



**Euxton CE Primary
School**

**Science Knowledge and
Assessment Document
(including common
misconceptions)**

Knowledge

Substantive knowledge

Structure – anything composed of parts arranged together in some way

Function - a specific job or procedure

Variation – the differences between living things of the same species

Adaption - The process by which animals, plants and other living things have changed so that they better suit their habitat

Cause and effect - Cause is why something happens, effect is what event has happened as a result of this

Changes – changing from one material/ state to another

Evolution – The way that living things change over time

Growth – the process of increasing in size

Energy - Strength and power. There are many forms such as thermal (heat), radiant (light) or kinetic (movement)

Process - A series of actions or steps taken in order to achieve a particular end

Similarity and difference - Similarity is sameness or a likeness between things and differences are a point or way in which people or things are dissimilar

Working scientifically - The processes of science: asking questions, designing experiments, reasoning and arguing with scientific evidence

Disciplinary knowledge

Fair & comparative testing - Comparative and fair test enquiries enable children to explore relationships between different variables. In simple comparative tests children compare one

event with another and identify different outcomes. For example, does the red car go faster than the green car?

☑ Identifying, classifying & grouping - Classification makes identification easier and is based on grouping things by looking at similar observable characteristics.

☑ Pattern Seeking - Pattern-seeking enquiries involve children making measurements or observations to explore situations where there are variables that they can't easily control. In this type of enquiry, children are trying to answer 'big questions' by identifying patterns in the measurements and observations they record.

Observing over time - Pupils identify and measure events and changes in living things, materials and physical process or events. These observations may take place over time spans of minutes or hours (e.g. puddles evaporating) up to several weeks or months (e.g. rearing young chicks).

Research using secondary sources - Common secondary research methods include data collection through the internet, libraries, archives, schools and organisational reports

EYFS

Marvellous Me	Autumn	Winter: Light&Dark	Dinosaurs	Spring into Summer	Mad about Mini beasts
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Marvellous Me	
Substantive knowledge I can...	Disciplinary knowledge I can...
What my senses are	Explore and investigate my senses

Autumn	
Substantive knowledge I can...	Disciplinary knowledge I can...
Describe what autumn is like.	Explore the season of autumn by gathering items and making observations.

Winter: Light & Dark	
Substantive knowledge I can...	Disciplinary knowledge I can...
Describe what winter is like.	Make observations from pictures of winter animals.
Some animals that live in colder habitats.	Explore the differences between light and dark upon the senses.
That some animals hibernate during winter months.	
The difference between light and dark.	

Dinosaurs	
Substantive knowledge I can...	Disciplinary knowledge I can...
Describe what spring is like.	Investigate fossils and make observations and conclusions about them.
What a dinosaur was and that they lived a long time ago.	
Name some dinosaurs	

Spring into Summer

Substantive knowledge I can...	Disciplinary knowledge I can...
How to describe what summer is like.	Explore and observe the different stages of the life cycle of a plant.
How the seasons change.	Dissect a plant to show the different parts.
Name some seeds.	
Describe germination.	
Identify and explain the difference between a fruit and a vegetable.	
Name the different parts of a plant.	

Mad about Mini beasts

Substantive knowledge I can...	Disciplinary knowledge I can...
Describe the life cycle of a caterpillar and a frog.	Explore my local environment so that I can make observations about mini beasts.
State that animals have a life cycle.	Use my knowledge of animals and habitats to suggest how some animals could survive in the wild.
State what a habitat is.	

Year 1 Science Assessment of Key Knowledge

Everyday Materials	Seasons and how they change	Plants	Living things and their habitats	Animals including humans
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Everyday Materials	
Substantive knowledge I can...	Disciplinary knowledge I can...
Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock	Distinguish between an object and the material from which it is made
Describe the simple physical properties of a variety of everyday materials	Compare and group together a variety of everyday materials on the basis of their simple physical properties
Vocabulary	
Hard, soft, stretchy, stiff, shiny, dull, rough, smooth, bendy/not bendy, waterproof/not waterproof, absorbent, opaque	
Common Misconceptions	
<p>Children can be confused about the meaning of the word “material” – many might have heard the word only in the context of fabric. Another common misconception is that materials are all solids – children might classify liquids and gases as non-materials.</p> <p>This misconception can be reinforced if the materials the children investigate include only solids such as wood, glass and plastic.</p> <p>Avoid this by including materials such as gases (air in a balloon) and liquids when discussing materials with the children.</p> <p>A material is anything made from matter that can be shaped or manipulated in order to make something. A material is therefore anything that physically occupies space and has mass, which can be a solid, a liquid or a gas.</p>	

