



- Reversible and Irreversible changes (Autumn 1)
- Light and Astronomy (Autumn 2)
- Forces- effects on movement (Spring 1)
- Material properties – testing material properties (Spring 2)
- Life cycles (Summer 1)
- Human life cycles (summer 2)
- Ongoing

(statutory- underlined in red).

Working scientifically

- 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

Environment - Observing Life cycles/living things and their habitats.	Material Properties – Testing Material Properties	Material Changes - Reversible changes
<p><u>Pupils should be taught to:</u></p> <ul style="list-style-type: none"> ▪ 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. <p>Notes and Guidance (non-statutory): Pupils should study and raise questions about their local environment throughout the year. They should observe life-cycle changes in a variety of living things, for example plants in the vegetable garden or flower border, and animals in the local environment. They should find out about the work of naturalists and animal behaviourists, for example, David Attenborough and Jane Goodall. Pupils should find out about different types of</p>	<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> ▪ 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. ▪ Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. ▪ Compare a variety of materials and measure their effectiveness (e.g. hardness, strength, flexibility, solubility, transparency, thermal conductivity, electrical conductivity). <p>Temperature and Thermal Insulation</p> <ul style="list-style-type: none"> ▪ Heat always moves from hot to cold. ▪ Some materials (insulators) are better at slowing down the movement of heat than others. ▪ Objects/liquids will warm up or cool down until they reach the 	<ul style="list-style-type: none"> ▪ <u>Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.</u> ▪ <u>Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.</u> ▪ <u>Demonstrate that dissolving, mixing and changes of state are reversible changes.</u> ▪ Changes can occur when different materials are mixed. ▪ Some material changes can be reversed and some cannot. ▪ Recognise that dissolving is a reversible change. ▪ Distinguish between melting and dissolving. ▪ Mixtures of solids (of different particle size) can be separated by sieving. ▪ Mixtures of solids and liquids can be separated by filtering if the solid is insoluble (undissolved). ▪ Evaporation helps us separate soluble materials from water. ▪ Changes to materials can happen at different rates (factors affecting dissolving, factors affecting evaporation – amount of liquid, temperature, wind speed). ▪ Freezing, melting and boiling changes can be reversed (revision from YR4).



reproduction, including sexual and asexual reproduction in plants and sexual reproduction in animals.

Pupils might work scientifically by:

- Observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world (in the rainforest, in the oceans, in desert areas and in prehistoric times).
- Asking pertinent questions.
- Suggesting reasons for similarities & differences.
- They might try to grow new plants from different parts of the parent plant, for example, seeds, stem and root cuttings, tubers, bulbs.
- Observe changes in an animal over a period of time (for example, by hatching and rearing chicks).
- Comparing how different animals reproduce and grow.

temperature of their surroundings.

Notes and Guidance (non-statutory):

Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials and relating these to what they learnt about magnetism in Year 3 and about electricity in Year 4.

Note: Pupils are not required to make quantitative measurements about conductivity and insulation at this stage. It is sufficient for them to observe that some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them.

Pupils might work scientifically by:

- Carry out tests to answer questions such as ‘Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?’
- Compare materials in order to make a switch in a circuit.

Notes and Guidance (non-statutory):

Pupils should explore reversible changes including evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes.

Material Changes – Irreversible changes

Pupils should be taught to:

- 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.

Notes and Guidance (non-statutory):

Pupils should explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example vinegar with bicarbonate of soda. They should find out about how chemists create new materials, for example Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton.

Note: Safety guidelines should be followed when burning materials.

Pupils might work scientifically by:

- Observing and comparing the changes that take place, for example, when burning different materials or baking bread or cakes.
- Researching and discussing how chemical changes have an impact on our lives, for example cooking.
- Discuss [research] the creative use of new materials such as polymers, super-sticky and super-thin materials.



Animals - Human Life Cycles	Light and Astronomy – Earth and Space	Forces – Effects on Movement
<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> Describe the <u>changes as humans develop to old age</u>. Animals are alive; they move, feed, grow, use their senses, reproduce, breathe/respire and excrete. <p>Notes and Guidance (non-statutory): Pupils should draw a timeline to indicate stages in the growth and development of humans. They should learn about the changes experienced in puberty.</p> <p>Pupils might work scientifically by:</p> <ul style="list-style-type: none"> Researching the gestation periods other animals and comparing them with humans. By finding out and recording the length and mass of a baby as it grows. 	<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> Describe the <u>movement of the Earth, and other planets, relative to the Sun in the solar system</u>. Describe the <u>movement of the Moon relative to the Earth</u>. Describe <u>Sun/Earth/Moon as approximately spherical bodies</u>. Use the <u>idea of the Earth's rotation to explain day and night</u>. The Earth spins once around its own axis in 24 hours, giving day and night. The Earth orbits the Sun in one year. We can see the Moon because the Sun's light reflects off it. The Moon orbits the Earth in approximately 28 days and changes to the appearance of the moon are evidence of this. The Sun appears to move across the sky from East to West and this causes shadows to change during the day. Changes to shadow length over a day or changes to sunrise and sunset times over a year are evidence supporting the movement of the Earth. <p>Notes and Guidance (non-statutory): Pupils should be introduced to a model of the Sun and Earth that enables them to explain day and night. Pupils should learn that the Sun is a star at the centre of our solar system and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006). They should understand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones).</p> <p>Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses. Pupils should find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.</p> <p>Pupils might work scientifically by:</p> <ul style="list-style-type: none"> Comparing the time of day at different places on the Earth through internet links and direct communication. Creating simple models of the solar system. Constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day. Finding out why some people think that structures such as Stonehenge might have been used as astronomical clocks. 	<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> Explain that <u>unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</u>. Identify the <u>effects of air resistance, water resistance and friction, that act between moving surfaces</u>. Recognise that <u>some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect</u>. There are different types of forces (push, pull, friction, air resistance, water resistance, magnetic forces, gravity). Gravity can act without direct contact between the Earth and an object. Friction, air resistance and water resistance are forces which slow down moving objects. Friction, air resistance and water resistance can be useful or unwanted. The effects of friction, air resistance and water resistance can be reduced or increased for a preferred effect. More than one force can act on an object simultaneously (either reinforcing or opposing each other). <p>Notes and Guidance (non-statutory): Pupils should explore falling objects and raise questions about the effects of air resistance. They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall. They should experience forces that make things begin to move, get faster or slow down. Pupils should explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel. Pupils should explore the effects of levers, pulleys and simple machines on movement. Pupils might find out how scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.</p> <p>Pupils might work scientifically by:</p> <ul style="list-style-type: none"> Exploring falling paper cones or cup-cake cases. Designing and making [exploring] a variety of parachutes. Carrying out fair tests to determine which designs are the most effective. Exploring resistance in water by making and testing boats of different shapes. Design and make artefacts that use simple levers, pulleys, gears and/or springs and explore their effects.

