

Science Overview and Progression



Disciplinary Knowledge - Working Scientifically					
	Early Years	Year 1 and 2	Year 3 and 4	Year 5 and 6	Key Stage 3
Asking Questions	<ul style="list-style-type: none"> • Ask simple questions about the world around them • Ask teachers or adults within school about things they observe 	<ul style="list-style-type: none"> · ask simple questions and recognise that they can be answered in different ways 	<ul style="list-style-type: none"> · ask relevant questions and use different types of scientific enquiries to answer them · set up simple practical enquiries, comparative and fair tests 	<ul style="list-style-type: none"> · plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary 	<ul style="list-style-type: none"> • ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience • select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate
Measuring and Recording	<ul style="list-style-type: none"> • Make observations about things they see around them • conduct guided investigations with supervision • make choices when performing simple identifying and classifying • make some predictions about living things based on prior knowledge • make suggestions about how things work based on their own observations • use basic observations to help answer questions with help from the teacher 	<ul style="list-style-type: none"> · observe closely, using simple equipment · perform simple tests · gather and record data to help in answering questions 	<ul style="list-style-type: none"> · make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers · record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables · gather, record, classify and present data in a variety of ways to help in answering questions 	<ul style="list-style-type: none"> · take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate · record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs 	<ul style="list-style-type: none"> • use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety • make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements • understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature • use and derive simple equations and carry out appropriate calculations • undertake basic data analysis including simple statistical techniques.
Concluding	<ul style="list-style-type: none"> • make some comparison between objects or living things • explore the natural 	<ul style="list-style-type: none"> · identify and classify 	<ul style="list-style-type: none"> · identify differences, similarities or changes related 	<ul style="list-style-type: none"> · identify scientific evidence that has been used to support or refute ideas or arguments 	<ul style="list-style-type: none"> • present observations and data using

Science Overview and Progression

	<p>world around me, making observations and drawing pictures of plants and animals.</p> <ul style="list-style-type: none"> • identify some similarities and differences between the natural world around me and contrasting environments, drawing on their experiences and what has been read in class 	<ul style="list-style-type: none"> • use their observations and ideas to suggest answers to questions 	<p>to simple scientific ideas and processes</p> <ul style="list-style-type: none"> • report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • use straightforward scientific evidence to answer questions or to support their findings 	<ul style="list-style-type: none"> • report and 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 	<p>appropriate methods, including tables and graphs</p> <ul style="list-style-type: none"> • interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions • present reasoned explanations, including explaining data in relation to predictions and hypotheses
Evaluating			<ul style="list-style-type: none"> • use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions 	<ul style="list-style-type: none"> • use test results to make predictions to set up further comparative and fair tests 	<ul style="list-style-type: none"> • evaluate data, showing awareness of potential sources of random and systematic error • identify further questions arising from their results.
Vocabulary	<p>look closely, observe, watch, touch, feel, smell, listen, same, different, compare, ask questions, record, sort, group</p>	<p>observe, changes, patterns, grouping, sorting, compare, same, different, identify (name), measure, data, record results, drawing, picture, table, tally chart, present, pictogram, block chart, Venn diagram, ask questions, test, investigate, explore, equipment, resources, magnifying glass, hand lens, ruler, tape measure, metre stick, pipette, syringe, spoon, teaspoon, answer questions, interpret results, scientific enquiry, pattern seeking, comparative testing, observing over time, classifying, researching using secondary sources</p>	<p>practical work, fair testing, relationships, accurate, thermometer, data logger, stopwatch, timer, estimate, data, diagram, identification key, chart, bar chart, prediction, similarity, difference, evidence, information, findings, criteria, values, properties, characteristics, conclusion, explanation, reason, evaluate, improve</p>	<p>variables, independent variable, dependent variable, control variable, evidence, justify, argument (science), causal relationship,</p> <p>accuracy, precision, scatter graphs, bar graphs, line graphs, force meter</p>	<p>Objectivity, accuracy, precision, repeatability, reproducibility, scientific methods, theories, modified, evidence, publish, peer review, risks, independent variables, dependent variables, control variables, fieldwork, laboratory, reliability, hypotheses, systematic error, random error, IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature, equations, data analysis, statistical techniques</p>