Seasons and how they change	
Substantive knowledge I can...	Disciplinary knowledge I can...
Describe weather associated with different seasons.	observe changes across the 4 seasons
State that total hours of sunlight vary throughout the year.	observe and describe weather associated with the seasons and how day length varies
Vocabulary	
Seasons, spring, summer, autumn, winter, windy, sunny, overcast, snow, rain, temperature	
Common Misconceptions	
<ul style="list-style-type: none"> • It always snows in winter • It is always sunny in the summer • There are only flowers in spring and summer • It rains most in the winter 	

Plants

Substantive knowledge I can...	Disciplinary knowledge I can...
identify and name a variety of common wild and garden plants, including deciduous and evergreen trees	explore and answer questions about plants growing in their habitat
identify and describe the basic structure of a variety of common flowering plants, including trees	observing closely, perhaps using magnifying glasses, and comparing and contrasting familiar plants;
	rawing diagrams showing the parts of different plants including trees.
	keep records of how plants have changed over time, for example, the leaves falling off trees and buds opening; and compare and contrast what they have found out about different plants.

Vocabulary

Leaves, trunk, branch, root, seed, bulb, flower, stem, wild, garden, deciduous, evergreen

Common Misconceptions

- plants are flowering plants grown in pots with coloured petals and leaves and a stem
- trees are not plants
- all leaves are green
- all stems are green
- a trunk is not a stem
- blossom is not a flower.

Living things and their habitats

Substantive knowledge I can...	Disciplinary knowledge I can...
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	explore and compare the differences between things that are living, dead, and things that have never been alive
identify and name a variety of plants and animals in their habitats, including microhabitats	sorting and classifying things according to whether they are living, dead or were never alive, and recording their findings using charts.
describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food	They could construct a simple food chain that includes humans

Vocabulary

Common Misconceptions

Children sometimes find it difficult to distinguish between homes and habitats. It helps to explain that a home is best thought of as a place of shelter for an organism, whereas a habitat must provide all its requirements for life. The children might assume that a habitat is unchanging, but most habitats alter considerably over time due to human involvement, changes in climate and seasonal variations. Some children might think that animals “choose” to live in certain places. In fact, they have adapted to live in particular habitats over millions of years. Some children may think: plants and seeds are not alive as they cannot be seen to move, fire is living, and arrows in a food chain mean ‘eats’.

Animals Including Humans

Substantive knowledge I can...	Disciplinary knowledge I can...
identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals	describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets)
identify and name a variety of common animals that are carnivores, herbivores and omnivores	using their observations to compare and contrast animals at first hand or through videos and photographs, describing how they identify and group them;
identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	grouping animals according to what they eat; and using their senses to compare different textures, sounds and smells.

Vocabulary

Amphibians, birds, fish, mammals, reptiles, carnivores, herbivore, omnivore, sight, hearing, touch, taste, smell, head, neck, ear, mouth, shoulder, hand, fingers, leg, foot, thumb, eye, nose, knee, toes, teeth, elbow

Common Misconceptions

Children often think of animals as just being furry. Children often do not think of humans as animals as we do not have 4 legs and fur or make animal noises. Difficulty distinguishing between living and non-living things – a toy robot moves and can talk, a plant doesn't make human noises so cannot be alive.

A flame appears to exhibit many of the life processes:

- Nutrition - it uses fuel
- Growth – fires become larger
- Movement – flames flicker
- Reproduction – flames can leap from one place to another
- It produces 'waste' – ash and smoke
- It needs oxygen

Of course, a flame is not living as it is not made up of cells and it is not growing, reproducing, or producing waste in a biological sense. This can form the basis of a very interesting discussion.

