Science Intention Map

Upper Key Stage Two

Placing learning at the heart of everything we do.

How do worms reproduce?
Why do birds lay eggs?
(Beast Creator)

Learning Intentions

1. Plan and carry out a range of enquiries, including writing methods, identifying variables and making predictions based on prior knowledge and understanding.
2. Within a group, decide which observations to make, when and for how long, and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.
3. Use relevant scientific vocabulary to report on their findings, answer questions and justify their conclusions based on evidence collected, identify improvements, further questions and predictions.
4. Gather and record data and results of increasing complexity, selecting from a range of methods (scientific diagrams, labels, classification keys, tables, graphs and models).
5. Group and sort plants by how they reproduce.
6. Describe, using their knowledge of food chains and webs, what could happen if a habitat had a living thing removed or introduced.
7. Describe the life process of reproduction in some plants and animals.
8. Describe the process of human reproduction.
9. Compare the life cycles of animals, including a mammal, an amphibian, an insect and a bird.

Knowledge Intentions

1. A method is a set of clear instructions for how to carry out a scientific investigation. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
2. An observation involves looking closely at objects, materials and living things. Accurate observations can be made repeatedly or at regular intervals to identify changes over time.
3. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered using evidence collected.
4. Data can be recorded and displayed in different ways, including tables, bar and line charts, classification keys and labelled diagrams.
5. Flowering plants reproduce sexually. The flower is essential for sexual reproduction. Other plants reproduce asexually. Bulbs, corms and rhizomes are some parts used in asexual reproduction in plants.
6. Population changes in a habitat can have significant consequences for food chains and webs.
7. Reproduction is the process of producing offspring and is essential for the continued survival of a species. There are two types of reproduction: sexual and asexual. Sexual reproduction involves two parents (one female and one male) and produces offspring that are different from the parents. Asexual reproduction involves one parent and produces offspring that is identical to the parent.
8. Humans reproduce sexually, which involves two parents (one female and one male) and produces offspring that are different from the parents.
9. A life cycle is the series of changes in the life of a living thing and includes these basic stages: birth, growth, reproduction and death. Mammals' life cycles include the stages: embryo, baby, adolescent and adult. Amphibians' life cycles include the stages: egg, larva (tadpole), adolescent and adult. Some insects' (butterflies, beetles and bees) life cycles include the stages: egg, larva, pupa and adult. Birds' life cycles include the stages: egg, baby, adolescent and adult.

End product: Reproduction of an animal/ plant

Upper KS2 Laboratory

Thomas Fairchild
Edith Rebecca Saunders

What is the life cycle of a mealworm?
(Peasants, Princes & Pestilence)

Learning Intentions

1. Ask a wide range of relevant scientific questions that broaden their understanding of the world around them and identify how they can answer them.
2. Plan and carry out a range of enquiries, including writing methods, identifying variables and making predictions based on prior knowledge and understanding.
3. Use relevant scientific vocabulary to report on their findings, answer questions and justify their conclusions based on evidence collected, identify improvements, further questions and predictions.
4. Gather and record data and results of increasing complexity, selecting from a range of methods (scientific diagrams, labels, classification keys, tables, graphs and models).
5. Group and sort plants by how they reproduce.
6. Compare the life cycles of animals, including a mammal, an amphibian, an insect and a bird.

Upper KS2 Laboratory

Maria Merian
Jane Goodall

Knowledge Intentions

1. Questions can help us find out about the world and can be answered using a range of scientific enquiries.
2. A method is a set of clear instructions for how to carry out a scientific investigation. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
3. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered using evidence collected.
4. Data can be recorded and displayed in different ways, including tables, bar and line charts, classification keys and labelled diagrams.
5. Flowering plants reproduce sexually. The flower is essential for sexual reproduction. Other plants reproduce asexually. Bulbs, corms and rhizomes are some parts used in asexual reproduction in plants.
6. A life cycle is the series of changes in the life of a living thing and includes these basic stages: birth, growth, reproduction and death. Mammals' life cycles include the stages: embryo, baby, adolescent and adult. Amphibians' life cycles include the stages: egg, larva (tadpole), adolescent and adult. Some insects' (butterflies, beetles and bees) life cycles include the stages: egg, larva, pupa and adult. Birds' life cycles include the stages: egg, baby, adolescent and adult.

