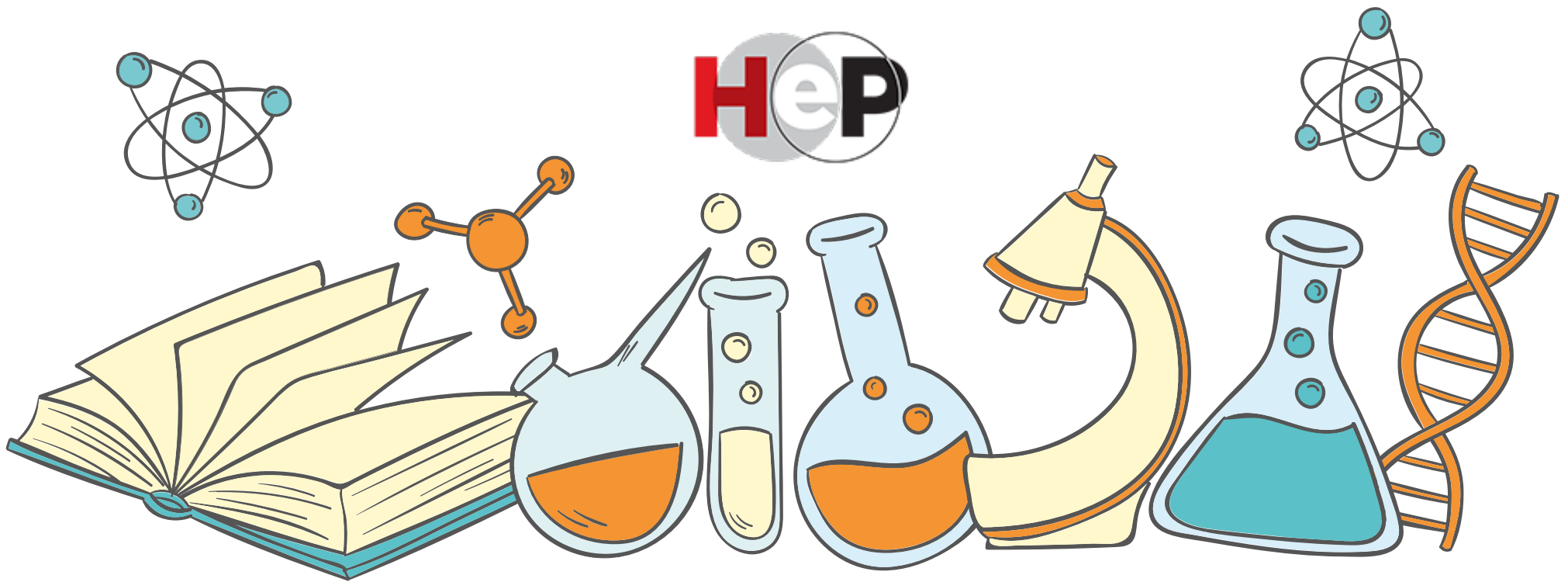


Science

Progression across the Curriculum



Year 3



Year 3 Progression map – Plants

National curriculum objectives:

- Identify and describe the functions of different parts of the flowering plant: roots, stem/trunk/leaves and flowers
- Explore the part flowers play in a flowering plants life cycle, including: pollination, seed formation and seed dispersal
- Explain the requirements of plants for life and growth (air, light, water, nutrients from soil, room to grow) and how they vary between plants
- Know the way in which water is transported between plants

Misconceptions:

- Flowers just look pretty
- Plants 'eat'
- Fertiliser is 'plant food'

Scope:

HEP Science lesson titles:

1. What are the parts of a plant?
2. What do plants need to grow?
3. How does water move around a plant?
4. Why do plants need flowers?
5. How do plants make new plants?
6. What are the stages of a plant life cycle?

Working scientifically:

Follow and set up a simple practical procedure, making predictions, observation over time, identifying and classifying, use of secondary data, fair tests and variables, repeats and averages making scaffolded conclusions based on evidence, presenting information, evaluation and repeatability

Key scientists and inventors:

- Jan Baptiste Van Helmont – chemist, physiologist, physicist
- Mary Seacole – Herbalist

Coherence:

Key vocabulary:

absorb, anchor, carbon dioxide, flowers, fertiliser, leaves, minerals, nutrients, stem, trunk, roots, carpel, filament, anther, stamen, stigma, style, pollen egg, ovary, fruit, seed, germination, pollination, fertilisation

Builds on:

Year 2:

Living and non-living differences, Plant habitats, Naming a variety of plants, How animals obtain their food from plants, Observing seeds and bulbs growth, Investigating how plants need water, light and warmth to grow

Future learning:

Year 3: Light sources and reflectors, soil

Year 4: Classifying plants, Plant life cycles and reproduction

Year 6: Evolution and inheritance of plants, Plant adaptations to their environment

Further reading:

[A Seed is Sleepy - Aston and Long](#)
[Botanicum \(welcome to the Museum\) - Willis and Scott](#)

