are living, dead or were never alive, and recording their findings using charts. • They should describe how they decided where to place things, exploring questions for example: 'Is a flame alive? Is a deciduous tree dead in winter?' and talk about ways of answering their questions. • They could construct a simple food chain that includes humans (e.g. grass, cow, human). • They could describe the conditions in different habitats and micro-habitats (under log, on stony path, under bushes) and find out how the conditions affect the number and type(s) of plants and animals that live there. Substantive Knowledge: • I can describe how different plants and animals are suited to the conditions of a particular habitat such as desert, Arctic, tropical, ocean or rainforest. • I can explain how living things in a habitat depend on each other. • I can use a food chain to show how animals get their food. • I can identify a 'producer', 'consumer', 'prey' and 'predator' within a food chain. Disciplinary Knowledge: • I can use secondary sources of information to identify, classify, group and pattern seek. Common Misconceptions: • Children may have misconceptions about where animals live as they may have only seen some of these animals in the zoo so might not realise where their habitat would be in the wild.

	Scientist Spotlight: Rachel Carson https://www.twinkl.co.uk/resource/tp-sc-151-planit-science-year-2-scientists-and-inventors-lesson-5-rachel-carson-lesson-pack Cross Curricular Connections: Geography 'Australia' topic

BIOLOGY – Living Things & Their Habitat	
Year 4	National Curriculum Statement: • Pupils should be taught to recognise that living things can be grouped in a variety of ways • explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment • recognise that environments can change and that this can sometimes pose dangers to living things. Non-Statutory Guidance: • Pupils should use the local environment throughout the year to raise and answer questions that help them to identify and study plants and animals in their habitat. They should identify how the habitat changes throughout the year. • Pupils should explore possible ways of grouping a wide selection of living things that include animals and flowering plants and non-flowering plants. • Pupils could begin to put vertebrate animals into groups such as fish, amphibians, reptiles, birds, and mammals; and invertebrates into snails and slugs, worms, spiders, and insects. • Pupils should explore examples of human impact (both positive and negative) on environments, for example, the positive effects of nature reserves, ecologically planned parks, or garden ponds, and the negative effects of population and development, litter or deforestation. • Pupils might **work scientifically** by: using and making simple guides or keys to explore and identify local plants and animals; making a guide to local living things; raising and answering questions based on their observations of animals and what they have found out about other animals that they have researched. Note: Plants can be grouped into categories such as flowering plants (including grasses) and non-flowering plants, such as ferns and mosses. Substantive Knowledge: • I can group living things in a variety of ways. • I can identify vertebrates by recognising similarities and differences. • I can recognise positive and negative changes to the local environment. • I can describe environmental dangers to endangered species. Disciplinary Knowledge: • I can use evidence (to identify an invertebrate). • I can use a classification key (to show the characteristics of living things). Common Misconceptions: • Snakes have exoskeletons that they shed. This is not true; snakes are vertebrate animals that shed their skin (not an exoskeleton). • Children may think fish breathe in water; however, it is not water that the fish take in when they breathe but the oxygen mixed in with the water. • Children may assume that all changes to habitats are negative. • Children may find it difficult to distinguish the difference between reptiles and amphibians. Scientist Spotlight: Gerald Durrell https://www.twinkl.co.uk/resource/tp2-s-196-planit-science-year-4-scientists-and-inventors-lesson-1-madagascar-in-danger-lesson-pack Cross Curricular Connections: Geography 'Under the Canopy' topic Pond dipping

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BIOLOGY – Living Things & Their Habitat	
Year 5	National Curriculum Statement: • Pupils should be taught to 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. Non-Statutory Guidance: • Pupils should study and raise questions about their local environment throughout the year. • They should observe life-cycle changes in a variety of living things, for example, plants in the vegetable garden or flower border, and animals in the local environment. • They should find out about the work of naturalists and animal behaviourists, for example, David Attenborough and Jane Goodall. • Pupils should find out about different types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals. • Pupils might **work scientifically** by: observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world (in the rainforest, in the oceans, in desert areas and in prehistoric times), asking pertinent questions and suggesting reasons for similarities and differences. • They might try to grow new plants from different parts of the parent plant, for example, seeds, stem and root cuttings, tubers, bulbs. They might observe changes in an animal over a period of time (for example, by hatching and rearing chicks), comparing how different animals reproduce and grow. Substantive Knowledge: • I can recap my knowledge of living things and their process (MRS GREN). • I can describe how some plants reproduce. • I can explain the life cycle of different plants. • I can describe the life cycle of different mammals. • I can explain how groups of animals reproduce. Disciplinary Knowledge: • Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • Identifying scientific evidence that has been used to support or refute ideas or arguments • Reporting and presenting 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 Specific LO's: • I can compare sexual and asexual reproduction in plants. • I can compare the life cycles of different animals and explain metamorphosis (lesson 4 – pond dipping) • I can compare the life cycles of different species. Common Misconceptions: • Children may confuse mating and reproduction. Reproduction is the combining of genetic material from a male and female part to produce new life. Both animals and plants reproduce sexually however animals have to mate in order for them to reproduce. • Children may think that the first stage of each life cycle is the egg; every life cycle begins with the egg. Labelling the 'egg' as the first stage would be incorrect as the stages in a life cycle are repeated and there is no first or last stage. • When discussing how mammals reproduce (and humans in particular) children may think that babies are conceived in the stomach. It is important that the children understand that stomachs are for food, not babies. Fertilisation takes place naturally in the fallopian tube (oviduct) of the female reproductive system and the fertilised egg, which develops into a ball of cells over time, develops in the uterus (womb) of the female to become a baby. Scientist Spotlight: David Attenborough OR Eva Crane https://www.twinkl.co.uk/resource/tp2-s-264-planit-science-year-5-scientists-and-inventors-lesson-1-david-attenborough-lesson-pack

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	https://www.twinkl.co.uk/resource/tp2-s-268-planit-science-year-5-scientists-and-inventors-lesson-5-eva-crane-lesson-pack Cross Curricular Connections: RSE sex education

BIOLOGY – Living Things and Their Habitats	
Year 6	National Curriculum Statement: • Pupils should be taught to describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals give reasons for classifying plants and animals based on specific characteristics. Non-Statutory Guidance: • Pupils should build on their learning about grouping living things in year 4 by looking at the classification system in more detail. • They should be introduced to the idea that broad groupings, such as micro-organisms, plants and animals can be subdivided. • Through direct observations where possible, they should classify animals into commonly found invertebrates (such as insects, spiders, snails, worms) and vertebrates (fish, amphibians, reptiles, birds and mammals). • They should discuss reasons why living things are placed in one group and not another. • Pupils might find out about the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification. • Pupils might **work scientifically** by: using classification systems and keys to identify some animals and plants in the immediate environment. They could research unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system. Substantive Knowledge: • I can describe how living things can be classified into different groups. • I can explain what the Linnaean system is and why it is used. • I understand how I can use classification keys to help group, identify and name a variety of living things. • I can learn how we can classify plants. • I can identify the characteristics of different types of animals. • I can develop my understanding of micro-organisms. • I can identify helpful and harmful micro-organisms. • I can investigate the best conditions for mould to grow. Disciplinary Knowledge: • I can plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • I can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • I can identify scientific evidence that has been used to support or refute ideas or arguments Specific LO's: • I can identify familiar arthropods using a classification key – *opportunity for immediate environment* • I can identify some common British trees using a classification key - *opportunity for immediate environment* Common Misconceptions: • Some children may think that all microorganisms are harmful and make you ill. It is important to highlight that some microorganisms are useful and play an important part in decomposition. • They may also think that microorganisms are all the same size; however, although all microbes cannot be seen with the naked eye, there is a huge variance in the size of microbes (e.g. in general, viruses are much smaller than bacteria). • Children may think that mushrooms are a type of plant. They are not, they are classified as fungi. Scientist Spotlight: Libbie Hyman

	https://www.twinkl.co.uk/resource/tp2-s-270-planit-science-year-6-scientists-and-inventors-lesson-2-libbie-hyman-lesson-pack Cross Curricular Connections: ICT & e-safety

