

Science Knowledge Progression – Harefield

Area: Light	
Year R	Light – light sources, transparent and opaque objects, how light travels, how shadows are formed
Year 1	<ul style="list-style-type: none"> • INK the names of some light sources (include natural and man-made). • INK the moon is NOT a light source. • INK we need light to see and darkness is the absence of light. • INK if something is blocking the light, there is no light so that part is dark, creating a shadow.
Year 2	<ul style="list-style-type: none"> • INK that we see sources of light because the light travels in a straight line from the source to our eyes.
Year 3	<ul style="list-style-type: none"> • INK light is reflected from some surfaces
Year 4	<ul style="list-style-type: none"> • INK as the light source gets closer to the object, the shadow gets larger • INK all objects cast a shadow (even transparent objects)
Year 5	<ul style="list-style-type: none"> •
Year 6	<ul style="list-style-type: none"> • INK light travels in a straight line, light is reflected, we see things when light enters our eyes • INK shadows have the same shapes as the objects which cast them

Area: Sound	
Year R	Sound – explore making sounds
Year 1	<ul style="list-style-type: none"> • INK the names of some sources of sound
Year 2	<ul style="list-style-type: none"> • INK sounds can be higher, lower, longer, shorter, louder, quieter, intermittent etc. • INK how to group sounds • INK some criteria I can use to group sounds
Year 3	<ul style="list-style-type: none"> • INK sounds are made by something vibrating. • INK vibrations (sound) travel quicker through a solid than a gas (such as the air) • INK sounds get fainter as the distance from the source increases because the amplitude (strength) of the wave (vibration) is less
Year 4	<ul style="list-style-type: none"> • INK Bigger, longer, thicker=lower and smaller, shorter, thinner=higher pitch • INK more force = bigger / stronger vibrations = louder volume
Year 5	<ul style="list-style-type: none"> •
Year 6	INK sounds are created by something vibrating, that Bigger, longer, thicker=lower and smaller, shorter, thinner=higher pitch and can apply this to make and play my own instrument

Area: Rocks	
Year R	<ul style="list-style-type: none"> •
Year 1	<ul style="list-style-type: none"> •
Year 2	<ul style="list-style-type: none"> •
Year 3	<ul style="list-style-type: none"> • INK the names of some types of rocks i.e. granite, chalk, sandstone, pumice, slate, marble, quartzite, obsidian and basalt • INK Other things could we use to sort the rocks - Colour, size, shiny/dull, layers, particles, grains, crystals, fossils, uniform texture, crumbly,

	<p>rounded edges/jagged edges, solid/got holes in, rough/smooth, speckled, striped.</p> <ul style="list-style-type: none"> • INK rocks change over time due to _____, _____ and _____. • INK the most hardwearing/durable rocks will not last forever. • INK organic matter includes dead plants/animals, air and water • INK Possible differences in soil are... • INK the Order of the Fossilisation Process:
Year 4	<ul style="list-style-type: none"> • INK these rock can be grouped because..... • INK harder rocks will rub away particles of softer rocks •
Year 5	Build revision questions into retrieval practice and starter questions
Year 6	Build revision questions into retrieval practice and starter questions

Area: Plants	
Year R	Plants – parts of a plant, life cycle of a plant, plant not plant, what plants need to grow
Year 1	<ul style="list-style-type: none"> • INK the following plants: Daisy, Rose, Daffodil, Cowslip, Primrose, Foxglove, Bluebell, Teasel, Hydrangea, Lavender, Dandelion, Poppy • INK the following trees: Oak, Beech, Ash, Cherry, Common Box, Holly, Pine • INK the following parts of a flower: flower, root, stem, leaf, fruit, seeds • INK the following parts of a tree: leaf, fruit, branch, root, trunk, flower/blossom
Year 2	<ul style="list-style-type: none"> • INK the deciduous trees lose their leaves in winter and evergreen trees stay green all year. INK how to groups trees and explain my groups. • INK whether a plant is a tree/flower / wild/garden / deciduous/evergreen / has fruit / is edible/poisonous • INK how to groups plants and explain my groups. • INK how to observe closely and identify similarities and differences. • INK how to suggest reasons for these differences • INK how to identify and classify a range of plants. • INK seeds are made in flowers and have to be dropped and planted to grow a new flower. • INK bulbs stay in the ground and grow new flowers each year. • INK ... grow from bulbs and ... grow from seeds. • INK plants need light and water to survive
Year 3	<ul style="list-style-type: none"> • INK the job of each part of the plant • INK seeds need warmth but not light, water, air and sufficient space to germinate • INK plants need light, water, air, space and nutrients to grow •
Year 4	<ul style="list-style-type: none"> • INK the roots of a plant absorb water from the ground, xylem cells in the stem carry water from the roots to all other parts of the plant • INK that a conference poster needs.... • INK - Flowers come from seeds, and they create seeds too. All flowering plants go through the following life cycle. • INK Germination is the process by which a plant begins to grow from a seed. Roots form under the soil. The stem, leaves and flower emerge above the soil. • INK Pollen produced by a flower is carried by insects or blown by the wind to another flower. This process is called pollination.

