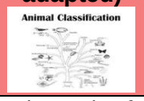
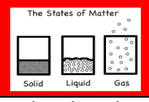
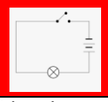
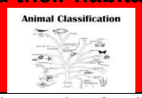
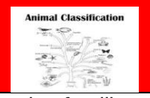
KS1 – Hazel (Year 1 & 2) Milestone 1				
Cycle A 2020-2021	**Autumn**	**Spring**	**Summer**	
Breadth **(Year group relates to NC PoS)**	**Seasonal changes (Y1)** (In future, this will be an ongoing topic all year.) 	**Uses of everyday materials (Y2 - adapted)** 	**Plants (Y1/Y2)** 	**Living things and their habitats (Y2 - adapted)** 
Threshold concept	This concept involves understanding what causes seasonal changes, day and night.	This concept involves becoming familiar with a range of materials, their uses and how they may be altered or changed.	This concept involves becoming familiar with different types of plants, their structure and reproduction.	This concept involves becoming familiar with a wider range of living things, including insects and understanding life processes.
Knowledge *Items in italics are not statutory in the National Curriculum*	• *Observe the apparent movement of the Sun during the day.* • Observe changes across the four seasons. • Observe and describe weather associated with the seasons and how day length varies.	• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick/rock, and paper/cardboard for particular uses. • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	• Identify and name a variety of common plants, including garden plants, wild plants and trees and those classified as deciduous and evergreen. • Identify and describe the basic structure of a variety of common flowering plants (including trees) including roots, stem/ trunk, leaves and flowers. • Observe and describe how seeds and bulbs grow into mature plants. • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	• Explore and compare the differences between things that are living, that are dead and that have never been alive. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants and how they depend on each other. • Identify and name a variety of plants and animals in their habitats, including micro-habitats. • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.
Skills	• Use observations and ideas to suggest answers to questions. • Gather and record data to help in answering questions.	• Make suggestions of what may happen in an investigation. • Perform simple investigations to test out ideas.	• Sort, group and classify by difference / similarity. • Use observations and ideas to suggest answers to questions. • Observe closely & use equipment to measure. • Take part in simple fair tests.	• Identify and classify.
Working scientifically Pupils should be taught to use these practical scientific methods, processes and skills through the teaching of the threshold concepts.	• Monitor temperature outside using a thermometer and compare over a length of time. Record results in a basic table.	• Suitability test – which material is best for a toy boat? Which material is best to keep an egg safe and undamaged? Which material is best for a protective tower / turret? • Fair test – does the thickness of a rubber hand affect its stretching ability? Hang weights (bungee jumping). • Predicting – which materials can be changed? Children to observe materials closely and then decide whether their shape can be changed. Explain why. Look at how some of the same materials differ in their ability to change shape e.g. metal cans can be squashed but a metal table leg cannot.	<u>Year 1</u> • Use magnifying lenses to observe closely and explore, compare and contrast familiar plants. • Keep records of how a plant changes over time e.g. leaves falling off trees; buds opening; plant growth; a seed sprouting. • Plant beans or grow your own sunflowers. • Make labelled drawings of observations. • Measure length / height of observations e.g. of beans / sunflowers. <u>Year 2</u> • Measure, with some accuracy, the growth of plants children have grown. Record results in a table. • Investigate and observe plants growing in different conditions (light, temperature, water, soil, etc.) • Plant seeds and count seeds that germinate, observe results. Record in a table or block chart.	• Sort and classify things into groups of living, dead or were never alive. Identify misconceptions e.g. is a flame alive? Is a deciduous tree dead in the winter? Is a robot alive? • Construct simple food chains that include humans (e.g. grass – cow – human). Use images and find out who eats who (matching game). • Collect data of which animals are found in different habitats / microhabitats. Make predictions based on the conditions. • Construct a basic classification key based on animals found in the local environment.
Key vocabulary	Season, autumn, winter, spring, summer, sun, light, day, night, year, month, week, fortnight, weather, forecast, temperature, hot, cold, cool, warm, cloud, sleet, snow, blizzard, freezing, frost, ice, hail, rain, rainfall, mist, fog, wind, thunder, lightning, storm, air, environment.	Material, material types (e.g. wood, plastic, wool, metal, glass, cotton, paper, cork, brick, rock, sand, fabric, etc.), manufactured, man-made, waterproof, hard, soft, flexible, stretch, bend, twist, squash, shiny, dull, warm, cold, strong, weak, magnetic, non-magnetic, absorbent, non-absorbent, transparent, opaque, translucent.	Plant, roots, stem, trunk, branches, leaf / leaves, flower (petals), fruit, bulb / tuber, seed, bud, evergreen, deciduous, grow, germination, seedling, water, light, temperature, reproduction, vegetables, variety of common plant names (e.g. bluebell, daisy, clover, dandelion, oak, acorn, bean.)	Living, dead, non-living, movement, respiration, sensitivity, nutrition, excretion, reproduction, growth, habitat, microhabitat, adapted, conditions, light, temperature, climate, water, humidity, survival, food chain, energy, producer, consumer, herbivore, omnivore, carnivore.