Year 2 Science Assessment of Key Knowledge

Everyday Materials	Plants	Living things and their habitats	Animals including humans
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Everyday Materials	
Substantive knowledge I can...	Disciplinary knowledge I can...
identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses	find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching
	comparing the uses of everyday materials in and around the school with materials found in other places
	observing closely, identifying and classifying the uses of different materials, and recording their observations.
Vocabulary	
Waterproof, fabric, rubber, cars, rock, paper, cardboard, wood, metal, plastic, glass, brick, twisting, squashing, bending, matches, cans, spoons,	
Common Misconceptions	
only fabrics are materials <ul style="list-style-type: none"> • only building materials are materials • only writing materials are materials • the word 'rock' describes an object rather than a material • 'solid' is another word for hard. 	

Animals Including Humans	
Substantive knowledge I can...	Disciplinary knowledge I can...
notice that animals, including humans, have offspring which grow into adults	find out about and describe the basic needs of animals, including humans, for survival (water, food and air)
describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene	observing, through video or first-hand observation and measurement, how different animals, including humans, grow; asking questions about what things animals need for survival and what humans need to stay healthy; and suggesting ways to find answers to their questions.
Vocabulary	
Living, dead, never alive, habitats, micro-habitats, food, food chain, leaf litter, shelter, sea shore, woodland, ocean, rainforest, conditions, desert, damp, shade,	

Plants

Substantive knowledge I can...	Disciplinary knowledge I can...
find out and describe how plants need water, light and a suitable temperature to grow and stay healthy	observe and describe how seeds and bulbs grow into mature plants
	observe and record, with some accuracy, the growth of a variety of plants as they change over time from a seed or bulb, or observing similar plants at different stages of growth; setting up a comparative test to show that plants need light and water to stay healthy.

Vocabulary

Leaves, trunk, branch, root, seed, bulb, flower, stem, wild, garden, deciduous, evergreen, observe, grow, compare, record, temperature, predict, measure, diagram, germinate, warmth, sunlight.

- plants are not alive as they cannot be seen to move
- seeds are not alive
- all plants start out as seeds
- seeds and bulbs need sunlight to germinate

Living things and their habitats

Substantive knowledge I can...	Disciplinary knowledge I can...
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	explore and compare the differences between things that are living, dead, and things that have never been alive
identify and name a variety of plants and animals in their habitats, including microhabitats	sorting and classifying things according to whether they are living, dead or were never alive, and recording their findings using charts.
describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food	They could construct a simple food chain that includes humans

Vocabulary

Living, dead, never alive, habitats, micro-habitats, food, food chain, leaf litter, shelter, sea shore, woodland, ocean, rainforest, conditions, desert, damp, shade,

Year 3 Science Assessment of Key Knowledge

Rocks	Light	Magnets and forces	Plants	Animals including humans
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Rocks	
Substantive knowledge I can...	Disciplinary knowledge I can...
Describe in simple terms how fossils are formed when things that have lived are trapped within rock	Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties
Recognise that soils are made from rocks and organic matter	
Vocabulary	
Rocks, igneous, metamorphic, sedimentary, anthropic, permeable, impermeable, chemical fossil, body fossil, trace fossil, Mary Anning, cast fossil, mould fossil, replacement fossil, extinct, organic matter, top soil, sub soil, base rock.	
Common misconceptions	
<p>Rocks are all hard in nature</p> <p>Rock-like, man-made substances such as concrete or brick are rocks materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural'</p> <p>Certain found artefacts, like old bits of pottery or coins, are fossils</p> <p>A fossil is an actual piece of the extinct animal or plant</p> <p>Soil and compost are the same thing.</p>	

Light

Substantive knowledge I can...	Disciplinary knowledge I can...
Recognise that they need light in order to see things and that dark is the absence of light	Notice that light is reflected from surfaces
Recognise that light from the sun can be dangerous and that there are ways to protect their eyes	Find patterns in the way that the size of shadows change
Recognise that shadows are formed when the light from a light source is blocked by an opaque object	

Vocabulary

Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent, translucent.

Common Misconceptions

Some children think that brightly coloured or shiny objects can be seen when it is completely dark. This misconception arises because in our everyday lives it is very difficult to remove all light, so we rarely experience true darkness. You can explain that shiny objects are reflectors. They are easily seen in daylight, and are visible at night when a light is shone on them, but they cannot be seen in complete darkness. To be seen in the dark, an object must be a light source, which means it must emit light. The Sun, stars, fires, light bulbs, television sets and computer screens are all light sources.