	<ul style="list-style-type: none"> • INK When the pollen reaches another flower, the flower uses it to make new seeds. This is called seed formation. • INK seeds are scattered by animals or the wind. This process is called dispersal. Some of the seeds will grow into new plants. • INK Bees pollinating by collecting nectar (POLLINATION) • INK Animals roll in flowers and pollen gets stuck in their fur (POLLINATION) • INK Birds and animals eating seeds and coming out in their faeces (SEED DISPERSAL) • INK Squirrels burying food (SEED DISPERSAL) • INK seeds getting stuck to fur/feathers and being carried away (SEED DISPERSAL) • INK that all plants need these seven things to grow: room to grow, the right temperature, light, water, air, nutrients, and time. • INK plants are adapted because...
Year 5	Build revision questions into retrieval practice and starter questions
Year 6	Build revision questions into retrieval practice and starter questions

Area: Materials and States of matter	
Year R	Materials and states of matter – wood, plastic, glass, metal, describing different materials (hard, soft, rough, solid, waterproof), melting ice, melting butter or chocolate
Year 1	<ul style="list-style-type: none"> • Distinguish* between an object and the materials from which it is made. • INK appropriate property words for different materials i.e. metal – shiny, dull, waterproof, smooth, opaque, flexible • INK the names of materials which are hard, soft, waterproof etc. • INK how to use a Venn diagram to group items • INK the meaning of the words, bend, stretch, squash and twist • INK 4 ways I can change the shape of a solid object • INK where various materials have come from – wood from trees; rock, sand, clay, metal from the ground; wool and cotton from animals and plants. • INK are natural materials because... • INK ... are man-made materials
Year 2	<ul style="list-style-type: none"> • INK how a natural material is changed and used • INK some ways I can groups materials • INK how to explain what I have done • INK Wood is used for... because..., Metal is used for ... because..., Glass is used for ... because..., Fabric is used for ... because..., Plastic is used for ... because... • INK how to use my observation to suggest and answer to a question • INK how to gather and record data in a table • INK objects which CAN and CANNOT be stretched, twisted, bent and squashed. • INK how to group solid objects according to the ways their shape can be changed
Year 3	<ul style="list-style-type: none"> • INK solids hold their shape, INK liquids form a pool not a pile, gases escape from an unsealed container • INK sand is a solid, INK oxygen, carbon dioxide and helium are gases • INK water can be a solid, liquid or gas

	<ul style="list-style-type: none"> • INK water changes to a solid called ice at 0 degrees C • INK water changes to a gas called water vapour at 100 degrees C • INK the part evaporation and condensation play in the water cycle • INK water evaporates from the sea / ground into the air, INK this water cools and condenses into rain or snow in clouds.
Year 4	<ul style="list-style-type: none"> • INK how to group items into solids, liquids and gases. • INK how the particles of each state are arranged • INK The higher the temperature, the _____ the rate of evaporation (and the washing dried). • INK thermal conductors let heat pass through them (so they heat up) • INK thermal insulators do not let heat pass through them (heat stays inside) • INK ... is a good thermal insulator and ... is a good thermal conductor • INK water changes to a solid called ice at 0 degrees C • INK water changes to a gas called water vapour at 100 degrees C • INK chocolate melts at a slightly higher temp (25 degrees ish) • INK gold melts at a high higher temp (1064 degrees)
Year 5	<ul style="list-style-type: none"> • INK _____, _____ and _____ will dissolve in water to form a solution • INK a higher temperature, more stirring, smaller particles or less particles = faster dissolving • INK filtering and sieving and ways to separate mixtures • INK a mixture is a combination of two different materials (which are not dissolved or changed) • INK Sieving separates solid and a solid that are different sizes • INK Filtering separates a liquid and a solid that are not dissolved • INK dissolving is reversible and evaporation is a way to recover the substance • INK heating, mixing, burning and rusting CAN be irreversible. • INK rusting is... • INK You use a sieve to separate a mixture of 2 solids of different sizes. You use a magnet to separate a magnetic solid from a non-magnetic solid. You use a filter to separate a solid (which is not dissolved) from a liquid. You use evaporation to separate a dissolved solid from a liquid.
Year 6	<ul style="list-style-type: none"> • INK which type of enquiry to use and what my variables are • INK how to investigate the uses of everyday materials