Year 3 Progression map – Rocks:

National curriculum objectives:	Scope:	Coherence:
<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>Misconceptions:</p> <ul style="list-style-type: none"> That rocks have always been where we find them now That rocks cannot change All rock is hard Rocks are waterproof Volcanoes are simply destructive and always dangerous That people can make rocks Fossils are found in the ground 	<p>H&EP Science lesson titles:</p> <ol style="list-style-type: none"> How can we describe rocks? How do volcanoes make igneous rocks? Where can we find fossils? Can rocks be changed? Can we recycle rocks? Why is soil important? <p>Working scientifically skills used:</p> <ul style="list-style-type: none"> Observe and classify different types of rocks Predict crystal size Conclusion crystal size Modelling rock formation, the rock cycle and soil and make simple conclusions using models 	<p>Key vocabulary:</p> <p>crust, meteorites, minerals, granite, mineralogist, porosity, properties, talc, crystal, lava, magma, obsidian, pumice, boulder, continents, fossils, meteorologist, palaeontologist, pebble, sediment, metamorphic, pressure, temperature, bedrock, humus, organic matter, silt, topsoil, waterlogged</p> <ul style="list-style-type: none"> Key scientists and inventors: Frederick Mohs – Mineralogist Alfred Wegener – Astronomer and meteorologist James Hutton - Geologist
Builds on:	Future learning:	Further reading:
<p>Year 2:</p> <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 find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching 	<p>Year 3: Contact forces and the effects of friction</p> <p>Year 4: Melting, freezing, evaporation and condensation</p> <p>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</p> <p>Micro-organisms</p>	<p>Rocks (Science in a Flash) Georgia Amson-Bradshaw</p> <p>Rocks and fossils (Science skills sorted)! Anna Claybourne</p>

Year 3 Progression map – Light

National curriculum objectives:	Scope:	Coherence:
<ul style="list-style-type: none"> 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 <p>Misconceptions:</p> <ul style="list-style-type: none"> Our eyes are light sources Shiny objects (good reflectors) are sources of light That we can see in the dark That light can bend around objects 	<p>H&EP science lesson titles</p> <ol style="list-style-type: none"> Light source or light reflector? Transparent, translucent or opaque? What makes a good reflector of light? What is a shadow? How can we protect our eyes from the Sun? How do telescopes work? <p>Working scientifically skills used:</p> <ul style="list-style-type: none"> Observe how light travels when it meets different objects Classify objects as good or poor reflectors of light Comparative testing Investigate shadow length Calculate averages Construct a bar chart Observe the sun safely Construct a telescope 	<p>Key vocabulary:</p> <p>absence, bioluminescence, Celsius, mirror, reflect, image, opaque, translucent, transparent, aluminium, dull, scattered, blocked, shadow, position, astronomer, iris, pupil, project, astronaut, binoculars, curved, lens, optician, telescope</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>Year 2:</p> <p>Plants need light to survive</p> <p>Some misconceptions may arise here as no formal learning about light</p>	<p>Year 4 – Sound: Differences between light and sound energy</p> <p>Year 4 – Electricity: How lamps light up in a circuit</p> <p>Year 5 – Earth and Space</p> <p>Year 6 – Light: 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</p>	<p><u>Light (Science in a Flash)</u></p> <p><u>Light: Shadows, Mirrors, and Rainbows (Amazing Science (Picture Window))</u></p>

Year 3 Progression map – Animals Including Humans:

National curriculum objectives:	Scope:	Coherence:
<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>Misconceptions:</p> <ul style="list-style-type: none"> that we have ‘metals’ inside our bodies in the form of minerals that hibernating animals are asleep that insects are not herbivores that bones are dead that blood cells are made in the blood or heart rather than bone that many different types of animals have horns made from bone most animals are invertebrates 	<p>HEP science lesson titles:</p> <ol style="list-style-type: none"> Know how living things get energy The different nutrients we need to eat The food requirements for a range of animals The bones in the body The structure and function of bones in other animals How animals move using muscles <p>Disciplinary knowledge:</p> <ul style="list-style-type: none"> Predict, observe, comparative test and evaluate vitamin C experiment Predict, observe chicken bone experiment Observe animal skeleton cookie Modelling muscles and bones 	<p>Key vocabulary:</p> <p>carbohydrates, fats, protein, vitamins, minerals, fibre, obesity, starvation, collagen, exoskeleton, biceps, contract, muscle, tendon, triceps</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>Year 2: Find out and describe the basic needs of animals for survival, describe the importance of exercise, eating the right amounts of different types of food for humans, feeding relationships.</p> <p>Year 3: simple functions of the digestive system, feeding relationships</p>	<p>Year 6: Structure and function of circulatory system, impact of diet and exercise lifestyle on body function, nutrients and transport around the body</p>	<p>Why do we eat? (Usborne Beginners)</p> <p>Stephanie Turnbull</p> <p>Bones and Muscles (Your Body: Inside and Out)</p> <p>Angela Royston</p>