Scientists to consider	Look at meteorologists and weather reports on news channels.	John Boyd Dunlop; Alexander Parkes; Joseph Aspdin; Leo Baekeland; Charles Macintosh.	Agnes Arber; David Bellamy; Joseph Banks; Joseph Hooker	

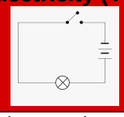
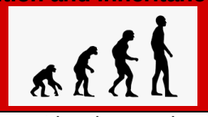
KS1 – Birch (Year 1) Milestone 1			
Cycle B 2021-2022	**Autumn**	**Spring**	**Summer**
	Seasonal Changes will run across the year (see Cycle A)		
Breadth **(Year group relates to NC PoS)**	**Animals including humans (Y1)** 	**Everyday materials (Y1)** 	**Plants (Y1)**
Threshold concept	This concept involves becoming familiar with different types of animals, and humans.	This concept involves becoming familiar with a range of materials and their properties.	This concept involves becoming familiar with different types of plants, their structure and reproduction.
Knowledge	• Identify and name a variety of common animals that are birds, fish, amphibians, reptiles, mammals and invertebrates. • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. • Describe and compare the structure of a variety of common animals (birds, fish, amphibians, reptiles, mammals and invertebrates, including pets). • Identify name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	• Distinguish between an object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock. • Describe the simple physical properties of a variety of everyday materials. • Compare and group together a variety of everyday materials on the basis of their simple physical properties.	• Identify and name a variety of common plants, including garden plants, wild plants and trees and those classified as deciduous and evergreen. • Identify and describe the basic structure of a variety of common flowering plants (including trees) including roots, stem/ trunk, leaves and flowers.
Skills	• Sort, group and classify by difference or similarity.	• Sort, group and classify by difference or similarity. • Perform simple tests / investigations. • Make observations and suggest answers to questions.	• Sort, group and classify by difference / similarity. • Use observations and ideas to suggest answers to questions. • Observe closely & use equipment to measure.
Working scientifically	Use the local environment throughout the year to: • Use magnifying glasses to observe closely and explore, compare and contrast minibeasts found in school grounds / Forest School area. • Use a Venn diagram to sort animal types / diets. Use two large hoops and labels first to model. • Use their senses to compare different textures, sounds and smells.	• Use a table to sort everyday materials into man-made and natural. • Group objects with the same properties. • Compare the materials they are made from. • Perform investigations to find the most appropriate material for an object e.g. 'What is the most suitable material for … a rainy day outfit; curtains; an egg basket; a superhero's cape; a gymnast's leotard etc.'	Use the local environment throughout the year to: • Use magnifying lenses to observe closely and explore, compare and contrast familiar plants. • Keep records of how a plant changes over time e.g. leaves falling off trees; buds opening; plant growth; a seed sprouting. • Use raised beds / polytunnel to grow flowers / vegetables / herbs e.g. salad leaves, peas, tomatoes, marigolds. • Make drawings / simple diagrams of the parts of different plants / trees.
Key vocabulary	Animals, human, fish, reptile, amphibian, bird, mammal, invertebrate, insect, carnivore, omnivore, herbivore, feathers, wings, scales, fur, hair, backbone, touch, taste, smell, hear, sight, eyes, nose, nostrils, mouth, tongue, ears, face, leg, foot, ankle, knee, toe, arm, hand, finger, thumb, head, neck, elbows, environment, habitat, hot, cold, dry, moist, climate, consumer, food chain, pets, wild.	Materials, object, similarity, difference, properties, solid, hard, stiff, bendy, squashing, twisting, stretching, elastic, flexible, not bendy, rigid, soft, shiny, dull, rough, smooth, waterproof, not waterproof, absorbent, not absorbent, transparent, opaque, metal, plastic, glass, brick, rock, paper, fabric, foil, elastic, wood, man-made, natural, manufactured.	Plant, tree, roots, stem, trunk, branches, leaf / leaves, flowers (blossom), petals, fruit, seed, bulb, bud, evergreen, deciduous, grow, seedling, water, light, temperature, reproduction, vegetables, variety of common plant names (e.g. birch, buttercup, bluebell, daisy, clover, dandelion, oak, acorn, bean.)
Scientists to consider	Charles Darwin; David Attenborough; Steve Irwin.	Robert Hooke	Agnes Arber; David Bellamy; Joseph Banks; Joseph Hooker

LKS2 – Rowan and Maple (Year 3 & 4) Milestone 2						
Cycle A 2020-2021	**Autumn**		**Spring**		**Summer**	
Breadth **(Year group relates to NC PoS)**	**Sound (Y4)** 	**States of matter (Y4)** 	**Forces and magnets (Y3)** 	**Electricity (Y4)** 	**Animals including humans (Y4)** 	**Plants (Y3)**
Threshold concept	This concept involves understanding how sound is produced, how it travels and how it is heard.	This concept involves becoming familiar with a range of materials, their uses and how they may be altered or changed.	This concept involves understanding what causes motion.	This concept involves understanding circuits and their role in electrical applications.	This concept involves becoming familiar with different types of animals, humans and the life processes they share.	This concept involves becoming familiar with different types of plants, their structure and reproduction.
Knowledge	• 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.	• 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 the temperature at which this happens in degrees Celsius (°C), building on their teaching in maths. • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	• 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.	• 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.	• 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.	• Identify and describe the functions of different parts of flowering plants: roots, stem, 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 role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.