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BIOLOGY – Animals including Humans	
Nursery	Cycle A: Aut 1 - UK native animals e.g. autumnal animals such as hedgehogs and squirrels, Spr 1 - oral health, general hygiene. Cycle B: Aut 1 - Marvellous Me' topic.

BIOLOGY – Animals including Humans	
Reception	HUMANS: Aut 1 - Our senses 'sniff station', Promotion of Oral Hygiene Tuff Tray, Optician/Dentist Role Play, Self-portrait (looking at similarities and differences), Halloween Skeleton Tuff Tray (labelling activity), Family Album, 'Now and Then' display Cross Curricular Connections - RWI Phonics – Fred Says touch your…, Music – (general) sound discrimination / (specific) heads, shoulders, knees and toes, PHSE – Jigsaw; Healthy Me ANIMALS: Aut 1 - Local animals that hibernate Aut 2 - Polar region animals Spr 1 - Under the sea animals Spr 2 - Observing (over time) frog, butterfly and chicken lifecycle Sum 1 - Extinct animals including 'Who's poo is this' classification activity Cross Curricular Connections - Caring for school 'pets' (guinea pigs and chickens)

BIOLOGY - Animals Including Humans (Humans)	
Year 1 **(a)**	National Curriculum Statement: • Pupils should be taught to identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. Non-Statutory Guidance: • Pupils should have plenty of opportunities to learn the names of the main body parts (including head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth) through games, actions, songs and rhymes. • Pupils might **work scientifically** by using their senses to compare different textures, sounds and smells. Substantive Knowledge: • I can name and locate parts of the human body. • I can say which part of the body is associated with each sense. Disciplinary Knowledge: • I can draw and label the basic parts of the human body (in the context of drawing and labelling a diagram of the body.) • I can investigate objects using my senses and record my findings. Common Misconceptions: • Your body is your trunk only – your body is from head to toe. • You use your hands to touch – any part of your skin can sense touch. • You use your mouth to taste – only the tongue has taste buds. • All humans have two arms/two legs/eyes to see/ears to hear - some humans have disabilities so do not have all the same body parts or cannot use all of their senses (diversity and inclusivity). Scientist Spotlight: Linda Brown Buck https://www.twinkl.co.uk/resource/tp-sc-156-planit-science-year-1-scientists-and-inventors-lesson-pack-lesson-7-super-senses Cross Curricular Connections: Food Technology & PE

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BIOLOGY – Animals including Humans (Animals)	
Year 1 **(b)**	National Curriculum Statement: • Pupils should be taught to identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals • They should identify and name a variety of common animals that are carnivores, herbivores and omnivores • They should describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets) Non-Statutory Guidance: • Pupils should use the local environment throughout the year to explore and answer questions about animals in their habitat. • They should understand how to take care of animals taken from their local environment and the need to return them safely after study. • Pupils should become familiar with the common names of some fish, amphibians, reptiles, birds and mammals, including those that are kept as pets. • Pupils might **work scientifically** by using their observations to compare and contrast animals at first hand or through videos and photographs, describing how they identify and group them; grouping animals according to what they eat. Substantive Knowledge: • I can name some common animals. • I can describe the structure of a variety of common animals. Disciplinary Knowledge • I can compare the simple features of living things to decide how to sort and group them. • I can notice patterns and relationships. • I can record and communicate my findings in a range of ways and begin to use simple scientific language. Common Misconceptions: • Animals eat humans e.g. sharks eat humans - No animals hunt humans as we do not live in the same habitat. • Anything with sharp teeth must be a carnivore. • Vegetarians or vegans are herbivores – This is a choice, not a biological truth. Scientist Spotlight: George Mottershead https://www.twinkl.co.uk/resource/tp-sc-136-planit-science-year-1-scientists-and-inventors-lesson-2-zoos-lesson-pack Cross Curricular Connections: Geography topics (Australia & Seaside)

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BIOLOGY – Animals including Humans	
Year 2	National Curriculum Statement: • Pupils should be taught to notice that animals, including humans, have offspring which grow into adults. • They should find out about and describe the basic needs of animals, including humans, for survival (water, food and air) • They should describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. Non-Statutory Guidance: • Pupils should be introduced to the basic needs of animals for survival, as well as the importance of exercise and nutrition for humans. • They should also be introduced to the processes of reproduction and growth in animals. The focus at this stage should be on questions that help pupils to recognise growth; they should not be expected to understand how reproduction occurs. • The following examples might be used: egg, chick, chicken; egg, caterpillar, pupa, butterfly; spawn, tadpole, frog; lamb, sheep. Growing into adults can include reference to baby, toddler, child, teenager, adult. • Pupils might **work scientifically** by: observing, through video or first-hand observation and measurement, how different animals, including humans, grow; asking questions about what things animals need for survival and what humans need to stay healthy; and suggesting ways to find answers to their questions. Substantive Knowledge: • I can name the stages of the human life cycle. • I can match animal offspring with their adults. • I can describe the basic needs of animals, including humans, for survival. • I can discuss the importance of humans needing to eat the right amount of different types of food. • I can explain the importance of humans needing to exercise. Disciplinary Knowledge: • I can ask relevant questions and suggest ways to find the answers. • I can gather and record data over a period of time. • I can present my data in various ways and begin to interpret the results. • I can create a food diary to observe how much of each food group I eat. • I can take part in physical exercise to observe the effects on my body. Common Misconceptions • Children might need a thorough explanation of the difference between a "need" and a "want" – needs are things that humans cannot survive without. • Children may have heard the word diet in a negative way when someone is trying to lose weight. Children need to be told that diet just means the food that someone eats. Scientist Spotlight: Louis Pasteur https://www.twinkl.co.uk/resource/tp-sc-149-planit-science-year-2-scientists-and-inventors-lesson-3-discovering-germs-lesson-pack Cross Curricular Connections: Food Tech, PE & Jigsaw (Healthy Me)

BIOLOGY - Animals Including Humans	
Year 3	National Curriculum Statement: • Pupils should be taught to identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat • that humans and some other animals have skeletons and muscles for support, protection and movement. Non-Statutory Guidance: • Pupils should continue to learn about the importance of nutrition and should be introduced to the main body parts associated with the skeleton and muscles, finding out how different parts of the body have special functions.