Area: Forces	
Year R	Forces – wind, exploring magnets, floating and sinking
Year 1	•
Year 2	•
Year 3	<ul style="list-style-type: none"> • INK magnets have two poles. • INK magnets attract or repel each other and attract some materials and not others. • INK whether two magnets will attract or repel each other depending on which poles and facing. • INK A force is a push or pull acting on an object. • INK Forces can make objects start / stop / go faster / slower. • INK some push and pull forces. • INK that some forces need contact between two objects, but magnetic forces can act at a distance.

	<ul style="list-style-type: none"> • INK Rough surfaces have more friction and therefore things move slower across them.
Year 4	<ul style="list-style-type: none"> • INK these materials are attracted to a magnet:_____ • INK metal is the only magnetic material • INK not all metals are magnetic (only cobalt, nickel and steel) • INK it takes a greater force to move an object across a surface with high friction (rougher surfaces) • INK How to use my knowledge of magnets' attraction and repulsion in my own design
Year 5	<ul style="list-style-type: none"> • INK... Gravity is constant. Gravity is a force which pulls objects to the Earth. Air resistance acts in the opposite direction to gravity (pushes up and slows objects down). Objects with more surface area have greater air resistance, so fall to the Earth slower. • INK water resistance acts opposite to gravity. Water resistance pushes upwards and is often called upthrust. Water resistance also acts in the opposite direction to something moving through it. • INK Friction slows things down. INK rough surface / more surface area = higher friction • INK... Some examples of levers, gears a pulleys i.e. pulley on window blind, lever when using a hammer. They make a job easier because you have to use a smaller force to have the same effect.
Year 6	<ul style="list-style-type: none"> • INK how to plan my own enquiry to answer a question. INK which type of enquiry I am using and why(Focussing on forces).

Area: Evolution and inheritance	
Year R	
Year 1	<ul style="list-style-type: none"> •
Year 2	<ul style="list-style-type: none"> • IN animals including humans - INK babies don't walk/talk/ potty train/dress/feed themselves. INK I am the same of my parents because...
Year 3	<ul style="list-style-type: none"> •
Year 4	<ul style="list-style-type: none"> •
Year 5	<ul style="list-style-type: none"> • INK Inheritance means _____. I have inherited _____ from _____. • INK how inheritance can be shown in cross breeding • INK fossils can tell me _____ about the past • INK variation in offspring can be positive or negative (give an example of each)
Year 6	<ul style="list-style-type: none"> • INK evolution is... • INK cactuses grow well in the desert because...

Area: Electricity	
Year R	Electricity – staying safe around electrical equipment, exploring toys with buttons
Year 1	<ul style="list-style-type: none"> • INK the names of some items which do/not use electricity and what they do (Ie produce light/heat) • INK the names of the basic electrical components (cells, wires, bulbs, switches and buzzer). • INK how to connect components safely
Year 2	<ul style="list-style-type: none"> • INK which electrical appliances use batteries and which use mains electricity

	<ul style="list-style-type: none"> • INK 1 component = bright loud fast as using all power from the battery and 2 components = dimmer / quieter / slower
Year 3	<ul style="list-style-type: none"> • INK a circuit needs a battery • INK a circuit needs to be a complete loop • INK a switch pressed down completes a circuit and 'turns the light on' • INK that metals tend to be good conductors. • INK that some materials can and cannot be used to connect across a gap in a circuit
Year 4	<ul style="list-style-type: none"> •
Year 5	<ul style="list-style-type: none"> • INK the recognised symbols for wires, bulb, battery, buzzer, switches and motors • INK batteries have different 'power' = voltage • INK more voltage = brighter/louder
Year 6	<ul style="list-style-type: none"> • INK Longer = dimmer bulb • INK what degree of trust means • INK The electric circuit in this activity is a series one, i.e. three bulbs are joined together in a line with the battery. In this arrangement, the electrical energy provided by the battery is shared out between the three bulbs, so the more bulbs you add, the less energy each bulb gets (therefore the brightness of each bulb is diminished).

