



2021-2022 Curriculum Map
SCIENCE

| Year | Context | Key Knowledge and Concepts |
|------|---|---|
| 7 | Cells and movement (10 hrs) | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ Multicellular organisms are composed of cells. There are many types of cell. Each has a different structure or feature so it can do a specific job ✓ Skill: Use a light microscope to observe and draw cells. Facts Both plant and animal cells have a cell membrane, nucleus, cytoplasm and mitochondria. Plant cells also have a cell wall, chloroplasts and usually a permanent vacuole ✓ The parts of the human skeleton work as a system for support, protection, movement and the production of new blood cells. Antagonistic pairs of muscles create movement when one contracts and the other relaxes ✓ Cells are the building blocks of all living things ✓ Chloroplasts, are green, capture light and are involved in making food from plants ✓ Engineering technology is used to help Science overcome issues and problems humans face |
| | Particle model, separating mixtures (8 hrs) | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ Properties of solids, liquids and gases can be described in terms of particles in motion but with differences in the arrangement and movement of these same particles: closely spaced and vibrating (solid), in random motion but in contact (liquid), or in random motion and widely spaced (gas). Observations where substances change temperature or state can be described in terms of particles gaining or losing energy ✓ A substance is a solid below its melting point, a liquid above it, and a gas above its boiling point ✓ A pure substance consists of only one type of element or compound and has a fixed melting and boiling point. Mixtures may be separated due to differences in their physical properties. The method chosen to separate a mixture depends on which physical properties of the individual substances are different ✓ Skill Use techniques to separate mixtures ✓ Fact Air, fruit juice, sea water and milk are mixtures. Liquids have different boiling points |
| | Energy costs and transfer | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ We pay for our domestic electricity usage based on the amount of energy transferred. Electricity is generated by a combination of resources which each have advantages and disadvantages ✓ Calculate the cost of home energy usage, using the formula: cost = power (kW) x time (hours) x price (per kWh) ✓ Fact Food labels list the energy content of food in kilojoules (kJ) ✓ We can describe how jobs get done using an energy model where energy is transferred from one store at the start to another at the end. When energy is transferred, the total is conserved, but some energy is dissipated, reducing the useful energy |
| | Speed and gravity (8hrs) | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ If the overall, resultant force on an object is non-zero, its motion changes and it slows down, speeds up or changes direction. Skill Use the formula: speed = distance (m)/time (s) or distance-time graphs, to calculate speed ✓ A straight line on a distance-time graph shows constant speed, a curving line shows acceleration. The higher the speed of an object, the shorter the time taken for a journey |



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| | | <ul style="list-style-type: none"> ✓ Mass and weight are different but related. Mass is a property of the object; weight depends upon mass but also on gravitational field strength. Every object exerts a gravitational force on every other object. The force increases with mass and decreases with distance. Gravity holds planets and moons in orbit around larger bodies. ✓ Skill Use the formula: weight (N) = mass (kg) x gravitational field strength (N/kg) ✓ g on Earth = 10 N/kg. On the moon it is 1.6 N/kg |
| | Metals and non-metals | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ Metals and non-metals react with oxygen to form oxides which are either bases or acids. Metals can be arranged as a reactivity series in order of how readily they react with other substances. Some metals react with acids to produce salts and hydrogen <p>Facts Iron, nickel and cobalt are magnetic elements. Mercury is a metal that is liquid at room temperature. Bromine is a non-metal that is liquid at room temperature</p> |
| | Acids and Alkalis | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ The pH of a solution depends on the strength of the acid: strong acids have lower pH values than weak acids. Mixing an acid and alkali produces a chemical reaction, neutralisation, forming a chemical called a salt and water <p>Facts Acids have a pH below 7, neutral solutions have a pH of 7, alkalis have a pH above 7. Acids and alkalis can be corrosive or irritant and require safe handling. Hydrochloric, sulphuric and nitric acid are strong acids. Acetic and citric acid are weak acids</p> |
| | Variation Human reproduction | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ There is variation between individuals of the same species. Some variation is inherited, some is caused by the environment and some is a combination. Variation between individuals is important for the survival of a species, helping it to avoid extinction in an always changing environment ✓ The menstrual cycle prepares the female for pregnancy and stops if the egg is fertilised by a sperm. The developing foetus relies on the mother to provide it with oxygen and nutrients, to remove waste and protect it against harmful substances <p>Facts The menstrual cycle lasts approximately 28 days. If an egg is fertilised it settles into the uterus lining</p> |
| | Voltage and resistance current | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ We can model voltage as an electrical push from the battery, or the amount of energy per unit of charge transferred through the electrical pathway. In a series circuit, voltage is shared between each component. In a parallel circuit, voltage is the same across each loop. Components with resistance reduce the current flowing and shift energy to the surroundings ✓ Skill Calculate resistance using the formula: resistance (Ω) = potential difference (V) \div current (A) ✓ Current is a movement of electrons and is the same everywhere in a series circuit. Current divides between loops in a parallel circuit, combines when loops meet, lights up bulbs and makes components work. Around a charged object, the electric field affects other charged objects, causing them to be attracted or repelled. The field strength decreases with distance ✓ Fact Two similarly charged objects repel, two differently charged objects attract |