Year 3 Progression map – Forces and Magnets

National curriculum objectives:	Scope:	Coherence:
<ul style="list-style-type: none"> compare how things move on different surfaces notice that some forces need contact between 2 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 2 poles predict whether 2 magnets will attract or repel each other, depending on which poles are facing <p>Misconceptions:</p> <ul style="list-style-type: none"> that we can see forces that friction is unhelpful copper coins are magnetic magnetic attraction only works through air 	<p>HEP Science lesson titles:</p> <ol style="list-style-type: none"> How forces can make things move Different contact forces and how they work Different non-contact forces and how they work Which metals are magnetic Factors that affect the strength of a magnet How compasses work <p>Working scientifically:</p> <ul style="list-style-type: none"> Observe and model make a tornado Comparative testing friction investigation Comparative testing magnetic behaviour Comparative testing magnetic materials Comparative testing magnetic strength Modelling making a compass Experimental design magnet assessment <p>Key scientists and inventors:</p> <ul style="list-style-type: none"> Maglev trains 	<p>Key vocabulary:</p> <p>contact, contraction, tendon, friction, lubricant, attract, repel, gravity, magnetic, pole, compass</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>Year 2: everyday materials and their properties, pushing and pulling, floating and sinking Year 3: Properties of some rocks and the effects of forces in the rock cycle</p>	<p>Year 5: Changes and properties of materials – materials properties and testing, Forces - effects of air resistance, water resistance and friction between surfaces, mechanisms, levers, pulleys and gears, Gravity in Earth and space</p>	<p>Forces (BOOM) Science , Georgia Amson-Bradshaw Magnets, pushing together, pulling apart, Natalie Rosinsky</p>

Year 3 Progression map – The Bee Project

National curriculum objectives:	Scope:	Coherence:
<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 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>Misconceptions:</p> <ul style="list-style-type: none"> That all bees make honey That honey is vomit That only bees can make honey That a bee is not a type of insect That pupae and larvae are a different animal to an insect 	<p>HEP science lesson titles</p> <ol style="list-style-type: none"> What is a bee? What is inside a hive? What do bees make? How do bees communicate? Who makes honey? What is happening to bees? <p>Working scientifically skills used:</p> <ul style="list-style-type: none"> Exploring, talking about, testing and developing ideas about everyday phenomena, modelling, observing changes over time, pattern-seeking, finding things out using secondary sources of information, comparative testing – crystallised honey, (Pupils can construct a bar chart) draw simple conclusions and use scientific language, evaluating and suggesting improvements 	<p>Key vocabulary:</p> <p>Abdomen, antennae, mandible, proboscis, stinger, thorax, venom, bee bread, cells, colonies, drone, hexagonal, larva, pupa, royal jelly, social bees, honey stomach, propolis, swarm, waggle dance, honeydew, solitary, sugarbag, beekeepers, insecticide</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>Year 2: 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 animal and plants, and how they depend on each other. Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different</p> <p>Year 3: Plants, Animals including humans</p>	<ul style="list-style-type: none"> Animals including humans (Y4) Animals including humans (Y5) Animals including humans (Y6) Living things and their habitats (Y4) Living things and their habitats (Y5) Living things and their habitats (Y6) 	<p>Bees - National Geographic Kids' Readers (Level 2), by Laura Marsh</p> <p>The Bee Book, by Charlotte Milner</p>

Year 4



Year 4 Progression map – States of matter

National curriculum objectives	Scope:	Coherence:
<ul style="list-style-type: none"> 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 <p>Misconceptions:</p> <ul style="list-style-type: none"> water melts ice freezes metals are only in the solid state things can only evaporate when they have been boiled steam and water vapour are the same condensation is when air turns to water water that evaporates has disappeared into the air 	<p>HEP science lesson titles:</p> <ol style="list-style-type: none"> What are the states of matter? Can we turn a solid into a liquid? What is the opposite of melting? Why do puddles disappear? Can we make rain? Do we drink the same water dinosaurs did? <p>Working scientifically skills used:</p> <ul style="list-style-type: none"> Classify solids, liquids and gases and their properties Observe solids, liquids and gases in action Research melting points Writing a method making ice cream Observe over time, Alka seltzer, condensation, melting, evaporation, freezing investigations Comparative testing, predictions, conclusions and evaluations melting, evaporation, condensation Modelling condensation and the water cycle Secondary data 	<p>Key vocabulary:</p> <p>solid, liquid, gas, melting, freezing, evaporation, water vapour, cloud, condensation, fog, precipitation.</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>Year 2:</p> <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 find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching <p>Year 3:</p> <ul style="list-style-type: none"> How rocks can be changed over time 	<p>Year 4:</p> <ul style="list-style-type: none"> The speed of sound through different materials Lack of matter in space (vacuum) <p>Year 5:</p> <ul style="list-style-type: none"> Changes and Properties and changes of materials - 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 	

Year 4 Progression map – Animals Including Humans:

National curriculum objectives	HEP science lesson titles	Coherence:
<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>Misconceptions: That humans are not animals That there is no need to brush baby teeth That saliva has no function That you need to be upright to digest food That the abdomen is the stomach That cows have 4 stomachs That all bacteria are bad</p>	<p>7. Can we group animals by what they eat? 8. Who eats what? 9. Why are we born without teeth? 10. Why doesn't the stomach eat itself? 11. How big is the small intestine? 12. Are all bacteria bad for us?</p> <p>Working scientifically skills used:</p> <ul style="list-style-type: none"> Observe and classify different types of rocks Predict crystal size Conclusion crystal size Modelling parts of the digestive system Comparative testing tooth decay, digestion in the stomach <p>Key scientists and inventors:</p>	<p>Key vocabulary: carnivore, consumer, herbivore, omnivore, predator, prey, producer, food chain, microplastics, canines, enamel, incisors, molars, premolars, salivary glands, taste buds, umami</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>Year 2:</p> <ul style="list-style-type: none"> Simple food chains, Energy is not mentioned in the NC before KS3, however, the idea of cycles and nutrient cycling is touched on in KS2. 	<p>Year 3: Plants, Animals including Humans Year 4,5 & 6 Living things and their habitats Year 5 & 6 Animals including humans</p>	<p>Food chains: Who eats what 1 Sam Hutchinson Your Amazing Digestion from Mouth through Intestine (Your Amazing Body Books) Joanne Settel</p>

Year 4 Progression map – Sound

National curriculum objectives:	Scope:	Coherence:
<ul style="list-style-type: none"> 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 <p>Misconceptions:</p> <ul style="list-style-type: none"> That sound cannot bend around corners That we cannot hear sounds that we cannot see That sound does not travel well through solids That we cannot hear under water 	<p>HEP Science lesson titles:</p> <ol style="list-style-type: none"> How are sounds made? How does sound travel? How do our ears work? Big or small? High or low? Can you keep the noise down? <p>Working scientifically skills used:</p> <ul style="list-style-type: none"> Conclusions/ Modelling making an instrument Modelling String telephone Modelling The ear Modelling Making a loudspeaker Comparative testing and pattern seeking Pitch Comparative testing Sound proofing 	<p>Key vocabulary:</p> <p>Brass, string, woodwind, vibration, vocal cord, echoes, medium, particle, wave, auditory nerve, audiologist, cochlea, ear canal, eardrum, hearing impairment, pinna, amplifier, decibel, audible range, echolocation, hertz, pitch, sonar, ultrasonography, ultrasound</p>
Builds on:	Future learning:	Further reading:
<p>Year 2:</p> <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 Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching <p>Year 3</p> <ul style="list-style-type: none"> Light (energy) Forces (Effects of forces on objects) Animals Including Humans (Adaptations) 	<p>Year 4:</p> <ul style="list-style-type: none"> Electricity <p>Year 6:</p> <ul style="list-style-type: none"> Light Electricity 	<p>Sound (All about Science) Angela Royston</p> <p>Sound and Hearing (Popcorn Science) Angela Royston</p>

Year 4 Progression map – Living Things and Their Habitats:

National curriculum objectives:	Scope:	Coherence:
<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 <p>Misconceptions:</p> <ul style="list-style-type: none"> if you cut an earthworm in half, you get two worms worms are a nuisance and have no use to humans or the environment litter dropped on land does not end up in the sea all plants grow flowers that animals underwater do not breathe that sharks are mammals that whales are fish that whales do not need air to breathe that all animals except mammals are cold-blooded that spiders are insects 	<p>H&EP Science lesson titles:</p> <ol style="list-style-type: none"> Some ways living things can be sorted The different vertebrate groups and their characteristics The different invertebrate groups and their characteristics How to classify living things based on their characteristics Where to find living things in their habitats How humans have affected animal and plant habitats <p>Working scientifically:</p> <ul style="list-style-type: none"> Observe over time living things in their habitats Identify and classify living things based on their characteristics Interpret classification keys Construct classification keys Predict what group living things belong to Pattern seeking Follow a simple practical procedure Booklet and video as secondary source of information/ data Make a conclusion based on evidence <p>Key scientists and inventors:</p> <ul style="list-style-type: none"> <i>Aristotle and Carl Linnaeus will be referred to in UKS2</i> 	<p>Key vocabulary:</p> <p>characteristics, invertebrates, vertebrates, cold-blooded, warm-blooded, gills, entomologist, antennae, abdomen, thorax, colonies, pooter, sweep net, deforestation, endangered, extinct, slash-and-burn.</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>KS1: Animals including humans and living things and their habitats, observe and talk about changes in seasons, KS2: Plants (characteristics and life cycles), food chains and interdependence, Animals including humans</p>	<p>Year 5: Living things and their habitats (vertebrate and invertebrate life cycles) Year 6: Evolution and Inheritance KS3: Interdependence, evolution and inheritance</p>	<p><u>What a waste - rubbish, recycling and protecting our planet</u> Jess French</p> <p><u>Out and about Minibeast explorer</u> - National Trust</p>