Science Overview and Progression

Substantive Knowledge - Biology								
	Early Years	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Key Stage 3
Plants	<p>Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes</p> <p>Vocabulary: plant, leaf, stem, branch, root, bark, flower, petal, seed, berry, fruit, vegetable, bulb, plant, hole, dig, water, weed, grow, shoot, die, dead,</p> <p>soil, names of plants they grow, tree, bush, herb, names of plants they see (Reception - Living things and their habitats)</p>	<ul style="list-style-type: none"> Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. Identify and describe the basic structure of a variety of common flowering plants, including trees. <p>Vocabulary: leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud, names of trees in the local area, names of garden and wild flowering plants in the local area</p>	<ul style="list-style-type: none"> 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. Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats) <p>Vocabulary: light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling names of plants in local habitats and micro-habitats (Y2 - Living things and their habitats)</p>	<ul style="list-style-type: none"> 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. <p>Vocabulary: photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (wind dispersal, animal dispersal, water</p>	<ul style="list-style-type: none"> Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats) Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats) Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats) <p>Vocabulary: classification, classification keys (Y4 - Living things and their habitats)</p>	<ul style="list-style-type: none"> Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) <p>Vocabulary: life cycle, reproduce, sexual, fertilises, asexual, plantlets, runners, tubers, cuttings (Y5 - Living things and their habitats)</p>	<ul style="list-style-type: none"> Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. (Y6 - Living things and their habitats) Give reasons for classifying plants and animals based on specific characteristics. (Y6 - Living things and their habitats) <p>Vocabulary: flowering, non-flowering, mosses, ferns, conifers (Y6 - Living things and their habitats)</p>	<ul style="list-style-type: none"> Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. <p>Vocabulary: Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms</p>

Science Overview and Progression

Living Things and their Habitat	<ul style="list-style-type: none"> Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. <p>Vocabulary: natural, plant, animal, leaves, seeds, conkers, acorns, twigs, bark, shells, feathers, pebbles, stones, same, different, pattern</p> <p>plant, leaf, stem, branch, root, bark, flower, petal, seed, berry, fruit, vegetable, bulb, plant, hole, dig, water, weed, grow, shoot, die, dead, soil (Nursery - Plants) plant, tree, bush, flower, vegetable, herb, weed, animal,</p>	<ul style="list-style-type: none"> Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants) Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals including humans) Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals including humans) Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans) Observe changes across the four 	<ul style="list-style-type: none"> Explore and compare the differences between things that are living, dead, and things 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 microhabitats. 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. Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals including humans) <p>Vocabulary: living, dead, never been alive, suited, suitable, basic needs, food,</p>	<p>dispersal), air, nutrients, minerals, soil, absorb, transport</p> <ul style="list-style-type: none"> Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants) <p>Vocabulary: photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (e.g. wind dispersal, animal dispersal, water</p> <p>dispersal), air, nutrients, minerals, soil, absorb, transport</p>	<ul style="list-style-type: none"> 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. Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 - Animals, including humans) <p>Vocabulary: classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate herbivore, carnivore, omnivore, producer, predator, prey (Y4 - Animals, including humans)</p>	<ul style="list-style-type: none"> 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. <p>Vocabulary: life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, cuttings</p>	<ul style="list-style-type: none"> 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. Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. (Y6 - Evolution and inheritance) Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. (Y6 - Evolution and inheritance) <p>Vocabulary: vertebrates, fish, amphibians, reptiles, birds, mammals, warm-blooded, cold-blooded,</p>	<ul style="list-style-type: none"> Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. Differences between species. <p>Vocabulary: Reproduction in humans (as an example of a mammal), including</p>
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Science Overview and Progression