Skills	• Make predictions. • Draw simple conclusions from test results.	• Take accurate measurements using a thermometer. • Report on findings from enquiries.	• Record findings through simple drawings and diagrams which include scientific labels. • Use straightforward, scientific evidence to answer questions or to support their findings.	• Record findings using simple scientific language and labelled diagrams.	• Set up simple investigations. • Draw simple conclusions from investigations.	• Identify differences, similarities and/or changes. • Gather, record, and present data in a variety of ways.
Working scientifically Pupils should be taught to use these practical scientific methods, processes and skills through the teaching of the threshold concepts.)	• Investigate if there is a correlation between volume and the size of vibrations. • Make a paper cup telephone- investigate how the sound travels depending on how pulled or relaxed the string is. • Predict and measure different volumes using datalogger. • Investigate how sounds change the further away from the source you are. • Find patterns in sounds that are made by the same object but	• Explore and observe water in its 3 states of matter. • Investigate the temperature in which materials change state. • Observe and record evaporation over period of time e.g. puddle in the playground. • Fair tests - Which materials dry the fastest? How does the temperature / surface area / substance affect the speed of evaporation (salt water, ink)? What makes an ice cube melt in the quickest time?	• Investigate which materials are magnetic / non-magnetic. Make predictions. • Make a game that includes a magnet e.g. fishing for treasure / guiding a magnetic counter through a maze. Think about what materials to use and why (possible DT link). • Fair tests - What happens to the distance an object can be moved when we increase the push force? Which materials weaken a magnet? (place materials between magnet and paper clip). How much weight can a fridge magnet hold?	• Predict whether a circuit will work or not. Observe patterns in circuits e.g. Does the bulb get brighter if more cells are added? • Investigate materials as insulators or conductors of electricity – does the electricity flow through the material or not?	• Investigate how different drinks affect the look and health of our teeth (use boiled eggs and look at the shells). • Investigate what happens if we don't clean our teeth. Cover eggs in fluoride toothpaste and others not. Place in sugary drinks. Compare the differences. • Use litmus paper to test the acid / sugar in different drinks. • Investigate if the surface area of food affects the speed of digestion in the stomach. Use different sized	• Compare the effect of different factors on plant growth, e.g. the amount of light / fertiliser. • Look for patterns in the structure of fruits that relate to how the seeds are dispersed. • Investigate - does grass grow better in wetter / lighter / warmer conditions? Grow grass seeds in trays (soil). Vary air conditions (covering bag) and nutrients (soluble NPK fertiliser). Does the amount of water provided affect the growth of plants e.g. no. of cress seeds germinated?

	different size (e.g. elastic bands, saucepan lids) and patterns in sounds made from different objects. • Investigate which materials are best insulators of sounds – design a pair of earmuffs?				jelly babies (cut up) and dissolve in white wine vinegar. Measure the time taken to dissolve. • Classify plants / animals from local habitat into feeding types. Organise into food chains / webs.	
Key vocabulary	Sound, volume, pitch, vibration, medium, conduct, conductor, insulate, insulator, amplify, tuning fork, decibel, high, low, natural, man-made, echo, vacuum, sound waves, sonar, sound proof, outer ear, auditory canal, ear drum, cochlea, auditory nerve, voice box, vocal chords, larynx, tongue, hammer, anvil, stirrup.	Solid, liquid, gas, vapour, particles, characteristic, thermometer, temperature, degrees, Celsius, heating, cooling, melting, freezing, solidifying, liquidising, change of state, matter, energy, water cycle, evaporation, condensation.	Force, push, pull, magnetic, non-magnetic, north pole, south pole, repel, attract, surface, strength, pattern, resistance, contact, direct, distance, gravity.	Electricity, energy, source, renewable, non-renewable, circuit, component, battery / cell, bulb, buzzer, motor, series, connector / wire, switch, conductor, insulator.	Teeth, incisor, canine, molar, pre-molar, acid, bacteria, plaque, enamel, digestion, mouth, tongue, salvia, gullet (oesophagus), stomach, small intestine, large intestine, anus (liver / pancreas), food chain, producer, consumer, predator, prey, carnivores, herbivores, omnivores.	Grow, seed, bulb, leaf, root, stem, flower (petals, sepals, stamens, ovary, pollen, eggs), fruit, formation, germination, seedling, water, transported, temperature, nutrients, light, reproduction, soil, pollination (wind, insect), fertilisation, seed, dispersal.
Scientists to consider	Galileo Galilei; Christian Doppler; Guglielmo Marconi; Alexander Graham Bell	Anders Celsius	Isaac Newton; Michael Faraday	Benjamin Franklin; James Joule	Weston Price; William Beaumont	George Washington Carver; David Bellamy

KS1 / LKS2 – Hazel (Year 2 & 3) Milestones 1 & 2				
Cycle B 2021-2022	**Autumn**		**Spring**	**Summer** **This unit will be adapted for Year 2/3**
Breadth **(Year group relates to NC PoS)**	**Light (Y3)** 	**Rocks, soils and fossils (Y3)** 	**Animals including humans (Y2 / 3 - adapted)** 	**Living things and their habitats (Y4 - adapted)** 
Threshold concept	This concept involves understanding how light and reflection affect sight.	This concept involves becoming familiar with a range of materials, their uses and how they may be altered or changed.	This concept involves becoming familiar with different types of animals, humans and the life processes they share.	This concept involves becoming familiar with a wider range of living things, including insects and understanding life processes.