End product: Mammal/ amphibian life cycle

How does the moon move? How do rockets lift off? Forces (Stargazer, forces)

Learning Intentions

1. Take increasingly accurate measurements in standard units, using a range of chosen equipment.
2. Plan and carry out a range of enquiries, including writing methods, identifying variables and making predictions based on prior knowledge and understanding.
3. Within a group, decide which observations to make, when and for how long, and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.
4. Use relevant scientific vocabulary to report on their findings, answer questions and justify their conclusions based on evidence collected, identify improvements, further questions and predictions.
5. Gather and record data and results of increasing complexity, selecting from a range of methods (scientific diagrams, labels, classification keys, tables, graphs and models).
6. Describe, using evidence from comparative or fair tests, why a material has been chosen for a specific use, including metals, wood and glass.
7. Use the idea of Earth's rotation to explain day and night, and the Sun's apparent movement across the sky.
8. Identify, demonstrate and compare reversible and irreversible changes.
9. Describe or model the movement of the planets in our Solar System, including Earth, relative to the Sun., Describe or model the movement of the Moon relative to Earth.
10. Describe the Sun, Earth and Moon as approximately spherical bodies and use this knowledge to understand the phases of the Moon and eclipses.
11. Explain that objects fall to Earth due to the force of gravity.
12. Compare and describe, using a range of toys, models and natural objects, the effects of water resistance, air resistance and friction.
13. Ask a wide range of relevant scientific questions that broaden their understanding of the world around them and identify how they can answer them.
14. Explain that objects fall to Earth due to the force of gravity.
15. Describe and demonstrate how simple levers, gears and pulleys assist the movement of objects.

Upper KS2 Laboratory

Galileo
Caroline Herschel

Knowledge Intentions

1. Specialised equipment is used to take measurements in standard units. Examples include data loggers plus sensors, such as light (lux), sound (dB) and temperature (°C); timers (seconds, minutes and hours); thermometers (°C), and measuring tapes (millimetres, centimetres, metres).
2. A method is a set of clear instructions for how to carry out a scientific investigation. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
3. An observation involves looking closely at objects, materials and living things. Accurate observations can be made repeatedly or at regular intervals to identify changes over time.
4. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered using evidence collected.
5. Data can be recorded and displayed in different ways, including tables, bar and line charts, classification keys and labelled diagrams.
6. A material's properties dictate what it can be used for. For example, cooking pans are made from metal, which is a good thermal conductor, allowing heat to quickly transfer from the hob to the contents of the pan.
7. As Earth orbits the Sun, it also spins on its axis. It takes Earth a day (24 hours) to complete a full spin. During the day, the Sun appears to move through the sky. However, this is due to the Earth rotating and not the Sun moving. Earth rotates to the east or, if viewed from above the North Pole, it rotates anti-clockwise, which means the Sun rises in the east and sets in the west. As Earth rotates, different parts of it face the Sun, which brings what we call daytime. The part facing away is in shadow, which is nighttime.
8. Reversible changes include heating, cooling, melting, dissolving and evaporating. Irreversible changes include burning, rusting, decaying and chemical reactions.
9. The Solar System is made up of the Sun and everything that orbits around it. There are eight planets in our Solar System: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Earth orbits around the Sun and a year (365 days) is the length of time it takes for Earth to complete a full orbit., The Moon orbits Earth, completing a full orbit every month (28 days).
10. The Sun, Earth, Moon and the planets in our solar system are roughly spherical. All planets are spherical because their mass is so large that they have their own force of gravity. This force of gravity pulls all of a planet's material towards its centre, which compresses it into the most compact shape – a sphere.
11. Gravity is a force of attraction. Anything with a mass can exert a gravitational pull on another object. The Earth's large mass exerts a gravitational pull on all objects on Earth, making dropped objects fall to the ground.
12. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered using evidence collected.
13. Friction, air resistance and water resistance are forces that oppose motion and slow down moving objects. These forces can be useful, such as bike brakes and parachutes, but sometimes we need to minimise their effects, such as streamlining boats and planes to move through water or air more easily and using lubricants and ball bearings between two surfaces to reduce friction.
14. An observation involves looking closely at objects, materials and living things. Accurate observations can be made repeatedly or at regular intervals to identify changes over time.
15. Questions can help us find out about the world and can be answered using a range of scientific enquiries.
16. Mechanisms, such as levers, pulleys and gears, give us a mechanical advantage. A mechanical advantage is a measurement of how much a simple machine multiplies the force that we put in. The bigger the mechanical advantage, the less force we need to apply.

