



# Burlington Junior School Science



## Working Scientifically skills

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<ul style="list-style-type: none"> <li>• Ask simple questions and recognise that they can be answered in different ways</li> <li>• Use simple equipment to observe closely.</li> <li>• Perform simple tests.</li> <li>• Identify and classify.</li> <li>• Use his/her observations and ideas to suggest answers to questions.</li> <li>• Gather and record data to help in answering questions</li> </ul>	<ul style="list-style-type: none"> <li>• Ask simple questions and recognise that they can be answered in different ways including use of scientific language from the national curriculum</li> <li>• Use simple equipment to observe closely including changes over time</li> <li>• Perform simple comparative tests</li> <li>• Identify, group and classify</li> <li>• Use his/her observations and ideas to suggest answers to questions noticing similarities, differences and patterns</li> <li>• Gather and record data to help in answering questions including from secondary sources of information</li> </ul>	<ul style="list-style-type: none"> <li>• Ask relevant questions and use different types of scientific enquiries to answer them</li> <li>• Set up simple practical enquiries, comparative and fair tests</li> <li>• Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers</li> <li>• Gather, record, classify and present data in a variety of ways to help in answering questions</li> <li>• Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables</li> <li>• Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions</li> <li>• Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</li> <li>• Identify differences, similarities or changes related to simple scientific ideas and processes</li> <li>• Use straightforward scientific evidence to answer questions or to support his/her findings</li> </ul>	<ul style="list-style-type: none"> <li>• Ask relevant questions and use different types of scientific enquiries to answer them</li> <li>• Set up simple practical enquiries, comparative and fair tests</li> <li>• Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers</li> <li>• Gather, record, classify and present data in a variety of ways to help in answering questions</li> <li>• Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables</li> <li>• Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions</li> <li>• Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</li> <li>• Identify differences, similarities or changes related to simple scientific ideas and processes</li> </ul>	<ul style="list-style-type: none"> <li>• Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li> <li>• Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li> <li>• Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> <li>• Use test results to make predictions to set up further comparative and fair tests</li> <li>• Report and present 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</li> <li>• Identify scientific evidence that has been used to support or refute ideas or arguments</li> </ul>	<ul style="list-style-type: none"> <li>• Plan different types of scientific enquiries to answer their own or others' questions, including recognising and controlling variables where necessary</li> <li>• Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li> <li>• Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> <li>• Use test results to make predictions to set up further comparative and fair tests</li> <li>• Report and present 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</li> <li>• Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as</li> </ul>

			<ul style="list-style-type: none"> <li>Use straightforward scientific evidence to answer questions or to support his/her findings</li> </ul>		<p>displays and other presentations</p> <ul style="list-style-type: none"> <li>Describe and evaluate their own and other people's scientific ideas related to topics in the national curriculum (including ideas that have changed over time), using evidence from a range of sources</li> <li>Group and classify things and recognise patterns</li> </ul>
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### Working Scientifically vocabulary

Question, answer, equipment, identify, Sort, group, map, describe	Observe, observing, classify, record, diagram, chart, data, compare, contrast, Biology, Chemistry, Physics	Research- relevant questions Comparative and fair testing Careful observation, Thermometer, Predictions Conclusions, Record- drawings, labelled diagrams, bar chart, tables, Differences, similarities, changes	Scientific enquiry Accurate measurements Data logger Data- gather and record Oral and written explanations, keys, evidence, improve secondary sources, guides Construct, interpret	Plan, variables, measurements, conclusion, prediction, comparative fair test, patterns, identify, classify, describe, display and present, evidence, support, explanations, graphs, bar graphs, tables, classification keys, labels, record data,	Accuracy, precision, Quantitative measurements, systematic, refute ideas, degree of trust, report and present, causal relationships, scatter graphs, line graphs, scientific diagrams, repeat readings
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### Animals including Humans

