HARESFIELD SCHOOL

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Haresfield CE Primary School

Progression of Knowledge and Skills in Science

Year A UKS2

Whole School Science Curriculum

Year	Knowledge	Skills
Y 5 / Y 6 Term 1 Year A	Focus: What happens in a potions lesson in Hogwarts? National Curriculum Knowledge ✓ Properties and Changes of Materials Prior Learning: Why do materials change state? LKS2	**Knowledge, Skills and Understanding** • compare and group together everyday materials on the basis of their properties, including their solubility 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 • 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 **Working Scientifically** • Plan investigations into dissolving, saturation point and reversible changes, controlling variables such as temperature and amount of solute • Plan fair tests to investigate conditions for rusting and rates of chemical reactions • Ask questions about how to separate mixtures, what affects dissolving speed, the difference between melting and dissolving, and conditions needed for oxidation • Observe separation methods, dissolving processes, melting vs dissolving, and non-reversible changes including rusting and burning • Measure temperatures, volumes, saturation points and burning rates using thermometers, measuring cylinders and timers, taking multiple readings for accuracy • Draw diagrams showing separation processes, reversible and non-reversible changes • Record observations and measurements in tables showing solubility tests, rusting conditions, and material properties • Conclude that mixtures can be separated and substances recovered through evaporation • Conclude that dissolving and melting are different reversible processes, while burning and rusting are non-reversible • Predict saturation points and rusting conditions based on variables • Use evidence to explain why different materials are chosen for specific purposes based on their properties • Suggest improvements to separation and chemical reaction investigations • Present findings about material properties, new materials created, and explain the work of famous chemists

Objective	Sticky Knowledge	Key Vocabulary and Definitions	Resources
Making and separating mixtures	Mixtures can be separated using sieving, filtration and evaporation depending on the type of mixture. Dissolved substances can be recovered from solutions by evaporating the liquid, leaving the solid behind.	Filtration: A method of separating an insoluble solid from a liquid by passing the mixture through filter paper.	Sieves, filter paper, funnels, sand, gravel, salt, water, shallow dishes, heat source (or sunny windowsill) (Create muddy mixtures for swamp scenes, then sparate them for reuse. Recover salt from “seawater” for a desert island scene by evaporating the water!)
Investigating solubility and reversible changes	Some materials will dissolve in liquid to form a solution. When no more can be dissolved we reach saturation point. Dissolving is a reversible change - we can recover the dissolved substance through evaporation.	Saturation: The point at which no more solute can dissolve in a solvent at a given temperature.	Sugar, salt, water at different temperatures, chocolate, ice, beakers, stirrers, measuring cylinders, thermometers, heat source (Investigate saturation points and temperature effects on dissolving. Compare melting chocolate with dissolving sugar to prove they're different processes. Show both are reversible!)
Non-reversible changes - chemical reactions -	Some changes result in the formation of new materials, and this kind of change is not usually reversible.	Non-reversible change: A change where new materials are formed and you cannot get the original materials back.	Bicarbonate of soda, white vinegar, beakers, balloons, measuring equipment, safety goggles (Create fizzing explosions for special effects! Investigate how changing the amount of reactants affects the reaction size. Once it's happened, you can't get the original materials back - unlike dissolving or melting!)
Non-reversible changes - oxidation and burning	Some non-reversable changes result in the formation of a new material, e.g. rust is made from iron, water and oxygen.	Oxidation: A non-reversible chemical reaction where a substance combines with oxygen to form a new material.	Iron nails, steel wool, water, oil, salt, containers, candles, matches, timers, heatproof mats, safety equipment (Make props look aged through oxidation! Set up investigations into optimum conditions for rusting to observe over the week. Calculate burning rates for candles. These changes can't be reversed - new materials are formed.)
Material properties and creating new materials	Different materials are chosen for specific uses based on their properties. Scientists like Spencer Silver (sticky note glue) and Ruth Benerito (wrinkle-free cotton) have created new materials to solve problems.	Suitability: How well a material's properties match what is needed for a particular job or purpose.	Examples of everyday objects made from metal, wood and plastic; material samples for testing; PVA glue, borax/contact lens solution, cornflour, food colouring (for making slime); research materials about famous chemists