    End product: understanding of the solar system

Can you turn a light down?
Can fruit light a bulb?
(A Child's War, electricity)

Learning Intentions

1. Ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.
2. Take accurate, precise and repeated measurements in standard units, using a range of chosen equipment.
3. Independently decide which observations to make, when and for how long and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.
4. Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.
5. Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge.
6. Compare and give reasons for variations in how components in electrical circuits function (brightness of lamps; volume of buzzers and function of on or off switches).
7. Explain how the brightness of a lamp or volume of a buzzer is affected by the number and voltage of cells used in a circuit.
8. Create circuits using a range of components and record diagrammatically using the recognised symbols for electrical components.
9. Plan and carry out a range of enquiries, including writing methods, identifying and controlling variables, deciding on equipment and data to collect and making predictions based on prior knowledge and understanding.
10. Understand and use electrical circuits that incorporate a variety of components (switches, lamps, buzzers and motors) and use programming to control their products.

Upper KS2 Laboratory

Hertha Ayrton
Joseph Priestley

Knowledge Intentions

1. Questions can help us find out about the world and can be answered using a range of scientific enquiries, including fair tests, research and observation.
2. Specialised equipment is used to take accurate measurements in standard units. Examples include data loggers plus sensors, such as light (lux), sound (dB) and temperature (°C); timers (seconds, minutes and hours); thermometers (°C) and measuring tapes (millimetres, centimetres, metres).
3. An observation involves looking closely at objects, materials and living things. Accurate observations can be made repeatedly or at regular intervals to identify changes over time, identify processes and make comparisons.
4. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered, using correct, precise terminology and collected evidence.
5. Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.
6. A circuit needs a power source, such as a battery or cell, with wires connected to both the positive and negative terminals. Other components include lamps, buzzers or motors, which an electric current pass through and affects a response, such as lighting a lamp or turning a motor. When a switch is open, it creates a gap and the current cannot travel around the circuit. When a switch is closed, it completes the circuit and allows a current to flow all the way around it.
7. Voltage is measured in volts (V) and is a measure of the difference in electrical energy between two parts of a circuit. The bigger the voltage, the more electrons are pushed through the circuit. The more voltage flowing through a lamp, buzzer or motor, the brighter the lamp, the louder the buzzer and the faster the motor.
8. There are recognised symbols for different components of circuits.
9. A method is a set of clear instructions for how to carry out a scientific investigation, including what equipment to use and observations to make. A variable is something that can be changed during a fair test. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
10. Computer programs can control electrical circuits that include a variety of components, such as switches, lamps, buzzers and motors.
11. There are recognised symbols for different components of circuits.

End product: draw and label a circuit with a switch

Do we slow down as we get older?
(Time Traveller)

Learning Intentions

1. Plan and carry out a range of enquiries, including writing methods, identifying variables and making predictions based on prior knowledge and understanding.
2. Use relevant scientific vocabulary to report on their findings, answer questions and justify their conclusions based on evidence collected, identify improvements, further questions and predictions.
3. Gather and record data and results of increasing complexity, selecting from a range of methods (scientific diagrams, labels, classification keys, tables, graphs and models).
4. Describe the process of human reproduction.
5. Explain why personal hygiene is important during puberty.
6. Describe the changes as humans develop from birth to old age.