Knowledge *Items in italics are not statutory in the National Curriculum*	• 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 a solid object. • Find patterns in the way that the size of shadows change.	• Compare and group together different kinds of rocks on the basis of their simple, physical properties. • *Relate the simple physical properties of some rocks to their formation (igneous or sedimentary).* • Describe in simple terms how fossils are formed when things that have lived are trapped within sedimentary rock. • Recognise that soils are made from rocks and organic matter.	• Notice that animals, including humans, have offspring which grow into adults. • Investigate and describe the basic needs of animals, including humans, for survival (water, food, and air). • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. • Identify that animals, including humans, need the right types and amounts of nutrition, and that they cannot make their own food and they get nutrition from what they eat. • Identify that humans and some animals have skeletons and muscles for support, protection and movement.	• 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 specific habitats.
Skills	• Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables.	• Identify differences, similarities or changes related to simple, scientific ideas and processes. • Set up simple, practical enquiries and comparative and fair tests.	• Ask simple questions. • Gather and record data to help in answering questions. • Research and record information from observations and a range of media.	• Ask and answer questions through observations and research. • Classify and present data in a variety of ways.
Working scientifically	• Explore shadows – notice how the shadow is a similar shape to the object. Predict and sketch the shape of the shadow. • At what time of day will my shadow be the largest/smallest? Draw around shadows outside with chalk at different times of the day. Make predictions. • Investigate what happens to shadows when the direction or distance of the light source changes. • Use datalogger app (Lux meter) to measure reflected light energy.	• Investigate (predict and observe) characteristics of rocks. e.g. porous / permeable – add droplet of water onto rock samples and time how long it takes to disappear/hardness – scratch the surface with a nail. • Use hand lenses or microscope to help identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. Use to look closely at soil. Observe and draw what is seen.	<u>Year 2</u> • Ask questions to find out what animals need to survive and what humans need to stay healthy. • Create bar / block charts to show information. Example investigative questions: Which drinks contain the most sugar? How many fruit and vegetables have you had each day? Which exercise is the best to keep us healthy? <u>Year 3</u> • Identify and group animals with and without skeletons and observe and compare their movements. Subgroup from this. • Explore what would happen if humans did not have skeletons. • Compare and contrast images of skeletons belonging to different animals. • Research the diets of different animals and compare and contrast (this could include humans). Record findings in a table or a report. • Draw bar charts to present and compare the food content e.g. Which drinks have the most sugar in them? Which yoghurt has the most protein?	• Ask and answer questions based on observations of animals. • Explore the ideas of what would happen if we changed the habitat e.g. cut grass, overgrown pond, rubbish, etc. Make predictions. • Classify animals and plants using a range of classification keys. • Collect a range of invertebrates from Forest School. Use magnifying lenses or magnifying containers to identify fine features. • Use Woodland Trust resources to identify different trees based on their leaves.
Key vocabulary	Light, dark(er/est), bright(er/est), dim, dull, shiny, travel; direction, straight line, distance, opaque, transparent, translucent, reflect, reflective, reflection, surface, sun; source, protect, damage, eyes, shadow, object, absence, solid, block, visibility, artificial, natural, patterns, shape, torch, candle, lamp.	Igneous rocks: basalt, fire opal, granite, obsidian, pumice. Sedimentary rocks: amber, limestone, coal, sandstone, rock salt, siltstone, flint, chalk. Metamorphic rocks: marble, slate, soapstone, quartzite. Rock, soil, appearance, hardness, rough, grain, crystal, particle, permeable, impermeable, porous, rock cycle, bedrock, weathering, erosion, organic, molten, lava, volcano, fossil, layers, pressure, organic matter, Moh's scale (measures rock hardness).	Human, animals, life cycle, growth, young, offspring, parent, baby, toddler, child, teenager, adult, elderly, mature, water, air, oxygen, food, nutrients, diet (balanced/unbalanced /poor/healthy/unhealthy), variety, exercise, fitness, heart rate, pulse, blood, healthy, unhealthy, germs, viruses, bacteria, diseases, parasites, bugs, infection, hygiene, cleanliness, medicine, safety, obesity, starvation, carbohydrates and fats (food for energy/activity), protein (foods for growth, vitamins, minerals and fibre (foods for health), wholegrain, dairy, energy, sugars, calories, food pyramid, carnivore, omnivore; herbivore, vegetarian, vegan, pescatarian, skeleton, protection, support, movement, organ, muscles, function, vertebrate, invertebrate, relax, contract, examples of bones and muscles.	Environment, habitat, microhabitat, key, classification (genus, species), (binomial name), animal, vertebrate, fish, amphibian, reptile, bird, mammal, invertebrate, snails, slugs, spiders, woodlice, insects, worms, plants, trees, flowering plants (grasses, etc.), non-flowering plants (conifers, ferns, mosses.)
Scientists to consider	Ibn al-Haytham	Mary Anning; Charles Lyell; James Hutton	James Lind; Louis Pasteur; Edward Jenner; Jamie Oliver; World Health Organisation; Wilhelm Roentgen	Rachel Carson; David Attenborough; Ernst Mayr; Guy Stewart Callendar.