Year 4 Progression map – Living Things and Their Habitats:

National curriculum objectives:	Scope:	Coherence:
<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 <p>Misconceptions:</p> <ul style="list-style-type: none"> if you cut an earthworm in half, you get two worms worms are a nuisance and have no use to humans or the environment litter dropped on land does not end up in the sea all plants grow flowers that animals underwater do not breathe that sharks are mammals that whales are fish that whales do not need air to breathe that all animals except mammals are cold-blooded that spiders are insects 	<p>HEP Science lesson titles:</p> <p>25. Some ways living things can be sorted 26. The different vertebrate groups and their characteristics 27. The different invertebrate groups and their characteristics 28. How to classify living things based on their characteristics 29. Where to find living things in their habitats 30. How humans have affected animal and plant habitats</p> <p>Working scientifically:</p> <ul style="list-style-type: none"> Observe over time living things in their habitats Identify and classify living things based on their characteristics Interpret classification keys Construct classification keys Predict what group living things belong to Pattern seeking Follow a simple practical procedure Booklet and video as secondary source of information/ data Make a conclusion based on evidence <p>Key scientists and inventors:</p> <ul style="list-style-type: none"> <i>Aristotle and Carl Linnaeus will be referred to in UKS2</i> 	<p>Key vocabulary:</p> <p>characteristics, invertebrates, vertebrates, cold-blooded, warm-blooded, gills, entomologist, antennae, abdomen, thorax, colonies, pooter, sweep net, deforestation, endangered, extinct, slash-and-burn.</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>KS1: Animals including humans and living things and their habitats, observe and talk about changes in seasons, KS2: Plants (characteristics and life cycles), food chains and interdependence, Animals including humans</p>	<p>Year 5: Living things and their habitats (vertebrate and invertebrate life cycles) Year 6: Evolution and Inheritance KS3: Interdependence, evolution and inheritance</p>	<p><u>What a waste - rubbish, recycling and protecting our planet</u> Jess French <u>Out and about Minibeast explorer</u> - National Trust</p>

Year 4 Progression map – Electricity

National curriculum objectives:	Scope:	Coherence:
<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 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 	<p style="text-align: center;">H&EP Science lesson titles:</p> <p>31. The different types of electricity 32. How electricity can be produced for our homes 33. The different parts of a circuit 34. What is meant by conductors and insulators 35. How to use electricity safely 36. How electricity has affected different parts of the world</p> <p>Working scientifically:</p> <ul style="list-style-type: none"> Observe over time - effects of static electricity Observe how foods can power a circuit Predict what will happen in different circuits Predict properties of different materials Suggest solutions to electrical problems 	<p>Key vocabulary: charge, electrostatic forces, static, flow, appliances, circuit, current, fossil fuels, nuclear, renewable, components, voltage, generator, hazards, conductor, insulator, electric shock.</p> <p>Misconceptions:</p> <ul style="list-style-type: none"> batteries store charge that a single cell is a battery that everyone can access electricity electricity just comes out of plugs bigger batteries are more powerful
Builds on:	Future learning:	Further reading:
<p>Year 2: Uses of everyday materials KS2: Animals including humans – electricity in animals – muscles, nerves, platypus Forces and magnets Year 3: H&EP Science unit – The Bee project</p>	<p>Year 4: H&EP Science unit - The History of science Year 5: Properties and changes of materials Year 6: Associate brightness of bulb or loudness of buzzer with the number of cells used in a circuit. Electrical symbols KS3: Electric current and potential difference, how to generate electricity using electromagnets, energy resources</p>	<p>Charging About: The Story of Electricity (Science Works) by Jacqui Bailey</p>

Year 4 Progression map - The History of science

National curriculum objectives:	Scope:	Coherence:
<ul style="list-style-type: none"> Explore the requirements of plants for life and growth (Y3) Notice that light is reflected from surfaces (Y3) Notice that some forces need contact between 2 objects, whilst others act at a distance, (Y3) Recognise that environments can change and that this can sometimes pose dangers to living things (Y4) Compare and group materials together (Y4) <p>Misconceptions:</p> <ul style="list-style-type: none"> That humans were alive at the same time as dinosaurs That humans evolved from Apes That humans invented fire That all Egyptians were mummified That the Roman empire was situated in Rome, only There were no scientific advancements during the idle Ages That Science was developed in the western world, only That Timbuktu is not a real place 	<p>HEP science lesson titles</p> <p>37. Did Science exist in prehistoric times? 38. How did ancient Egyptians use science? 39. What was ancient Greek science? 40. How did ancient Romans use science? 41. What was science in the Middle Ages? 42. What is modern science?</p> <p>Working scientifically skills used:</p> <p>Making systematic and careful observations, reporting on findings from enquiries, including oral and written explanations, using results to draw simple conclusions, identify differences, similarities or changes related to simple scientific ideas or processes, using simple straightforward evidence to answer questions or support their findings</p>	<p>Key vocabulary:</p> <p>Machines, prehistoric, technology, bronze, civilisations, mummification, papyrus, horizon, pharaohs, philosophy, aqueducts, hygiene, malaria, mosquitoes, algebra, Baghdad, Kaaba, Persia, Timbuktu, gravity, Renaissance.</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>KS1: Basics of science e.g. Naming plants and animals, etc. Naming and identifying parts of the body, everyday materials and seasonal changes KS2: Learning to name and describe basic processes, such as how seeds and bulbs grow into mature plants, uses and suitability of a range of materials</p>	<p>Properties and changes of materials (Y5) Earth and space (Y5) Forces (Y5) Evolution and inheritance (Y6) Light (Y6)</p>	<p><u>100 Scientists who made history, by Andrea Mills</u> <u>Kid Scientists Childhood Science Superstars, by Stabler and Cross</u></p>