Area: Earth and Space	
Year R	Earth and space – Earth is one of the planets, day and night, Sun is a star, Moon
Year 1	<ul style="list-style-type: none"> •
Year 2	<ul style="list-style-type: none"> • INK Sun appears in different places in the sky throughout the day. Sun stays still and Earth moves.
Year 3	<ul style="list-style-type: none"> •
Year 4	<ul style="list-style-type: none"> •
Year 5	<ul style="list-style-type: none"> • INK The Sun / Earth / moon / planets are not flat by spherical. Earth and other planets orbit the sun. Moon orbits Earth while Earth orbits the sun. • INK moon orbits Earth, why the moon 'appears' different shapes, that other planets also have moons.
Year 6	<ul style="list-style-type: none"> • INK Earth turns as it orbits the sun. When we are facing the sun = day, when we are not = night • INK how to present what I have learned • INK how to use secondary sources to research • INK Where in the world it is morning/ afternoon/ night compared to us

Area: Animals including human AND Living things and their habitats	
Year R	Animals and living things – hibernating animals, nocturnal animals, farm animals, jungle animals, sorting animals by their features, young animals, habitats, body parts, life cycles
Year 1	<ul style="list-style-type: none"> • INK the names of body parts • INK I use my eyes to see, my ears to hear, my tongue to taste, my nose to smell and my skin to touch • INK the names of some animals which are mammals. I know all mammals have... • INK the name of some animals which are birds. I know all birds have... • INK the names of some animals which are fish. I know all fish have...

	<ul style="list-style-type: none"> • INK the names of some animals which are reptiles. I know all reptiles have... • INK the names of some animals which are amphibians. I know all amphibians have... • INK carnivores eat meat only, herbivores eat plants only, omnivores eat meat and plants • INK some animals , including humans, resemble their parents from birth and some do not (i.e. butterfly) • INK the names for baby animals (i.e. calf) • INK: __ is alive, __ is dead, __ never lived, Dead = used to be alive • INK living things need, food, water, shelter and air (oxygen) • INK animals and plants which live in arctic, desert, forest, pond, field, ocean habitats • INK minibeasts prefer to live --- because--- • INK minibeasts are invertebrates • INK how each of the living things are connected. i.e. bush provides shelter for minibeasts, minibeasts provide food for birds etc.
Year 2	<ul style="list-style-type: none"> • INK: Mammals – live babies, milk, fur, warm blooded, Fish – gills to breath underwater, tails, scales, lay eggs, Birds – Lay eggs, wings, feathers, 2 legs, Reptiles – cold blooded, lay eggs, scaly skin, Amphibians – Lay eggs, born in water, wet smooth skin • INK A __ is a __ because__ • INK about carnivores, herbivores and omnivores. Include all of the main features (What they eat, teeth, claws, camouflage etc.) and some examples of animals. • INK carnivores have sharp teeth/claws, some herbivores camouflage to hide • INK what changes occur in some animals from infants to adults. Butterflies/frogs • INK babies don't walk/talk/ potty train/dress/feed themselves. • INK I am the same of my parents because... • INK A __ is alive / dead / never lived because__ • INK All living things: Respire (breathe), Grow, Move, Excrete waste, Reproduce, Are sensitive, Need nutrition • INK Diet is affected by 4 main factors: habitat, -availability / time of day, to reduce competition i.e. if lions eat something, hipps eats omething different so they can all eat happily (MADE UP EXAMPLE), physiological features i.e. grass containing cellulose can only be digested by a ruminants stomach, hardly possible for a carnivores stomach. • INK __, __ and __ are carbohydrates, __, __ and __ are protein, __, __ and __ are diary and __, __ and __ are fruit/veg • INK carbohydrates / protein / dairy / fruit and veg are good for us because... • INK humans need _____ to be healthy and they cannot make their own food – they get nutrition from what they eat
Year 3	<ul style="list-style-type: none"> • INK animals and humans need the right types and amount of nutrition and that they cannot make their own food but get nutrition from what they eat. • INK the function of each part of the digestive system. Mouth – Oesophagus, Stomach, Small intestines, Large intestines, rectum and Anus