<ul style="list-style-type: none"> <li>Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals</li> <li>Identify and name a variety of common animals that are carnivores, herbivores and omnivores</li> <li>Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)</li> <li>Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense</li> </ul>	<ul style="list-style-type: none"> <li>Understand that animals, including humans, have offspring which grow into adults</li> <li>Describe the basic needs of animals, including humans, for survival (water, food and air)</li> <li>Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene</li> </ul>	<ul style="list-style-type: none"> <li>Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat</li> <li>Identify that humans and some other animals have skeletons and muscles for support, protection and movement</li> </ul>	<ul style="list-style-type: none"> <li>Describe the simple functions of the basic parts of the digestive system in humans</li> <li>Identify the different types of teeth in humans and their simple functions</li> <li>Construct and interpret a variety of food chains, identifying producers, predators and prey</li> </ul>	<ul style="list-style-type: none"> <li>Describe the changes as humans develop to old age</li> </ul>	<ul style="list-style-type: none"> <li>Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood</li> <li>Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function</li> <li>Describe the ways in which nutrients and water are transported within animals, including humans</li> </ul>
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## Vocabulary

Nutrition, nutrients, carbohydrates, protein, fats,  
Fibre, water, vitamins, minerals, skeleton, bones, joints, endoskeleton, exoskeleton, hydrostatic, skeleton, vertebrate, invertebrate, contract, Relax, muscles, ball joint, socket joint, hinge joint, gliding joint.

human digestive system, digestion, mouth, tongue - mixes, moistens, saliva, oesophagus, transports, stomach acid, enzymes, small intestine – absorbs water, vitamins, large intestine – compacts, colon, teeth, incisors – cutting, slicing canines – ripping, tearing molars – chewing, grinding, floss, brush, food chain, sun producers, prey, predators, carnivore, herbivore omnivore

Puberty, life cycle, gestation, growth reproduce, foetus, baby, fertilisation, toddler, child, teenager, adult, old age, life expectancy, adolescence, adulthood, early adulthood, middle adulthood, late adulthood childhood

heart, blood vessels, veins, arteries, blood, system, lungs, circulatory system, skeletal system, muscular system, digestive system, oxygenated blood, deoxygenated blood, nutrients, water

**Misconceptions- NB- to address these- Concept cartoons and maps, Venn diagrams, Classification grids, misconceptions questionnaires are available**

**Blood constituents-** activity using cordial, chocolate buttons, marshmallows and strawberry laces to address misconception re blood content.

*Misconception:* All ocean creatures are 'fish', e.g. whales, dolphin

*Fact:* Whales, dolphins, jellyfish and shellfish are not fish, but seahorses and sea dragons are fish!

*Misconception:* All fishes lay eggs.

*Fact:* Some fishes give birth to live young, e.g. guppy, molly, swordtail, most types of sharks

*Misconception:* All mammals give birth to live young.

*Fact:* Most mammals give birth to live young; The duck-billed platypus and spiny anteater are two mammals which lay eggs.

*Misconception:* Spiders are insects; any tiny creepy crawly is an insect.

*Fact:* Spiders are not insects. They are arachnids, belonging to the same group as scorpions. They have four pairs of legs and two body segments. Insects have three pairs of legs and three body segments.

*Misconception:* Turtles and penguins are amphibians.

*Fact:* Turtles are reptiles and penguins are birds.

*Misconception:* Only large animals are consumers.

*Fact:* Small animals may be consumers, e.g. the black widow spider is a consumer.

*Misconception:* Male animals are always bigger and stronger than females.

*Fact:* That may generally be true for human beings, but it is not so for many animals, e.g. the queen ants and bees are much bigger than the males.

*Misconception:* Digestion starts in the stomach.

*Fact:* Digestion starts in the mouth, where the salivary amylase (a digestive enzyme) acts on the starch in food.

*Misconception:* Digestion ends in the stomach or large intestine.

*Fact:* Digestion ends in the small intestine, where carbohydrates, proteins and fats are digested. Proteins are digested in the stomach. Water and minerals are absorbed into the bloodstream in the large intestine.

