Planning for assessment

# Knowledge matrices Y5


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| Year | 5 | Topic | Living things and their habitats |
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- 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.

| Prior learning | Future learning |
|---|---|
| • Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans)<br>• Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants) | • Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3)<br>• Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3) |

**WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE**

**Show understanding of a concept using scientific vocabulary correctly**

| Key learning | Possible evidence |
|---|---|
| As part of their life cycle, plants and animals reproduce. Most animals reproduce sexually. This involves two parents where the sperm from the male fertilises the female egg. Animals, including humans, have offspring which grow into adults. In humans and some animals, these offspring will be born live, such as babies or kittens, and then grow into adults. In other animals, such as chickens or snakes, there may be eggs laid that hatch to young which then grow to adults. Some young undergo a further change before becoming adults e.g. caterpillars to butterflies. This is called a metamorphosis.<br><br>Plants reproduce both sexually and asexually. Bulbs, tubers, runners and plantlets are examples of asexual plant reproduction which involves only one parent. Gardeners may force plants to reproduce asexually by taking cuttings. Sexual reproduction occurs through pollination, usually involving wind or insects. | • Can draw the life cycle of a range of animals identifying similarities and differences between the life cycles<br>• Can explain the difference between sexual and asexual reproduction and give examples of how plants reproduce in both ways |


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| Key vocabulary | |
|---|---|
| Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings | |

**Common misconceptions**

Some children may think:

- all plants start out as seeds
- all plants have flowers
- plants that grow from bulbs do not have seeds
- only birds lay eggs.

**Apply knowledge in familiar related contexts, including a range of enquiries**

| Activities | Possible evidence |
|---|---|
| • Use secondary sources and, where possible, first-hand observations to find out about the life cycle of a range of animals.<br>• Compare the gestation times for mammals and look for patterns e.g. in relation to size of animal or length of dependency after birth.<br>• Look for patterns between the size of an animal and its expected life span.<br>• Grow and observe plants that reproduce asexually e.g. strawberries, spider plants, potatoes.<br>• Take cuttings from a range of plants e.g. African violet, mint.<br>• Plant bulbs and then harvest to see how they multiply.<br>• Use secondary sources to find out about pollination. | • Can present their understanding of the life cycle of a range of animals in different ways e.g. drama, pictorially, chronological reports, creating a game<br>• Can identify patterns in life cycles<br>• Can compare two or more animal life cycles they have studied<br>• Can explain how a range of plants reproduce asexually |

| Year | 5 | Topic | Animals, including humans |
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| • Describe the changes as humans develop to old age. | | | |

| Prior learning | Future learning |
|---|---|
| • Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) | • Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3) |

**WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE**

**Show understanding of a concept using scientific vocabulary correctly**

| Key learning | Possible evidence |
|---|---|
| When babies are young, they grow rapidly. They are very dependent on their parents. As they develop, they learn many skills. At puberty, a child's body changes and develops primary and secondary sexual characteristics. This enables the adult to reproduce.<br><br>This needs to be taught alongside PSHE. The new statutory requirements for relationships and health education can be found below:<br><br>• statutory guidance on Physical health and mental wellbeing (primary and secondary).<br><br>Other useful guidance includes:<br><br>• Joint briefing on teaching about puberty in KS2 from PHSE Association and Association for Science Education<br>• Briefing on humans development and reproduction in the Primary Curriculum from PHSE Association and Association for Science Education. | • Can explain the changes that takes place in boys and girls during puberty<br>• Can explain how a baby changes physically as it grows, and also what it is able to do |

| Key vocabulary | |
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| Puberty – the vocabulary to describe sexual characteristics | |

| Common misconceptions |
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| Some children may think:<br>• a baby grows in a mother's tummy<br>• a baby is "made". |

| Apply knowledge in familiar related contexts, including a range of enquiries | |
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| **Activities** | **Possible evidence** |
| This unit is likely to be taught through direct instruction due to its sensitive nature, although children can carry out a research enquiry by asking an expert e.g. school nurse to provide answers to questions that have been filtered by the teacher. | • Can present information about the changes occurring during puberty as an information leaflet for other Y5 children or answers to 'problem page questions' |

