	***Science* Overview**	**Our Mission Statement for *Science* (the INTENT):** At Dereham Junior Academy we want children to receive a high-quality science education which provides them with a strong understanding of the key knowledge, methods, processes and uses of science in everyday life and how these relate to them. An education that may even lead to them **aspiring** to a career in science. We aim to foster a love of scientific enquiry and promote an environment where children have the **courage** to develop their own working scientifically skills through practical hands-on experiences. We want them to be able to **trust** in what they find out and work **respectfully** in situations which encourage excitement, curiosity about the world around them and lead the children to ask questions. We aim to empower our children to go out into the world as scientifically literate citizens who reflect with awe and wonder on the world around them and make a positive change to it using the knowledge and skills they have learnt. This will, in turn, help them to be both confident and proactive in the decisions they may need to make about health and nutrition or environmental concerns in a **creative** and **kind** way.			

	***Science* KNOWLEDGE** *(Declarative – Concepts, Rules, Facts)*			**BEING a *Scientist*** *(Procedural – Applying that Declarative Knowledge)*	**Suggested Special Days, Visits or Calendar Events** **&** **Recommended Reads**
	Threshold Concept 1:Biology The study of living things *(Bold = more in depth)*	**Threshold Concept 2**:Chemistry The study of the substances that make up matter *(Bold = more in depth)*	**Threshold Concept 3**:Physics The study of matter, forces and energy *(Bold = more in depth)*	**Threshold Concept 1**:Plan, Do, Review. *(Bold = more in depth)* *NC statement* *DCOEJA*	
Year 3	**PLANTS** • **identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers** • **explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant** • investigate the way in which water is transported within plants • **explore the part that flowers play in the life cycle of flowering plants,**	**ROCKS** • **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. (Geography link?) **Key Vocabulary:** rock, stone, pebble, boulder, grain, crystals,	**LIGHT** • 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.**	**PLAN** • asking relevant questions and using different types of scientific enquiries to answer them (NOTE – at this stage scientific enquiry will often be teacher led with opportunities for whole class discussion about the most appropriate way to investigate scientific questions) • setting up simple practical enquiries, comparative and fair tests • Chn should be given opportunities to ask their own questions and these should be displayed somewhere in the classroom to refer back to (could then be given opportunity to answer one as a class through investigation) • Begin to discuss how different questions might be investigated (which of the 5 types of enquiry would be most suitable? Can we do this in school? Is the question testable? (Very teacher led) **DO** • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions	

	including pollination, seed formation and seed dispersals **Key vocabulary:** photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil, absorb, transport Added: Roots, ovary, stamen, pistil, pollinator, flower, stem, leaves, petal **ANIMALS INCLUDING HUMANS** • **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 (DT link?)** • identify that humans and some other animals have skeletons and muscles for support, protection and movement. **Key vocabulary:** nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, protect, move, skull, ribs, spine	layers, hard, soft, texture, absorbs water, fossil, bone, flesh, minerals, marble, chalk, granite, sandstone, slate, types of soil (e.g. peaty, sandy, chalky, clay)	**Key Vocabulary:** light, light source, dark, absence of light, surface, shadow, reflect, mirror, Added Artificial, natural, Transparent, Translucent, Opaque **FORCES** • **compare how things move on different surfaces** • notice that some forces need contact between two objects, but magnetic forces can act at a distance • observe how magnets attract or repel each other and attract some materials and not others • **compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials** • describe magnets as having two poles • predict whether two magnets will attract or repel each other, depending on which poles are facing **Key Vocabulary:** force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet,	**Evidence** • Children given an opportunity to carry out different types of scientific enquiry (E.g. Fair test, Comparative test, sorting and classifying etc) • Opportunities to create labelled diagram (hand drawn) • Opportunities to complete bar graphs (numbered axis provided) • Opportunities to create a table of results (*can be printed and results handwritten) *children to begin hand drawing their own tables in books. **REVIEW** • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings. • Opportunity to share results by preparing and sharing a presentation with class • Write simple conclusions (using sentence stems) which identify what they have found out and relate to subject knowledge e.g. When answering the question, 'Which material creates the most friction?' The bubble wrap slowed down the toy car the most. **I know this because** it traveled the least distance (5.6cm) This suggests that the bubble wrap creates the most friction because I know friction is a force that slows things down. • With support, Children given opportunity to compare their results (did they all get the same results) If so what does this imply about their data (it's reliable) Chn given support to check secondary sources to see if this matches up with their findings.	

			horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole		
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.** **Key vocabulary:** classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate **ANIMALS INCLUDING HUMANS** ● **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.**	**MATERIALS** ● **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.** **Key vocabulary:** solid, liquid, gas, heating, cooling, change of state, melting, freezing, melting point, boiling, boiling point, evaporation, condensation, temperature, water cycle	**SOUND** ● 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. **Key vocabulary:** sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, quiet, loud, insulation **ELECTRICITY** ● identify common appliances that run on electricity ● **construct a simple series electrical circuit, identifying and naming its basic parts, including**	**PLAN** ● asking relevant questions and using different types of scientific enquiries to answer them ● setting up simple practical enquiries, comparative and fair tests ● Continue to give children opportunities to ask scientific questions and help them become more independent at identifying the different type of enquiry needed to answer them. Get them to think about how practical they are. Can we test this at school? Does the question need to be rephrased so it is more concise? ● Give 2/3 options of enquiry type to choose from when setting up and planning investigations. E.g. Is it best to use a fair test or is this observing over time? (Sometimes it might have elements of both!! – e.g. eggs in different liquids you might change the liquid type but measure the same amount and leave for the same amount of time etc then observe what happens over time) ● STILL TEACHER GUIDED AT THIS STAGE (E.g. Whole Class discussion) **DO** ● making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers ● gathering, recording, classifying and presenting data in a variety of ways to help in answering questions ● Opportunities to record data (discrete) in a bar chart (independently drawn / using computer software) ● Opportunities to record data in a table (hand drawn)	

	Key vocabulary: digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, large intestine, rectum, anus, incisor, canine, molar, premolar, herbivore, carnivore, omnivore, producer, predator, prey		**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.** **Key vocabulary:** electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative,terminal, connect/connections, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal	• Opportunities to record simple conclusions (as year 3) **without** need for sentence stems (given as a scaffold if needed) **REVIEW** • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings. • Opportunity to share results by preparing and sharing a presentation with class. • Children given opportunity to compare their results (did they all get the same results) If so what does this imply about their data (it's reliable) Chn able to check secondary sources to see if this matches up with their findings.(literature printed for them / websites provided for them to look at)	
Year 5	**LIVING THINGS AND THEIR HABITATS** • **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.** **Key vocabulary:** life cycle, reproduce, sexual, sperm, fertilises, egg, live young,	**PROPERTIES AND CHANGES OF MATERIALS** • **compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets** • **know that some materials will dissolve in**	**EARTH AND SPACE** • **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	**PLAN** • planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • Opportunities must be given to ~~ask **their own question** and then~~ plan and carry out appropriate investigation type. (Teacher - I do (model) -→ Chn You do (independent practice)	Planetarium visit to school for space topic Could we get local astronomer group in for after school star gazing event? Visit to/from Scientist (plants) John Innes Centre TBC

	metamorphosis, asexual, plantlets, runners, cuttings, stigma, style, ovary, ovule, sepal, filament, anther, **ANIMALS INCLUDING HUMANS** • describe the changes as humans develop to old age. **Key vocabulary:** puberty, Plus the vocabulary to describe sexual characteristics in line with the school's RSHE and Life Skills policy	**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.** **Key vocabulary:** thermal insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material	• **use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.** **Key vocabulary:** Sun, Moon, Earth, planets (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, Solar System, rotate, star, orbit **FORCES** • **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.** **Key vocabulary:** force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears	• Chn given opportunity to set up at least ONE comparative or fair test having made a new prediction based on given test results (these could be previously recorded results from a class investigation or results provided by teacher) **DO** • 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 • As Year 3 and 4, children given an opportunity to carry out a variety of different enquiry types. • Planned opportunities for children to control variables (Fair Test / Comparative test) planned by children (Evidence in books) • Chn given opportunity to use a range of equipment for measuring e.g. data loggers, rulers, thermometers, newton meters, scales. Children taught to take repeat readings (results tables should now include further columns for repeat readings) Chn should be able to explain why this is important. • Chn to know what a line graph is and how to record data in one. They should be taught when it is best to use this type of graph (changes over time, continuous data from fair test) • Opportunities to record continuous data in a line graph (hand drawn or digital) • Opportunities to record continuous data in a scatter graph (hand drawn or digital) • By y5 chn should now be able to independently draw and label their own bar graphs and also be confident producing these on a computer **REVIEW** • 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 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. • Chn should begin to record their degree of trust explaining why their results may not be completely trustworthy and give reasons / things that would need to happen for more certainty	Science museum trip.