*Misconception:* The digestive system has two outlets – one for faeces and one for urine.

*Fact:* The digestive system has one outlet – the anus through which undigested food is discharged from the body.

*Misconception:* Digestion is the process which releases usable energy from food.

*Fact:* Digestion is the breakdown of large food molecules into smaller ones. Respiration is the process by which energy is released from food.

*Misconception:* Confusion over the sequence of the processes and anatomical route of digestion.

*Fact:* Digestion starts in the mouth before the food goes through the gullet (oesophagus) where no digestion takes place. Food then goes to the stomach where proteins are digested before entering the small intestine. In the small intestine, fats, carbohydrates and proteins are digested. Digested food is absorbed through the wall of the small intestine into the bloodstream. Undigested food passes into the large intestine where water and minerals are absorbed by the body. The rest of the undigested food is stored in the rectum temporarily and discharged out of the body through the anus.

*Misconception:* The discharge of undigested food through the anus is called excretion.

*Fact:* The discharge of undigested food through the anus is called egestion or defecation. Excretion is the discharge of metabolic wastes from the body, e.g. urine excreted by the kidneys, carbon dioxide excreted by the lungs.

*Misconception:* Gullet is not an organ.

*Fact:* The gullet is an organ, which is formed by different types of tissues to perform a specific function. Skin is also an organ.

*Misconception:* We breathe in *only* oxygen and breathe out *only* carbon dioxide.

*Fact:* We breathe in air and the air we breathe in has more oxygen than the air we breathe out; we breathe out air with more carbon dioxide than the air that we breathe in. Pie-charts showing the compositions of inhaled and exhaled air may be shown to pupils to correct the misconception.

*Misconception:* Inhaled air remains in the head.

*Fact:* The oxygen in inhaled air is transported to the cells all over the body by the red blood cells.

*Misconception:* Air is inhaled into the lungs, then exhaled, without links with the heart and circulatory system.

*Fact:* Air inhaled into the lungs is circulated to the heart, then to the rest of the body through the circulatory system.

*Misconception:* The amount of nitrogen in inhaled and exhaled air is different.

*Fact:* The body does not use the nitrogen in the inhaled air, thus the amount of nitrogen in inhaled and exhaled air is the same.

*Misconception:* Air is blown into the straw (which represents the airway) to inflate the balloon (which represents the lung) in the model of a lung.

*Fact:* The plastic or rubber sheet representing the diaphragm should be pulled to inflate the lung.

*Misconception:* Inability to link the need for oxygen with the use of food.

*Fact:* Oxygen is needed for aerobic respiration, to release energy from food in the cells.

*Misconception:* Respiration is the same as breathing; the respiratory system is for carrying out respiration.

*Fact:* Respiration is the release of energy from food and takes place in the cells, with or without oxygen. Breathing is the exchange of respiratory gases between the body and the surroundings through the respiratory system.

*Misconception:* There are air tubes linking the lungs and the heart.

*Fact:* The lungs and the heart are linked by blood vessels.

*Misconception:* Blood from the lungs to the other parts of the body has only one gas – oxygen.

*Fact:* Blood from the lungs is *rich* in oxygen.

*Misconception:* The brain is responsible for thinking (cognition) but not responsible for physical actions, voluntary movements (e.g. swimming) and involuntary movements (e.g. coughing and sneezing), emotions or sensations.

*Fact:* Different parts of the brain are responsible for cognition, emotions, personality, sensations and voluntary and involuntary movements.

*Misconception:* No relationship between muscles and meat.

*Fact:* Meat is the muscles of animals.

*Misconception:* Muscles and brain are not involved in the workings of the digestive, circulatory or respiratory systems.

*Fact:* The brain controls the workings of these systems and many of the organs in these systems are made up of muscular tissues.

An insect is not an animal.