	<ul style="list-style-type: none"> • INK how muscles work in pairs to help animals move. • INK the names, locations and functions of the main bones in the human skeleton: Skull, spine, ribcage, femur, pelvis • INK how to label a bicep / tricep and can explain how they make an arm move • INK how a carroll diagram works • INK how we can group living things by different criteria: living, dead, animal, plant, vertebrate, invertebrate, their class i.e. mammal/fish, flowering / non-flowering, tree, diet, habitat, appearance, hibernation, nocturnal, camouflage • INK humans have incisors for snipping and cutting food, Molars for grinding and chewing food and canines for ripping and tearing food. • INK the location of the different types of teeth in a human mouth and how many there are • INK arrows in a food chain show energy being transferred • INK predators are animals which eat other animals • INK prey are animals which are eaten by other animals (plants are not prey) • INK producers make their own energy from sunlight
Year 4	<ul style="list-style-type: none"> • INK vertebrates have a backbone. There are 5 class of vertebrates (mammal, birds, fish, reptiles and amphibians). Invertebrates have no backbone. There are 6 classes of invertebrates: worms, sponges, stinging cells, echinoderms, arthropods and molluscs. • INK how a classification key works. • INK nature reserves / ecologically planned parks / garden ponds have a positive effect because... • INK population and development, litter and deforestation have a negative effect because... • INK primary consumers are animals that eat primary producers (herbivores). Secondary consumers eat primary consumers (could be omnivores or carnivores). Tertiary consumers eat secondary consumers. • INK: Carnivores have canines and incisors, Herbivores have incisors for snipping and molars at the back for grinding • INK A _____ is suited / adapted because.... i.e. Why have bats developed big ears? Tell me 2 ways a penguin is suited to swimming underwater • INK a food chains always begin with sunlight. • INK how water is essential in a food chain. • INK _____, _____, _____ damage teeth. I must _____, _____, _____ to look after my teeth. • INK how to cite evidence • INK how to record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.
Year 5	<ul style="list-style-type: none"> • INK the Mammal life cycle: Egg -> foetus -> infant -> juvenile -> adult • INK 6 stages of a life cycle of an amphibian • INK life cycle of a bird • INK the life cycle of an insect (complete and incomplete metamorphosis) • INK the stages in growth and development in humans: Foetus, Baby, Toddler, Childhood, Adolescence, Adult, Old age • INK heart, blood, veins, arteries

	<ul style="list-style-type: none"> • INK how to label a diagram of the human heart. • INK: The function of blood vessels is to deliver blood to the organs and tissues in your body. The blood carries oxygen and nutrients the body part need to function and also carry waste products and carbon dioxide away from your organs and tissues. The heart pumps blood through the blood vessels. • INK nutrients and water are absorbed in the gut and travel around the rest of the body in the blood vessels. • INK how to label a diagram of the human circulatory system. • INK how to look at a diagram of a flower and label it with the correct vocabulary of the sexual reproductive parts e.g. pollen, stamen, anther, filament, stigma, style, ovary, ovule, stem, sepal. • INK the names of these parts and their functions • INK how tubers, runners and conifers reproduce. • INK A sexual reproduction is_____. • INK Viruses are the smallest of the microbes and are generally harmful to humans. Viruses cannot survive by themselves. They need a 'host' cell in order to survive and reproduce. Once inside the host cell, they rapidly multiply and destroy the cell in the process! • INK Fungi are multi cellular organisms (made up of more than one cell) that can be both beneficial and harmful to humans. Fungi obtain their food by either decomposing dead organic matter or by living as parasites on a host. Fungi can be harmful by causing infection or being poisonous to eat; others can be beneficial or harmless, e.g. Penicillium which produces the antibiotic penicillin. • INK Bacteria are single-celled organisms that, under the right conditions, can multiply once every 20 minutes. During their normal growth, some produce substances (toxins) which are extremely harmful to humans and cause disease (e.g Staphylococcus); other bacteria are completely harmless to humans, and others can be extremely useful to us (e.g. Lactobacillus in yogurt and probiotics drinks, penicillin from fungi, yeast in bread, etc.). Some are even necessary for human life
Year 6	<ul style="list-style-type: none"> • INK similarities and differences in the life cycles of different types of animals • INK How to Present information (relating to the life cycle of animals) • INK how to research the stages of foetal development. • INK how to work scientifically to research gestation periods • INK my creature is a _____ because____ • INK how to report and present findings from enquiries, including conclusions, casual relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. (classifying living things)