| | Year | 5 | Topic | Properties and changes of materials |
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| | • 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.<br>• Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution.<br>• Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.<br>• Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.<br>• Demonstrate that dissolving, mixing and changes of state are reversible changes.<br>• 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. | | | |

| Prior learning | Future learning |
|---|---|
| • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials)<br>• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)<br>• 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. (Y3 - Forces and magnets)<br>• Compare and group materials together, according to whether they are solids, liquids or gases. (Y4 - States of matter)<br>• 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). (Y4 - States of matter)<br>• Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - States of matter) | • Chemical reactions as the rearrangement of atoms. (KS3)<br>• Representing chemical reactions using formulae and using equations. (KS3)<br>• Combustion, thermal decomposition, oxidation and displacement reactions. (KS3)<br>• Defining acids and alkalis in terms of neutralisation reactions. (KS3)<br>• The pH scale for measuring acidity/alkalinity; and indicators. (KS3) |


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## WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

### Show understanding of a concept using scientific vocabulary correctly

| Key learning | Possible evidence |
|---|---|
| Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment.<br>Mixtures can be separated by filtering, sieving and evaporation.<br>Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible. | • Can use understanding of properties to explain everyday uses of materials, for example, how bricks, wood, glass and metals are used in buildings<br>• Can explain what dissolving means, giving examples<br>• Can name equipment used for filtering and sieving<br>• Can use knowledge of liquids, gases and solids to suggest how materials can be recovered from solutions or mixtures by evaporation, filtering or sieving<br>• Can describe some simple reversible and non-reversible changes to materials, giving examples |
| **Key vocabulary** | |
| Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material | |

### Common misconceptions

Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.

Some children may think:

- thermal insulators keep cold in or out
- thermal insulators warm things up
- solids dissolved in liquids have vanished and so you cannot get them back
- lit candles only melt, which is a reversible change.

### Apply knowledge in familiar related contexts, including a range of enquiries

| Activities | Possible evidence |
|---|---|
| • Investigate the properties of different materials in order to recommend materials for particular functions depending on these properties e.g. test waterproofness and thermal insulation to identify a suitable fabric for a coat.<br>• Explore adding a range of solids to water and other liquids e.g. cooking oil, as appropriate.<br>• Investigate rates of dissolving by carrying out comparative and fair test. | • Can create a chart or table grouping/comparing everyday materials by different properties<br>• Can use test evidence gathered about different properties to suggest an appropriate material for a particular purpose |

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| • Separate mixtures by sieving, filtering and evaporation, choosing the most suitable method and equipment for each mixture.<br>• Explore a range of non-reversible changes e.g. rusting, adding fizzy tablets to water, burning.<br>• Carry out comparative and fair tests involving non-reversible changes e.g. What affects the rate of rusting? What affects the amount of gas produced?<br>• Research new materials produced by chemists e.g. Spencer Silver (glue of sticky notes) and Ruth Benerito (wrinkle free cotton). | • Can group solids based on their observations when mixing them with water<br>• Can give reasons for choice of equipment and methods to separate a given solution or mixture such as salt or sand in water<br>• Can explain the results from their investigations |

| Year | 5 | Topic | Earth and space |
|---|---|---|---|

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

| Prior learning | Future learning |
|---|---|
| • Explore the natural world around them. (Reception – Earth and space)<br>• Describe what they see, hear and feel whilst outside. (Reception – Earth and space)<br>• Observe changes across the four seasons. (Y1 - Seasonal changes)<br>• Observe and describe weather associated with the seasons and how day length varies. (Y1 - Seasonal changes) | • 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). (KS3)<br>• Our Sun as a star, other stars in our galaxy, other galaxies. (KS3)<br>• The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. (KS3)<br>• The light year as a unit of astronomical distance. (KS3) |

**WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE**

**Show understanding of a concept using scientific vocabulary correctly**

| Key learning | Possible evidence |
|---|---|
| The Sun is a star. It is at the centre of our solar system. There are 8 planets (can choose to name them, but not essential). These travel around the Sun in fixed orbits. Earth takes 365¼ days to complete its orbit around the Sun. The Earth rotates (spins) on its axis every 24 hours. As Earth rotates half faces the Sun (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. | • Can create a voice over for a video clip or animation<br>• Can show, using diagrams, the movement of the Earth and Moon<br>• Can explain the movement of the Earth and Moon<br>• Can show using diagrams the rotation of the Earth and how this causes day and night<br>• Can explain what causes day and night |
| **Key vocabulary** | |
| Earth, Sun, Moon, (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, solar system, rotates, star, orbit, planets | |