Upper KS2 Laboratory

Andrew Steel

Dian Fossey

Knowledge Intentions

1. A method is a set of clear instructions for how to carry out a scientific investigation. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
2. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered using evidence collected.
3. Data can be recorded and displayed in different ways, including tables, bar and line charts, classification keys and labelled diagrams.
4. Humans reproduce sexually, which involves two parents (one female and one male) and produces offspring that are different from the parents.
5. Good personal hygiene (washing, wearing clean clothes and brushing teeth) can prevent disease or illness. Puberty is the period during which adolescents reach sexual maturity and become capable of reproduction. It causes physical and emotional changes.
6. Humans go through characteristic stages as they develop towards old age. These stages include baby, infant, toddler, child, adolescent, young adult, adult and senior citizen. Puberty is the transition between childhood and adulthood.

End product: Understanding of the aging process from birth to old age.

Why are things classified?
(ID)

Learning Intentions

1. Ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.
2. Take accurate, precise and repeated measurements in standard units, using a range of chosen equipment.
3. Plan and carry out a range of enquiries, including writing methods, identifying and controlling variables, deciding on equipment and data to collect and making predictions based on prior knowledge and understanding.
4. Independently decide which observations to make, when and for how long and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.
5. Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.
6. Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge
7. Research unfamiliar animals and plants from a range of habitats, deciding upon and explaining where they belong in the classification system.
8. Use and construct classification systems to identify animals and plants from a range of habitats., Classify living things, including microorganisms, animals and plants, into groups according to common observable characteristics and based on similarities and differences.
9. Identify that living things produce offspring of the same kind, although the offspring are not identical to either parent.

Upper KS2 Laboratory

*Rosalind Franklin*

Dolly the Sheep

Knowledge Intentions

1. Questions can help us find out about the world and can be answered using a range of scientific enquiries, including fair tests, research and observation.
2. Specialised equipment is used to take accurate measurements in standard units. Examples include data loggers plus sensors, such as light (lux), sound (dB) and temperature (°C); timers (seconds, minutes and hours); thermometers (°C) and measuring tapes (millimetres, centimetres, metres).
3. A method is a set of clear instructions for how to carry out a scientific investigation, including what equipment to use and observations to make. A variable is something that can be changed during a fair test. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
4. An observation involves looking closely at objects, materials and living things. Accurate observations can be made repeatedly or at regular intervals to identify changes over time, identify processes and make comparisons.
5. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered, using correct, precise terminology and collected evidence.
6. Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.
7. Living things are classified into groups, according to common observable characteristics and based on similarities and differences.
8. Classification keys help us identify living things based on their physical characteristics., Scientists classify living organisms into broad groups according to their characteristics. Vertebrates are an example of a classification group. There are a number of ranks, or levels, within the biological classification system. The first rank is called a kingdom, the second a phylum, then class, order, family, genus and species.
9. Animals that sexually reproduce generate new offspring of the same kind by combining the genetic material of two individuals. Each offspring inherits two of every gene, one from the female parent and one from the male parent.

End product: Classification of characteristics in which groups can be separated.
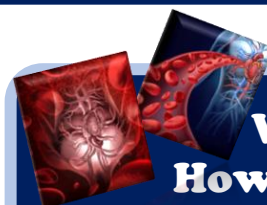
What is in blood?
How does blood flow?
Yr6 Animals including humans
(Blood Heart)

Learning Intentions

1. Ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.
2. Take accurate, precise and repeated measurements in standard units, using a range of chosen equipment.
3. Plan and carry out a range of enquiries, including writing methods, identifying and controlling variables, deciding on equipment and data to collect and making predictions based on prior knowledge and understanding.
4. Independently decide which observations to make, when and for how long and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.
5. Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.
6. Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge.
7. Explain that the circulatory system in animals' transports oxygen, water and nutrients around the body.
8. Name and describe the purpose of the circulatory system and the functions of the heart, blood vessels and blood.
9. Explain the impact of positive and negative lifestyle choices on the body.

