Archbishop Hutton's Primary School

Upper Key Stage 2 WORKING SCIENTIFICALLY

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and 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

NATIONAL CURRICULUM PROGRAMES OF STUDY

Pupils in years 5 and 6 should use their science experiences to: explore ideas and raise different kinds of questions; select and plan the most appropriate type of scientific enquiry to use to answer scientific questions; recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why. They should use and develop keys and other information records to identify, classify and describe living things and materials, and identify patterns that might be found in the natural environment. They should make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them; choose the most appropriate equipment to make measurements and explain how to use it accurately. They should decide how to record data from a choice of familiar approaches; look for different causal relationships in their data and identify evidence that refutes or supports their ideas. They should use their results to identify when further tests and observations might be needed; recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact. They should use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas and should talk about how scientific ideas have developed over time. These opportunities for working scientifically should be provided across years 5 and 6 so that the expectations in the programme of study can be met by the end of year 6. Pupils are not expected to cover each aspect for every area of study.

Prior knowledge: KS1/LKS2

Light

- To recognise that they need light in order to see things and that dark is the absence of light Y3.
- To notice that light is reflected from surfaces Y3.
- To recognise that light from the sun can be dangerous and that there are ways to protect their eyes Y3.
- To recognise that shadows are formed when the light from a light source is blocked by a solid object Y3.
- To find patterns in the way that the size of shadows change Y3.

Earth & Space

- To observe changes across the four seasons Y1.
- To observe and describe weather associated with the seasons and how day length varies Y1.

Year Group Expectations: Year 5/6

Light

- To recognise that light appears to travel in straight lines Y6.
- To 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 Y6.
- To 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 Y6.
- Touse the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them Y6.

Earth & Space

- To describe the movement of the Earth, and other planets, relative to the Sun in the solar system Y5.
- To describe the movement of the Moon relative to the Earth Y5.
- To describe the Sun, Earth and Moon as approximately spherical bodies Y5.
- To use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky Y5.

NC: Later Knowldege KS3

Physics

- That the similarities and differences between light waves and waves in matter
- That light waves travelling through a vacuum; speed of light
- That the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface
- That theuse of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye
- That light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.

Earth & Space

- gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only)
- Our Sun as a star, other stars in our galaxy, other galaxies
- The seasons and the Earth's tilt, day length at different times of year, in different hemispheres
- The light year as a unit of astronomical distance.

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<tr>
<td><u>Livings things and habitats & Rocks</u>

• To identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other Y2
• To describe in simple terms how fossils are formed when things that have lived are trapped within rock Y3.
• To recognise that environments can change and that this can sometimes pose dangers to living thing Y4.
• To recognise that living things can be grouped in a variety of ways Y4.
• To explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment Y4.</td>
<td><u>Evolution & Inheritance</u>

• To recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents Y6.
• To identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution Y6.
• To recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago Y6.

<u>Classification</u>

• To describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird Y5.
• To describe the life process of reproduction in some plants and animals Y5.
• To 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 Y6.
• To give reasons for classifying plants and animals based on specific characteristics Y6.</td>
<td><u>Human Biology</u>

• That heredity as the process by which genetic information is transmitted from one generation to the next.
• That a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model.
• That the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection.
• That changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction.
• Differences between species.</td>
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<td><u>Electricity</u>

To identify common appliances that run on electricity Y4.
To construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers Y4.
To 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 Y4.
To recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit Y4.
To recognise some common conductors and insulators, and associate metals with being good conductors Y4.</td>
<td><u>Electricity</u>