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	• Pupils might **work scientifically** by: identifying and grouping animals with and without skeletons and observing and comparing their movement; exploring ideas about what would happen if humans did not have skeletons. • They might compare and contrast the diets of different animals (including their pets) and decide ways of grouping them according to what they eat. • They might research different food groups and how they keep us healthy and design meals based on what they find out. Substantive Knowledge: • I can explain the things that animals and humans need to survive and stay healthy. • I can sort foods into their relevant food groups. • I can describe the nutrients provided by a range of foods. • I can explain what vertebrates and invertebrates are and give some examples of each. • I can explain how bones and muscles work together to create movement. Disciplinary Knowledge: • I can sort animals according to their skeleton type. • I can discuss the advantages and disadvantages of different skeleton types. • I can begin to explore how animals with different skeletons move. • I can investigate ideas about how the human skeleton supports movement. Common Misconceptions: • Children may have misconceptions about the bones in our body and where they are. They may think we have fewer bones and that the bones do not cover our whole body. • Children may also think that animals have the same skeleton as humans. • Children may have misconceptions about muscles. Some children think that only males have muscles but children need to understand that all humans have muscles in order to move. • Children may have misconceptions about the word diet. We need to explain that a diet just means what an animal eats e.g. a shark's diet is smaller fish. Some children may have heard this term used when people want to lose weight. Scientist Spotlight: Marie Curie https://www.twinkl.co.uk/resource/tp2-s-175-planit-science-year-3-scientists-and-inventors-lesson-2-marie-curie-lesson-pack Cross Curricular Connections: Food Technology, PE & PHSE (Healthy Me)

BIOLOGY – Animals including Humans	
Year 4	National Curriculum Statement: • Pupils should be taught to describe the simple functions of the basic parts of the digestive system in humans • identify the different types of teeth in humans and their simple functions • construct and interpret a variety of food chains, identifying producers, predators and prey. Non-Statutory Guidance: • Pupils should be introduced to the main body parts associated with the digestive system, for example, mouth, tongue, teeth, oesophagus, stomach and small and large intestine and explore questions that help them to understand their special functions. • Pupils might **work scientifically** by: comparing the teeth of carnivores and herbivores, and suggesting reasons for differences; finding out what damages teeth and how to look after them. • They might draw and discuss their ideas about the digestive system and compare them with models or images. Substantive Knowledge: • I can explain what tooth decay is. • I can explain how to look after my teeth. • I can name the different types of teeth found in humans. • I can explain the function of the different teeth types. • I can name the main parts of the digestive system. • I can say where the digestive system organs are located in the body.

	• I can explain the function (job) of each part of the digestive system. • I can order the steps in the digestion process using my knowledge of the parts and their function. • I can construct a food chain for a given habitat. • I can identify the producer, predator and prey in a food chain. Disciplinary Knowledge: • I can plan and set up a 'tooth decay' investigation. • I can decide what to change, what to keep the same and what to observe in a 'tooth decay' investigation. • I can make observations and recordings of teeth. • I can draw conclusions, about keeping teeth healthy, from a set of results and evaluate an investigation. • I can use a scientific model and secondary source to verbally explain the process of digestion. • I can summarise the key stages of digestion using the correct scientific vocabulary. • I can interpret what a food chain is telling me. Common Misconceptions • Children may think that their stomach is where their belly button is and that all food is digested there. However, although some simple foods such as sugar are digested, most foods travel to the small intestine for further digestion and to be absorbed into the blood. • Children may think that food goes down one tube and liquids go down another. • They may also think that the air we breathe goes down the same tube as the food and water. • When drawing food chains, children may get confused by the direction of the arrow. Scientist Spotlight: Washington Sheffield https://www.twinkl.co.uk/resource/tp2-s-201-planit-science-year-4-scientists-and-inventors-lesson-6-toothpaste-lesson-pack Cross Curricular Connections: Visit from dental nurse

BIOLOGY - Animals Including Humans	
Year 5	National Curriculum Statement: • Pupils should be taught to: describe the changes as humans develop to old age. Non-Statutory Guidance: • Pupils should draw a timeline to indicate stages in the growth and development of humans. They should learn about the changes experienced in puberty. • Pupils could **work scientifically** by researching the gestation periods of other animals and comparing them with humans; by finding out and recording the length and mass of a baby as it grows. Substantive Knowledge: • I can order the stages of human development. • I can describe the stages of human development • I can understand the prenatal stage of a human lifecycle. • I can explain how babies grow and develop. • I can describe and explain the changes that occur during puberty. • I can identify and explain the impact of the changes that take place in old age. Disciplinary Knowledge: • Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • Identifying scientific evidence that has been used to support or refute ideas or arguments • Reporting and presenting 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 Specific LO's: • I can compare gestation periods of different mammals. Common Misconceptions:

	• Children may have misconceptions about being an adult and that you stop learning as well as stop growing. • Children will need to understand that our bodies can still change when we are an adult. • Children may know what will change with their body during puberty but may not know about the opposite sex. • Children may also think that a baby grows inside its mother's stomach where food goes. Scientist Spotlight: Leonardo Da Vinci https://www.twinkl.co.uk/resource/tp2-s-267-planit-science-year-5-scientists-and-inventors-lesson-4-leonardo-da-vinci-lesson-pack Cross Curricular Connections: Maths – Units of measurement, collecting and interpreting data and PHSE – Puberty

BIOLOGY – Animals including Humans	
Year 6	National Curriculum Statement: • Pupils should be taught to 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. Non-Statutory Guidance: • Pupils should build on their learning from years 3 and 4 about the main body parts and internal organs (skeletal, muscular and digestive system) to explore and answer questions that help them to understand how the circulatory system enables the body to function. • Pupils should learn how to keep their bodies healthy and how their bodies might be damaged – including how some drugs and other substances can be harmful to the human body. • Pupils might **work scientifically** by: exploring the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health. Substantive Knowledge: • I can recap different systems in the body • I can identify key parts of the circulatory system • I can explain the process of double circulation. • I can describe the path the blood takes around the body. • I can identify and explain the job roles of different blood vessels. • I can identify and explain the job roles of components of blood. • I can state and explain the importance of exercise and its impact on the body. Disciplinary Knowledge: • I can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • I can take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate Common Misconceptions • Children may think that oxygenated blood is red whilst blood with no oxygen is blue. Children need to know that blood is never blue, but some scientific diagrams show it as blue so we can distinguish between the different types of blood. • Children may not realise that exercise is needed to keep the heart healthy and you should aim to complete at least 30 minutes of exercise a day that increases your heart rate. Scientist Spotlight: Marie Maynard Daly OR Daniel Hale Williams https://www.twinkl.co.uk/resource/science-scientists-and-inventors-marie-maynard-daly-year-6-lesson-pack-3-tp2-s-317 https://www.twinkl.co.uk/resource/science-scientists-and-inventors-daniel-hale-williams-year-6-lesson-pack-6-tp2-s-321 Cross Curricular Connections: Maths – plotting & interpreting graphs

DANE ROYD SCHOOL

BIOLOGY - Plants	
Nursery	Cycle A: Aut 1 - harvest vegetables, grow sunflowers, Spr 2 - sorting, naming, planting & caring for vegetables, plant, grow and care for beans. Cycle B: Sum 2 - sorting, naming, planting and caring for a variety of plants.