Upper KS2 Laboratory

Rosalind Franklin

Dolly the Sheep

Knowledge Intentions

1. Questions can help us find out about the world and can be answered using a range of scientific enquiries, including fair tests, research and observation.
2. Specialised equipment is used to take accurate measurements in standard units. Examples include data loggers plus sensors, such as light (lux), sound (dB) and temperature (°C); timers (seconds, minutes and hours); thermometers (°C) and measuring tapes (millimetres, centimetres, metres)
3. A method is a set of clear instructions for how to carry out a scientific investigation, including what equipment to use and observations to make. A variable is something that can be changed during a fair test. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
4. An observation involves looking closely at objects, materials and living things. Accurate observations can be made repeatedly or at regular intervals to identify changes over time, identify processes and make comparisons.
5. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered, using correct, precise terminology and collected evidence.
6. Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.
7. The role of the circulatory system is to transport oxygen, water and nutrients around the body. They are transported in blood and delivered to where they are needed.
8. The circulatory system includes the heart, blood vessels and blood. The heart pumps blood through the blood vessels and around the body. There are three types of blood vessel: arteries, veins and capillaries. They each have a different-sized hole (lumen) and walls. The blood carries gases (oxygen and carbon dioxide), water and nutrients to where they are needed. The red blood cells carry oxygen and carbon dioxide around the body. The blood also contains white blood cells, which protect the body from infection.
9. Lifestyle choices can have a positive (exercise and eating healthily) or negative (drugs, smoking and alcohol) impact on the body.
10. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered, using correct, precise terminology and collected evidence.

End product: understanding of the circulatory system

How does light travel? Can you see through it?
(Revolution / Firedamp & Davy Lamps)

Learning Intentions

1. Use relevant scientific vocabulary to report on their findings, answer questions and justify their conclusions based on evidence collected, identify improvements, further questions and predictions.
2. Compare and group everyday materials by their properties, including hardness, solubility, transparency, conductivity (electrical and thermal) and magnetism.
3. Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.
4. Explain that, due to how light travels, we can see things because they give out or reflect light into the eye.
5. Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge
6. Identify that light travels in straight lines.

Knowledge Intentions

1. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered using evidence collected.
2. Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.
3. Light travels in straight lines.
4. Light sources give out light. They can be natural or artificial. When light hits an object, it is absorbed, scattered, reflected or a combination of all three. Light from a source or reflected light enter the eye. Vertebrates, such as mammals, birds and reptiles, have a cornea and lens that refracts light that enters the eye and focuses it on the nerve tissue at the back of the eye, which is called the retina. Once light reaches the retina, it is transmitted to the brain via the optic nerve.

End product: investigation into how light travels

Upper KS2 Laboratory

Sir Humphrey Davy

George Stephenson

How do animals stay warm? Can we slow cooling down?
(Frozen Kingdom)

Learning Intentions

1. Ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.
2. Plan and carry out a range of enquiries, including writing methods, identifying and controlling variables, deciding on equipment and data to collect and making predictions based on prior knowledge and understanding.
3. Independently decide which observations to make, when and for how long and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.
4. Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.
5. Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge.
6. Research unfamiliar animals and plants from a range of habitats, deciding upon and explaining where they belong in the classification system.

Upper KS2 Laboratory

Carl Linnaeus

Knowledge Intentions

1. Questions can help us find out about the world and can be answered using a range of scientific enquiries, including fair tests, research and observation.
2. A method is a set of clear instructions for how to carry out a scientific investigation, including what equipment to use and observations to make. A variable is something that can be changed during a fair test. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
3. An observation involves looking closely at objects, materials and living things. Accurate observations can be made repeatedly or at regular intervals to identify changes over time, identify processes and make comparisons.
4. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered, using correct, precise terminology and collected evidence.
5. Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.
6. Living things are classified into groups, according to common observable characteristics and based on similarities and differences.
7. An adaptation is a physical or behavioural trait that allows a living thing to survive and fill an ecological niche. Adaptations evolve by natural selection. Favourable traits help an organism survive and pass on their genes to subsequent generations.

End product: classification of animals/plants linked to habitat

What colour is a shadow?
Yr6 Light
(Hola Mexico)

Learning Intentions

1. Explain, using words, diagrams or a model, why shadows have the same shape as the objects that cast them and how shadows can be changed.
2. Identify that light travels in straight lines.
3. Explain the dangers of using lasers and ways to use them safely.
4. Use a sensor to monitor an environmental variable, such as temperature, sound or light.
5. *Plan and carry out a range of enquiries, including writing methods, identifying and controlling variables, deciding on equipment and data to collect and making predictions based on prior knowledge and understanding.*
6. Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.
7. Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge.
8. Take accurate, precise and repeated measurements in standard units, using a range of chosen equipment.
9. Independently decide which observations to make, when and for how long and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.
10. Ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.
11. Describe, using diagrams, how light behaves when reflected off a mirror (plane, convex or concave) and when passing through a lens (concave or convex).
12. Explain that, due to how light travels, we can see things because they give out or reflect light into the eye.
13. Describe, using scientific language, phenomena associated with light (rainbows, colours on soap bubbles and refraction in a glass of water).