	<p>names of plants and animals they see, name of a contrasting environment (e.g. beach, forest)</p>	<p>seasons. (Y1 - Seasonal change)</p> <p>Vocabulary: names of garden and wild flowering plants in the local area (Y1 - Plants)</p> <p>head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, names of animals experienced first-hand from each vertebrate group (Y1 - Animals, including humans)</p> <p>weather, sunny, rainy, raining, shower, windy, snowy, cloudy, hot, warm, cold, storm, thunder, lightning, hail, sleet, snow, icy, frost, puddles, rainbow, seasons, winter, summer, spring, autumn, Sun, sunrise, sunset, day length (Y1 - Seasonal changes)</p>	<p>food chain, shelter, move, feed, water, air, survive, survival, names of local habitats (e.g. pond, woodland etc.), names of micro-habitats (e.g. under logs, in bushes etc.), conditions, light, dark, shady, sunny, wet, damp, dry, hot, cold, names of living things in the habitats and micro-habitats studied</p> <p>light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling (Y2 - Plants)</p> <p>offspring, reproduction, growth, baby, toddler, child, teenager, adult, old person, names of animals and their babies (e.g. chick/chicken, cat/kitten, caterpillar/butterfly) (Y2 - Animals, including humans)</p>				<p>invertebrates, insects, spiders, snails, worms, flowering, non-flowering, mosses, ferns, conifers</p>	<p>the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta</p> <ul style="list-style-type: none"> • The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • The effects of recreational drugs (including substance misuse) on behaviour, health and life processes • The structure and functions of the gas exchange system in humans, including adaptations to function • The mechanism of breathing to move air in and out of the lungs • The impact of exercise, asthma and smoking on the human gas exchange system
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Science Overview and Progression

<p>Animals including Humans</p>	<p>Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes.</p> <p>Vocabulary: egg, chick, bird, caterpillar, cocoon, chrysalis, butterfly, frog spawn, tadpole, froglet, frog, grow, change, die, names of animals and their young, fur, feathers, scales, tail, wings, beak, claws, paws, hooves, swim, walk, run, jump, fly, patterns, spots, stripes, grow, change, baby, toddler, child, adult, old person, smell, taste, touch, feel, hear, see, blind, deaf, names of animals, live, on land, in water, jungle, desert, North Pole, South Pole, sea, hot, cold, wet, dry, snow,</p>	<ul style="list-style-type: none"> Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. Identify and name a variety of common animals that are carnivores, herbivores and omnivores. Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, 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. <p>Vocabulary: head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, names of animals experienced first-hand from each vertebrate group, parts of the human body including those within the school's RSE policy, senses, touch, see, smell, taste, hear, fingers, skin, eyes, nose, ears, tongue</p>	<ul style="list-style-type: none"> Notice that animals, including humans, have offspring which grow into adults. Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. 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. (Y2 - Living things and their habitats) <p>Vocabulary: offspring, reproduction, growth, baby, toddler, child, teenager, adult, old person, names of animals and their babies (e.g. chick/chicken, kitten/cat, caterpillar/butterfly), survive, survival, water, food, air, exercise, heartbeat, breathing, hygiene, germs, disease, food types (e.g.</p>	<ul style="list-style-type: none"> 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. Identify that humans and some other animals have skeletons and muscles for support, protection and movement. <p>Vocabulary: nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, protect, move, skull, ribs, spine</p>	<ul style="list-style-type: none"> 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. <p>Vocabulary: digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, large intestine, rectum, anus, incisor, canine, molar, premolar, herbivore, carnivore, omnivore, producer, predator, prey</p>	<ul style="list-style-type: none"> 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. (Y5 - Living things and their habitats) Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) <p>Vocabulary: puberty, the vocabulary to describe sexual characteristics in line with the school's RSE policy, life cycle, foetus, baby, child, adolescent, adult, reproduce, sexual, sperm, fertilises, egg, live young (Y5 - Living things and their habitats)</p>	<ul style="list-style-type: none"> 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. Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. (Y6 - Living things and their habitats) Give reasons for classifying plants and animals based on specific characteristics. (Y6 - Living things and their habitats) <p>Vocabulary: heart, pulse, rate, pumps, blood, blood vessels, transported, lungs,</p>	<ul style="list-style-type: none"> Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. The structure and functions of the gas exchange system in humans, including adaptations to function. The mechanism of breathing to move air in and out of the lungs. The impact of exercise, asthma and smoking on the
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Science Overview and Progression