Whole School Science Curriculum

Year	Knowledge	Skills
Y 5 / Y 6 Term 2 Year A	Focus: Why can't I see around corners? National Curriculum Knowledge ✓ Light Prior Learning: Light LKS2 - Why can't we see in the dark?	**Knowledge, Skills and Understanding** • 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. **Working Scientifically** • Plan investigations into how light travels and shadow formation, controlling variables such as light source distance and object size • Plan tests to identify light sources vs reflectors • Ask questions about how we see objects, why shadows change size and shape, and the difference between light sources and reflectors • Make systematic observations, take measurements with increasing accuracy, and take repeat readings when appropriate • Observe how light travels in straight lines, which surfaces reflect light best, and how shadow shape matches objects • Measure shadow sizes and distances using rulers and tape measures, taking multiple readings for accuracy • Draw light path diagrams showing source → object → eye and shadow formation • Record observations and measurements in tables • Conclude that light travels in straight lines and we see objects through reflection • Predict shadow size and shape based on light source position • Use evidence that light cannot bend to explain shadow formation and why we can't see around corners • Suggest improvements to investigations and present findings through shadow puppet shows and written explanations

Objective	Sticky Knowledge	Key Vocabulary and Definitions	Resources
Light sources and how light travels	Light travels in straight lines from a light source. Light cannot bend around corners or travel in curves.	Light source: An object that produces its own light, such as the sun, a torch or a candle.	Torches, cardboard with holes, string, rulers, mirrors, dark space or blackout materials, light boxes, laser pointers (teacher use only) (Film directors need to understand how light travels to position cameras and lighting correctly. Investigate how light travels in straight lines using torches and cards with holes.)
How we see objects - reflection	We see objects because light from a light source travels to the object, **reflects** off it, and then travels into our eyes.	Reflection: When light bounces off the surface of an object and travels in a different direction.	Range of objects (shiny, dull, different colours), torches, mirrors, white paper, dark paper, diagrams for labelling (Cinematographers need to understand reflection to light scenes properly. Investigate which objects reflect light best and draw diagrams showing how light travels from source to object to eye.)
Light sources vs reflectors	Objects are seen in two ways: either they give out their own light (light sources) or they reflect light from another source into our eyes. Without light, we cannot see anything.	Luminous: An object that produces its own light and can be seen in the dark.	Torches, candles (teacher demonstration), glow sticks, reflective materials, the moon (discussion/images), dark space, various objects to test (Create a movie scene in darkness - which objects can be seen without external lighting? Test objects to classify them as luminous (light sources) or non-luminous (reflectors). Explain why the moon isn't a light source!)
Shadows and how they are formed	Shadows have the same shape as the object that casts them because light cannot bend around the object. The size of a shadow changes depending on the distance between the light source, object and surface.	Opaque: A material that does not let light pass through it, so it blocks light and creates a shadow.	Torches, range of objects (different shapes and sizes), white screens/walls, measuring equipment, transparent/translucent/opaque materials (Shadow puppetry is an ancient form of storytelling used in films! Investigate how shadows are formed and why they're the same shape as objects. Explore how to make shadows bigger and smaller for dramatic effects.)
Investigating shadows and light paths	Light travels in straight lines from a source. When it hits an opaque object, it cannot pass through or bend around it, so a shadow is formed on the other side.	Light path: The straight line route that light takes as it travels from a source, which can be shown using arrows in diagrams.	Torches, various shaped objects, screens, measuring equipment (rulers, tape measures), cameras/tablets for recording, materials for creating shadow puppet shows (Film lighting technicians must control shadows carefully. Investigate how changing the position of lights affects shadows. Create a shadow puppet show applying your knowledge, then explain the science behind your lighting choices using diagrams.)

Whole School Science Curriculum

Year	Knowledge	Skills
Y 5 / Y 6 Term 3 Year A	Focus: Classification National Curriculum Knowledge ✓ Living things and their habitats : Classification Prior Learning: What lives in this habitat? LKS2	**Knowledge Skills and Understanding** • To be able to identify and name the main parts of the human circulatory system • describe the functions of the heart, blood vessels and blood • To know what the pulse is • To recognise the impact of exercise and lifestyle on the way their bodies function • To know why a heathy diet and exercise are important • To know how the skeleton and muscles help the body to move • the skeleton bends at the joints, for example, the knees muscles are attached to bones by the tendons when muscles contract the bones move, fill tiny spaces in the bones **Working Scientifically** • Plan how to sort and classify living things using different criteria • Plan investigations to observe and record characteristics of microorganisms, plants and animals • Ask questions about what makes living things similar or different and why classification is useful • Observe observable characteristics of living things using magnifying glasses and microscopes • Record similarities and differences between living things in tables and Venn diagrams • Create classification charts and diagrams showing how living things are grouped • Draw and label specimens showing key characteristics used for classification • Give reasons for classifying living things into specific groups based on observable characteristics • Use observable characteristics to predict which group an unfamiliar living thing belongs to • Explain classification decisions using scientific evidence and vocabulary • Create and present classification keys that others can use to identify living things