BIOLOGY - Plants	
Reception	Spr 2: Plant and care for a bean (inside), Plant and care for flowers (outside), Dane Royd Farm Shop Role Play (inside), Dane Royd Garden Centre Role Play (outside) Cross Curricular Connections: Food Technology – plant and care for a tomato, ICT – interactive naming parts of a flower game, Various scavenger hunts (introducing magnifying glasses)

BIOLOGY - Plants	
Year 1	National Curriculum Statement: • Pupils should be taught to identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. • They should be taught to identify and describe the basic structure of a variety of common flowering plants, including trees. Non-Statutory Guidance: • Pupils should use the local environment throughout the year to explore and answer questions about plants growing in their habitat. • Where possible, they should observe the growth of flowers and vegetables that they have planted. • They should become familiar with common names of flowers, examples of deciduous and evergreen trees, and plant structures (including leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk, branches, stem). • Pupils might **work scientifically** by observing closely, perhaps using magnifying glasses, and comparing and contrasting familiar plants; describing how they were able to identify and group them, and drawing diagrams showing the parts of different plants including trees. • Pupils might keep records of how plants have changed over time, for example the leaves falling off trees and buds opening; and compare and contrast what they have found out about different plants. Substantive Knowledge: • I can name a variety of common wild plants. • I can name a variety of common garden plants. • I can name some trees. Disciplinary Knowledge: • I can ask simple questions and recognise that they can be answered in different ways in the context of considering what beans need to grow. • I can gather and record data, from our local environment, to help in answering questions about which wild plant is the most common. • I can observe closely, using a magnifying glass, in the context of observing garden plants. • I can identify and classify leaves from trees as deciduous or evergreen. • I can plant and care for a bean. Common Misconceptions: • Only things with brains are alive – plants are living things and can die. Scientist Spotlight: Jane Colden

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	https://www.twinkl.co.uk/resource/tp-sc-157-planit-science-year-1-scientists-and-inventors-lesson-pack-lesson-8-brilliant-botany Cross Curricular Connections: Geography 'Journey to Oz' topic

BIOLOGY - Plants	
Year 2	National Curriculum Statement: • Pupils should be taught to observe and describe how seeds and bulbs grow into mature plants • They should find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. Non-Statutory Guidance: • Pupils should use the local environment throughout the year to observe how different plants grow. • Pupils should be introduced to the requirements of plants for germination, growth and survival, as well as to the processes of reproduction and growth in plants. • Pupils might **work scientifically** by: observing and recording, with some accuracy, the growth of a variety of plants as they change over time from a seed or bulb, or observing similar plants at different stages of growth; setting up a comparative test to show that plants need light and water to stay healthy. Substantive Knowledge: • I can describe how seeds and plants grow into mature plants. • I can discuss what plants need to grow and stay healthy. • I can explain what happens if plants do not get all the things they need. Disciplinary Knowledge: • I can design and set up a test to find out what plants need to stay healthy. Common Misconceptions: • Seeds and bulbs need light to grow – Seeds and bulbs need water to grow but most do not need light; seeds and bulbs have a store of food inside them. Scientist Spotlight: Tim Smit & Nicholas Grimshaw (The Eden Project) https://www.twinkl.co.uk/resource/tp-sc-147-planit-science-year-2-scientists-and-inventors-lesson-1-greenhouse-growing-lesson-pack Cross Curricular Connections: Maths (measures)

BIOLOGY - Plants	
Year 3	National Curriculum Statement: • Pupils should be taught to identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers • explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant • investigate the way in which water is transported within plants • explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. Non-Statutory Guidance: • Pupils should be introduced to the relationship between structure and function: the idea that every part has a job to do. They should explore questions that focus on the role of the roots and stem in nutrition and support, leaves for nutrition and flowers for reproduction. • Pupils might **work scientifically** by: comparing the effect of different factors on plant growth, for example, the amount of light, the amount of fertiliser; discovering how seeds are formed by observing the different stages of plant life cycles over a period of time; looking for patterns in the structure of fruits that relate to how the seeds are dispersed. • They might observe how water is transported in plants, for example, by putting cut, white carnations into coloured water and observing how water travels up the stem to the flowers.

	Note: Pupils can be introduced to the idea that plants can make their own food, but at this stage they do not need to understand how this happens. Substantive Knowledge: • I can label parts of a plant and describe their function. • I can name the different parts of a flower and explain their role in pollination and fertilisation. • I can understand and order the stages of the life cycle of a flowering plant. Disciplinary Knowledge: • I can set up an investigation to find out what plants need to grow well • I can record my results in a variety of ways to help answer questions. • I can investigate how water is transported in plants • I can make prediction, observe changes over time and come to my own conclusion. Common Misconceptions: • Children may not realise that plants are living things and that they can die. They may only think things with faces and brains are alive. • Children may not know that plants have roots in the ground that help the plant. • Children may think that all seeds look the same so we need to make sure that we allow them to explore and observe a variety of seeds and bulbs. Scientist Spotlight: George Washington Carver https://www.twinkl.co.uk/resource/science-scientists-and-inventors-george-washington-carver-y3-lesson-3-tp2-s-303 Cross Curricular Connections: Planting for food technology (potatoes, spring onions, tomatoes and runner beans) Geography 'Under the Canopy' topic

DANE ROYD SCHOOL

BIOLOGY – Evolution & Inheritance	
Nursery	Cycle A: Spr 2 – 'down on the farm' topic (various lifecycles). Cycle B: Sum 2 - minibeast lifecycle.

BIOLOGY – Evolution & Inheritance	
Reception	Aut 2 - Polar region animal adaptation Spr 2 - Observing (over time) frog, butterfly and chicken lifecycle Sum 1 - Extinct animals, including fossils and the work of Mary Anning

BIOLOGY – Evolution & Inheritance	
Year 6	National Curriculum Statement: • Pupils should be taught to recognise that living things have changed over time and that fossils provide information about living things that inhabited the 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. Non-Statutory Guidance: • Building on what they learned about fossils in the topic on rocks in year 3, pupils should find out more about how living things on earth have changed over time. • They should be introduced to the idea that characteristics are passed from parents to their offspring, for instance by considering different breeds of dogs, and what happens when, for example, labradors are crossed with poodles. • They should also appreciate that variation in offspring over time can make animals more or less able to survive in particular environments, for example, by exploring how giraffes' necks got longer, or the development of insulating fur on the arctic fox. • Pupils might find out about the work of palaeontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution. • Pupils might **work scientifically** by: observing and raising questions about local animals and how they are adapted to their environment; comparing how some living things are adapted to survive in extreme conditions, for example, cactuses, penguins and camels. • They might analyse the advantages and disadvantages of specific adaptations, such as being on two feet rather than four, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers. Note: At this stage, pupils are not expected to understand how genes and chromosomes work. Substantive Knowledge: • I can recognise that characteristics are passed from parents to offspring. • I can identify how animals and plants have adapted to their environment in order to survive • I can understand how fossils form and how they can be used to give us information about living things that lived many years ago. • I can understand and explain Darwin's 'Theory of Evolution' giving examples to support my ideas. Disciplinary Knowledge: • I can plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • I can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • I can identify scientific evidence that has been used to support or refute ideas or arguments Common Misconceptions: • That evolution happens quickly and that individual species adapt rapidly to changes in their environment. This is not the case, evolution happens over time.