LKS2 – Maple (Year 3 & 4) Milestone 2				
Cycle B 2021-2022	**Autumn**		**Spring**	**Summer**
Breadth **(Year group relates to NC PoS)**	**Light (Y3)** 	**Rocks, soils and fossils (Y3)** 	**Animal including humans (Y3)** 	**Living things and their habitats (Y4)** 
Threshold concept	This concept involves understanding how light and reflection affect sight.	This concept involves becoming familiar with a range of materials, their uses and how they may be altered or changed.	This concept involves becoming familiar with different types of animals, humans and the life processes they share.	This concept involves becoming familiar with a wider range of living things, including insects and understanding life processes.
Knowledge *Items in italics are not statutory in the National Curriculum*	• 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 a solid object. • Find patterns in the way that the size of shadows change.	• Compare and group together different kinds of rocks on the basis of their simple, physical properties. • *Relate the simple physical properties of some rocks to their formation (igneous or sedimentary).* • Describe in simple terms how fossils are formed when things that have lived are trapped within sedimentary rock. • Recognise that soils are made from rocks and organic matter.	• Identify that animals, including humans, need the right types and amounts of nutrition, and that they cannot make their own food and they get nutrition from what they eat. • Identify that humans and some animals have skeletons and muscles for support, protection and movement.	• 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 specific habitats.
Skills	• Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables.	• Identify differences, similarities or changes related to simple, scientific ideas and processes. • Set up simple, practical enquiries and comparative and fair tests.	• Research and record information from observations and a range of media. • Gather and record data to answer a question.	• Ask and answer questions through observations and research. • Classify and present data in a variety of ways.
Working scientifically	• Explore shadows – notice how the shadow is a similar shape to the object. Predict and sketch the shape of the shadow. • At what time of day will my shadow be the largest/smallest? Draw around shadows outside with chalk at different times of the day. Make predictions. • Investigate what happens to shadows when the direction or distance of the light source changes. • Use datalogger app (Lux meter) to measure reflected light energy.	• Investigate (predict and observe) characteristics of rocks. e.g. porous / permeable – add droplet of water onto rock samples and time how long it takes to disappear/hardness – scratch the surface with a nail. • Use hand lenses or microscope to help identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. Use to look closely at soil. Observe and draw what is seen.	• Explore what would happen if humans did not have skeletons. • Identify and group animals with and without skeletons and observe and compare their movements. Subgroup from this. • Research the diets of different animals and compare and contrast (this could include humans). Record findings in a table or a report. • Compare and contrast images of skeletons belonging to different animals. • Draw bar charts to present and compare the food content e.g. Which drinks have the most sugar in them? Which yoghurt has the most protein?	• Ask and answer questions based on observations of animals. • Explore the ideas of what would happen if we changed the habitat e.g. cut grass, overgrown pond, rubbish, etc. Make predictions. • Classify animals and plants using a range of classification keys. • Collect a range of invertebrates from Forest School. Use magnifying lenses or magnifying containers to identify fine features. • Use Woodland Trust resources to identify different trees based on their leaves.
Key vocabulary	Light, dark(er/est), bright(er/est), dim, dull, shiny, travel; direction, straight line, distance, opaque, transparent, translucent, reflect, reflective, reflection, surface, sun; source, protect, damage, eyes, shadow, object, absence, solid, block, visibility, artificial, natural, patterns, shape, torch, candle, lamp.	Igneous rocks: basalt, fire opal, granite, obsidian, pumice Sedimentary rocks: amber, limestone, coal, sandstone, rock salt, siltstone, flint, chalk. Metamorphic rocks: marble, slate, soapstone, quartzite. Rock, soil, appearance, hardness, rough, grain, crystal, particle, permeable, impermeable, porous, rock cycle, bedrock, weathering, erosion, organic, molten, lava, volcano, fossil, layers, pressure, organic matter, Moh's scale (measures rock hardness).	Nutrition, nutrients, diet (balanced/unbalanced /poor/healthy/unhealthy), carbohydrates and fats (food for energy/activity), protein (foods for growth, vitamins, minerals and fibre (foods for health), wholegrain, dairy, water, energy,; food pyramid, carnivore, omnivore; herbivore, vegetarian, vegan, pescatarian, skeleton, protection, support, movement, organ, muscles, function, vertebrate, invertebrate, relax, contract, examples of bones and muscles.	Environment, habitat, microhabitat, key, classification (genus, species), (binomial name), animal, vertebrate, fish, amphibian, reptile, bird, mammal, invertebrate, snails, slugs, spiders, woodlice, insects, worms, plants, trees, flowering plants (grasses, etc.), non-flowering plants (conifers, ferns, mosses.)
Scientists to consider	Ibn al-Haytham	Mary Anning; Charles Lyell; James Hutton	Jamie Oliver; World Health Organisation; Wilhelm Roentgen	Rachel Carson; David Attenborough; Ernst Mayr; Guy Stewart Callendar.

