**Uplands Junior L.E.A.D Academy Subject Overview**

**Science**

**Intent:** *The science curriculum aims to ensure that all pupils develop substantive knowledge in the three disciplines of biology, chemistry and physics; an understanding of the nature, processes and methods of science; and are equipped to understand the uses and implications of science today and for the future.*

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| **In science, children are taught ‘working scientifically skills’. They use these skills to answer questions, using the most appropriate type of ‘scientific enquiry.’ Primary STEM Education Consultancy.** | | | | | |
| **Working scientifically Years 3 and 4** | | | | **Working scientifically Years 5 and 6** | |
| 1. asking relevant questions and using different types of scientific enquiries to answer them 2. setting up simple practical enquiries, comparative and fair tests 3. making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers 4. gathering, recording, classifying and presenting data in a variety of ways to help in answering questions 5. recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables 6. reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions 7. using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions 8. identifying differences, similarities or changes related to simple scientific ideas and processes 9. using straightforward scientific evidence to answer questions or to support their findings. | | | | 1. planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary 2. taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate 3. recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs 4. using test results to make predictions to set up further comparative and fair tests 5. 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 6. identifying scientific evidence that has been used to support or refute ideas or arguments. | |
| **Scientific enquiry skills (KS2)** | | | | | |
| **Observation over time**  Some questions can be answered by observing how living things, materials and physical processes change over time (minutes, hours, weeks or months.) | | |  | | |
| **Comparative and fair testing**  In a comparative test, the variable that is being changed is categoric eg. The names of plants or types of materials. In a fair test, the variable that is being changed is quantifiable eg. Can be counted or measured. | | |  | | |
| **Identifying, grouping and classifying**  Some questions can be answered by naming things or sorting them into groups. | | |  | | |
| **Pattern-seeking**  Some questions can be answered by looking for links between variables where there is no causal relationship.  Some are answered by carrying out a survey. | | |  | | |
| **Researching using secondary sources**  Some questions cannot be answered by pupils using first-hand experiences for ethical or practical reasons and need to be answered using secondary sources. | | |  | | |
|  | **Year 3** | **Year 4** | | **Year 5** | **Year 6** |
| Autumn 1 | **Unit:** Rocks  **Key Vocabulary:**  Fossilisation, fossil, particle, rock, soil, sediment.  **Knowledge:**   * 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   **Working scientifically**  3. Use a hand lens or microscope to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them or not.  2. Investigate what happens when rocks are rubbed together.  Can you use an identification key to classify rocks?  What happens when water keeps dripping on a sandcastle?  **Key questions**  How can we sort rocks?  Are all rocks formed in the same way?  Can water pass through rocks?  How are fossils formed?  Are all soils the same?  **Prior Knowledge:**  I can describe properties of materials. (Y1)  Different materials are suitable for different uses. (Y2) | **Unit:** Electricity  **Key Vocabulary:**  Appliance, bulb, buzzer, cell, circuit, component, conductor, insulator, switch, wire.  **Knowledge:**   * 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   **Working scientifically**  9. Use scientific evidence to explain patterns found (most metals conduct electricity).  7. Draw conclusions and raise questions for other similar tests.  3. Making systematic observations.  Is there a pattern between the material an object is made from and whether it conducts electricity or not?  How long does a battery light a torch for?  **Key questions**  What is electricity and is it safe?  What is an electrical circuit?  Can we control the flow of electricity?  What is the difference between a conductor and an insulator?  Are metals good conductors?  **Prior Knowledge:**  Different materials are suitable for different uses. (Y2) | | **Unit:** Forces  **Key Vocabulary:**  Water resistance, air resistance, gravity, mass, Newton.  **Knowledge:**   * 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   **Working scientifically**  1. Plan fair tests to explore the effect of water and air resistance.  2. Measure time taken for ‘parachutes’ made of different materials to fall to the ground. Repeat readings.  Which shape of parachute takes the longest to fall to the ground?  Do all objects fall through air and water in the same way?  **Key questions**  What is gravity?  What makes things slow down?  Can we slow things that travel through water and the air?  Where can we see simple machines and what effect do they have? (pulleys)  Where can we see simple machines and what effect do they have? (levers)  Where can we see simple machines and what effect do they have? (gears)  **Prior Knowledge:**  Some forces are invisible such as magnetic fields. (Y3)  Friction is a force between two surfaces. Rough surfaces create greater friction. Smooth surfaces create less friction. (Y3 | **Unit:** Electricity  **Key Vocabulary:**  Filament, voltage, electrical current, series circuit, parallel circuit.  **Knowledge:**   * associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit * compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches * use recognised symbols when representing a simple circuit in a diagram   **Working scientifically**  1. Plan to test different components, changing one variable at a time.  4. Use results to make predictions and set up further tests.  How does the voltage of batteries in a circuit affect the brightness of a lamp?  Does the temperature of a light bulb increase the longer it is on?  **Key questions**  What is the difference between an electrical circuit and an electrical current?  What is voltage and how does it affect components in a circuit?  Do we need switches in circuits?  What variation can we see in the performance of different components?  **Prior Knowledge:**  Circuits allow electricity to travel through them. It must be closed for this to happen. (Y4)  Conductors allow electricity to flow through them but insulators do not. (Y4) |
| Autumn 2 | **Unit:** Animals, including humans (nutrition and skeletons)  **Key Vocabulary:**  Voluntary muscles, involuntary muscles, skeleton, joint, nutrition.  **Knowledge:**   * 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   **Working scientifically**  8. Identify and group animals with and without skeletons.  6. Research different food groups (including their pets) and how they keep us healthy. Then, report on the findings.  What are the different food groups and what foods can we find them in?  How do the skeletons of different animals compare?  **Key questions**  Can I control all of my muscles?  What is the purpose of bones?  Are there any animals that do not have a skeleton?  What is nutrition and where do animals get it from?  **Prior Knowledge:**  I can describe which part of the body is associated with with sense. (Y1)  Describe the basic needs of animals: food, air, water. (Y2)  I know the importance of exercise and eating the right amounts of different types of foods. (Y2) | **Unit:** Living things and their habitats (classification)  **Key Vocabulary:**  Characteristic, classify, vertebrate, invertebrate, flowering plant, non-flowering plant.  **Knowledge:**   * 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 the local and wider environment * recognise that environments can change and that this can sometimes pose dangers to living things   **Working scientifically**  4. Use and make simple guides or keys to explore and identify local plants and animals.  9. Predict what might happen if an environment changes and explore scientific evidence to support this.  6. Report on findings from enquiries.  Can you use a classification key to identify animals in the local and wider environment?  How does the variety of plants and animals that we can see in our local environment change over the year?  **Key questions**  What are vertebrates and invertebrates?  How can we classify animals?  What are the two main groups of plants?  What can happen to plants and animals if their environment changes?  **Prior Knowledge:**  Many animals can be grouped into: fish, birds, mammals, reptiles, amphibians. (Y1)  Plants and animals live in habitats to which they are suited. (Y2)  Humans and some other animals have a skeleton for protection and support. (Y3) | | **Unit:** Properties and changes of materials  **Key Vocabulary:**  Chemistry, dissolve, insoluble, soluble, reversible, irreversible.  **Knowledge:**   * compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets * know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution * use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating * give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic * demonstrate that dissolving, mixing and changes of state are reversible changes * explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda * Children should find out about how chemists create new materials- Spencer Silver, who invented the glue for sticky notes.   **Working scientifically**  1. Plan comparative tests of conductivity and fair tests of solubility.  4. Use test results to set up similar tests, making predictions.  How does a container of saltwater change over time?  Can you group solids based on whether they are soluble or not?  Can you find whether or not a solid is a conductor?  Can you find whether or not a solid is soluble?  **Key questions**  What different ways can I find the properties of materials?  Why are metals, wood and plastic good for certain purposes?  How is a solution formed and is everything soluble?  What is a mixture and how can it be separated?  Are all changes reversible?  How do chemists like Spencer Silver make new materials?  **Prior Knowledge:**  I can describe properties of materials. (Y1)  Different materials are suitable for different uses. (Y2)  There are three states of matter: solids, liquids and gases. (Y4)  Evaporation, condensation and freezing are processes whereby water can change between the three states. (Y4) | **Unit:** Living things and their habitats (common characteristics and micro-organisms)  **Key Vocabulary:**  Biology, taxonomy, species, organism, micro-organism.  **Knowledge:**   * describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals * give reasons for classifying plants and animals based on specific characteristics * Pupils find out about the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification.   **Working scientifically**  6. Research classification systems. Research scientific evidence that suggests plants and animals belong within the classification system.  3. Use classification keys.  Who was Carl Linnaeus and what did he contribute to science?  Can you make a classification key for vertebrates/invertebrates or micro-organisms?  **Key questions**  What is classification?  What are the five main kingdoms of organisms and how are they different?  What is taxonomy and how did Carl Linnaeus use it?  How does classification help scientists?  **Prior Knowledge:**  I can describe characteristics of fish, birds, mammals, reptiles, amphibians, insects and arachnids. (Y4)  I know that their life cycles are different. (Y5)  I know that some plants reproduce sexually and others reproduce asexually. (Y5) |