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	• Children think that if you believe in evolution then you can't believe in God; however many evolution scientists also believe in God and have a religious background. Just because you believe in one, doesn't mean you can't believe in the other. • Children may have heard that humans came from monkeys. Humans do belong to the same family as the great apes and the closest known living relative to Homo sapiens is the chimpanzee. However, this does not mean humans 'evolved from monkeys'. Humans share a common ape-like ancestor with old world monkeys and have very little connection to new world monkeys, which branched o the phylogenetic tree nearly 40 million years ago. Scientist Spotlight: Mary Leaky OR Mary Anning https://www.twinkl.co.uk/resource/tp2-s-273-planit-science-year-6-scientists-and-inventors-lesson-5-mary-leakey-lesson-pack https://explorify.uk/en/activities/who-is/mary-anning Cross Curricular Connections: Humanities (see topic drivers in UKS2 LTP)

DANE ROYD SCHOOL

CHEMISTRY – Everyday Materials	
Nursery	Continuous provision available throughout the year; - Creation Station - Construction zone - Loose-parts

CHEMISTRY – Everyday Materials	
Reception	Continuous provision available throughout the year; - Creation Station - Construction zone - Loose-parts Spr 1: - Recycle Station (plastic, paper, metal) - Effective boat design

CHEMISTRY – (Properties of) Everyday Materials	
Year 1	National Curriculum Statement: • Pupils should be taught to distinguish between an object and the material from which it is made • They should identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock • They should describe the simple physical properties of a variety of everyday materials • They should compare and group together a variety of everyday materials on the basis of their simple physical properties. Non-Statutory Guidance: • Pupils should explore, name, discuss and raise and answer questions about everyday materials so that they become familiar with the names of materials and properties such as: hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent. • Pupils should explore and experiment with a wide variety of materials, not only those listed in the programme of study, but including for example: brick, paper, fabrics, elastic, foil. • Pupils might **work scientifically** by performing simple tests to explore questions, for example: 'What is the best material for an umbrella? ...for lining a dog basket? ...for curtains? ...for a bookshelf? ...for a gymnast's leotard?' Substantive Knowledge: • I can distinguish between an object and the material from which it is made. • I can identify and name a variety of everyday materials, including; wood, plastic, glass, metal, water and rock. • I can describe the simple physical properties of everyday materials. Disciplinary Knowledge: • I can compare and group together a variety of everyday materials on the basis of their simple physical properties. Common Misconceptions: • 'Material' means fabric – material refers to the matter from which something is made. • If something is hard then it must be strong – glass is hard but very fragile. • If something is soft then it must be fragile - fabric is soft but can be strong. Scientist Spotlight: Charles Macintosh https://explorify.uk/en/activities/who-is/charles-macintosh Cross Curricular Connections: History 'Toys' topic & DT

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CHEMISTRY – (Uses of) Everyday Materials	
Year 2	National Curriculum Statement: • Pupils should be taught to distinguish between an object and the material from which it is made • They should identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock • They should describe the simple physical properties of a variety of everyday materials • They should compare and group together a variety of everyday materials on the basis of their simple physical properties. Non-Statutory Guidance: • Pupils should explore, name, discuss and raise and answer questions about everyday materials so that they become familiar with the names of materials and properties such as: hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent. • Pupils should explore and experiment with a wide variety of materials, not only those listed in the programme of study, but including for example: brick, paper, fabrics, elastic, foil. • Pupils might **work scientifically** by performing simple tests to explore questions, for example: 'What is the best material for an umbrella? …for lining a dog basket? …for curtains? …for a bookshelf? …for a gymnast's leotard?' Substantive Knowledge: • I can distinguish between an object and the material from which it is made. • I can identify and name a variety of everyday materials, including; wood, plastic, glass, metal, water and rock. • I can describe the simple physical properties of everyday materials. Disciplinary Knowledge: • I can compare and group together a variety of everyday materials on the basis of their simple physical properties. Common Misconceptions: • 'Material' means fabric – material refers to the matter from which something is made. • If something is hard then it must be strong – glass is hard but very fragile. • If something is soft then it must be fragile - fabric is soft but can be strong. Scientist Spotlight: Charles Macintosh https://explorify.uk/en/activities/who-is/charles-macintosh Cross Curricular Connections: History 'Toys' topic & DT

CHEMISTRY – (Changes of) Everyday Materials	
Year 5	National Curriculum Statement: • Pupils should be taught to: 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 change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. Non-Statutory Guidance:

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- Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism in year 3 and about electricity in year 4.
- They should explore reversible changes, including, evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes.
- Pupils should explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example, vinegar with bicarbonate of soda.
- They should find out about how chemists create new materials, for example, Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton.
- Pupils might **work scientifically** by: carrying out tests to answer questions, for example, 'Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?'
- They might compare materials in order to make a switch in a circuit.
- They could observe and compare the changes that take place, for example, when burning different materials or baking bread or cakes.
- They might research and discuss how chemical changes have an impact on our lives, for example, cooking, and discuss the creative use of new materials such as polymers, super-sticky and super-thin materials.

Note: Pupils are not required to make quantitative measurements about conductivity and insulation at this stage. It is sufficient for them to observe that some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them. Safety guidelines should be followed when burning materials.

Substantive Knowledge:

- I can recap my understanding of the three states of matter.
- I can define the terms soluble, insoluble, solute and solution.
- I can explain why different processes are used to separate certain materials.
- I can describe reversible and irreversible changes.

Disciplinary Knowledge:

- Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- Reporting and presenting 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
- Using test results to make predictions to set up further comparative and fair tests

Specific LO's:

- I can compare different materials based on their properties.
- I can investigate what makes a good insulator and a good conductor.
- I can carry out an enquiry about the solubility of materials.
- I can use different processes to separate materials.

Common Misconceptions:

- Children often use the word 'disappear' when describing dissolving, and teachers often think this is a misconception. However, children may be using the word 'disappear' to describe that they can no longer see it BUT understand that the substance is still in the liquid. It is important to ask the children what they mean by using the word 'disappear'. Whether they think that the soluble substance has gone (i.e. no longer in the water; this is a misconception) or they realise the substance is still in the liquid, but we can't see it. They need to be encouraged to use the word dissolved to accurately describe what happened.