Upper KS2 Laboratory

Thomas Edison

Knowledge Intentions

1. A shadow appears when an object blocks the passage of light. Apart from some distortion or fuzziness at the edges, shadows are the same shape as the object. The distortion or fuzziness depends on the position or type of light source.
2. Light travels in straight lines.
3. Lasers are intense beams of light and they should never be pointed at people's faces or aircraft.
4. Computer monitoring uses sensors as a scientific tool to record information about environmental changes over time. Computer monitoring can also log data from sensors and record the resulting information in a table or graph.
5. A method is a set of clear instructions for how to carry out a scientific investigation, including what equipment to use and observations to make. A variable is something that can be changed during a fair test. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
6. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered, using correct, precise terminology and collected evidence.
7. Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.
8. Specialised equipment is used to take accurate measurements in standard units. Examples include data loggers plus sensors, such as light (lux), sound (dB) and temperature (°C); timers (seconds, minutes and hours); thermometers (°C) and measuring tapes (millimetres, centimetres, metres).
9. An observation involves looking closely at objects, materials and living things. Accurate observations can be made repeatedly or at regular intervals to identify changes over time, identify processes and make comparisons.
10. Questions can help us find out about the world and can be answered using a range of scientific enquiries, including fair tests, research and observation.
11. Mirrors and lenses are used in a range of everyday objects (telescopes, periscopes, cards and on roads). The human eye has a lens that bends and focuses light on the back of the eye (retina) so that we can see.
12. Light sources give out light. They can be natural or artificial. When light hits an object, it is absorbed, scattered, reflected or a combination of all three. Light from a source or reflected light enter the eye. Vertebrates, such as mammals, birds and reptiles, have a cornea and lens that refracts light that enters the eye and focuses it on the nerve tissue at the back of the eye, which is called the retina. Once light reaches the retina, it is transmitted to the brain via the optic nerve.
13. 'White' light is a term used to describe visible, ordinary daylight. White light can be split into a spectrum of colours (rainbow) by droplets of water or prisms.

End product: investigation into shadow

Can we clean dirty water?
Will it erupt?
Properties & changing materials
(Alchemy Island)

Learning Intentions

1. Plan and carry out a range of enquiries, including writing methods, identifying variables and making predictions based on prior knowledge and understanding.
2. Within a group, decide which observations to make, when and for how long, and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.
3. Use relevant scientific vocabulary to report on their findings, answer questions and justify their conclusions based on evidence collected, identify improvements, further questions and predictions.
4. Gather and record data and results of increasing complexity, selecting from a range of methods (scientific diagrams, labels, classification keys, tables, graphs and models).
5. Compare and group everyday materials by their properties, including hardness, solubility, transparency, conductivity (electrical and thermal) and magnetism., Explain, following observation, that some substances (solutes) will dissolve in liquid (solvents) to form a solution and the solute can be recovered by evaporating off the solvent.
6. Separate mixtures by filtering, sieving and evaporating.
7. Identify, demonstrate and compare reversible and irreversible changes.
8. Explain the precautions needed for working safely when heating, burning, cooling and mixing materials.
9. Use electrical circuits of increasing complexity in their models or products, showing an understanding of control.
10. Use relevant scientific vocabulary to report on their findings, answer questions and justify their conclusions based on evidence collected, identify improvements, further questions and predictions.
11. Take increasingly accurate measurements in standard units, using a range of chosen equipment.
12. Ask a wide range of relevant scientific questions that broaden their understanding of the world around them and identify how they can answer them.
13. Explain, following observation, that some substances (solutes) will dissolve in liquid (solvents) to form a solution and the solute can be recovered by evaporating off the solvent.
14. Describe, using evidence from comparative or fair tests, why a material has been chosen for a specific use, including metals, wood and glass.