	<p>ice, hair (e.g. black, brown, dark, light, blonde, ginger, grey, white, long, short, straight, curly), eyes (e.g. blue, brown, green, grey), skin (e.g. black, brown, white), big/tall, small/short, bigger/smaller, baby, toddler, child, adult, old person, old, young, brother, sister, mother, father, aunt, uncle, grandmother, grandfather, cousin, friend, family, boy, girl, man, woman</p>		<p>meat, fish, vegetables, bread, rice, pasta, dairy) living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, water, air, survive, survival (Y2 - Living things and their habitats)</p>			<p>oxygen, carbon dioxide, cycle, circulatory system, diet, drugs, lifestyle</p>	<p>human gas exchange system.</p> <p>Vocabulary: Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta</p> <ul style="list-style-type: none"> • The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • The effects of recreational drugs (including substance misuse) on behaviour, health and life processes • The structure and functions of the gas exchange system in humans, including adaptations to function • The mechanism of breathing to move air in and out of the lungs
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Science Overview and Progression

								<ul style="list-style-type: none"> The impact of exercise, asthma and smoking on the human gas exchange system
Evolution and Inheritance	<ul style="list-style-type: none"> Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. <p>Vocabulary: natural, plant, animal, leaves, seeds, conkers, acorns, twigs, bark, shells, feathers, pebbles, stones, same, different, pattern (Nursery - Living things and their habitats) plant, tree, bush, flower, vegetable, herb, weed, animal, names of plants and animals they see, name of a contrasting environment (e.g. beach, forest) (Reception - Living</p>	<p>Vocabulary: leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud (Y1 - Plants)</p>	<ul style="list-style-type: none"> 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. (Y2 - Living things and their habitats) Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) <p>Vocabulary: light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling (Y2 - Plants) living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, water, air, survive, survival, conditions, light, dark, shady, sunny, wet, damp, dry, hot, cold (Y2 - Living things and their habitats)</p>	<ul style="list-style-type: none"> Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks) Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants) <p>Vocabulary: photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (e.g. wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil (Y3 - Plants) soil, fossil, bone, flesh, minerals (Y3 - Rocks)</p>	<ul style="list-style-type: none"> Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats) <p>Vocabulary: environment, habitat, human impact, positive, negative, migrate, hibernate (Y4 - Living things and their habitats) herbivore, carnivore, omnivore, producer, predator, prey (Y4 - Animals, including humans)</p>	<ul style="list-style-type: none"> Describe the life process of reproduction in some plants and animals. (Living things and their habitats - Y5) <p>Vocabulary: life cycle, reproduce, asexual, plantlets, runners, tubers, cuttings (Y5 - Living things and their habitats)</p>	<ul style="list-style-type: none"> 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. <p>Vocabulary: offspring, sexual reproduction, vary, characteristics, adapted, inherited, species, evolve, evolution</p>	<ul style="list-style-type: none"> Heredity as the process by which genetic information is transmitted from one generation to the next. A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction. <p>Vocabulary: Heredity as the process by which genetic information is transmitted from</p>

Science Overview and Progression

	things and their habitats)							<p>one generation to the next</p> <ul style="list-style-type: none"> • A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model • The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection • Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction
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Substantive Knowledge - Chemistry								
	Early Years	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Key Stage 3
Materials	<ul style="list-style-type: none"> • Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how 	<ul style="list-style-type: none"> • Distinguish between an object and the material from which it is made. • Identify and name a variety of everyday 	<ul style="list-style-type: none"> • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, 	<ul style="list-style-type: none"> • Compare and group together different kinds of rocks on the basis of their appearance and simple physical 	<ul style="list-style-type: none"> • Compare and group materials together, according to whether they are solids, liquids or gases. 	<ul style="list-style-type: none"> • Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, 		<ul style="list-style-type: none"> • Chemical reactions as the rearrangement of atoms. • Representing chemical reactions using formulae and using equations. • Combustion, thermal decomposition, oxidation and