Year 5



Year 5 Progression map – Properties and Changes of Materials

National curriculum objectives:	HEP science lesson titles	Coherence:
<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>43. What do we use materials for? 44. What are thermal conductors and insulators? 45. What happens when we mix materials? 46. What are reversible changes? 47. How do we separate some mixtures? 48. What is an irreversible change?</p> <p>Working scientifically skills used:</p> <ul style="list-style-type: none"> Comparative testing, fair tests, variables, co-planning experiments, conclusions and evaluations <p>Key scientists and inventors:</p> <ul style="list-style-type: none"> Stephanie Kwolek – Inventor of Kevlar 	<p>Key vocabulary: Ceramics, durability, silica, silicon, synthetic, thermal conductors, thermal insulators, microplastics, sieve, acetone, alloy, dissolved, soluble, solution, solvent, alkali, bicarbonate, irreversible, neutralisation, phlogiston</p> <p>Misconceptions:</p> <ul style="list-style-type: none"> Materials refers to fabrics only Materials refers to construction only Children may talk about the properties of an object, rather than the properties of a material
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>Year 2: Identifying and comparing suitability of everyday materials for specific uses Year 3: Comparing and grouping rocks based on properties, comparing and grouping magnetic materials, the effects of forces on objects Year 4: Compare and group materials based on states of matter, changes of state, compare and group materials based on electrical conduction or insulation</p>	<p>KS3: Acids and alkalis, combustion, thermal decomposition, chemical reactions and word equations, diffusion</p>	<p><u>The crayon man by Natascha Biebow</u> <u>The most magnificent thing by Ashley Spires</u> <u>What is it made from? by Bobby Kalman</u></p>

Year 5 Progression map – Animals Including Humans Part 5

National curriculum objectives	HEP science lesson titles	Coherence:
<p>Describe the changes as humans develop to old age</p> <p>Misconceptions:</p> <ul style="list-style-type: none"> • Humans are not animals • All animals have a 9 month pregnancy • All female animals have a pregnancy • Acne is a result of being unclean 	<p>49. Where does the human life cycle begin? 50. How does a child prepare for adulthood? 51. What is a period? 52. When are new humans made? 53. Do other animals have the same life cycle? 54. What is the last stage of the human life cycle?</p> <p>Working scientifically skills used:</p> <ul style="list-style-type: none"> • Comparative testing, fair tests, variables, co-planning experiments, conclusions and evaluations <p>Key scientists and inventors:</p> <ul style="list-style-type: none"> • Stephanie Kwolek – Inventor of Kevlar 	<p>English:</p> <p>Key vocabulary: milestones, acne, adolescence, adolescent, antiperspirant, puberty, scrotum, testes, wet dreams, fetus, mature, menstrual cycle, mood swing, peer pressure, period, vaginal discharge, womb, amniotic fluid, ultrasound, umbilical cord, gestation period, Alzheimer's, dementia, elastic</p>
Builds on:	Future learning:	Further reading:
<p>Year 2: Explore and compare the differences between things that are living, dead and never been alive; Notice that animals, including humans, have offspring which grow into adults</p> <p>Year 4: Recognise that living things can be grouped in a number of ways,</p>	<p>Year 5: Describe the life process of reproduction in some plants and animals</p> <p>Year 6: Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.</p> <p>KS3: Reproduction in humans, including the structure of the male and female reproductive systems and placenta, menstrual cycle, gametes, fertilisation, gestation to birth, maternal lifestyle</p>	<p>Puberty is gross, but also really awesome by Loveless Gina</p> <p>How did I begin by Nick Manning</p>