Scientist Spotlight: Stephanie Kwolek

https://www.twinkl.co.uk/resource/science-scientists-and-inventors-stephanie-kwolek-and-materials-year-5-lesson-6-tp2-s-342

Cross Curricular Connections:

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CHEMISTRY – Rocks	
Reception	Sum 1 - Extinct animals, including fossils and the work of Mary Anning

CHEMISTRY – Rocks	
Year 3	National Curriculum Statement: • Pupils should be taught compare and group together different kinds of rocks on the basis of their appearance and simple physical properties • describe in simple terms how fossils are formed when things that have lived are trapped within rock • recognise that soils are made from rocks and organic matter. Non-Statutory Guidance: • Pupils should explore different kinds of rocks and soils, including those in the local environment. • Pupils might **work scientifically** by: observing rocks, including those used in buildings and gravestones, and exploring how and why they might have changed over time; using a hand lens or microscope to help them to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. • Pupils might research and discuss the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed. • Pupils could explore different soils and identify similarities and differences between them and investigate what happens when rocks are rubbed together or what changes occur when they are in water. They can raise and answer questions about the way soils are formed. Substantive Knowledge: • I can understand that rocks are formed in three different ways. • I can understand and explain how fossils are formed. Disciplinary Knowledge: • I can observe and compare different types of rock. • I can recognise and show that soils are made from rocks and organic matter. Common Misconceptions: • Children may think that all rocks are the same and all soils are the same. • Children may not know that rocks are formed over time, they might just think that they have always been there. • Children may not think that the Earth is made fully of different types of rock. • Children may struggle to grasp that the centre of the Earth is molten rock as they will only understand rocks as being hard and strong. Scientist Spotlight: William Smith https://www.twinkl.co.uk/resource/tp2-s-176-planit-science-year-3-scientists-and-inventors-lesson-3-william-smith-lesson-pack Cross Curricular Connections: Stone Age, Bronze Age, Iron Age Egyptian Pyramids

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CHEMISTRY – States of Matter	
Reception	Autumn 2 - Melting ice experiments Cross Curricular Connections – Food Technology

CHEMISTRY – States of Matter	
Year 4	National Curriculum Statement: • Pupils should be taught to: 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. Non-Statutory Guidance: • Pupils should explore a variety of everyday materials and develop simple descriptions of the states of matter (solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container). • Pupils should observe water as a solid, a liquid and a gas and should note the changes to water when it is heated or cooled. • Pupils might **work scientifically** by: grouping and classifying a variety of different materials; exploring the effect of temperature on substances such as chocolate, butter, cream (for example, to make food such as chocolate crispy cakes and ice-cream for a party). • They could research the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid. • They might observe and record evaporation over a period of time, for example, a puddle in the playground or washing on a line, and investigate the effect of temperature on washing drying or snowmen melting Note: Teachers should avoid using materials where heating is associated with chemical change, for example, through baking or burning. Substantive Knowledge: • I can understand the properties of solids, liquids and gases. • I can sort and describe materials based on their properties. • I can understand that some materials change state when they are heated or cooled. I can identify the part played by evaporation and condensation in the water cycle. I can associate the rate of evaporation with temperature. Disciplinary Knowledge: • I can investigate if all liquids (ketchups!) behave the same. • **I can make careful observations - expand** • **I can gather data - expand** • **I can communicate my results – noting similarities and differences - expand** • I can take accurate measurements using a thermometer. • I can plan and carry out a *fair test* to investigate if all liquids evaporate. • I can investigate the best way to evaporate water from clothes using a *comparative test.* Common Misconceptions: • Children may think that all gases smell. This is not true; some gases do smell but not all. • Children may confuse steam with water vapour. • Children may also think that clouds are a gas. This is not true; clouds are droplets of water that have condensed around dust • particles. • Children find condensation difficult to explain. It is important to point out everyday examples of condensation throughout the school year e.g. why is there water on the inside of the windows? How did the water get there? Scientist Spotlight: Lord Kelvin

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	https://www.twinkl.co.uk/resource/tp2-s-199-planit-science-year-4-scientists-and-inventors-lesson-4-absolute-zero-lesson-pack Cross Curricular Connections: Maths – reading instruments Food technology - viscosity and melting process Geography 'rainforests' topic – water cycle

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PHYSICS – Seasonal Changes	
Nursery & Reception	Throughout the academic year: Autumn Scavenger Hunt Harvest Festival Bonfire Night Halloween Christmas Easter Summer Cross Curricular Connections: First Aid – Sun safety

PHYSICS – Seasonal Changes	
Year 1	National Curriculum Statement: • Pupils should be taught to observe changes across the four seasons. • They should observe and describe weather associated with the seasons and how day length varies. Non-Statutory Guidance: • Pupils should observe and talk about changes in the weather and the seasons. • Pupils might **work scientifically** by: making tables and charts about the weather; and making displays of what happens in the world around them, including day length, as the seasons change. Substantive Knowledge: • I can identify the four seasons and describe associated weather trends. • I understand that day length varies. Disciplinary Knowledge: • I can use a range of equipment to gather information about the weather e.g. a thermometer and a rain gauge. Common Misconceptions: • It will snow at Christmas in the UK – it is statistically more likely to snow at Easter than Christmas in the UK. • Seasons are the same across the world – the Earth's tilted axis cause seasons. • It is safe to look directly at the sun if you are wearing sunglasses - Pupils should be warned that it is **NOT** safe! Scientist Spotlight: George James Symons https://www.twinkl.co.uk/resource/tp-sc-138-planit-science-year-1-scientists-and-inventors-lesson-4-measuring-the-weather-lesson-pack Cross Curricular Connections: Maths (time & temperature)

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PHYSICS – Earth & Space	
Nursery	Cycle A: Sum 1 - intorduce the children to the concept of planet earth (land and sea). Cycle B: Spr 2 - intorduce the children to the concept of planet earth (land and sea).

PHYSICS – Earth & Space	
Reception	Sum 2 – '3,2,1, Blast Off' topic

PHYSICS – Earth & Space	
Year 5	National Curriculum Statement: • Pupils should be taught to 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. Non-Statutory Guidance: • Pupils should be introduced to a model of the Sun and Earth that enables them to explain day and night. • Pupils should learn that the Sun is a star at the centre of our solar system and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006). • They should understand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones). • Pupils should find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy (lesson 3), Alhazen and Copernicus (lesson 3). • Pupils might **work scientifically** by: comparing the time of day at different places on the Earth through internet links and direct communication; creating simple models of the solar system; constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day; finding out why some people think that structures such as Stonehenge might have been used as astronomical clocks. Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses. Substantive Knowledge: • I can name and describe some features of the planets in our solar system. • I can explain why we know that the Earth is a spherical body • I can explain the movement of the Earth and other planets relative to the sun in the solar system. • I can explain the movement of the moon relative to the sun and Earth in the solar system. • I can explain how and why we experience day and night. • I can explain why we experience different seasons across a year. • I can describe the movement of the moon relative to the Earth. Disciplinary Knowledge: • Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • Identifying scientific evidence that has been used to support or refute ideas or arguments • Reporting and presenting 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 Common Misconceptions:

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	• When learning about the order of the planets based on the distance from the Sun, it is important that the children understand that the planets are orbiting around the Sun (they don't stay in a line from the Sun as often depicted) but the distance away from the Sun stays the same. When considering day and night, some children may think that the Sun disappears or goes behind a cloud. This is not true; day and night occur as the Earth is rotating on its axis. Because the Sun appears to move across the sky, it can be difficult for the children to comprehend that it is the Earth moving NOT the Sun. • Another common misconception by children is that the Moon actually changes shape (as this is what they observe from Earth) and that there is no gravity on the Moon (The Moon's mass is about 1.2% of the mass of the Earth which makes the gravity on the Moon 83.3% lower than that of the Earth). Some children may also think that the Moon 'disappears' in the daytime however it is still in the sky but the sunlight is too bright (much of the time) to see it. It is useful to have a globe in the classroom to reinforce the fact that the Earth is a spherical body. Scientist Spotlight: Mike deGrasse Tyson OR Maggie Aderin Pocock https://www.twinkl.co.uk/resource/science-scientists-and-inventors-the-solar-system-year-5-lesson-pack-4-tp2-s-335 https://explorify.uk/en/activities/who-is/maggie-aderin-pocock Cross Curricular Connections: Geography – Is the Earth flat? orange peel investigation

DANE ROYD SCHOOL

PHYSICS – Light	
Nursery	Cycle A & B: Aut 2 - Introducing the concept and vocabulary of shadows.