Oak – UKS2 (Year 5 & 6) Milestone 3					
Cycle A 2020-21	**Autumn**		**Spring**	**Summer**	
Breadth **(Year group relates to NC PoS)**	**Properties & changes of materials (Y5)**	**Forces (Y5)**	**Electricity (Y6)** 	**Animals including humans (Y6)**	**Evolution and inheritance (Y6)** 
Threshold concept	This concept involves becoming familiar with a range of materials, their uses and how they may be altered or changed.	This concept involves understanding what causes motion.	This concept involves understanding circuits and their role in electrical applications.	This concept involves becoming familiar with different types of animals, humans and the life processes they share.	This concept involves understanding that organisms come into existence, adapt, change and evolve, and become extinct.
Knowledge *Items in italics are not statutory in the National Curriculum*	• Understand how 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. • 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, oxidisation and the action of acid on bicarbonate of soda.	• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. • Identify the effect of drag forces, such as air resistance, water resistance and friction that act between moving surfaces. • *Describe, in terms of drag forces, why moving objects that are not driven tend to slow down.* • *Understand that force and motion can be transferred through mechanical devices such as gears, pulleys, levers and springs.* • Understand that some mechanisms including levers, pulleys and gears, allow a smaller force to have a greater effect.	• 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.	• Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. • Recognise the importance of diet, exercise, drugs and lifestyle on the way the human body functions. • Describe the ways in which nutrients and water are transported within animals, including humans.	• 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.
Skills	• Plan enquires and control variables where necessary. • Use appropriate techniques and apparatus.	• Take measurements using a Newtonmeter (force meter). • Repeat reading for increased accuracy. • Use detailed diagrams to demonstrate a scientific idea.	• Take measurements using a voltmeter / ammeter. • Plan scientific enquiries to answer questions – control variables where necessary. • Use diagrams to demonstrate science.	• Take measurements with increasing accuracy and precision. • Record data and results in tables, bar and line graphs.	• Use simple models to describe scientific ideas.
Working scientifically Pupils should be taught to use these practical scientific methods, processes and skills through the teaching of the threshold concepts.	• Observe and compare the changes that take place when burning different materials or baking bread or cakes. • Make predictions and observe what will happen when: rubbish is burned; acid is mixed with calcium carbonate (acid on limestone); metal coins are mixed with baking soda and vinegar; Mentos are added to cola; baking soda added to vinegar). • Investigate how changing variables affects the time taken for sugar to dissolve in hot water. • Investigate which materials form solutions and which form mixtures (e.g. water, sand, salt, oil, coffee, flour, etc.)	• Investigate forces in action (e.g. which surfaces involve the most friction? (sliding toy cars / shoes down a ramp on different surfaces). Use force meters. • Design parachutes to safely land eggs – draw conclusions from the winner / loser (possible DT link). • Make different shaped boats and test resistance in water (possible DT link). • Fair test: How does the height at which we drop a ball affect the height of its bounce?	• Investigate the effect of changing one component at a time in a circuit. How do we change the brightness of a bulb? How do we change the volume of a buzzer? • Problem solve incorrectly set up circuits. • Investigate materials that are good conductors and insulators of electricity. Measure with voltmeter / ammeter. • Experiment with home-made batteries (tomato / lemon juice / potato). • Measure the voltage or brightness of LED bulb. • Measure Voltage (Voltmeter) & possibly current (Ammeter) at different points. Create line graph. • Investigate if the current/voltage changes if the length of a wire/graphite rod increases.	• What happens to our pulse rate when we do different exercises? Use pulse sensor during exercise. • How quickly do we recover after harder exercise /more exertion? Use different numbers of squat thrusts. Compare recovery rate across class. • What happens to our breathing rate / volume when we exercise? Measure over time.	• Replicate Darwin's finches and use different types of apparatus to replicate beaks and see which 'food' they can pick up best. What does this show us? • Explore the idea of camouflage on predation. Use coloured counters on grass – which colour was most picked up in 15 seconds? Develop the concept of 'natural selection'.
Key vocabulary	Material (types), properties (types), solid, liquid, gas, solution, mixture, particle, energy, dissolve (solute, solvent, soluble, solubility, saturation), filtering, sieving, evaporating, reversible, irreversible.	Force, contact, non-contact, push, pull, movement, surface, friction force, air resistance, gravity water resistance, buoyancy, up-thrust, force arrow, spring, accelerate, deaccelerate, Newton, Newton meter / force meter, mass, weight, lever, pulley, gear, mechanism.	Circuit, electricity, energy, cell, battery, positive terminal, negative terminal, voltage (V), current, wire, insulator, conductor, resistance, filament, lamp, buzzer, motor, switch, series, Voltmeter, Ammeter.	Organs (various), circulatory system, circulation, blood, plasma, red blood cells, oxygenated, deoxygenated, exchange, artery, vein, heart, heart chambers, pulse, recovery time, drugs (various), alcohol, nicotine, tar.	Fossil, extinction, variation, inheritance, feature, adaptation (various), species, natural selection, evolution.