• To associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit Y6.
• To 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 Y6.
• To use recognised symbols when representing a simple circuit in a diagram Y6.</td>
<td><u>Electricity</u>
• Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge
• Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current
• Differences in resistance between conducting and insulating components (quantitative).
• Static electricity</td>
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<td>SCIENCE</td>
<td>Theme: SCIENCE AROUND US</td>
<td>SCIENCE</td>
<td>Theme: NATURAL WORLD</td>
<td>SCIENCE WEEK</td>
<td>Theme:MATERIALS</td>
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<td colspan="2">Why do turtles have shells?</td>
<td colspan="2">Electricity</td>
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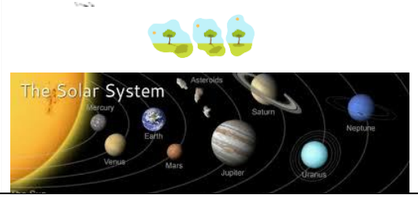
<td> 
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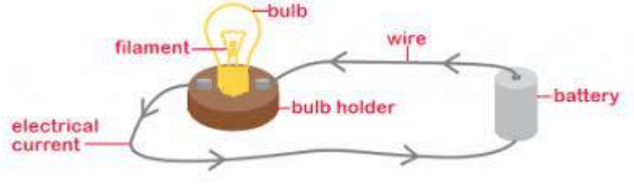
<td> 
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Key Knowledge and Progression in Higher KS2 Science | Subject Lead: Mrs Gavriluk | Date: June 2023 | Y5/6 Year B

	Key Knowledge: • Light appears to travel in straight lines and we see objects when light from them goes into our eyes. • The light may come directly from light sources but for other objects some light must be reflected from the object into our eyes for the object to be seen. • Objects that block light (are not fully transparent) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object and the size of the shadow is larger when the light source and object move closer to each other as more of the light is blocked. • The sun is a star. It is at the centre of our solar system. • There are 8 planets (can name them). These travel around the sun in fixed orbits. • Earth takes 365 ¼ days to complete its orbit around the sun. • The earth rotates (spins) on its axis. • As earth rotates, half faces the sun (here it is day) and half is facing away from the sun (night). • As the earth rotates the sun appears to move across the sky. • The moon orbits the earth. It takes about 28 days to complete its orbit. • The sun, earth and moon are approximately spherical.		**Key Knowledge:** • All living things have offspring of the same kind, as feature in the offspring are inherited from the parents. • Life cycles have evolved to help organisms survive to adulthood. • Over time the characteristics that are most suited to the environment become increasingly common. • Organisms best suited to their environment are more likely to survive long enough to reproduce. • Organisms are best adapted to reproduce are more likely to do so. • Organisms reproduce and offspring have similar characteristic patterns. • Variation exists within a population (and between offspring of some plants). • Competition exists for resources and mates. • Living things can be formally grouped according to characteristics. • Plants and animals are two main groups but there are other livings things that do not fit into these groups e.g. micro-organisms such as bacteria and yeast, and toadstools and mushrooms. • Plants can make their own food whereas animals cannot. • Animals can be divided into two main groups – those that have backbones (vertebrates) and those that do not (invertebrates). • Vertebrates can be divided into five small groups – fish, amphibians, reptiles, birds and mammals. • Each group has common characteristics. • Invertebrates can be divided into a number of groups including insects, spiders, snails and worms. • Plants can be divided broadly into two main groups – flowering plants and non-flowering plants.		**Key Knowledge:** • Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound. • If you use a battery with a higher voltage, the same thing happens. • Adding more bulbs to a circuit will make each bulb less bright. • Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter. • Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. • Any bulbs, motors or buzzers will then turn off as well. • You can use recognised circuit symbols to draw simple circuit diagrams.
	Procedural Knowledge • Observe objects in different lighting conditions – using light from sources that can be moved, reflected and blocked in different ways. • Observe shadows of different objects as the object and the		**Procedural Knowledge** • Design a new plant or animal to live in a particular habitat. • Use models to demonstrate evolution e.g. Darwin's finches bird beak activity. • Use secondary sources to find out about how the population of peppered moths changed during the industrial revolution.		**Procedural Knowledge** • Explain how a circuit operates to achieve particular operations, such as control the light for a torch with different brightnesses or make a motor go faster or slower • Make circuits to solve particular problems such as a quiet and a loud burglar alarm • Carry out fair tests exploring changes in circuits • Make circuits that can be controlled as part of a D&T project