The Moon is commonly mistaken for a light source. The Moon doesn't make its own light, but instead reflects the light from the Sun.

Some children believe that eyes give out a form of light which enables us to see.

Magnets and Forces

Substantive knowledge I can...	Disciplinary knowledge I can...
Describe magnets as having 2 poles	Compare how things move on different surfaces
Notice that some forces need contact between 2 objects, but magnetic forces can act at a distance	Observe how magnets attract or repel each other and attract some materials and not others
	Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials
	Predict whether 2 magnets will attract or repel each other, depending on which poles are facing

Vocabulary

Force, push, pull, friction, surface, magnet, magnetic, magnetic field, pole, north, south, attract, repel, compass

Common Misconceptions

The bigger the magnet the stronger it is

All metals are magnetic

People think that to keep an object moving you need to keep giving the object a force (push)

A stationary object has no forces acting on it. The reason the object is stationary is because the forces acting on it are balanced.

Plants

Substantive knowledge I can...	Disciplinary knowledge I can...
Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers.	Investigate the way in which water is transported within plants.
Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant.	Research and report on the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

Vocabulary

Air, light, water, nutrients, soil, support, anchor, reproduction, pollination, dispersal, transportation, flower, energy, growth, seedling, carbon dioxide, oxygen, sugar, material, photosynthesis, chlorophyll

Common Misconceptions

- plants eat food
- food comes from the soil via the roots
- flowers are merely decorative rather than a vital part of the life cycle in reproduction
- plants only need sunlight to keep them warm
- roots suck in water which is then sucked up the stem

Animals Including Humans: nutrition, skeleton and muscles

Substantive knowledge I can...	Disciplinary knowledge I can...
Name the 7 types of nutrition animals need . Explain animals cannot make their own food and they get nutrition from what they eat.	Take measurements, using a range of scientific equipment, with accuracy and completing repeat readings as required. Record results using a graph.
Know that animals with skeletons and muscles have them to support the body, protect the organs and help the body to move.	
Name some major muscles and bones - muscles (biceps, triceps and quadriceps) and bones (clavicle, pelvis and sternum)	

Vocabulary

Nutrients, nutrition, carbohydrates, protein, fats, vitamins, minerals, water, fibre, skeleton, bones, joints, endoskeleton, exoskeleton, hydrostatic skeleton, vertebrates, invertebrates, muscles, contract, relax,

Common Misconceptions

Some children believe that all fat and sugar is bad for them. It is important to discuss with them the fact that the body needs some fats and sugars in order to function. Some children may believe that the only reason we eat food is to give us energy. Vitamin D is essential for strong bones and vitamin C is important in protecting cells and keeping them healthy. Iron is an essential mineral that helps to make red blood cells, which carry oxygen around the body.

If we have too little iron in our diet we can become anaemic. Children develop many different ideas about the bones and muscles in their bodies and they might not realise that muscles are found all around the body. Some children may think that muscles are only used for actions like walking or throwing. They probably won't think of the heart or the tongue as a muscle.

Children may not realise that bones are living tissue. They may not make the connection between growing taller and their bones getting bigger.

Year 4 Science Assessment of Key Knowledge

Changes of state	Electricity	Sound	Living things and their habitats	Animals including humans
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Changes of State	
Substantive knowledge I can...	Disciplinary knowledge I can...
Explain the differences between solids, liquids and gases and put them into groups.	Identify the cause and effect of heating and cooling materials, including water.
Explain the process of evaporation and condensation in the water cycle, including making observations over time.	Measure or research the temperature at which materials change state, in degrees Celsius, including water.
Vocabulary	
Solid, liquid, gas, particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, process, condensation, evaporation, water vapour, energy, precipitation, collection.	
Common Misconceptions	
<p>Many children think of solids as being strong and hard materials. Identifying soft solids like cotton wool or granular solids like sugar is more challenging. Most gases are invisible, which makes it hard to prove to children that they are there. If you show an “empty” bottle to young children, many of them will say that there is nothing inside it. Some older children will know that it contains air.</p> <p>To help your class understand the nature of gases you can spray some perfume at the front of the classroom and ask the children to put their hands up when they can smell it. After being sprayed into the air, the perfume vaporises/evaporates into a gas and spreads out across the room to fill the available space. The children can't see the perfume, but they can tell it is there because they can smell it. A common misconception held by children is that solids become lighter when they melt.</p>	

Electricity

Substantive knowledge I can...	Disciplinary knowledge I can...
Identify common appliances that run on electricity.	Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.
Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery.	Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.
Draw a picture to show a working circuit.	Recognise some common conductors and insulators, and associate metals with being good conductors.
Explain that electricity can be dangerous and how to take precautions to stay safe.	Research a famous scientist connected to the development of electricity.