To lose weight humans need to eat less fat and more carbohydrates-

Fact- humans need a balanced diet with a sensible calorific intake over a period of time.

Teeth stop growing in a mature adult- false- teeth continue to move and grow right throughout life

## Living things and their Habitats

	<ul style="list-style-type: none"> <li>• Explore and compare the differences between things that are living, dead, and things that have never been alive</li> <li>• 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</li> <li>• Identify and name a variety of plants and animals in their habitats, including micro-habitats</li> <li>• 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</li> </ul>		<ul style="list-style-type: none"> <li>• Recognise that living things can be grouped in a variety of ways</li> <li>• Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment</li> <li>• Recognise that environments can change and that this can sometimes pose dangers and have an impact on living things</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird</li> <li>• Describe the life process of reproduction in some plants and animals</li> </ul>	<ul style="list-style-type: none"> <li>• 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</li> <li>• Give reasons for classifying plants and animals based on specific characteristics</li> </ul>
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## Vocabulary

			Environment, flowering non-flowering plants, animals, vertebrate environment dangers!	life cycles mammal amphibian insect bird life process of reproduction plants animals vegetable garden flower boarder	identify, identification, classify, classification, division, family, genus, species, reason, common
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			<p>vertebrate fish amphibians  reptiles birds mammals  invertebrate snails slugs  worms spiders insects  plants flowering plants  (including grasses) non-  flowering (including mosses  and ferns)  human impact positive - nature  reserves, ecologically planned  parks, garden ponds negative  - population, development,  litter, deforestation</p>	<p>animal naturalists David  Attenborough  animal behaviourist Jane  Goodall  reproduction plants: sexual,  asexual animals: sexual  lifecycles around the world  rainforest oceans desert  prehistoric similarities  differences</p>	<p>characteristics, distinguishing  characteristics, leaves,  shape, size, colour,  backbone, wings, jointed  legs, cased, transparent,  antennae, shell, segments,  explain, group, small,  harmful, beneficial (helpful),  colony, colonies, mould,  multiply, historically,  grouping, Aristotle, Carl  Linnaeus, kingdom</p> <p>mammal, amphibian, insect,  bird, metamorphosis, tadpole,  nymph, pupae, chrysalis,  caterpillar, migrate, hibernate,  courtship, plumage, habitat,  adaptation, behaviour, young,  chick, life cycle, egg, pupae,  adult, butterfly, nectar, death  rate, nest, brood, fledgling,  juvenile, diet, migration,  resident, invertebrate,  mollusc, worm, snail,  woodlouse, centipede,  millipede, beetle, aphid,  adaptation, predator, prey,  survival, habitat, question,  investigation, fair test,  change, measure, predict,  prediction, explanation,  observations, draw  conclusions, justify, analyse</p>
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## Plants

<ul style="list-style-type: none"> <li>Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees</li> <li>Identify and describe the basic structure of a variety of common flowering plants, including trees</li> </ul>	<ul style="list-style-type: none"> <li>Observe and describe how seeds and bulbs grow into mature plants</li> <li>Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy</li> </ul>	<ul style="list-style-type: none"> <li>Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers</li> <li>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</li> <li>Investigate the way in which water is transported within plants</li> </ul>			<ul style="list-style-type: none"> <li>Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution</li> </ul>
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- Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal

## Vocabulary

common wild plants garden plants  
 deciduous evergreen tree  
 deciduous evergreen trunk  
 branches leaf root  
 plant leaf root leaves bud flowers  
 blossom petals root stem fruit  
 vegetables bulb seed  
 visit

- Misconceptions
- Cactus do not have leaves- FACT-their spines are the leaves in this case.
- Plants take in food from the soil- FACT they absorb nutrients which are made into food in their cells
- Plants, fungi, eggs and seeds are not living- FACT- they are
- Plants obtain energy directly from the sun- FACT-they use it in a process called **Photosynthesis**. This a chemical reaction that takes place inside a plant, producing food for the plant to survive. Carbon dioxide, water and light are all needed for **photosynthesis** to take place. **Photosynthesis** happens in the leaves of a plant.
- Plants absorb water through their leaves FACT- they absorb moisture through their roots