	• light source are moved so that the distance between them and their distance from the surface where the light is falling changes. • Predict or explain some uses or behaviours of light, reflection and shadows such as periscope design, shadow puppets, bending of light in water. • Use secondary sources to help create a model e.g. role play or using balls, to show the movement of the Earth around the Sun and the Moon around the Earth. • Use secondary sources to help make a model to show why day and night occur • Make first-hand observations of how shadows caused by the Sun change through the day • Make a sundial • Research time zones • Consider the views of scientists in the past and evidence used to deduce shapes and movements of the Earth, Moon and planets before space travel		• Make observations of fossils to identify living things that lived on Earth millions of years ago. • Identify features in animals and plants that are passed on to offspring. • Explore this process by considering the artificial breeding of animals or plants e.g. dogs. • Compare the ideas of Charles Darwin and Alfred Wallace on evolution. • Use secondary sources to learn about the formal classification system devised by Carl Linnaeus and why it is important. • Use first hand observation to identify characteristics shared by the animals in a group. • Use secondary sources to research the characteristics of animals that belong to a group. • Use information about the characteristics of an unknown animal or plant to assign it to a group. • Classify plants and animals presenting this in a range of ways – Venn diagrams, Carroll diagrams and keys. • Create an imaginary animal which has features from one or more groups		
	Key Vocabulary: straight lines, light rays, light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous. Earth, Sun, Moon, Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune spherical, solar system, rotates, star, orbits, planets, axis.		**Key Vocabulary:** fossils, adaptation, evolution, characteristics, reproduction, genetic offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species. Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering and non-flowering		**Key Vocabulary**: Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage
	Assessment Can describe with diagrams, as appropriate, how light travels in straight lines either from sources or reflected from other objects into our eyes. Can describe with diagrams, as appropriate, how light travels in straight lines past translucent or opaque objects to form a shadow of the same shape.		**Assessment:** Can explain the process of evolution. Can give examples of how plants and animals are suited to an environment. Can give examples of how an animal or plant has evolved over time e.g. penguin, peppered moth. Give examples of living things that lived millions of years ago and the fossil evidence we have to support this. Can give examples of fossil evidence that can be used to support the theory of evolution.		**Assessment:** Can make electric circuits and demonstrate how variation in the working of particular components, such as the brightness of bulbs. can be changed by increasing or decreasing the number of cells or using cells of different voltages. Can draw circuit diagrams of a range of simple series circuits using recognised symbols. Can make electric circuits and demonstrate how variation in the working of particular components, such as the brightness of bulbs

	Can predict and explain with diagrams or models, as appropriate, how the path of light rays can be directed by reflection to be seen, for example, reflection in car rear view mirrors or in a periscope. Can predict and explain with diagrams or models, as appropriate, how the shape and size of shadows can be varied. Can create a voice over for a video clip or animation. Can show using diagrams the movement of the Earth and Moon. Can explain the movement of the Earth and Moon. Can show using diagrams the rotation of the Earth and how this causes day and night. Can explain what causes day and night. Can use the model to explain how the Earth moves in relation to the Sun and the moon moves in relation to the Earth. Can demonstrate and explain verbally how day and night occur. Can explain evidence gathered about the position of shadows in term of the movement of the Earth. Can show this using a model. Can explain how a sundial works. Can explain verbally using a model why we have time zones. Can describe the arguments and evidence used by scientists in the past.		Can identify characteristics that will make a plant or animal suited or not suited to a particular habitat. Can link the patterns seen in the model to the real examples. Can explain why the dominant colour of the peppered moth changed over a very short period of time. Can give examples of animals in the five vertebrate groups and some of the invertebrate groups Can give the key characteristics of the five vertebrate groups and some invertebrate groups Can compare the characteristics of animals in different groups Can give examples of flowering and non-flowering plants. Can use classification materials to identify unknown plants and animals. Can create classification keys for plants and animals Can give a number of characteristics that explain why an animal belongs to a particular group.		can be changed by increasing or decreasing the number of cells or using cells of different voltages. Can draw circuit diagrams of a range of simple series circuits using recognised symbols.