Science Overview and Progression

	<p>environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes.</p> <p>Vocabulary: mix, stir, cook, hot, oven, microwave, change, burn, melt, hard, runny, set, freeze, freezer, cold, blended, hard, soft, bendy, stiff, wobbly, wood, plastic, paper, card, fabric, ice, water, frozen, icicle, snow, melt, wet, cold, slippery, smooth, big, bigger, biggest, smaller, smaller, smallest, hard, soft, bendy, rigid, wood, plastic, paper, card, metal, strong, weak, hot, apply heat, waterproof, soggy, not waterproof, best, change, change back</p>	<p>materials, including wood, plastic, glass, metal, water, and rock.</p> <ul style="list-style-type: none"> 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 <p>Vocabulary: object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see-through, not see-through</p>	<p>glass, brick, rock, paper and cardboard for particular uses.</p> <ul style="list-style-type: none"> Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. <p>Vocabulary: opaque, transparent, translucent, reflective, non-reflective, flexible, rigid, shape, push/pushing, pull/pulling, twist/twisting,</p> <p>squash/squashing, bend/bending, stretch/stretching</p>	<p>properties. (Y3 - Rocks)</p> <ul style="list-style-type: none"> Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks) 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. (Y3 - Forces and magnets) <p>Vocabulary: rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorbs water, fossil, bone, flesh, minerals, marble, chalk, granite, sandstone, slate, types of soil (e.g. peaty, sandy, chalky, clay) (Y3 - Rocks)</p> <p>magnetic force, magnet,</p>	<ul style="list-style-type: none"> 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. Recognise some common conductors and insulators, and associate metals with being good conductors. (Y4 - Electricity) <p>Vocabulary: solid, liquid, gas, heating, cooling, state change, melting, freezing, melting point, boiling, boiling point, evaporation, condensation, temperature, water cycle</p> <p>electrical conductor, electrical insulator, metal,</p>	<p>conductivity (electrical and thermal), and response to magnets.</p> <ul style="list-style-type: none"> 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 	<p>displacement reactions.</p> <ul style="list-style-type: none"> Defining acids and alkalis in terms of neutralisation reactions. The pH scale for measuring acidity/alkalinity; and indicators. <p>Vocabulary: Chemical reactions as the rearrangement of atoms</p> <ul style="list-style-type: none"> Representing chemical reactions using formulae and using equations Combustion, thermal decomposition, oxidation and displacement reactions Defining acids and alkalis in terms of neutralisation reactions The pH scale for measuring acidity/alkalinity; and indicators
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Science Overview and Progression

Rocks	<ul style="list-style-type: none"> Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. <p>Vocabulary: natural, shells, pebbles, stones</p>	<ul style="list-style-type: none"> Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - 	<ul style="list-style-type: none"> Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) <p>Vocabulary: opaque, transparent, translucent, reflective, non-reflective (Y2 - Uses of everyday materials)</p>	<ul style="list-style-type: none"> 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. <p>Vocabulary: rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorbs water, fossil, bone, flesh, minerals, marble, chalk, granite,</p>	non-metal (Y4 - Electricity)	Vocabulary: thermal insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material		<ul style="list-style-type: none"> Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. (Y6 - Evolution and inheritance) <p>Vocabulary: evolution</p>	<ul style="list-style-type: none"> The composition of the Earth. The structure of the Earth. The rock cycle and the formation of igneous, sedimentary and metamorphic rocks. <p>Vocabulary:</p> <ul style="list-style-type: none"> The composition of the Earth The structure of the Earth The rock cycle and the formation of igneous, sedimentary and metamorphic rocks
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Science Overview and Progression

		<p>Everyday materials)</p> <p>Vocabulary: object, material, rock, brick, clay, hard, soft, waterproof, absorbent, rough, smooth, shiny, dull, see-through, not see-through (Y1 - Everyday materials)</p>		<p>sandstone, slate, types of soil (e.g. peaty, sandy, chalky, clay)</p>				
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Substantive Knowledge – Physics									
	Early Years	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Key Stage 3	
Light	<p>• Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes.</p> <p>Vocabulary: light, torch, bulb, lamp, spotlight, shiny, bright, brighter, brightest, Sun, shine, glow, mirror, Sun, sunny, light, shadow, shady, clouds, torch, see-through, not see-through, source, light source</p>	<p>• Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)</p> <p>• Describe the simple physical properties of a variety of everyday materials. (Y1 - Materials)</p>	<p>Vocabulary: opaque, transparent, translucent, reflective, non-reflective (Y2 - Uses of everyday materials)</p>	<p>•Recognise that they need light in order to see things and that dark is the absence of light.</p> <p>• Notice that light is reflected from surfaces.</p> <p>•Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.</p>			<p>• 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. (Y5 - Properties and changes of materials)</p>	<p>•Recognise that light appears to travel in straight lines.</p> <p>• 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.</p> <p>• Explain that we see things because light travels from light sources to our eyes or from light</p>	<p>• The similarities and differences between light waves and waves in matter.</p> <p>• Light waves travelling through a vacuum; speed of light.</p> <p>• The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface.</p> <p>• Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye.</p> <p>• Light transferring energy from source to absorber leading to chemical and electrical effects;</p>