Vocabulary

Electricity, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, component.

Common Misconceptions

- electricity flows to bulbs, not through them
- electricity flows out of both ends of a battery
- electricity works by simply coming out of one end of a battery into the components
- different coloured wires effect how the circuit works
- wires are made from plastic
- electricity is an object that can be seen
- current, voltage and electricity are all the same thing
- current gets less as it passes through components
- if a circuit is broken energy goes off into the air
- electricity comes out of both ends of the battery and leads to both sides of the component

Animals Including Humans

Substantive knowledge I can...	Disciplinary knowledge I can...
Describe the simple functions of the basic parts of the digestive system in humans.	Construct and interpret a variety of food chains, identifying producers, predators and prey.
Identify the different types of teeth in humans and their simple functions.	

Vocabulary

Herbivore, Carnivore, Digestive system, tongue, mouth, teeth, oesophagus, stomach, gall bladder, small intestine, pancreas, large intestine, liver, tooth, canine, incisor, molar, premolar, producer, consumer.

Common Misconceptions

Some very young children might believe that the whole digestive system consists of a single tube that travels from their mouth to their stomach, and no further. Or they might think that food goes down one tube, and drink goes down another, hence food "going down the wrong hole"

Sound

Substantive knowledge I can...	Disciplinary knowledge I can...
Identify how sounds are made, associating some of them with something vibrating.	Find patterns between the volume of a sound and the strength of the vibrations that produced it
Recognise that vibrations from sounds travel through a medium to the ear.	Find patterns between the pitch of a sound and features of the object that produced it.
Recognise that sounds get fainter as the distance from the sound source increases.	Research prominent musicians who use vibrations to play instruments.

Vocabulary

Amplitude, volume, quiet, loud, ear, pitch, high, low, particles, instruments, wave.

Common Misconceptions

Children often think that light is only found in bright places. They know that dark is the opposite of light, so assume that if it's dark, there must not be any light around at all. When asked to explain how we see things they might draw arrows coming out of a person's eyes and hitting objects. Similarly, when asked to explain how sounds travel through the air to our ears, the children might draw a line of musical notes, copying a convention that is often used in comics or cartoons.

Be aware of these misconceptions and aim to correct them during your lessons. An awareness of common misconceptions can help you notice gaps in the children's knowledge as and when they occur. You can actively assess their understanding in these areas, for instance by asking them to draw diagrams and pictures to demonstrate their knowledge of sight and hearing.

Living things and their habitats

Substantive knowledge I can...	Disciplinary knowledge I can...
Recognise that living things can be grouped in a variety of ways	Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.
Recognise that environments can change and that this can sometimes pose dangers to living things.	

Vocabulary

Environment, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation.

Common Misconceptions

- The death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain
- There is always plenty of food for wild animals
- Animals are only land-living creatures
- Animals and plants can adapt to their habitats, however they change
- All changes to habitats are negative
- The children might assume that a habitat is unchanging, but most habitats alter considerably over time due to human involvement, changes in climate and seasonal variations
- Some children might think that animals "choose" to live in certain places. In fact, they have adapted to live in particular habitats over millions of years.