Objective	Sticky Knowledge	Key Vocabulary and Definitions	Resources
Introduction to classification	Living things are classified (sorted into groups) based on their observable characteristics - features we can see or measure. Scientists classify living things to help identify them, understand relationships between them, and organise information.	**Classification:** The process of sorting living things into groups based on their observable characteristics and similarities.	Pictures/cards of a wide variety of living things (animals, plants, microorganisms), sorting hoops/circles, large sheets of paper for group work, magnifying glasses (Museum curators classify living things to organise collections and help visitors understand the natural world. Sort a variety of living things into groups using your own criteria, then explain your classification system!)
Classifying micro-organisms, plants and animals	All living things can be classified into three broad groups: micro-organisms (tiny living things that can only be seen with a microscope), plants (living things that make their own food through photosynthesis), and animals (living things that need to eat other organisms for food and can usually move around). Carl Linnaeus was a Swedish scientist who developed the modern classification system in the 1700s. He grouped living things based on their observable characteristics and created a naming system still used by scientists today.	**Micro-organisms:** Tiny living things that are too small to see with the naked eye and can only be seen using a microscope, such as bacteria and some fungi. **Observable characteristics:** Features of living things that we can see, measure, or detect, such as how they move, what they eat, their body structure, or how they reproduce..	Microscopes, images of micro-organisms, plant specimens, animal specimens/pictures, classification keys, Venn diagrams, characteristic cards, short video clip about Carl Linnaeus (3-5 minutes), timeline showing 1700s, pictures of Linnaeus and his work (Biologists classify living things into major groups to understand the diversity of life on Earth. Investigate the key characteristics of micro-organisms, plants and animals, and explain why each living thing belongs to its group! Learn about Carl Linnaeus, who pioneered this classification approach over 250 years ago!)
Classifying animals - vertebrates and invertebrates	Vertebrates can be further classified into five groups based on characteristics such as how they are born, body covering, and temperature regulation: fish, amphibians, reptiles, birds and mammals.	**Cold-blooded:** Animals whose body temperature changes with their environment. **Warm-blooded:** Animals that maintain a constant body temperature.	Animal picture cards, classification charts, skeletons/models showing backbones, images of different vertebrate groups, invertebrate specimens (if available), sorting materials (Zookeepers classify animals to provide appropriate care and habitats. Sort animals into vertebrates and invertebrates, then classify vertebrates into their five groups based on observable characteristics!)
Classifying plants	Plants can be classified into different groups based on observable characteristics such as flowers, leaves, stems, roots and how they reproduce.. The main groups are flowering plants and non-flowering plants (plants without proper roots).	**Non-flowering plants:** Plants that do not produce flowers or seeds, such as ferns and mosses.	Plant specimens (or pictures): flowering plants, ferns, mosses, magnifying glasses, classification keys for plants, hand lenses, leaf and flower samples (Botanists classify plants to understand plant diversity and identify useful plants for medicine and food. Observe and classify a variety of plants into flowering and non-flowering groups, giving reasons based on their observable characteristics!)
Using classification keys	Classification keys are tools that help us identify living things by asking yes/no questions about their observable characteristics. Each question divides the living things into smaller groups until we can identify what it is. Scientists use classification keys to identify unfamiliar living things.	**Classification key:** A series of questions about observable characteristics that help identify living things by gradually narrowing down the possibilities.	Examples of classification keys, living thing specimens or pictures to identify, materials for creating keys (paper, cards), local habitat samples (leaves, minibeasts), tablets/computers for research (Wildlife experts use classification keys to identify species in the field. Use classification keys to identify mystery living things, then create your own key to help others classify a collection of organisms based on their characteristics!)