## Evolution and Inheritance

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

## Vocabulary

					population, variation, environment, inheritance, adaptation, selective breeding, generation, survival, natural selection, evolution, fossils, genes, genetics, DNA, extinct, extinction, speciation, question, investigation, fair test, change, measure, predict, prediction, explanation, observations, draw conclusions
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*Misconception*  
Camels' humps store water.  
*Fact:* Camels' humps store fats, which can break down to produce energy and water when there is a shortage of food. Water is stored in the bloodstream and sacs in the stomachs of the camels.

## Seasonal changes

<ul style="list-style-type: none"> <li>• Observe changes across the four seasons</li> <li>• Observe and describe weather associated with the seasons and how day length varies</li> </ul>					
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## Materials and States of Matter

<ul style="list-style-type: none"> <li>• Distinguish between an object and the material from which it is made</li> <li>• Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock</li> <li>• Describe the simple physical properties of a variety of everyday materials</li> <li>• Compare and group together a variety of everyday materials on the basis of their simple physical properties</li> </ul>	<ul style="list-style-type: none"> <li>• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses</li> <li>• Describe how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching</li> </ul>		<ul style="list-style-type: none"> <li>• Compare and group materials together, according to whether they are solids, liquids or gases</li> <li>• 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)</li> <li>• Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature</li> </ul>	<ul style="list-style-type: none"> <li>• 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</li> <li>• Recognise that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution</li> <li>• Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through</li> </ul>	
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				filtering, sieving and evaporating <ul style="list-style-type: none"> <li>• Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic</li> <li>• Demonstrate that dissolving, mixing and changes of state are reversible changes</li> <li>• 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</li> </ul>	
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**Vocabulary**

			Solid, solidify, iron, ice, melt, freeze, liquid, evaporate, condense, gas, container, changing state, heated, heat, cooled, cool, degrees Celsius, Thermometer, water cycle, evaporation, condensation, temperature, melting, warm/cool, water, water vapour	properties hardness solubility transparency electrical conductor thermal conductor response to magnets dissolve solution separate separating solids liquids gases evaporating reversible changes dissolving mixing evaporation filtering sieving melting irreversible new material burning rusting magnetism electricity chemists Spencer Silver Ruth Benerito quantitative measurements conductivity insulation chemical	
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Misconceptions- **Misconceptions- NB- to address these- concept cartoons and maps, venn diagrams, classification grids, misconceptions questionnaire**

Common misconceptions-

Melting and dissolving are confused.

Particles of solid have no motion

Gases are not matter because most are invisible.

Mass and volume are the same thing.

Steam is the visible cloud of water vapour above boiling water.

Materials can only exhibit properties of one state of matter.- FALSE- e.g., water

An object at rest has no energy.- FALSE-

Gravitational potential energy depends on the height of an object.

An inanimate object has no force acting on it. FALSE- gravity

Larger objects exert a greater force that smaller objects.

Friction always hinders motion.  
 When dropped in a vacuum, objects of different masses fall at different speeds.  
 Ice cannot change temperature.  
 All liquids boil and freeze at the same temperature.-Temperature is a property of a particular material- e.g., metal is naturally colder than plastic.