Scientists to consider		Sir Isaac Newton; Galileo Galilei	Joseph Swan; Michael Faraday; Thomas Edison; Allesandro Volt	William Harvey; Christian Barnard; Magdi Yacoub; Gertrude Elion	Mary Anning; Charles Darwin; Alfred Wallace

UKS2 – Rowan (Year 5) Milestone 3					
Cycle B 2021-2022	**Autumn**		**Spring**		**Summer**
Breadth **(Year group relates to NC POS)**	**Light (Y6)** 	**Earth and Space (Y5)** 	**Properties & changes of materials (Y5)** 	**Animals including humans (Y5)** 	**Living things and their habitats (Y5)**
Threshold concept	This concept involves understanding how light and reflection affect sight.	This concept involves understanding what causes seasonal changes, day and night.	This concept involves becoming familiar with a range of materials, their uses and how they may be altered or changed.	This concept involves becoming familiar with different types of animals, humans and the life processes they share.	This concept involves becoming familiar with a wider range of living things, including insects and understanding life processes.
Knowledge *Items in italics are not statutory in the National Curriculum*	• Understand 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 eyes. • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them, and to predict the size of shadows when the position of the light source changes. • 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.	• 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.	• Compare and group together everyday materials based on evidence from comparative and fair tests, including their hardness, solubility, conductivity (electrical and thermal), and response to magnets. • Understand how 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, oxidisation and the action of acid on bicarbonate of soda.	• Describe the changes as humans develop to old age.	• 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.
Skills	• Use scientific diagrams to explain.	• Use simple models to describe scientific ideas.	• Plan enquires and control variables where necessary. • Use appropriate techniques and apparatus.	• Record data and results in bar and line graphs.	• Present findings in a variety of ways (including written, visual, oral presentations).
Working scientifically .	• Investigate: does light intensity change when a torch is shone through a longer tube (line with foil)? Measure with light probe of data logger. How does the light intensity of transmitted light change by increasing sheets of tissue paper? (Increase intensity of light source for fixed number of sheets). Does light intensity decrease with increasing number of reflections? Use data logger. • Measure the height of shadows when the light source is at different positions. • Draw scientific diagrams to demonstrate the movement of light.	• Investigate asteroids and their impact. What effect does the weight of an asteroid (pebbles) have on its crater size (flour/sand)? (link gravity to mass). • Investigation: use shadows around a stick to explore the movement of sun across the sky. Model using torches. • Investigation: does the amount of energy the sun transfers change during the day? Measure temperature of water bottle left in sun over time. Use data logger (could include light intensity).	• Investigate effectiveness of materials through investigations e.g. which materials would be the most effective for making a warm jacket / for wrapping ice cream to stop it melting / for making blackout curtains / for completing a circuit? • Compare materials on basis of conductors and insulators e.g. which materials will produce a brighter bulb in a circuit than others or which materials can be used to make a switch? Which materials feel hotter than others when a heat source is placed against them? • Observe and compare the changes that take place when burning different materials or baking bread or cakes. • Make predictions and observe what will happen when: rubbish is burned; acid is mixed with calcium carbonate (acid on limestone); metal coins are mixed with baking soda and vinegar; Mentos are added to cola; baking soda added to vinegar). • Investigate how changing variables affects the time taken for sugar to dissolve in hot water. • Investigate which materials form solutions and which form mixtures (e.g. water, sand, salt, oil, coffee, flour, etc.)	• Use a bar graph to demonstrate the different gestations periods / life expectancy for different animals. • Plot the life expectancy for humans over a period of time and draw conclusions from the patterns. • Use a line graph to record the length and mass of a baby as it grows.	• Try growing new plants from different parts of the parent plant, e.g. seeds, stem, root cuttings, tubers, bulbs. • Observe changes in an animal over a period of time (e.g. chicks) • Investigate: does wind speed affect how far pollen is blown? Use flour blown by fan at different speeds and measure distance spread. • Explore: do certain insects prefer certain plants? Count insect visitors to different plants over half an hour.

Key vocabulary	Light source, luminous, non-luminous, energy, absorbed, reflected, transmitted, scattered, shiny, opaque, reflective, transparent, translucent, image, plane, concave, convex, mirror, shadow.	Solar system, planets (names), star, sun, Earth, moon, gravity, orbit (elliptical), rotation, axis, poles, equator, northern/ southern hemisphere, shadow, day, (lunar) month, year, leap year, eclipse, luminous, non-luminous, phases (names).	Material (types), properties (types), solid, liquid, gas, solution, mixture, particle, energy, dissolve (solute, solvent, soluble, solubility, saturation), filtering, sieving, evaporating, reversible, irreversible, insulate, insulator, insulation, conduct, conductor, conduction, thermal, electrical.	Baby, toddler, child, adolescent, adult, offspring, puberty, pubic hair, egg, sperm, testes, ovaries, oviduct / fallopian tube, uterus, cervix, vagina, vulva, sperm duct, foreskin, scrotum, glands, erection, ejaculation, intercourse, fertilisation, gamete.	Life cycle (various, associated terminology), reproduction (internal / external), gamete, petals, sepals, carpel, stigma, ovary, anther, stamen, pollen, pollination, fertilisation, dispersal.