Science Overview and Progression

Sounds	<ul style="list-style-type: none"> Children know about similarities and differences in relation to places, objects, materials and living things. 	<p>Vocabulary: senses, see, eyes (Y1 - Animals, including humans) shiny, dull, see-through, not see-through (Y1 - Materials)</p>	<ul style="list-style-type: none"> 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. <p>Vocabulary: light, light source, dark, absence of light, surface, shadow, reflect, mirror, Sun, sunlight, dangerous</p>	<ul style="list-style-type: none"> Identify how sounds are made, associating some of 	<p>sources to objects and then to our eyes.</p> <ul style="list-style-type: none"> Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. <p>Vocabulary: straight lines, light rays</p>	<p>photo-sensitive material in the retina and in cameras.</p> <ul style="list-style-type: none"> Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection. <p>Vocabulary: The similarities and differences between light waves and waves in matter</p> <ul style="list-style-type: none"> Light waves travelling through a vacuum; speed of light The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection
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Science Overview and Progression

	<p>They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes.</p> <p>Vocabulary: sound, noise, loud, quiet, high, low, music, bang, blow, pluck, soft, hard, fast, slow, names of instruments, sound, noise, listen, hear, music, voices, bird song, traffic, sirens, thunder, high, low, loud, quiet, soft, volume, crackle, thunder, hum, buzz, roar</p>	<p>the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)</p> <p>Vocabulary: senses, hear, ear (Y1 - Animals, including humans)</p>			<p>them with something vibrating.</p> <ul style="list-style-type: none"> • 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. <p>Vocabulary: sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, quiet, loud, insulation</p>		<p>waves can be reflected, and add or cancel – superposition.</p> <ul style="list-style-type: none"> • Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound. • Sound needs a medium to travel, the speed of sound in air, in water, in solids. • Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. • Auditory range of humans and animals. • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. • Waves transferring information for conversion to electrical signals by microphone. <p>Vocabulary: Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition</p> <ul style="list-style-type: none"> • Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound • Sound needs a medium to travel, the speed of sound in air, in water, in solids • Sound produced by vibrations of objects, in loud speakers, detected by their
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Science Overview and Progression

								<p>effects on microphone diaphragm and the ear drum; sound waves are longitudinal</p> <ul style="list-style-type: none"> • Auditory range of humans and animals • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound • Waves transferring information for conversion to electrical signals by microphone
Forces and Magnets	<ul style="list-style-type: none"> • Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. <p>Vocabulary: object, float, sink, water, up, down, top, bottom, push, pull, magnet, spring, squash, bend, twist, stretch, turn, spin, smooth, rough, fast, slow, float, sink, up, down, top, bottom, surface, move, roll, drop, fly, turn, spin, fall, fast, slow, faster, slower, fastest, slowest, further, furthest,</p> <p>wind, air, water, blow, bounce</p>		<ul style="list-style-type: none"> • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials) <p>Vocabulary: flexible, rigid, shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching (Y2 - Uses of everyday materials)</p>	<ul style="list-style-type: none"> • 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 		<ul style="list-style-type: none"> • 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. 		<ul style="list-style-type: none"> • Magnetic fields by plotting with compass, representation by field lines. • Earth's magnetism, compass and navigation. • Forces as pushes or pulls, arising from the interaction between two objects. • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. • Moment as the turning effect of a force. • Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. • Forces measured in Newtons, measurements of stretch or compression as force is changed <p>Vocabulary: Magnetic fields by plotting with compass, representation by field lines</p>

Science Overview and Progression

				<p>to a magnet, and identify some magnetic materials. • Describe magnets as having two poles.</p> <p>• Predict whether two magnets will attract or repel each other, depending on which poles are facing.</p> <p>Vocabulary: force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole</p>		<p>Vocabulary: force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears</p>		<ul style="list-style-type: none"> • Earth's magnetism, compass and navigation • Forces as pushes or pulls, arising from the interaction between two objects • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces • Moment as the turning effect of a force • Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water • Forces measured in Newtons, measurements of stretch or compression as force is changed
Seasonal Changes	<ul style="list-style-type: none"> • Children know about similarities and differences in relation to places, objects, 	<ul style="list-style-type: none"> • Observe changes 		<ul style="list-style-type: none"> • Recognise that light from the sun 		<ul style="list-style-type: none"> • Use the idea of the Earth's rotation to 		<ul style="list-style-type: none"> • The seasons and the Earth's tilt, day length at