## Electricity

<p><i>Know that electricity is needed to make somethings work.</i></p>	<p><i>Know that electricity is needed to make somethings work.          Know that some appliances need batteries and some use mains electricity to work.</i></p>		<ul style="list-style-type: none"> <li>• Identify common appliances that run on electricity</li> <li>• 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</li> <li>• Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit</li> <li>• Recognise some common conductors and insulators, and associate metals with being good conductors</li> </ul>		<ul style="list-style-type: none"> <li>• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit</li> <li>• 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</li> <li>• Use recognised symbols when representing a simple circuit in a diagram</li> </ul>
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## Vocabulary

			<p>appliances electricity electrical circuit cell wire bulb buzzer danger electrical safety sign insulators wood rubber plastic glass conductors metal water switch open closed</p>		<p>heart, blood vessels, veins, arteries, blood, system, lungs, circulatory system, skeletal system, muscular system, digestive system, oxygenated blood, deoxygenated blood, nutrients, water</p>
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**Misconceptions- NB- to address these- Concept cartoons and maps, Venn diagrams, Classification grids, Misconceptions questionnaire- all available**

**Heat conduction- show domino effect using books.**

*Misconception:* Electric current flows from the negative to the positive terminal.

*Fact:* The conventional current flows from the positive to the negative terminal, although in actual fact, current in a wire in a circuit is due to the flow of electrons from the negative to the positive terminal.

*Misconception:* Electric current is 'used up' by an electric bulb in a circuit, so there is less current 'going back' to the battery in the wire after the electric bulb in a series circuit.

*Fact:* Electric current in the wires on both sides of the electric bulb is the same.

*Misconception:* The second bulb is less bright than the first bulb in a series circuit because electric current has been 'used up' by the first bulb in the circuit.

*Fact:* Both bulbs are equally bright if they are identical. The current flowing through both bulbs is the same in a series circuit and depends on the voltage and total effective resistance of the two bulbs.

*Misconception:* In an open circuit, current flows to the part where there is a gap and 'turns back' to the battery when it finds that it cannot flow through the gap.

*Fact:* In an open circuit, current does not flow at all.

*Misconception:* An electric cell is called a battery.

*Fact:* A battery is made up of two or more electric cells connected in series.

*Misconception:* An electric cell delivers a constant current in a closed circuit.

Energy is a thing and object or something that is tangible.

*Fact:* An electric cell maintains a constant voltage or potential difference. The current delivered depends on the voltage and the effective resistance of the circuit.

*Misconception:* Electric current is the same as electrical energy.

*Fact:* Electric current is the rate of flow of electric charges.

*Misconception:* A change in one place of a circuit only affects the parts 'downstream' from the change (sequential model).

*Fact:* An electric circuit is a complete system and different parts of the circuit interact so that a change in one place affects the whole circuit.

*Misconception:* When electric current increases, voltage increases; there is no voltage when there is no current flowing.

*Fact:* Voltage is a precondition for current to flow, not a property of current. Voltage is present even when no current is flowing.

Electricity is used up when it goes around a circuit.

Current flows from a battery to a bulb but not from the bulb back to the battery.

Electricity is produced in a wall socket.

Wires are hollow and electrons move inside the hollow space.

## Earth and Space

*Know that the Sun is a star.*

*Know that the Moon orbits the Earth.*

*Name the planets.*

- 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

## Vocabulary

				Earth, Sun, Moon, moons, planets, stars, solar system, Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, rotate, day, night, Aristotle, Ptolemy, Galileo, Copernicus, Brahe, Alhazen orbit, axis, spherical, heliocentric, Geocentric, hemisphere, season, tilt	
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Misconceptions-

**To address misconceptions- Create the solar system on the field to help to highlight the vast differences in size of planets and distances apart.**

Misconceptions

The sun only emits yellow light.

Incomplete understanding of a science process- we can't predict eclipses.

Over generalisation- imagining all planets to be solid with oceans like the Earth.

Performance- All stars will last forever.

The earth is larger than the sun.

Gravity increases with height.

Gravity cannot exist without air.

Air doesn't weigh anything.

Stars and constellations appear in the same place all the time.

Changing distance from the earth to the sun causes seasonal change.

All stars are the same distance from the earth.

The moon can only be seen at night.

All stars are the same size and brightness depends on distance from us.

Moon and sun are the same size.