Year 5 Science Assessment of Key Knowledge

Properties and changes of materials	Earth and Space	Forces	Living things and their habitats	Animals including humans
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Properties and changes of materials	
Substantive knowledge I can...	Disciplinary knowledge I can...
Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution	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
Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating	Separate a mixture, seeking patterns and recording findings.
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	Demonstrate that dissolving, mixing and changes of state are reversible changes
	Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic
Vocabulary	
Solid, liquid, gas, particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, process, condensation, evaporation, water vapour, energy, precipitation, collection. Hardness, Solubility, Transparency, Conductivity, Magnetic, Filter, Evaporation, Dissolving, Mixing Material, conductor, dissolve, insoluble, suspension, chemical, physical, irreversible, solution, reversible, separate, mixture, insulator, transparent, flexible, permeable, soluble, property, magnetic, hard.	
Common Misconceptions	
<p>The difference between burning and melting. Burning is a chemical reaction in which new products, such as smoke and ash, are produced, whereas melting is a physical change in which a solid turns into a liquid. Burning is irreversible, as it is not possible to turn smoke and ash back into unburned fuel. Melting is reversible, as the liquid can be frozen back into a solid.</p> <p>To distinguish between smoke and steam. Smoke is a combination of different chemicals that results from an irreversible chemical reaction, whereas steam is a form of water vapour that results from a reversible physical change. If you hold a sheet of glass close to a boiling kettle, you will see the steam condense back into water droplets. When something burns, part of it vanishes and no longer exists.</p>	

Earth and Space

Substantive knowledge I can...	Disciplinary knowledge I can...
Describe the movement of the Earth and other planets relative to the sun in the solar system	Through research and use of secondary resources, use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky
Describe the movement of the moon relative to the Earth	
Describe the sun, Earth and moon as approximately spherical bodies	

Vocabulary

Earth, Sun, Moon, Axis, Rotation, Day, Night, Phases of the Moon, star, constellation, waxing, waning, crescent, gibbous. Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, planets, solar system, day, night, rotate, orbit, axis, spherical, geocentric, heliocentric.

Common Misconceptions

Children may believe that the Earth is flat and stationary. They will have observed the Moon and Sun appearing to move across the sky, and will know that the Sun rises and sets, giving us day and night. The children might think that the Sun is a planet and that it rotates around the Earth. Some children may think that stars 'disappear' or 'go away' during the day. Children may believe that the Moon appears only at night. They may think that night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.

Forces

Substantive knowledge I can...	Disciplinary knowledge I can...
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	Explore falling objects and raise questions about the effects of air resistance
	Explore the effects of levers, pulleys and simple machines on movement, collecting data and collating it into a graph.

Vocabulary

Air resistance, Water resistance, Friction, Gravity, Newton, Gears, Pulleys, force, push, pull, opposing, streamline, brake, mechanism, lever, cog, machine, pulley.

Common Misconceptions

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.

Animals including Humans

Substantive knowledge I can...	Disciplinary knowledge I can...
Describe the changes as humans develop to old age, including the changes experienced in puberty.	Draw a timeline to indicate stages in the growth and development of humans.
	Research the gestation periods of other animals and comparing them with humans.
	Research and record the length and mass of a baby as it grows.

Vocabulary

Foetus, Embryo, Womb, Gestation, Baby, Toddler, Teenager, Elderly, Growth, Development, Puberty, Hormone, Physical, Emotional, Sexual, Asexual, Pollination, Dispersal, reproduction, cell, fertilisation, pollination, male, female, pregnancy, young, mammal, metamorphosis, amphibian, insect, egg, embryo, bird, plant

Common Misconceptions

Children often think of an egg as the “start” of a life cycle. In fact, since the different stages repeat in a continuous cycle, there is no start. Young children don’t often think of humans as animals, as they think of all animals as things that are kept as pets, or found in zoos or farms.

Living things and their habitats

Substantive knowledge I can...	Disciplinary knowledge I can...
Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird	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.
Describe the life process of reproduction in some plants and animals	Research the work of naturalists and animal behaviourists, for example, David Attenborough and Jane Goodall.
	observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world

Vocabulary

Environment, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation.

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 and only birds lay eggs.

Some children believe that seeds are not living things. Others might think that seeds contain miniature plants. You could counter this misconception by cutting a broad bean in half and showing the children what’s inside.

Children often think of an egg as the “start” of a life cycle. In fact, since the different stages repeat in a continuous cycle, there is no start.

However, it could be said that each individual organism starts life as a fertilised egg.

Young children don’t often think of humans as animals, as they think of all animals as things that are kept as pets, or found in zoos or farms. You can address this misconception by comparing animals and humans, and drawing out the similarities. Like all animals we have offspring that grow into adults. It is worth reminding children that not all animals have the same kind of life cycle as we do, and not all offspring look like their adult form.