Science Overview and Progression

	<p>materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes.</p> <p>Vocabulary: grow, shoot, die, dead (Nursery - Plants) egg, chick, bird, caterpillar, cocoon, chrysalis, butterfly, frog spawn, tadpole, froglet, frog, grow, change, die, names of animals and their young (Nursery - Animals, excluding humans) spring, summer, autumn, winter, seasons, sunny, cloudy, hot, warm, cold, shower, raining, storm, thunder, lightning, hail, sleet, snow, icy, frost, puddles, windy, rainbow, animals, young, plants, flowers</p>	<p>across the four seasons.</p> <ul style="list-style-type: none"> Observe and describe weather associated with the seasons and how day length varies. <p>Vocabulary: weather, sunny, rainy, raining, shower, windy, snowy, cloudy, hot, warm, cold, storm, thunder, lightning, hail, sleet, snow, icy, frost, puddles, rainbow, seasons, winter, summer, spring, autumn, Sun, sunrise, sunset, day length</p>		<p>can be dangerous and that there are ways to protect their eyes. (Y3 - Light)</p>		<p>explain day and night and the apparent movement of the Sun across the sky. (Y5 - Earth and space)</p>	<p>different times of year, in different hemispheres.</p> <p>Vocabulary: The seasons and the Earth's tilt, day length at different times of year, in different hemispheres</p>
Earth and Space	<ul style="list-style-type: none"> Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and 	<ul style="list-style-type: none"> Observe changes across the four seasons. (Y1 - Seasonal changes) Observe and describe weather associated 		<p>Vocabulary: light, light source, Sun, sunlight, dangerous (Y3 - Light)</p>		<ul style="list-style-type: none"> Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. Describe the movement of the Moon 	<ul style="list-style-type: none"> Gravity force, weight = mass x gravitational field strength (g), on Earth $g=10$ N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only).

Science Overview and Progression

	<p>plants and explain why some things occur and talk about changes.</p> <p>Vocabulary: Sun, Moon, Earth, star, planet, sky, day, night, space, round, bounce, float</p>	<p>with the seasons and how day length varies. (Y1 - Seasonal changes)</p>				<p>relative to the Earth.</p> <ul style="list-style-type: none"> 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. <p>Vocabulary: Sun, Moon, Earth, planets (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, Solar System, rotate, star, orbit</p>	<ul style="list-style-type: none"> Our Sun as a star, other stars in our galaxy, other galaxies. The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. The light year as a unit of astronomical distance. <p>Vocabulary: Gravity force, weight = mass x gravitational field strength (g), on Earth $g=10 \text{ N/kg}$, different on other planets and stars; gravity forces</p> <p>between Earth and Moon, and between Earth and Sun (qualitative only)</p> <ul style="list-style-type: none"> Our Sun as a star, other stars in our galaxy, other galaxies The seasons and the Earth's tilt, day length at different times of year, in different hemispheres The light year as a unit of astronomical distance
<p>Electricity</p>	<ul style="list-style-type: none"> Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. 				<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge. Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current. Differences in resistance between conducting and

Science Overview and Progression

	<p>Vocabulary: battery, plug, socket, electricity, wire, sound, light, move</p>			<p>lamp is part of a complete loop with a battery.</p> <ul style="list-style-type: none"> • 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. <p>Vocabulary: electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol</p>	<p>function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.</p> <ul style="list-style-type: none"> • Use recognised symbols when representing a simple circuit in a diagram. <p>Vocabulary: circuit diagram, circuit symbol, voltage</p>	<p>insulating components (quantitative).</p> <ul style="list-style-type: none"> • Static electricity <p>Vocabulary: Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow</p> <p>of charge</p> <ul style="list-style-type: none"> • Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current • Differences in resistance between conducting and insulating components (quantitative). • Static electricity
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