Upper KS2 Laboratory

Jabir ibn Hayyan

Knowledge Intentions

1. A method is a set of clear instructions for how to carry out a scientific investigation. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
2. An observation involves looking closely at objects, materials and living things. Accurate observations can be made repeatedly or at regular intervals to identify changes over time.
3. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered using evidence collected.
4. Data can be recorded and displayed in different ways, including tables, bar and line charts, classification keys and labelled diagrams.
5. Materials can be grouped according to their basic physical properties. Properties include hardness, solubility, transparency, conductivity (electrical and thermal) and magnetism., Some materials (solutes) will dissolve in liquid (solvents) to form a solution. The solute can be recovered by evaporating off the solvent by heating.
6. Some mixtures can be separated by filtering, sieving and evaporating. Sieving can be used to separate large solids from liquids and some solids from other solids. Filtering can be used to separate small solids from liquids. Evaporating can be used to separate dissolved solids from liquids.
7. Reversible changes include heating, cooling, melting, dissolving and evaporating. Irreversible changes include burning, rusting, decaying and chemical reactions.
8. Very hot and very cold materials can burn skin. Heating materials should be done safely.
9. Electrical circuits can be controlled by a simple on/off switch, or by a variable resistor that can adjust the size of the current in the circuit. Real-life examples are a dimmer switch for lights or volume control on a stereo.
10. Specialised equipment is used to take measurements in standard units. Examples include data loggers plus sensors, such as light (lux), sound (dB) and temperature (°C); timers (seconds, minutes and hours); thermometers (°C), and measuring tapes (millimetres, centimetres, metres).
11. Questions can help us find out about the world and can be answered using a range of scientific enquiries.
12. Some materials (solutes) will dissolve in liquid (solvents) to form a solution. The solute can be recovered by evaporating off the solvent by heating.
13. A material's properties dictate what it can be used for. For example, cooking pans are made from metal, which is a good thermal conductor, allowing heat to quickly transfer from the hob to the contents of the pan.

End product :investigation into revisable/ irreversible changes

Why do birds have different beaks?
How does inheritance work?
(Darwin)

Learning Intentions

1. Ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.
2. Plan and carry out a range of enquiries, including writing methods, identifying and controlling variables, deciding on equipment and data to collect and making predictions based on prior knowledge and understanding.
3. Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.
4. Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge.
5. Research unfamiliar animals and plants from a range of habitats, deciding upon and explaining where they belong in the classification system.
6. Use and construct classification systems to identify animals and plants from a range of habitats., Classify living things, including microorganisms, animals and plants, into groups according to common observable characteristics and based on similarities and differences.
7. Identify that living things produce offspring of the same kind, although the offspring are not identical to either parent., Describe how animals and plants can be bred to produce offspring with specific and desired characteristics (selective breeding).
8. Identify how animals and plants are adapted to suit their environment, such as giraffes having long necks for feeding, and that adaptations may lead to evolution.
9. Explain that living things have changed over time, using specific examples and evidence.

Upper KS2 Laboratory

Charles Darwin

Knowledge Intentions

1. Questions can help us find out about the world and can be answered using a range of scientific enquiries, including fair tests, research and observation.
2. A method is a set of clear instructions for how to carry out a scientific investigation, including what equipment to use and observations to make. A variable is something that can be changed during a fair test. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
3. The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered, using correct, precise terminology and collected evidence.
4. Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.
5. Living things are classified into groups, according to common observable characteristics and based on similarities and differences.
6. Classification keys help us identify living things based on their physical characteristics., Scientists classify living organisms into broad groups according to their characteristics. Vertebrates are an example of a classification group. There are a number of ranks, or levels, within the biological classification system. The first rank is called a kingdom, the second a phylum, then class, order, family, genus and species.
7. Animals that sexually reproduce generate new offspring of the same kind by combining the genetic material of two individuals. Each offspring inherits two of every gene, one from the female parent and one from the male parent., Animals and plants can be bred to produce offspring with specific and desired characteristics. This is called selective breeding. Examples include cows that produce large quantities of milk or crops that are disease resistant.
8. An adaptation is a physical or behavioural trait that allows a living thing to survive and fill an ecological niche. Adaptations evolve by natural selection. Favourable traits help an organism survive and pass on their genes to subsequent generations.
9. Scientists compare fossilised remains from the past to living species that exist today to hypothesise how living things have evolved over time. Humans and apes share a common ancestry and evidence for this comes from fossil discoveries and genetic comparison.