Year 6 Science Assessment of Key Knowledge

Electricity	Light	Evolution and inheritance	Living things and their habitats	Animals including humans
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Electricity	
Substantive knowledge I can...	Disciplinary knowledge I can...
associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit	compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches
	use recognised symbols when representing a simple circuit in a diagram
	Pupils should construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors.
	Pupils might work scientifically by: systematically identifying the effect of changing one component at a time in a circuit; designing and making a set of traffic lights, a burglar alarm or some other useful circuit.
Vocabulary	
Electricity, neutrons, protons, electrons, nucleus, atom, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, conductor.	
Common Misconceptions	
<p>larger-sized batteries make bulbs brighter a complete circuit uses up electricity</p> <ul style="list-style-type: none"> • Components in a circuit that are closer to the battery get more electricity. • Batteries store electric charge or electrons 	

Light

Substantive knowledge I can...	Disciplinary knowledge I can...
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	Observe and recognise that light appears to travel in straight lines
State that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye	Design and make a periscope and using the idea that light appears to travel in straight lines to explain how it works.
State that light travels in straight lines to explain why shadows have the same shape as the objects that cast them	They could extend their experience of light by looking a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water, and coloured filters (they do not need to explain why these phenomena occur).

Vocabulary

Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent, translucent. Reflect Absorb Emitted Scattered Refraction.

Common Misconceptions

Children often think that light is only found in bright places. They know that dark is the opposite of light, so assume that if it's dark, there must not be any light around at all. In reality, even on a dark night there will always be some light present. If possible, black out the classroom and ask the children what they can see once their eyes have adjusted to the dark.

When asked to explain how we see things, children may draw arrows coming out of a person's eyes and hitting objects. Really, it is the opposite way round: light travels from the objects to our eyes.

Animals including Humans

Substantive knowledge I can...	Disciplinary knowledge I can...
Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood	Exploring the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.
Describe the ways in which nutrients and water are transported within animals, including humans	
Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function	

Vocabulary

Oxygenated, Deoxygenated, Valve, Exercise, Respiration Circulatory system, heart, lungs, blood vessels, blood, artery, vein, pulmonary, alveoli, capillary, digestive, transport, gas exchange, villi, nutrients, water, oxygen, alcohol, drugs, tobacco.

Common Misconceptions

It is a common myth that veins are blue because they carry deoxygenated blood. Blood in the human body is red regardless of how oxygen-rich it is, but the shade of red may vary. The level or amount of oxygen in the blood determines the hue of red.

Evolution and Inheritance

Substantive knowledge I can...	Disciplinary knowledge I can...
Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago	Observing and raising questions about local animals and how they are adapted to their environment;
Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents	Comparing how some living things are adapted to survive in extreme conditions, for example, cactuses, penguins and camel
Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution	Analyse the advantages and disadvantages of specific adaptations, such as being on 2 feet rather than 4, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers.

Vocabulary

Fossils, Adaptation, Evolution, Characteristics, Reproduction, Genetics, Variation, Inherited, Environmental, Mutation, Competition, Survival of the Fittest, Evidence,

Common Misconceptions

Adaptation occurs during an animal's lifetime: giraffes' necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow thick fur during their life

- offspring most resemble their parents of the same sex, so that sons look like fathers
- all characteristics, including those that are due to actions during the parent's life such as dyed hair or footballing skills, can be inherited
- cavemen and dinosaurs were alive at the same time.

Living things and their habitats

Substantive knowledge I can...	Disciplinary knowledge I can...
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	Use classification systems and keys to identify some animals and plants in the immediate environment
Give reasons for classifying plants and animals based on specific characteristics	Research unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system.
	Through direct observations where possible, they should classify animals into commonly found invertebrates (such as insects, spiders, snails, worms) and vertebrate.

Vocabulary

Variation Organisms Populations. Classification Characteristics Environment, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation. Classify, compare, bacteria, microorganism, organism, invertebrates, vertebrates, Linnaean.

Common Misconceptions

Some children may think all micro-organisms are harmful.
Children may misidentify an organism such as coral as a plant. The coral that they see on the beach is just exoskeleton, inside which is actually a living animal. Coral cannot photosynthesise – it needs to eat plankton to survive.
There are many plants that children might not immediately think of as plants since they don't have flowers such as mosses and ferns.
The reverse is also true: mushrooms are often thought of as plants – because they have roots and grow in the ground – but they do not contain chlorophyll, and they are classed as fungi.