PHYSICS – Light	
Reception	Aut 1 (self-portrait) & Spr 2 (symmetry in nature) - Introducing the concept and vocabulary of reflection.

PHYSICS – Light	
Year 3	National Curriculum Statement: • Pupils should be taught to recognise that they need light in order to see things and that dark is the absence of light • notice that light is reflected from surfaces • recognise that light from the sun can be dangerous and that there are ways to protect their eyes • 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 Non-Statutory Guidance: • Pupils should explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them to answer questions about how light behaves. • They should think about why it is important to protect their eyes from bright lights. • They should look for, and measure, shadows, and find out how they are formed and what might cause the shadows to change. • Pupils might **work scientifically** by: looking for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes. Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses. Substantive Knowledge: • I can explain reflection. • I can identify reflective materials. • I can select the most reflective material for a purpose. • I can explain why mirrors are good reflectors. • I can explain the benefits and dangers of the sun. • I can explain about UV light and its dangers. • I can describe ways to protect our eyes from the sun. • I can explain how light travels. • I can sort different materials according to whether they are opaque, transparent or translucent. Disciplinary Knowledge: • I can investigate which surfaces reflect light. • I can use mirrors to reflect light onto different objects. • I can use a range of materials to investigate different shadows. Common Misconceptions: • Children may think that the Moon and other shiny/reflective objects are light sources as they appear to shine however, they are not. The Moon reflects light from the Sun (it does not give o- its own light) and cat's eyes, mirrors, reflective material on clothing also only reflect light (they are not light sources). • Children may think that you see things because light comes out of your eyes. • Misconceptions about shadows often centre around the position of the object, light source and shadow. The shadow always forms on the opposite side of the object from the light source; the shadow is a similar shape as the object and the base of the shadow always touches the object. Scientist Spotlight: Arthur Wilson https://www.twinkl.co.uk/resource/tp2-s-178-planit-science-year-3-scientists-and-inventors-lesson-5-concave-and-convex-lesson-pack

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	Cross Curricular Connections: Art (Stonehenge shadows)

PHYSICS: Light	
Year 6	National Curriculum Statement: • Pupils should be taught to 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. Non-Statutory Guidance: • Pupils should build on the work on light in year 3, exploring the way that light behaves, including light sources, reflection and shadows. • They should talk about what happens and make predictions. • Pupils might **work scientifically** by: deciding where to place rear-view mirrors on cars; designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works. • They might investigate the relationship between light sources, objects and shadows by using shadow puppets. • They could extend their experience of light by looking 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). Substantive Knowledge: • I can recognise how light travels. • I can distinguish between different sources of light explaining my reasoning. • I can 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 • I can identify different parts of the eye. • I can identify the functions of the eye which helps us to see. • I can explain how shadows are caused. • I can identify shadows based on the position of the sun. • I can explain how moving an object can change the size of a shadow. Disciplinary Knowledge: • I can carry out different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • I can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • I can 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 • I can identify scientific evidence that has been used to support or refute ideas or arguments Common Misconceptions: • Children may think that the moon and other shiny/reflective objects are light sources as they appear to shine however, they are not. The Moon reflects light from the Sun (it does not give off its own light) and cat's eyes, mirrors, reflective material on clothing also only reflect light (they are not light sources). • Children may think that you see things because light comes out of your eyes. • Misconceptions about shadows often centre around the position of the object, light source and shadow. The shadow always forms on the opposite side of the object from the light source; the shadow is a similar shape as the object and the base of the shadow always touches the object. Scientist Spotlight: Ibn Al-Haytham https://www.ibnalhaytham.com/wp-content/uploads/2015/10/iah-workshops.pdf Cross Curricular Connections:

	Maths – Reading & measuring angles & Art – light and shade, colour rainbows

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DANE ROYD SCHOOL

PHYSICS – Sound	
Nursery	Throughout the academic year: exploring a variety of musical instruments and singing.

PHYSICS – Sound	
Reception	Throughout the academic year: exploring a variety of musical instruments and learning to perform a variety of songs e.g. JIGSAW, Harvest, Christmas etc. Daily 'wake up shake up' Weekly singing assembly Weekly KAPOW music lessons Monthly musical artist of the month Half termly music appreciation

PHYSICS: Sound	
Year 4	National Curriculum Statement: • Pupils should be taught to identify how sounds are made, associating some of them with something vibrating • 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. Non-Statutory Guidance: • Pupils should explore and identify the way sound is made through vibration in a range of different musical instruments from around the world; and find out how the pitch and volume of sounds can be changed in a variety of ways. • Pupils might **work scientifically** by: finding patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses. • They might make earmuffs from a variety of different materials to investigate which provides the best insulation against sound. They could make and play their own instruments by using what they have found out about pitch and volume. Substantive Knowledge: • I can describe and explain sound sources and explain how sources of sound vibrate. • I can explain how different sounds travel and how vibrations change when a sound gets louder. Disciplinary Knowledge: • I can gather sound data from around school and answer relevant questions using simple scientific language. • I can explore ways to change the pitch of a sound and create an instrument to explain how it makes high and low sounds. • I can investigate how different materials alter sound. Common Misconceptions: • Children will often confuse volume with pitch. The vocabulary needs to be exemplified carefully (and frequently) to ensure correct usage. • You can see and hear a distant event at the same moment – this is not true. Light travels faster than sound (hence you see lightning then hear thunder even though they have occurred at the same time). • Hitting an object harder gives a higher pitch – this is not true; hitting an object harder will produce a louder sound as the vibrations created are stronger but won't affect the pitch. • Sound moves faster in air than in solids (air is "thinner" and forms less of a barrier) - this is not true. Sound moves faster through solids as the particles are closer to one other another. • As sound waves move, the air moves along with them. This is not true. The vibration is passed from air particle to the next air particle. Scientist Spotlight: Alexander Graham Bell https://www.twinkl.co.uk/resource/tp2-s-197-planit-science-year-4-scientists-and-inventors-lesson-2-alexander-graham-bell-lesson-pack

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	Cross Curricular Connections: Ukulele Music appreciation assemblies - interrelated dimensions

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DANE ROYD SCHOOL

PHYSICS – Forces & Magnets	
Nursery	Cycle A: Sum 2 - introducing the concept and vocabulary associated with magnets. Cycle B: Sum 1 - transport (cause and effect toys)