| Spring 1 | **Unit:** Plants  **Key Vocabulary:**  Nutrients, transpiration, pollination, germination, seed dispersal, botanist.  **Knowledge:**   * identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers * explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant * investigate the way in which water is transported within plants * explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal   **Working scientifically**  2. Compare the effect of different factors on plant growth.  3. Observe how water is transported in plants.  5. Recording findings using labelled diagrams.  What are the conditions that help a seed to germinate faster?  What happens to celery when it is left in a glass of coloured water?  **Key questions**  What do all flowering plants have in common?  Do all plants need the same things in order to survive?  How does water move through a plant?  Why is pollination important?  How do plants disperse their seeds?  **Prior Knowledge:**  I can find the root, stem, leaf and flower of a plant. (Y1)  Plants need water, light and a suitable temperature to grow and stay healthy. (Y2) | **Unit:** Sound  **Key Vocabulary:**  Medium, pitch, sound, vibration, volume.  **Knowledge:**   * 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   **Working scientifically**  1. Ask questions about the sounds that are made by different objects and find answers to them.  2. Set up a practical enquiry to see which materials are the best insulators of sound using dataloggers to measure sound.  How does the length of a tuning fork/guitar string affect the pitch of the sound?  What is the relationship between the volume of a sound and the strength of vibrations it produces?  **Key questions**  How are sound waves made?  How do sound waves travel?  What is volume and can we change it?  What is pitch and can we change it?  How does distance from the source affect how we hear sound?  **Prior Knowledge:**  I can describe properties of materials. (Y1)  Different materials are suitable for different uses. (Y2) | |  | **Unit:** Animals including humans (Circulatory system)  **Key Vocabulary:**  Atrium, artery, blood vessel, oxygenated, deoxygenated, vein, ventricle.  **Knowledge:**   * 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   **Working scientifically**  6. Explore scientific research relevant to the relationship between diet, exercise, drugs, lifestyle and health.  5. Presentation on how the circulatory system works.  Which organs of the body make up the circulatory system?  How does the length of time we exercise for affect our heart rate?  What scientific research can I use to make healthy lifestyle choices?  **Key questions**  What is the purpose of blood and how does it move around the body?  Is the left side of the heart exactly the same as the right?  What is the difference between a vein and an artery?  Can humans alter their heart rate?  How does my lifestyle affect how my heart functions?  **Prior Knowledge:**  Mammals have lungs to help them breathe air. (Y4)  The heart is an involuntary muscle. (Y3)  I can describe the basic function of the digestive system. (Y4) |
| Spring 2 |  |  | | **Unit:** Living things and their habitats  **Key Vocabulary:**  Asexual reproduction, sexual reproduction, fertilisation, life cycle, metamorphosis, offspring.  **Knowledge:**   * 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 * Children should find out about the work of naturalists and animal behaviourists, David Attenborough and Jane Goodall.   **Working scientifically**  5. Compare life cycles of plants and animals in local environment with other plants and animals around the world. Then present findings.  3. Grow new plants from a different part of the parent plant and record findings in different ways.  What is the same and what is different between the life cycles of an insect and a mammal?  How does a potato change as it asexually reproduces?  **Key questions**  How are living things near me interconnected?  How are animals’ life cycles different?  What did Jane Goodall contribute to science?  What is the difference between sexual and asexual reproduction in plants?  Why is it important for children in Leicester to study the work of David Attenborough?  **Prior Knowledge:**  I can describe characteristics of fish, birds, mammals, reptiles, amphibians, insects and arachnids. (Y4)  I know that some plants produce and grow from seeds, while others produce no seeds and grow from spores. (Y4) |  |
| Summer 1 | **Unit:** Forces and magnets  **Key Vocabulary:**  Attract, repel, force, friction, magnet, magnetic pole.  **Knowledge:**   * 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   **Working scientifically**  4. Gather and record data regarding how far things move on different surfaces.  1. Ask questions about the strength of magnets and find a way of testing them.  9. Using scientific evidence to support findings.  How do the properties of a surface affect how far an object will move on it?  Does the size and shape of a magnet affect how strong it is?  **Key questions**  What is a force and what does it do?  What is friction? Can we increase or reduce it?  How is magnetic force different from other forces?  Are all objects magnetic?  How do the poles of a magnet behave?  **Prior Knowledge:**  Forces such as bending and squashing can be applied to materials and objects. (Y2) | **Unit:** Animals including humans (Digestion and teeth)  **Key Vocabulary:**  Digestion, plaque, saliva, food chain, producer, predator, prey.  **Knowledge:**   * 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   **Working scientifically**  5. Draw and discuss ideas about the digestive system and compare them with models or images.  