## Forces and Magnets

<i>Explore floating and sinking, pushes and pulls.</i>	<i>Explore cars moving quicker on different surfaces. Sort objects using a magnet.</i>	<ul style="list-style-type: none"> <li>• Compare how things move on different surfaces</li> <li>• Notice that some forces need contact between two objects, but magnetic forces can act at a distance</li> <li>• 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</li> <li>• Describe magnets as having two poles Predict whether two magnets will attract or repel each other, depending on which poles are facing</li> </ul>		<ul style="list-style-type: none"> <li>• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</li> <li>• Identify the effects of air resistance, water resistance and friction, that act between moving surfaces</li> <li>• Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect</li> </ul>	
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				<ul style="list-style-type: none"> <li>Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird</li> <li>Describe the life process of reproduction in some plants and animals</li> </ul>	
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## Vocabulary

		Force, push, pull, open, surface, magnet, magnetic, attract, repel, magnetic poles, North, South		Gravity, air resistance, water resistance, friction, surface, force, effect, move, accelerate, decelerate, Stop, change, direction, brake, mechanism, pulley, gear, spring, theory of gravitation, Galileo Galilei, Isaac Newton	
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### **Activities to address misconception-**

**Do we need a force to keep something moving? Activity- Use a skateboard**

**Can any object float? Activity-hands on activity to investigate**

**To keep an object moving a force must be kept on it.**

*Misconception:* The bigger the gears (more teeth), the faster it moves.

*Fact:* The smaller gear with fewer teeth makes one rotation faster.

*Misconception:* Confusion between the axle and the wheel

*Fact:* The axle is the part (rod or shaft) which the wheel turns about.

*Misconception:* The fulcrum is always between the effort and load in a lever.

*Fact:* In second and third class levers, the fulcrum is not between the effort and the load. Demonstrate this to pupils using levers such as forceps, tongs and stapler.

*Misconception:* If there is motion, there is a force acting; when an object is moving, there is a force in the direction of its motion.

*Fact:* No force is acting on the object if the object is in uniform motion (constant speed in a straight line).

*Misconception:* If there is no motion, then there is no force acting.

*Fact:* There are forces acting on a stationary object in equilibrium.

*Misconception:* Kicks and throws are not associated with 'push'.

*Fact:* Kicks and throws are pushes.

*Misconception:* When oil is applied, there is no more friction.

*Fact:* When oil is applied, friction is reduced.

*Misconception:* Moving objects come to a stop even when there is no friction.

*Fact:* Moving objects continue to move when there is no friction.

Other misconceptions-

Larger magnets are stronger than smaller magnets.

All metals are attracted to a magnet.

Only magnets produce a magnetic field.

*Misconception:* Friction only exists between two rough surfaces.

*Fact:* Friction can exist between two very smooth surfaces, e.g. two smooth and clean glass rods, due to electrostatic attraction between the atoms or molecules on the two surfaces in contact.

*Misconception:* Friction only exists between two solid surfaces.

*Fact:* There is friction when solid objects move through fluids (e.g. air resistance when objects move through air).

*Misconception:* Air has no weight or negative weight.

*Fact:* Air has weight and the weight of air per unit area is air pressure.

*Misconception:* There must be air for gravity to act.

*Fact:* The presence of air is not a precondition for gravitational force to act. The Moon has no air, yet has gravity.

*Misconception:* Only large objects, such as planets, exert a gravitational force.

*Fact:* All objects exert gravitational force as gravitational force is the force of attraction between two masses and objects have mass.

*Misconception:* Gravity increases with height above the Earth (confusion between gravity and potential energy).

*Fact:* Gravity decreases with height above the Earth's surface.

*Misconception:* The gravitational force acting on an object by the Earth is larger than the gravitational force acting on the Earth by the object.

*Fact:* Both forces are equal in magnitude (Newton's third law of motion: For every action, there is an equal but opposite reaction). An object accelerates towards the centre of the Earth in a free fall while the Earth does not appear to move because the Earth is much more massive.

*Misconception:* Confusion between mass and weight.