PHYSICS – Forces & Magnets	
Year 3	National Curriculum Statement: • Pupils should be taught to: compare how things move on different surfaces • notice that some forces need contact between two objects, but 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. Non-Statutory Guidance: • Pupils should observe that magnetic forces can act without direct contact, unlike most forces, where direct contact is necessary (for example, opening a door, pushing a swing). • They should explore the behaviour and everyday uses of different magnets (for example, bar, ring, button and horseshoe). • Pupils might **work scientifically** by: comparing how different things move and grouping them; raising questions and carrying out tests to find out how far things move on different surfaces and gathering and recording data to find answers their questions; exploring the strengths of different magnets and finding a fair way to compare them; sorting materials into those that are magnetic and those that are not; looking for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another; identifying how these properties make magnets useful in everyday items and suggesting creative uses for different magnets. Substantive Knowledge: • I can identify a force as being either a push or a pull. • I can sort magnetic and non-magnetic materials. Disciplinary Knowledge • I can investigate the effect friction has on objects moving on different surfaces. • I can investigate the strength of different magnets. Common Misconceptions: • Children may think that all metals are magnetic. This is false, as only iron, nickel and cobalt are magnetic. • Children might think that all silver-coloured objects are attracted to a magnet. This is not true, as aluminium is silver in colour but is not attracted to a magnet. • Children might think that bigger magnets are stronger than smaller magnets. This is not true, as the size of the magnet is not directly related to its strength. Scientist Spotlight: Scientists who discovered electromagnetism https://www.twinkl.co.uk/resource/tp2-s-179-planit-science-year-3-scientists-and-inventors-lesson-6-electromagnets-lesson-pack Cross Curricular Connections: PE

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PHYSICS – Forces & Magnets	
Year 5	National Curriculum Statement: • Pupils should be taught to 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. Non-Statutory Guidance: • Pupils should explore falling objects and raise questions about the effects of air resistance. • They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall. • They should experience forces that make things begin to move, get faster or slow down. • Pupils should explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel. • Pupils should explore the effects of levers, pulleys and simple machines on movement. • Pupils might find out how scientists, for example, Galileo Galilei (lesson 4) and Isaac Newton (lesson 2) helped to develop the theory of gravitation. • Pupils might **work scientifically** by: exploring falling paper cones or cup-cake cases, and designing and making a variety of parachutes and carrying out fair tests to determine which designs are the most effective. • They might explore resistance in water by making and testing boats of different shapes. • They might design and make products that use levers, pulleys, gears and/or springs and explore their effects. Substantive Knowledge: • I can identify and explain balanced and unbalanced forces. • I can explain the force of gravity • I can measure the force of gravity using a newton meter and describe the pattern between weight and mass. • I can identify and explain what friction is. • I can explore the effects of water resistance. • I can recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect. Disciplinary Knowledge • I can carry out different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • I can take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • I can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • I can 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 • I can identify scientific evidence that has been used to support or refute ideas or arguments Specific LO's: • I can carry out an investigation linked to gravity. • I can carry out an investigation linked to friction. • I can carry out an investigation linked to water resistance. • I can carry out an investigation linked to levers. Common Misconceptions: • The word 'force' can have different meanings in the English language e.g. may the force be with you… a forceful character. Many common uses of the word 'force' may give children the impression that it is intrinsic to human activity rather than a concept in physical science. • Children may also think that an object needs a constant force to keep it moving; this is true but only because of friction. • Children may think that forces only act in one direction.

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	Scientist Spotlight: see highlighted names above Cross Curricular Connections: PE

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DANE ROYD SCHOOL

PHYSICS: Electricity	
Year 4	National Curriculum Statement: • Pupils should be taught to 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. Non-Statutory Guidance: • Pupils should construct simple series circuits, trying different components, for example, bulbs, buzzers and motors, and including switches, and use their circuits to create simple devices. • Pupils should be taught about precautions for working safely with electricity. • Pupils might **work scientifically** by: observing patterns, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit. • Pupils should draw the circuit as a pictorial representation, not necessarily using conventional circuit symbols at this stage; these will be introduced in year 6. **Note: Pupils might use the terms current and voltage, but these should not be introduced or defined formally at this stage. Pupils should be taught about precautions for working safely with electricity.** Substantive Knowledge: • I can understand how electricity is generated and how to use it safely • I can identify everyday appliances and the electricity they use • I can construct a simple circuit and predict if it is complete or incomplete • I can recognise circuit symbols and draw circuits using these • I can identify a problem within a circuit • I can recognise the purpose of a switch within a circuit and build my own switch • I can recognise some common conductors and insulators and associate metals with being good conductors Disciplinary Knowledge: • Asking relevant questions and using different types of scientific enquiries to answer them • Setting up simple practical enquiries, comparative and fair tests • 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 • Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions Common Misconceptions: • When making their own circuits, it is a common error that the arms of the split pins touch at the back therefore allowing electricity to flow around the circuit. This would mean you wouldn't be able to turn the bulb on and off using the paper clip as a switch. It would just be constantly on. • Children may confuse thermal conductors and insulators with electrical conductors and insulators. Thermal means relating to heat. • Some children may think that electricity is only bought from a shop. Although batteries are, children need to be taught that mains electricity comes to our homes in cables from a PowerStation. • Children may think that the bigger the battery, the more electricity is contained in it and will make a bulb shine brighter. Although it is true to say a battery's voltage does affect the brightness of a bulb, the size of the battery isn't always related to the voltage e.g. a 1.5V battery can come in 4 different sizes. Scientist Spotlight: Garrett Morgan OR Thomas Edison and Lewis Latimer

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	https://www.twinkl.co.uk/resource/tp2-s-286-science-scientists-and-inventors-garrett-morgan-year-4-lesson-pack-4 https://www.twinkl.co.uk/resource/tp2-s-200-planit-science-year-4-scientists-and-inventors-lesson-5-thomas-edison-lesson-pack Cross Curricular Connections: Computing/iPads

PHYSICS - Electricity	
Year 6	National Curriculum Statement: • Pupils should be taught to 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. Non-Statutory Guidance: • Building on their work in year 4, pupils should construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors. • They should learn how to represent a simple circuit in a diagram using recognised symbols. • Pupils should be taught to take the necessary precautions for working safely with electricity. • Pupils might **work scientifically** by: systematically identifying the effect of changing one component at a time in a circuit; designing and making a set of traffic lights, a burglar alarm or some other useful circuit. Note: Pupils are expected to learn only about series circuits, not parallel circuits Substantive Knowledge: • I can name and list common appliances which run on electricity. • I can identify how electricity powers appliances. • I can identify the scientific symbols for the components of a circuit. • I can draw a picture of a circuit using the correct symbols. Disciplinary Knowledge: • I can carry out different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • I can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • I can 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 Specific LO's: • I can predict whether an electrical circuit will function and suggest ways of improving it. • I can investigate the effect of changing the number of bulbs and the voltage of the cells. • I can describe the effect of changing the number and voltage of cells in an electrical circuit. Common Misconceptions: • When adding several components to a circuit, children may think that the bulb is the brightest or the first buzzer makes the most noise. This misconception often arises from the idea that electricity comes out of the battery so the first is the brightest and the last is the dimmest. In fact, all the bulbs would be the same level of brightness (the electricity is 'shared' between the components). • When making a circuit with different coloured wires, the children may 'wrongly' assume that the different coloured wires have different properties. • Children may think that the bigger the battery, the more electricity is contained in it and will make a bulb shine brighter. Although it is true to say a battery's voltage does affect the brightness of a bulb, the size of the battery isn't always related to the voltage e.g. a 1.5V battery can come in 4 different sizes. Scientist Spotlight: Steve Jobs OR Haydn Francis

	https://www.twinkl.co.uk/resource/tp2-s-274-planit-science-year-6-scientists-and-inventors-lesson-6-steve-jobs-lesson-pack https://explorify.uk/en/activities/who-is/haydn-francis Cross Curricular Connections: Computing

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