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| | Seeing sound Sound effects | Learners will know: <ul style="list-style-type: none"> ✓ Sound consists of vibrations which travel as a longitudinal wave through substances. The denser the medium, the faster sound travels. The greater the amplitude of the waveform, the louder the sound. The greater the frequency (and therefore the shorter the wavelength), the higher the pitch ✓ Sound does not travel through a vacuum. The speed of sound in air is 330 m/s, a million times slower than light ✓ When a wave travels through a substance, particles move to and fro. Energy is transferred in the direction of movement of the wave. Waves of higher amplitude or higher frequency transfer more energy ✓ A physical model of a transverse wave demonstrates it moves from place to place, while the material it travels through does not, and describes the properties of speed, wavelength and reflection |
| | Independence Plant reproduction | Learners will know: <ul style="list-style-type: none"> ✓ Organisms in a food web (decomposers, producers and consumers) depend on each other for nutrients. So, a change in one population leads to changes in others. The population of a species is affected by the number of its predators and prey, disease, pollution and competition between individuals for limited resources such as water and nutrients ✓ Insects are needed to pollinate food crops ✓ Plants have adaptations to disperse seeds using wind, water or animals. Plants reproduce sexually to produce seeds, which are formed following fertilisation in the ovary ✓ Flowers contain the plant's reproductive organs. Pollen can be carried by the wind, pollinating insects or other animals |
| | Earth structure Universe | Learners will know: <ul style="list-style-type: none"> ✓ Sedimentary, igneous and metamorphic rocks can be inter converted over millions of years through weathering and erosion, heat and pressure, and melting and cooling ✓ Fact The three rock layers inside Earth are the crust, the mantle and the core ✓ The solar system can be modelled as planets rotating on tilted axes while orbiting the Sun, moons orbiting planets and sunlight spreading out and being reflected. This explains day and year length, seasons and the visibility of objects from Earth. Our solar system is a tiny part of a galaxy, one of many billions in the Universe. Light takes minutes to reach Earth from the Sun, four years from our nearest star and billions of years from other galaxies |
| 8 | Breathing Digestion | Learners will know: <ul style="list-style-type: none"> ✓ In gas exchange, oxygen and carbon dioxide move between alveoli and the blood. Oxygen is transported to cells for aerobic respiration and carbon dioxide, a waste product of respiration, is removed from the body. Breathing occurs through the action of muscles in the ribcage and diaphragm. The amount of oxygen required by body cells determines the rate of breathing ✓ The body needs a balanced diet with carbohydrates, lipids, proteins, vitamins, minerals, dietary fibre and water, for its cells' energy, growth and maintenance. Organs of the digestive system are adapted to break large food molecules into small ones which can travel in the blood to cells and are used for life processes ✓ Facts Iron is a mineral important for red blood cells. Calcium is a mineral needed for strong teeth and bones. Vitamins and minerals are needed in small amounts to keep the body healthy |



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| | Periodic table Elements | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ The elements in a group all react in a similar way and sometimes show a pattern in reactivity. As you go down a group and across a period the elements show patterns in physical properties ✓ Facts Metals are generally found on the left side of the table, non-metals on the right. Group 1 contains reactive metals called alkali metals. Group 7 contains non-metals called halogens. Group 0 contains unreactive gases called noble gases ✓ Most substances are not pure elements, but compounds or mixtures containing atoms of different elements. They have different properties to the elements they contain. Skills Use particle diagrams to classify a substance as an element, mixture or compound and as molecules or atoms. Name simple compounds using rules: change non-metal to -ide; mono, di, tri prefixes; and symbols of hydroxide, nitrate, sulfate and carbonate ✓ Fact The symbols of hydrogen, oxygen, nitrogen, carbon, hydrogen, iron, zinc, copper, sulfur, aluminium, iodine, bromine, chlorine, sodium, potassium and magnesium |
| | Work Heating and cooling | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ Work is done and energy transferred when a force moves an object. The bigger the force or distance, the greater the work. Machines make work easier by reducing the force needed. Levers and pulleys do this by increasing the distance moved, and wheels reduce friction ✓ The thermal energy of an object depends upon its mass, temperature and what it's made of. When there is a temperature difference, energy transfers from the hotter to the cooler object. Thermal energy is transferred through different pathways, by particles in conduction and convection, and by radiation |
| | Contact forces Pressure | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line. One effect of a force is to change an object's form, causing it to be stretched or compressed. In some materials, the change is proportional to the force applied ✓ Skill Sketch the forces acting on an object, and label their size and direction ✓ Pressure acts in a fluid in all directions. It increases with depth due to the increased weight of fluid, and results in an upthrust. Objects sink or float depending on whether the weight of the object is bigger or smaller than the upthrust. Different stresses on a solid object can be used to explain observations where objects scratch, sink into or break surfaces ✓ Skill Use the formula: fluid pressure, or stress on a surface = force (N)/area (m²) |
| | Chemical energy Types of reactions | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ During a chemical reaction bonds are broken (requiring energy) and new bonds formed (releasing energy). If the energy released is greater than the energy required, the reaction is exothermic. If the reverse, it is endothermic ✓ Combustion is a reaction with oxygen in which energy is transferred to the surroundings as heat and light. Thermal decomposition is a reaction where a single reactant is broken down into simpler products by heating. Chemical changes can be described by a model where atoms and molecules in reactants rearrange to make the products and the total number of atoms is conserved <p>Skill Write word equations from information about chemical reactions</p> |