End product: understanding of adaptation due to environment.

Upper KS2 Working Scientifically

	National Curriculum Programme of Study	2021 - 2022	2022 - 2023
Sc5-6/1.1	planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.	T1 T2, T3, T4, T5, T6,	T1, T3, T4, T5, T6,
Sc5-6/1.2	taking measurements, using a range of scientific equipment, with increasing accuracy and precision.	T1, T3, T5,	T1, T3, T4, T6,
Sc5-6/1.3	recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, and bar and line graphs.	T1, T3, T4, T6,	T1, T2, T3, T4, T5, T6,
Sc5-6/1.4	using test results to make predictions to set up further comparative and fair tests.	T1, T2, T3, T4, T5, T6,	T1, T2, T3, T4, T5, T6,
Sc6/1.5	using simple models to describe scientific ideas.		
Sc6/1.6	reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations.	T1, T2, T3, T4, T5, T6,	T1, T2, T3, T4, T5, T6,
Sc6/1.7	identifying scientific evidence that has been used to support or refute ideas or arguments.	T1, T2, T3, T4, T5, T6,	T1, T2, T3, T4, T5, T6,

	Year A 2021 - 2022						Year B 2022 - 2023					
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6
Living things & Habitats			▓			▓	█	█			▓	
Animals including humans	█										▓	
Properties of materials		▓			█				▓			
Earth & Space									█			
Evolution						▓						▓
Light				▓								
Electricity												█

Completed in depth	█	Light touch, not every PoS addressed	▓

Year Five

National Curriculum Programme of Study		2021-2022	2022-2023
Living things & their habitats			
Sc5/2.1a	describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird		*T1, T2,*
Sc5/2.1b	describe the life process of reproduction in some plants and animals.		*T1, T2, T5,*
Animals including humans			
Sc5/2.2a	describe the changes as humans develop to old age.		*T5,*
Properties and changes of materials			
Sc5/3.1a	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.	*T2, T5,*	
Sc5/3.1b	know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution.	*T5,*	
Sc5/3.1c	use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating	*T5,*	
Sc5/3.1d	give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.	*T5,*	
Sc5/3.1e	demonstrate that dissolving, mixing and changes of state are reversible changes	*T5,*	*T3,*
Sc5/3.1f	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.	*T5,*	*T3,*
Earth and Space			
Sc5/4.1a	describe the movement of the Earth, and other planets, relative to the Sun in the solar system		*T3,*
Sc5/4.1b	describe the movement of the Moon relative to the Earth		*T3,*
Sc5/4.1c	describe the Sun, Earth and Moon as approximately spherical bodies		*T3,*
Sc5/4.1d	use the idea of the Earth's rotation to explain day and night, and the apparent movement of the sun across the sky.		*T3,*

Year Six

National Curriculum Programme of Study	2021-2022	2022-2023
Living Things and their habitats		
Sc6/2.1a 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.	T6,	T6,
Sc6/2.1b give reasons for classifying plants and animals based on specific characteristics.	T3,	T6,
Animals including humans		
Sc6/2.2a identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.	T1,	T5
Sc6/2.2b recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.	T1,	T5)
Sc6/2.2c describe the ways in which nutrients and water are transported within animals, including humans.	T1,	T5
Evolution		
Sc6/2.3a recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.		
Sc6/3.2b recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.	T6,	T6,
Sc6/2.3c identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.	T3, T6,	
Light		
Sc6/4.1a recognise that light appears to travel in straight lines.		T2
Sc6/4.1b 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.	T4,	T2
Sc6/4.1c 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.		T2
Sc6/4.1d use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.	T4,	T2
Electricity		
Sc6/4.2a associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.		T4,
Sc6/4.2b 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.		T4,
Sc6/4.2c use recognised symbols when representing a simple circuit in a diagram.		T4,