				(e.g. mistakes with measurements, not enough data, not a big enough sample size, importance of repeat readings) evidence of this should be found in books. • Chn should learn to write more detailed conclusions which include causal relationships (and know what this means – see Fair test versus Comparative test explanation) e.g. the larger the parachute the slower it travels to the ground. I think this is because a larger parachute has a larger surface area and this creates more air resistance which slows the falling object down. • Chn use their own data to state if it shows their prediction to be correct or not. Does it support or refute ideas or arguments? (This will then lead to trust in data dialogue e.g. your results show that the smaller parachute fell slowest which refutes commonly held views but why might this be? Can we trust your data?) • One opportunity during year 5 (solar system?) where children are introduced to a time when a popularly held belief was proven by science to be incorrect and how this changed the way people think about things now. Chn made aware that our understanding of the world is always changing as we discover more.	

Year 6	**LIVING THINGS AND THEIR HABITATS** ● **describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals** ● **give reasons for classifying plants and animals based on specific characteristics** **Key vocabulary:** vertebrates, fish, amphibians, reptiles, birds, mammals, warm-blooded, cold-blooded, invertebrates, flowering, non-flowering, mosses, ferns, conifers, bacteria, micro organisms **ANIMALS INCLUDING HUMANS** ● **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**		**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 ● **use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them** **Key vocabulary: As Year 3 plus -** straight lines, light rays **ELECTRICITY** ● **associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit**	**PLAN** ● planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary ● Opportunities must be given to ask **their own question** and then plan and carry out appropriate investigation type. (Teacher – I do model / Chn – You do independent application) **DO** ● 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 ● As Year 3,4 and 5 children given an opportunity to carry out a range of enquiry types. ● Opportunities to control variables (Fair Test / Comparative test) through planning their own investigations. Chn given opportunity to use a range of equipment for measuring e.g. data loggers, rulers, thermometers, newton meters, scales. Children taught to take repeat readings (results tables should now include further columns for repeat readings) **and find a mean average.** Chn should be able to explain why this is important. ● Opportunities to record data(continuous) in a line graph to be completed (hand drawn or digital) to build on work in year 5 ● Opportunities to record continuous data in a scatter graph (hand drawn or digital). They should know when it is best to use this type of graph and why (relationships between variables). **REVIEW** ● 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 degree of trust in results, in oral and written forms such as displays and other presentations	

	lifestyle on the way their bodies function • **describe the ways in which nutrients and water are transported within animals, including humans.** **Key vocabulary:** heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, cycle, circulatory system, diet, drugs, lifestyle **EVOLUTION AND INHERITANCE** • **recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago** • **recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents** • **identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.** **Key vocabulary:** offspring, sexual reproduction, vary, variation, characteristics, adapted, inherited (inheritance), species, evolve, evolution, natural selection Added – traits, environmental, genes, fossilisation		• **compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches** • **use recognised symbols when representing a simple circuit in a diagram.** **Key vocabulary: As Year 4 plus -** circuit diagram, circuit symbol, voltage	• identifying scientific evidence that has been used to support or refute ideas or arguments. • Chn should be able to find an average result having collected repeat readings and discuss why scientists use averages. Pros? Cons? • Chn should be able to explain from looking at scatter graphs explaining if they show a positive, negative or no correlation and how they know. • Building on Year 5, Chn should begin to record their degree of trust explaining why their results may not be completely trustworthy and give reasons / things that would need to happen for more certainty (e.g. mistakes with measurements, not enough data, not a big enough sample size, importance of repeat readings) evidence of this should be found in books. • Building on Year 5, Chn should learn to write more detailed conclusions which include causal relationships (and know what this means – see Fair test versus Comparative test explanation) e.g. the larger the parachute the slower it travels to the ground. I think this is because a larger parachute has a larger surface area and this creates more air resistance which slows the falling object down. • Building on Year 5, Chn use their own data to state if it shows their prediction to be correct or not. Does it support or refute ideas or arguments? (This will then lead to trust in data dialogue e.g. your results show that the smaller parachute fell slowest which refutes commonly held views but why might this be? Can we trust your data?)	