Science

Progression Pathways

Chemistry

Physics

Biology

Working Scientificall y

Chemistry….

Year 1

- 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.

Year 2

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and 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.

Year 3

- 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.

Year 4

- Compare and group materials together, according to whether they are solids, liquids or gases.
- Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C).
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

Year 5

- Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.
- Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution.
- Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.
- Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.
- Demonstrate that dissolving, mixing and changes of state are reversible changes.
- Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Year 6

- *Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.*

Suggested Scientists

Year 1	Year 2	Year 3	Year 4	Year 5
Dr Pearl Agyakwa (Materials scientist) **Zach Johnson** (Clothes made from recycled plastic bottles found in the ocean)	**Charles Macintosh** (Inventor of waterproof material) **Victoria Callaghan** (Develops sustainable packaging for BASF plc)	**Mary Anning** (Fossilist) **Anjana Khatwa** (Geologist who collects rocks and fossils from the beach and studies them to learn about the creatures that lived in the sea and on Earth over 150 million years ago)	**Daniel Fahrenheit** (Physicist who invented the Fahrenheit temperature scale and the thermometer) **Anders Celsius** (Astronomer who invented the degrees Celsius temperature scale)	**Becky Schroeder** (Inventor of the glow sheet) **Spencer Silver & Arthur Fry** (Chemical Engineer & Chemist respectively who invented the post-it note)

Physics….

Earth and Space

Reception

- Explore the natural world around them.
- Describe what they see, hear and feel whilst outside.
- Understand the effect of changing seasons on the natural world around them

Year 1

- Observe changes across the four seasons.
- Observe and describe weather associated with the seasons and how day length varies.

Year 3

- *Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.*

Year 5

- 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.

Suggested Scientists

Year 1

John Dalton
(British Weather pioneer)
Jim Cantore
(Meteorologist and storm tracker)

Year 5

Galileo Galilei
(Astronomer, Mathematician & Physicist who made the first telescope and discovered Neptune and the rings of Saturn)
Mai Jemison
(Astronaut)
Johannes Kepler
(Mathematician, Astronomer and Astrologer who developed the theory that the planets moved on oval paths around the sun.

Physics….

Light

Reception /Year 1

- *Describe what they see, hear and feel whilst outside. Reception*
- *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*
- *Describe the simple physical properties of a variety of everyday materials.Y1*

Year 3

- Recognise that they need light in order to see things, and that dark is the absence of light.
- Notice that light is reflected from surfaces.
- Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.
- Recognise that shadows are formed when the light from a light source is blocked by an opaque object.
- Find patterns in the way that the size of shadows change.

Year 6

- Recognise that light appears to travel in straight lines.
- Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.
- Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

Sound

Reception /Year 1

- *Describe what they see, hear and feel whilst outside. Reception*
- *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*

Year 4

- 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.

Suggested Scientists

Year 3

Percy Shaw (Inventor of the cat's eye)
Patricia Bath (Ophthalmologist and inventor)

Year 4

Evelyn Glennie (Deaf percussionist)
Karrie Keyes (Audio engineer)
Miller Reese Hutchinson (Hearing Aids)

Year 6

Euclid (Mathematician who predicted that light travels in straight lines and we only see things that light falls on)
Colin Webb (Professor of Laser Physics)

Physics….

Forces

Reception /Year 2

- *Describe what they see, hear and feel whilst outside. Reception*
- *Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. Y2*

Year 3

- 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.

Year 5

- 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.

Electricity

Year 4

- 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.

Year 6

- 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.

Suggested Scientists

Year 3

William Gilbert (Magnetism and electricity)
Eric Laithwaite (Electrical Engineer who developed the technology behind the Maglev train)

Year 4

Thomas Edison (Inventor of the lightbulb and power grid)
Lewis Howard Latimer (Electronic Engineer who improved the design of Edison's light bulb and brought street lighting to the world)
Ronit Kanwar (Businessman who set up company to provide affordable, sustainable solar-powered lights for poor in rural India)

Year 5

Isaac Newton (Discovered gravity)
Rafsan Chowdhury (Mechanical Engineer)

Year 6

Mildred S Dresselhaus (Materials Scientist whose research led to the development of the rechargeable batteries in all modern electronic equipment)
Nikola Tesla (Electrical & Mechanical Engineer who developed the AC electrical system and made important advances in technologies such as x-rays, neon lights and robotics)

Biology….

Animals and humans

Reception

- Name and describe people who are familiar to them.