Year 5 Progression map – Forces

National curriculum objectives	H&EP science lesson titles	Coherence:
<p>Pupils should be taught to:</p> <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 <p>Misconceptions:</p> <ul style="list-style-type: none"> If an object is at rest, no forces are acting upon it Friction is bad There is no gravity on the moon That mass and weight are the same thing That heavier objects fall to the ground faster than lighter objects Objects have to be in contact with each other to exert a force on each other Weight is measured in kilograms Friction only exists between solid objects Alternative meaning of force e.g. forcing someone to do something Objects slow down and stop when they 'run out' of force 	<p>55. What happens when friction is low? 56. What happens when friction is high? 57. What is air resistance? 58. What is water resistance? 59. What does gravity do? 60. What are some simple machines?</p> <p>Working scientifically</p> <p>Scientific enquiry skills used: Observation, comparative testing, fair testing</p> <p>Key scientists and inventors: Galileo Galilei, Sir Isaac Newton</p> <p>Careers: Mechanical engineer, marine engineer</p>	<p>Key vocabulary: Catapults, grit, newton meter, newtons, trebuchets, synovial fluid, aerodynamics, drag, mechanical engineer, streamlined, marine engineer, mass, clutch, effort, fulcrum, gear, lever, load</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>Year 3: Forces and magnets, Animals including humans Year 5: Properties and changes of materials</p>	<p>Year 5: Earth and space KS3: Forces and motion, energy, pressure</p>	<p>The aerodynamics of biscuits by Clare Helen Walsh</p>

Year 5 Progression map – Living Things and their Habitats

National curriculum objectives	HEP science lesson titles	Coherence:
<p>Pupils should be taught to:</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>Misconceptions:</p> <ul style="list-style-type: none"> Reproduction and sex are the same thing Animals do not need to breathe under water Only humans feed their young milk Animals do not look after their young Only female animals care for their young Small animals do not have a gestation period Duck billed platypus is not a real animal Frogs only live in water Tadpoles are fish Frogs do not have teeth Only lungs are used for breathing 	<p>Q1. Do all animals develop the same way?</p> <p>Q2. What is metamorphosis?</p> <p>Q3. What is inside a cocoon?</p> <p>Q4. Which came first, the chicken or the egg?</p> <p>Q5. Why is there variation amongst living things?</p> <p>Q6. Do you always need two parents to reproduce?</p> <p>Working scientifically</p> <p>Scientific enquiry skills used: Secondary research, modelling,</p> <p>Key scientists and inventors: David Attenborough</p>	<p>Key vocabulary: Mammary glands, marsupials, offspring, camouflaged, clusters, embryo, frog spawn, metamorphosis, tadpole, cocoon, entomologists, larva/ larvae (plural), moulting, nymph, parasites, pupa, scabies, down, egg tooth, incubated, asexual, fertilisation, ovaries, ovules, testes, variation, bulb, cutting, clone, plantlet, regenerate, tuber</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>Year 3: Plants - explore the part that flowers play in the life cycle of flowering plants, including pollination and seed formation;</p> <p>Year 4: Living Things and Their Habitats - 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</p> <p>Animals Including Humans - construct and interpret a variety of food chains, identifying producers, predators and prey</p> <p>Year 5: Animals Including Humans - describe the changes as humans develop to old age</p>	<p>Year 6: Living Things and Their Habitats, Evolution and Inheritance</p>	<p>Animals Lives and Life Cycles by Science Essentials</p> <p>Seed Sleepy Nature, Diana Hutts and Aston Sylvia Long</p>
		<p>The enormous turnip by Katie Daynes</p>

Year 5 Progression map – Earth and Space

National curriculum objectives	HEP science lesson titles	• Coherence:
<p>Pupils should be taught to:</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 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 <p>Misconceptions:</p> <ul style="list-style-type: none"> The Earth is at the centre of the solar system The Earth is flat There is no gravity in space The Sun is not a star Objects in space do not move Orbits are circular Ours is the only galaxy Night-time happens because the Sun moves down The Moon changes shape 	<p>67. Do objects move in space?</p> <p>68. Why do we have day and night?</p> <p>69. Does the Moon change shape?</p> <p>70. Can we use celestial objects to tell the time?</p> <p>71. What is the Geocentric Model of the solar system?</p> <p>72. What is the Heliocentric Model of the solar system?</p> <p>Working scientifically</p> <p>Scientific enquiry skills used: Secondary research and modelling</p> <p>Key scientists and inventors: Ptolemy, Alhazen, Nicolaus Copernicus, Tycho Brahe, Johannes Kepler, Galileo Galilei, James Webb, Edwin Hubble</p>	<p>• Key vocabulary: Asteroid, celestial bodies, comet, elliptical, galaxy, orbit, sphere, universe, axis, rotation, crescent, phase, satellite, Geocentric, Heliocentric</p>
<p>Builds on:</p>	<p>Future learning:</p>	
<p>Year 3: Light, Forces and magnets Year 4: States of matter, Sound Year 5: Forces</p>	<p>Year 6: Light KS3: Earth and atmosphere, Forces and waves</p>	