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| Common misconceptions | |
|---|---|
| Some children may think:<br>• the Earth is flat<br>• the Sun is a planet<br>• the Sun rotates around the Earth<br>• the Sun moves across the sky during the day<br>• the Sun rises in the morning and sets in the evening<br>• the Moon appears only at night<br>• night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth. | |
| **Apply knowledge in familiar related contexts, including a range of enquiries** | |
| **Activities** | **Possible evidence** |
| • 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.<br>• Use secondary sources to help make a model to show why day and night occur.<br>• Make first-hand observations of how shadows caused by the Sun change through the day.<br>• Make a sundial.<br>• Research time zones.<br>• 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. | • Can use the model to explain how the Earth moves in relation to the Sun and the Moon moves in relation to the Earth<br>• Can demonstrate and explain verbally how day and night occur<br>• Can explain evidence gathered about the position of shadows in term of the movement of the Earth and show this using a model<br>• Can explain how a sundial works<br>• Can explain verbally, using a model, why we have time zones<br>• Can describe the arguments and evidence used by scientists in the past |

| Year | 5 | Topic | Forces |
|---|---|---|---|

- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
- Identify the effects of air resistance, water resistance and friction that act between moving surfaces.
- Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

| Prior learning | Future learning |
|---|---|
| • Compare how things move on different surfaces. (Y3 - Forces and magnets)<br>• Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets)<br>• Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Forces and magnets)<br>• 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. (Y3 - Forces and magnets)<br>• Describe magnets as having two poles. (Y3 - Forces and magnets)<br>• Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 - Forces and magnets) | • Forces as pushes or pulls, arising from the interaction between two objects. (KS3)<br>• Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3)<br>• Moment as the turning effect of a force. (KS3)<br>• Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. (KS3)<br>• Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3) |

## WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

### Show understanding of a concept using scientific vocabulary correctly

| Key learning | Possible evidence |
|---|---|
| A force causes an object to start moving, stop moving, speed up, slow down or change direction. Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall.<br><br>Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water, or the air and water may be moving over a stationary object.<br><br>A mechanism is a device that allows a small force to be increased to a larger force. The pay back is that it requires a greater movement. The small force moves a long | • Can demonstrate the effect of gravity acting on an unsupported object<br>• Can give examples of friction, water resistance and air resistance<br>• Can give examples of when it is beneficial to have high or low friction, water resistance and air resistance<br>• Can demonstrate how pulleys, levers and gears work |

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| distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover. Pulleys, levers and gears are all mechanisms, also known as simple machines. | |
| **Key vocabulary** | |
| Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears | |

**Common misconceptions**

Some children may think:

- the heavier the object the faster it falls, because it has more gravity acting on it
- forces always act in pairs which are equal and opposite
- smooth surfaces have no friction
- objects always travel better on smooth surfaces
- a moving object has a force which is pushing it forwards and it stops when the pushing force wears out
- a non-moving object has no forces acting on it
- heavy objects sink and light objects float.

**Apply knowledge in familiar related contexts, including a range of enquiries**

| Activities | Possible evidence |
|---|---|
| • Investigate the effect of friction in a range of contexts e.g. trainers, bathmats, mats for a helter-skelter.<br>• Investigate the effects of water resistance in a range of contexts e.g. dropping shapes through water and pulling shapes, such as boats, along the surface of water.<br>• Investigate the effects of air resistance in a range of contexts e.g. parachutes, spinners, sails on boats.<br>• Explore how levers, pulleys and gears work.<br>• Make a product that involves a lever, pulley or gear.<br>• Create a timer that uses gravity to move a ball.<br>• Research how the work of scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation. | • Can explain the results of their investigations in terms of the force, showing a good understanding that as the object tries to move through the water or air or across the surface the particles in the water, air or on the surface slow it down<br>• Can demonstrate clearly the effects of using levers, pulleys and gears |