Year 1

- 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

Year 2

- 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.
- *+ objectives from living things and their habitats.*

Year 3

- 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

Year 4

- 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

Year 5

- Describe the changes as humans develop to old age
- *+ objectives from living things and their habitats.*

Year 6

- 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.
- *+ objectives from living things and their habitats.*

Suggested Scientists

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Chris Packham (Animal Conservationist, Wildlife photographer) **Miller Hutchinson** (Engineer who invented the first electric hearing aid)	**Florence Nightingale** (Nurse and founder of modern nursing) **Florence Nightingale** (Nurse and founder of modern nursing)	**Willhelm Röntgen** (Invented the X-Ray) **Adelle Davis** (Biochemist & Nutritionist who linked health and diet)	**William Beaumont** (Surgeon who first observed and studied human digestion as it occurs in the stomach) **Paul Sharpe** (Bioengineer who studies how to regrow teeth if they become damaged)	**Virginia Apgar** (Doctor & Medical Researcher who developed a method of evaluating the well-being of new-born babies) **Robert Winston** (Professor of Science and Society, Emeritus Professor of Fertility Studies & TV presenter)	**Barouh Berkovits** (invented the pacemaker and defibrillator) **William Harvey** (Discovered how blood moves through the body) **Ruth Ella Moore** (Bacteriologist who researched immunology, blood groups and tuberculosis)

Biology….

Living things and their habitats

Year 1

- *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.*
- *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)*
- *Observe changes across the four seasons.*

Year 2

- 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 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

Year 4

- 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.

Year 5

- 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.

Year 6

- Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals.
- Give reasons for classifying plants and animals based on specific characteristics.

Suggested Scientists

Year 2

Prem Singh Gill (Polar Scientist who studies where Antarctic seals live, breed and feed, so we can know more about where they prefer to live)
Dawood Qureshi (Marine Biologist who studies wildlife in the ocean)

Year 4

Rachel Carson (Aquatic Biologist who wrote about environmental pollution)

Year 5

Roger Arliner Young (Zoologist who studied reproduction in marine organisms)
Jane Goodall (Wildlife Researcher & Conservationist who studied chimpanzees)

Year 6

Carl Linneus (Naturalist and botanist)
Nazifa Tabassum (Microbiologist and Science Communicator)
Beatrix Potter (Mycologist, study of fungi, and Scientific Illustrator)

Biology….

Plants

Reception

- Explore the natural world around them.
- Recognise some environments that are different to the one in which they live.

Year 1

- 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

Year 2

- 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.

Year 3

- 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

Year 5

- Describe the life process of reproduction in some plants and animals.

Year 6

- 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

Suggested Scientists

Year 1	Year 2	Year 3	Year 5	Year 6
Arit Anderson (Garden Designer and presenter of Gardeners World)	**Poppy Okotcha** (Horticulturalist interested in the connection between healthy environments, healthy food, and healthier people)	**Dr Kelsey Byers** (Biologist who studies flower smells and how they attract insects) **Maria Sibylla Merian** (1647-1717) (Documented the relationship between plants and insects)		**Charles Darwin** (Naturalist, developed the theory of evolution) **Kevin Laland** (Evolutionary biologist)

Working Scientifically…

Reception

- Show curiosity and ask questions.
- Make observations using their senses and simple equipment.
- Make direct comparisons.
- Use equipment to measure.
- Record their observations by drawing, taking photographs, using sorting rings or boxes and simple tick sheets.
- Use their observations to help them answer their questions.
- Talk about what they are doing and have found out.
- Identify, sort and group.

Year 1 & 2

- Ask simple questions and recognise that they can be answered in different ways.
- Observe closely using simple equipment.
- Perform simple tests.
- Identify and classify.
- Gather and record data to help in answering questions.
- Use their observations and ideas to suggest answers to questions.

Year 3 & 4

- Ask relevant questions and use different types of scientific enquiries to answer them.
- Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.
- Set up simple practical enquiries, comparative and fair tests.
- Gather, record, classify and present data in a variety of ways to help in answering questions.
- Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables.
- Use straightforward scientific evidence to answer questions or to support their findings.
- Identify differences, similarities or changes related to simple scientific ideas and processes.
- Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.
- Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.

Year 5 & 6

- Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
- 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.
- Identify scientific evidence that has been used to support or refute ideas or arguments.
- 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.
- Use test results to make predictions to set up further comparative and fair tests