Year 5 Progression map – The scientific method

National curriculum objectives:	Scope:	Coherence:
<ul style="list-style-type: none"> planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs using test results to make predictions to set up further comparative and fair tests reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations identifying scientific evidence that has been used to support or refute ideas or arguments <p>Misconceptions:</p> <ul style="list-style-type: none"> accuracy and precision are the same thing A hypothesis must be proven true A hypothesis and prediction are the same thing 	<p>Substantive knowledge:</p> <p>73. What is the scientific method? 74. What are variables? 75. What is the best equipment for the job? 76. Is the data reliable? 77. How did the scientific method transform blood transfusions? 78. How did the scientific method help us learn about chimpanzees?</p> <p>Disciplinary knowledge:</p> <ul style="list-style-type: none"> Design comparative test for a wheelchair ramp Comparative test – vinegar volcano Comparative test – data logger Fair testing Secondary research – blood transfusions Secondary research and observation over time 	<p>Key vocabulary:</p> <p>Hypothesis, variables, Bunsen burner, data, measuring cylinder, pipette, accurate, average, conclusion, precision, precise, repeatable</p>
<p>Builds on:</p>	<p>Future learning:</p>	<p>Further reading:</p>
<p>Working Scientifically KS2: Plants, States of Matter, Living Things and Their Habitats, Animals Including Humans, Earth and space, Properties and changes of materials.</p>	<p>Working scientifically</p>	<p><u>Awesome science experiments</u> <u>Experiments with the Scientific Method (In the Science Lab)</u></p>

Year 6



Animals Including Humans - Year 6: PROGRESSION MAP

National Curriculum Objectives

- 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

Common misconceptions:

- **The Heart is on the Left Side of Your Chest:** Actually, the heart is located in the centre of the chest, between the lungs. It's tipped slightly so that a part of it sticks out and taps against the left side of the chest, which is what makes it seem as though it is located there.
- **Blood is Blue Inside Your Body:** Blood is always red. It may look blue through your skin, but that's because of how light interacts with your skin and blood.
- **The Heart Does All the Work in Moving Blood Around:** While the heart is very important, it's not doing all the work. The blood vessels help, too! Arteries, veins, and capillaries have muscular walls that contract and relax to help pump blood.
- **You Don't Need to Worry About Heart Health Until You're Older:** It's never too early to start taking care of your heart. Eating a balanced diet, exercising regularly, and avoiding harmful substances like tobacco can help you keep your heart healthy from a young age.

Prior learning:

- Animals, including humans (Year 3) - Discuss the function of a skeleton in humans and some animals.
- Animals, including humans (Year 4) - Describe the functions of the digestive system; identify the types and functions of human teeth.
- Animals, including humans (Year 5) - Understand changes in human development from birth to old age.

Lesson Titles:

1. What is the human circulatory system?
2. How does blood get around the body?
3. What is in the blood?
4. How do we get water and nutrients?
5. How can we keep our heart healthy?
6. What are some blood disorders?

Scientific enquiry:

- Lesson 1 - Comparative testing
 Lesson 2 - Pattern seeking
 Lesson 3 - Identifying, classifying and grouping
 Lesson 4 - Identifying, classifying and grouping
 Lesson 5 - Fair testing
 Lesson 6 - Researching using secondary sources

Future learning at KS3:

1. Further explore the role of the circulatory system and the composition of blood.
2. Understand the relationship between health and disease, including the impact of lifestyle choices on health.
3. Learn about the function of the immune system and how it responds to infections.
4. Explore the impact of drugs, alcohol, and smoking on the body and overall health.
5. Understand the importance of a balanced diet and regular exercise to maintain health.

Coherence:

English writing

- **Explanation Texts:** Students can write detailed explanations of how the circulatory system works, how nutrients and water are transported within the body, or how different lifestyle choices can impact health. They could also write instructions for a healthy lifestyle or guide on how to keep your heart healthy.
- **Information Texts:** Students can write their own informational booklets or leaflets about the circulatory system, healthy living, the impact of drugs on the body, or the importance of diet and exercise. This can include writing chapter summaries, creating glossaries of technical terms, or designing diagrams and captions.
- **Reading comprehension** - Reading books and resources related to health, diet, and the circulatory system can develop comprehension skills.

Maths:

Statistics: Interpreting data from blood pressure readings or heart rates before and after exercise; calculating averages.

Design and Technology:

- **Cooking and nutrition** - Understanding the principles of a healthy and varied diet.
- **Design, make, evaluate and technical knowledge** - Building the model pumping heart.

Art:

Creating sketchbooks - Sketching and labelling parts of the human body or circulatory system; creating representations of blood cells.

Book Recommendations:

- **The Great Body Book: An Adventure Through the Insides of the Human Body** by Giuliano Ferri - Covers objectives related to identifying and naming the main parts of the human circulatory system and understanding the impact of lifestyle on bodily functions.
- **See Inside Your Body** by Katie Daynes - Supports learning objectives related to identifying and describing the functions of the heart, blood vessels, and blood.
- **The Circulatory System** by Rebecca Pettiford - Aligns with objectives related to understanding how nutrients and water are transported within humans.
- **Cells at Work!** by Akane Shimizu - This is aimed at 13 years and up, so it may not be appropriate for children, but it may appeal to teachers who follow Manga. It is a manga series that personifies cells in the human body, including red blood cells, white blood cells, and platelets, which can make learning about these components of the circulatory system more engaging and relatable.

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