*Fact:* Mass is the amount of matter while weight is the gravitational force acting on an object.

*Misconception:* Things fall naturally; the person letting go of the thing causes it to fall.

*Fact:* A force (gravity) is needed for things to fall.

*Misconception:* Heavier objects fall faster than lighter objects from the same height on Earth.

*Fact:* Heavy and light objects fall at the same rate (acceleration due to gravity,  $g$ , is the same).

*Misconception:* Gravity begins to act when an object begins to fall and it ceases to act when the object lands on the ground.

*Fact:* Gravity exists between the object and the Earth all the time.

*Misconception:* There is no gravitational force acting on a ball that is thrown up at the highest point of its motion.

*Fact:* There is a gravitational force acting on the ball at all times.

*Misconception:* The Moon has no gravity; not all planets have gravity.

*Fact:* Since they have mass, they have gravity.

Objects float in water because they are lighter than water.

## Light

Know that light is needed to see.

Recognise that he/she needs light in order to see things and that dark is the absence of light

- Recognise that light appears to travel in straight lines

		<p>Notice that light is reflected from surfaces</p> <p>Recognise that light from the sun can be dangerous and that there are ways to protect eyes</p> <p>Recognise that light from the sun can be dangerous and that there are ways to protect eyes</p> <p>Find patterns in the way that the size of shadows change</p>			<ul style="list-style-type: none"> <li>• 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</li> <li>• 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</li> <li>• Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them</li> </ul>
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## Vocabulary

		<p>Light, see, dark, reflect, surface, natural, star, Sun, Moon, shadow, blocked, solid, artificial, torch, candle, lamp, sunlight, dangerous, protect eyes</p>			<p>bright, dark, dim, dull, eye, light, mirror, opaque, reflect, shadow, shiny, translucent, transparent</p>
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**Misconceptions- Light waves can be understood as similar to water waves- set up a bowl or water tank and create waves to show the transfer of energy. Also, actually showing reflection and refraction.**

Other misconceptions  
 Light is not conceived to exist independently in space and move with a finite speed.  
 Shadows are dark reflections  
 Light pushes shadows away  
 Light from a bulb only extends a certain amount and then stops.-how far it extends depends on the brightness of the bulb.  
 Light is only reflected from shiny surfaces  
 Light always passes through transparent surfaces and when it is seen, it is seen exactly where it is located.  
 Sunglasses are just dark glass or plastic  
 Colour is a property of an object.

## Sound

<p><i>Exploring how to change the volume of a sound during music lessons.</i></p>	<p><i>Exploring how to change the volume and pitch of a sound during music lessons.</i></p>	<p><i>Exploring how to change the volume and pitch of a sound during music lessons.</i></p>	<ul style="list-style-type: none"> <li>• Identify how sounds are made, associating some of them with something vibrating</li> <li>• Recognise that vibrations from sounds travel through a medium to the ear</li> <li>• Find patterns between the pitch of a sound and</li> </ul>		
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			<p>features of the object that produced it</p> <ul style="list-style-type: none"> <li>Find patterns between the volume of a sound and the strength of the vibrations that produced it</li> </ul> <p>Recognise that sounds get fainter as the distance from the sound source increases</p>		
<b>Vocabulary</b>					
			<p>vibrate vibration vibrating air medium ear hear sound volume pitch faint fainter loud louder string percussion woodwind brass insulate</p>		
<b>Rocks</b>					
		<ul style="list-style-type: none"> <li>Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties</li> <li>Describe in simple terms how fossils are formed when things that have lived are trapped within rock</li> <li>Recognise that soils are made from rocks and organic matter</li> </ul>			<ul style="list-style-type: none"> <li>Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago</li> </ul>
<b>Vocabulary</b>					
		<p>appearance physical properties hard/soft shiny/dull rough/smooth absorbent/not absorbent fossils sedimentary rock soils organic matter buildings gravestones grains crystals</p>			