Scientists to consider	Thomas Young; Sir David Brewster; Sir Isaac Newton	Stephen Hawking; Ptolemy; Alhazen; Copernicus	Alexander Parkes (plastic); John Dunlop (rubber tyre); Spencer Silver (glue for sticky notes); Ruth Benerito (wrinkle-free cotton).	Robert Winston	David Attenborough; Jane Goodall; Chris Peckham; Bill Oddie

UKS2 – Oak (Year 6) Milestone 3					
Cycle B 2021-2022	**Autumn**		**Spring**		**Summer**
Breadth **(Year group relates to NC POS)**	**Light (Y6)** 	**Earth and Space (Y5)** 	**Properties & changes of materials (Y5) adapted** 	**Animals including humans (Y5)** 	**Living things and their habitats (Y5 / Y6)**
Threshold concept	This concept involves understanding how light and reflection affect sight.	This concept involves understanding what causes seasonal changes, day and night.	This concept involves becoming familiar with a range of materials, their uses and how they may be altered or changed.	This concept involves becoming familiar with different types of animals, humans and the life processes they share.	This concept involves becoming familiar with a wider range of living things, including insects and understanding life processes.
Knowledge *Items in italics are not statutory in the National Curriculum*	• Understand 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 eyes. • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them, and to predict the size of shadows when the position of the light source changes. • 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.	• 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.	• Compare and group together everyday materials based on evidence from comparative and fair tests, including their hardness, solubility, conductivity (electrical and thermal), and response to magnets. • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.	• Describe the changes as humans develop to old age.	• 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. • 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.
Skills	• Use scientific diagrams to explain.	• Use simple models to describe scientific ideas.	• Plan enquires and control variables where necessary. • Use appropriate techniques and apparatus.	• Record data and results in bar and line graphs.	• Present findings in a variety of ways (including written, visual, oral presentations). • Record data using a classification key.
Working scientifically .	• Investigate: does light intensity change when a torch is shone through a longer tube (line with foil)? Measure with light probe of data logger. How does the light intensity of transmitted light change by increasing sheets of tissue paper? (Increase intensity of light source for fixed number of sheets). Does light intensity decrease with increasing number of reflections? Use data logger. • Measure the height of shadows when the light source is at different positions. • Draw scientific diagrams to demonstrate the movement of light.	• Investigate asteroids and their impact. What effect does the weight of an asteroid (pebbles) have on its crater size (flour/sand)? (link gravity to mass). • Investigation: use shadows around a stick to explore the movement of sun across the sky. Model using torches. • Investigation: does the amount of energy the sun transfers change during the day? Measure temperature of water bottle left in sun over time. Use data logger (could include light intensity).	• Investigate effectiveness of materials through investigations e.g. which materials would be the most effective for making a warm jacket / for wrapping ice cream to stop it melting / for making blackout curtains / for completing a circuit? • Compare materials on basis of conductors and insulators e.g. which materials will produce a brighter bulb in a circuit than others or which materials can be used to make a switch? Which materials feel hotter than others when a heat source is placed against them?	• Use a bar graph to demonstrate the different gestations periods / life expectancy for different animals. • Plot the life expectancy for humans over a period of time and draw conclusions from the patterns. • Use a line graph to record the length and mass of a baby as it grows.	• Try growing new plants from different parts of the parent plant, e.g. seeds, stem, root cuttings, tubers, bulbs. • Observe changes in an animal over a period of time (e.g. chicks) • Investigate: does wind speed affect how far pollen is blown? Use flour blown by fan at different speeds and measure distance spread. • Explore: do certain insects prefer certain plants? Count insect visitors to different plants over half an hour. • Collect animals or images of living things in the local area and use a dichotomous key to classify. • Investigate: where do microbes grow? Collect microbe samples using cotton buds from different parts of classroom / body. Grow on SEALED petri dishes. Examine and compare. • Investigate: which conditions are best for mould to grow? Allow slices of bread to stand in clear open zip-lock bags in different areas for one day. SEAL and incubate in warm place for 1/2 weeks.
Key vocabulary	Light source, luminous, non-luminous, energy, absorbed, reflected, transmitted, scattered, shiny, opaque, reflective, transparent, translucent, image, plane, concave, convex, mirror, shadow.	Solar system, planet (names), star, sun, Earth, moon, gravity, orbit (elliptical), rotation, axis, poles, equator, northern/ southern hemisphere, shadow, day, (lunar) month, year, leap year, eclipse, luminous, non-luminous, phases.	Material (types), properties (types), solid, liquid, gas, insulate, insulator, insulation, conduct, conductor, conduction, thermal, electrical.	Baby, toddler, child, adolescent, adult, offspring, puberty, pubic hair, egg, sperm, testes, ovaries, oviduct / fallopian tube, uterus, cervix, vagina, vulva, sperm duct, foreskin, scrotum, glands, erection, ejaculation, intercourse, fertilisation, gamete.	Life cycle (associated terminology), reproduction (internal / external), gamete, petals, sepals, carpel, stigma, ovary, anther, stamen, pollen, pollination, fertilisation, dispersal. Classification, binomial, kingdom (phylum, class, order, family, genus, species), vertebrate, invertebrate, microorganisms, bacteria, fungi, virus, (protist), classification characteristics (various), spider/number key, diversity, variation.
Scientists to consider	Thomas Young; Sir David Brewster; Sir Isaac Newton	Stephen Hawking; Ptolemy; Alhazen; Copernicus	Alexander Parkes (plastic); John Dunlop (tyre); Spencer Silver (sticky notes glue); Ruth Benerito (wrinkle-free cotton).	Robert Winston	David Attenborough; Jane Goodall; Chris Peckham; Bill Oddie; Carl Linnaeus; Hans Sloane; Evelyn Cheesman; Gilbert White.