Whole School Science Curriculum

Year	Knowledge	Skills
Y 5 / Y 6 Term 3 Year A	Focus: Do all species start as an egg? National Curriculum Knowledge ✓ Animals Including Humans: Life Cycles Prior Learning: What if you had animal teeth? LKS2	**Knowledge Skills and Understanding** • To be able to identify and name the main parts of the human circulatory system • describe the functions of the heart, blood vessels and blood • To know what the pulse is • To recognise the impact of exercise and lifestyle on the way their bodies function • To know why a heathy diet and exercise are important • To know how the skeleton and muscles help the body to move • the skeleton bends at the joints, for example, the knees muscles are attached to bones by the tendons when muscles contract the bones move, fill tiny spaces in the bones **Working Scientifically** • Plan research into baby growth patterns and gestation periods of different animals • Plan how to gather and present information about human development stages • Ask questions about why humans change at different life stages and why gestation periods vary between animals • Research and record data about baby length and mass as they grow, presenting findings in tables and graphs • Research gestation periods of different animals and record in comparison tables and charts • Create timelines showing stages of human development from birth to old age with key characteristics • Observe and record physical changes that occur during different life stages • Identify patterns in baby growth data, such as rapid growth in the first year • Compare gestation periods and conclude that larger animals generally have longer gestation periods • Use evidence to explain that puberty is a normal part of development that happens at different times • Present findings about human development stages and ageing, explaining that development is a lifelong process

Objective	Sticky Knowledge	Key Vocabulary and Definitions	Resources
Stages of human development	Humans go through different stages of development from birth to old age: baby, toddler, child, teenager (adolescent), adult and older adult. At each stage, humans change physically, emotionally and socially.	**Development:** The process of growing and changing physically, emotionally and socially from birth through to old age.	Timeline materials (large paper, string, pegs), pictures/photos showing different life stages, measuring equipment, mirrors, information about characteristics of each life stage (Documentary makers create films about human development across the lifespan. Create a timeline showing the stages of human development from birth to old age, identifying key changes at each stage!)
Growth in babies and children	Babies grow and develop rapidly in their first year of life, gaining weight and length quickly. Growth continues through childhood but at a slower rate.	**Growth:** The physical increase in size and mass of a human body, which is fastest during infancy and adolescence.	Baby growth data/charts, graph paper or tablets for creating graphs, measuring tapes, scales (bathroom scales for demonstration), growth chart examples, recording sheets (Paediatricians (children's doctors) track baby growth to ensure healthy development. Research and record data about how babies grow in their first year, then present your findings using graphs to show patterns in growth!)
Puberty and adolescence	Puberty is the stage when a child's body develops into an adult body capable of reproduction. During puberty, hormones cause physical changes such as growth spurts, body hair, voice changes (in boys) and periods starting (in girls). Emotional changes also happen during puberty.	**Puberty:** The stage of development when a child's body changes into an adult body, usually happening between ages 8-14, caused by hormones.	Age-appropriate puberty education resources, diagrams showing physical changes, information sheets, question boxes for anonymous questions, links to school nurse/PSHE resources (Health educators help young people understand the changes their bodies go through. Learn about the physical and emotional changes that happen during puberty and understand that these changes are a normal part of growing up!)
Gestation and reproduction	Gestation is the time between conception and birth when a baby develops inside its mother. Human gestation is approximately 9 months (40 weeks	**Gestation period:** The length of time between conception (when a baby starts to develop) and birth, which varies between different animal species.	Research materials (books, tablets, internet access), animal gestation data, graph paper or digital tools for creating comparison charts, images of animal babies at birth (Zoologists and vets need to know gestation periods to care for pregnant animals. Research gestation periods of different animals, compare them with humans, and present your findings showing patterns and reasons for differences!)
Adulthood and ageing	During adulthood, humans reach their full physical development and may start families. As humans age, physical changes occur such as greying hair, wrinkles, reduced strength and flexibility, and changes in memory.	**Ageing:** The natural process of growing older, involving physical and mental changes that happen gradually throughout adulthood and into old age.	Photos/images showing adults at different ages, interviews with older adults (recorded or live if possible), information about healthy ageing, timeline materials to complete from Lesson 1 (Gerontologists study ageing to help people stay healthy as they grow older. Complete your human development timeline by exploring adulthood and old age, recognising that development is a lifelong process and celebrating the positive aspects of ageing!)