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| | Evolution and inheritance | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ Natural selection is a theory that explains how species evolve and why extinction occurs. Biodiversity is vital to maintaining populations. Within a species variation helps against environment changes, avoiding extinction. Within an ecosystem, having many different species ensures resources are available for other populations, like humans ✓ Inherited characteristics are the result of genetic information, in the form of sections of DNA called genes, being transferred from parents to offspring during reproduction. Chromosomes are long pieces of DNA which contain many genes. Gametes, carrying half the total number of chromosomes of each parent, combine during fertilisation <p>Facts The DNA of every individual is different, except for identical twins. There is more than one version of each gene eg different blood groups</p> |
| | Electromagnetism | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ An electromagnet uses the principle that a current through a wire causes a magnetic field. Its strength depends on the current, the core and the number of coils in the solenoid ✓ The magnetic field of an electromagnet decreases in strength with distance ✓ Magnetic materials, electromagnets and the Earth create magnetic fields which can be described by drawing field lines to show the strength and direction. The stronger the magnet, and the smaller the distance from it, the greater the force a magnetic object in the field experiences ✓ Two 'like' magnetic poles repel and two 'unlike' magnetic poles attract. Field lines flow from the north-seeking pole to the south-seeking pole |
| | Light Light properties | <p>Learners will know:</p> <ul style="list-style-type: none"> ✓ When a light ray meets a different medium, some of it is absorbed and some reflected. For a mirror, the angle of incidence equals the angle of reflection. The ray model can describe the formation of an image in a mirror and how objects appear different colours. When light enters a denser medium it bends towards the normal; when it enters a less dense medium it bends away from the normal. Refraction through lenses and prisms can be described using a ray diagram as a model ✓ Skill Construct ray diagrams to show how light reflects off mirrors, forms images and refracts ✓ Light travels at 300 million metres per second in a vacuum. ✓ Different colours of light have different frequencies ✓ When a light ray meets a different medium, some of it is absorbed and some reflected. For a mirror, the angle of incidence equals the angle of reflection. The ray model can describe the formation of an image in a mirror and how objects appear different colours. When light enters a denser medium it bends towards the normal; when it enters a less dense medium it bends away from the normal. Refraction through lenses and prisms can be described using a ray diagram as a model ✓ Skill Construct ray diagrams to show how light reflects off mirrors, forms images and refracts ✓ Light travels at 300 million metres per second in a vacuum. Different colours of light have different frequencies ✓ When a wave travels through a substance, particles move to and fro. Energy is transferred in the direction of movement of the wave. Waves of higher amplitude or higher frequency transfer more energy |



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| | | <ul style="list-style-type: none"> ✓ A physical model of a transverse wave demonstrates it moves from place to place, while the material it travels through does not, and describes the properties of speed, wavelength and reflection |
| | Respiration Photosynthesis | Learners will know: <ul style="list-style-type: none"> ✓ Respiration is a series of chemical reactions, in cells, that breaks down glucose to provide energy and form new molecules. Most living things use aerobic respiration but switch to anaerobic respiration, which provides less energy, when oxygen is unavailable. ✓ Yeast fermentation is used in brewing and breadmaking. ✓ Plants and algae do not eat, but use energy from light, together with carbon dioxide and water to make glucose (food) through photosynthesis. They either use the glucose as an energy source, to build new tissue, or store it for later use. Plants have specially-adapted organs that allow them to obtain resources needed for photosynthesis. ✓ Iodine is used to test for the presence of starch. |
| | Climate Earth Resources | Learners will know: <ul style="list-style-type: none"> ✓ Carbon is recycled through natural processes in the atmosphere, ecosystems, oceans and the Earth's crust (such as photosynthesis and respiration) as well as human activities (burning fuels). Greenhouse gases reduce the amount of energy lost from the Earth through radiation and therefore the temperature has been rising as the concentration of those gases has risen. Scientists have evidence that global warming caused by human activity is causing changes in climate ✓ Facts Methane and carbon dioxide are greenhouse gases. Earth's atmosphere contains around 78% nitrogen, 21% oxygen ✓ There is only a certain quantity of any resource on Earth, so the faster it is extracted, the sooner it will run out. Recycling reduces the need to extract resources. Most metals are found combined with other elements, as a compound, in ores. The more reactive a metal, the more difficult it is to separate it from its compound. Carbon displaces less reactive metals, while electrolysis is needed for more reactive metals |