8. Compare the teeth of carnivores and herbivores and suggesting reasons for the differences.  Do carnivores and herbivores have the same teeth?  Which organs are part of the digestive system?  **Key questions**  Are all teeth the same?  How do humans digest food?  What is the difference between producer, predator and prey?  What food chains exist in our local area?  **Prior Knowledge:**  Some muscles move voluntary and some move involuntarily. (Y3)  Humans get nutrition from what they eat. (Y3)  Animals get food from plants and other animals. I can use a simple food chain. (Y2) | | **Unit**: Animals, including humans  **Key Vocabulary:**  Adolescence, foetus, gestation, puberty, hormone.  **Knowledge:**   * describe the changes as humans develop to old age   **Working scientifically**  3. Research gestation periods of other animals compared to humans. Record data using graphs.  5. Report and present findings, offering possible explanations and predictions.  Is there a relationship between a mammal’s size and its gestation period?  Can you identify all the stages in the human life cycle?  **Key questions**  How does the human gestation period compare with other animals?  How do humans change as they develop to old age?  What is puberty?  How does a human’s life span compare with other animals?  **Prior Knowledge:**  Mammals give birth to live young called offspring. (Y5)  The joining of male and female cells is called fertilisation. (Y5) | **Unit:** Evolution and Inheritance  **Key Vocabulary:**  Adaptation, characteristics, natural selection, evolution, extinct, inheritance.  **Knowledge:**   * 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 * Pupils find out about the work of palaeontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution.   **Working scientifically**  6. Identify scientific evidence to support or refute arguments.  3. Report and present findings.  What did Charles Darwin observe when he visited the Galapagos Islands?  Was there a pattern between the amount of air pollution present and the colour of the peppered moth?  **Key questions**  What are fossils and what can we learn from them?  Why are offspring similar but not identical to their parents?  How are evolution and inheritance linked?  What is adaptation and how is that linked to evolution?  How does the work of Darwin and Wallace help us to understand how species have changed over time?  **Prior Knowledge:**  Fossils are imprints in rocks of dead animals or plants. (Y3)  I can describe the life cycle of some animals. (Y5) |
| Summer 2 | **Unit:** Light  **Key Vocabulary:**  Transparent, opaque, dark, light, light source, reflect, shadow.  **Knowledge:**   * 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   **Working scientifically**  1. Ask and answer questions about how shadows are formed.  3. Look for patterns in what happens to shadows when the light source moves, taking measurements of distance between light source and object.  How does the distance of a light source from an object affect the size of the shadow produced?  How does the distance of an object from a screen affect the size of the object’s shadow?  **Key questions**  What is darkness?  What is a light source and are they all safe?  How does light travel?  What is the difference between a transparent and an opaque object?  What is a shadow and are they all the same size?  **Prior Knowledge:**  I can describe properties of materials. (Y1)  Different materials are suitable for different uses. (Y2) | **Unit:** States of Matter  **Key Vocabulary:**  Cool, condensation, evaporation, freeze, melt, precipitation, solidify, water vapour.  **Knowledge:**   * 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   **Working scientifically**  5. Observe and record evaporation of water over time.  7. Suggest improvements to the test and raise questions for other similar tests.  How does the surface area of water affect the speed of its evaporation?  What is the melting point of a range of materials?  **Key questions**  What are the three states of matter?  Can things change state?  What processes are involved in the Water Cycle?  Can we speed up evaporation?  Where else might we see condensation?  **Prior Knowledge:**  I can describe properties of materials. (Y1)  Different materials are suitable for different uses. (Y2) | | **Unit:** Earth and Space  **Key Vocabulary:**  Axis, rotate, gravity, galaxy, orbit, satellite.  **Knowledge:**   * 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 * Examine the work of scientists such as Ptolemy, Alhazen and Copernicus.   **Working scientifically**  6. Use evidence to support or refute Copernicus’s theory on the Solar System.  3. Record data using different graphs.  Do bigger planets take longer to orbit the Sun?  Who was Nicolaus Copernicus and how did his ideas change the way people think about the Solar System?  **Key questions**  Why was Nicolaus Copernicus important?  How does gravity affect things in our galaxy?  Why does the Sun appear to move across the sky during the day?  Why can’t we see the Moon all of the time? | **Unit:** Light  **Key Vocabulary:**  Ray of light, artificial light source, natural light source, ray diagram, shade.  **Knowledge:**   * 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**  2. Use scientific equipment to test the fact that light travels in straight lines and can be reflected into the eye.  3. Record results using scientific diagrams and labels.  Is there a pattern between the position of an object and whether it is visible or not?  How does a shadow change over the course of a day?  **Key questions**  Are all light sources the same?  Can light travel around corners?  Do our eyes see out or does light travel in?  Are shadows all the same shape and size?  **Prior Knowledge:**  Light travels in straight lines from a source. (Y3)  Light reflects off objects. (Y3)  When light is blocked, a shadow is created. (Y3) |