basic education
Department: Basic Education
REPUBLIC OF SOUTH AFRICA

Life and living

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
2 weeks	Photosynthesis and Respiration	**Photosynthesis** • interactions and interdependence in an ecosystem are driven by the need for energy to sustain life • the Sun is the important source providing this energy in the form of light and heat • plants use carbon dioxide (from the air), water (from the soil) and energy from the Sun in a series of chemical reactions to produce glucose (food). This process is called *photosynthesis* • oxygen gas is released into the air as a by-product *carbon dioxide + water* —(*chlorophyll*, *sunlight*)→ *glucose + oxygen* *[No further details are required]* • plants change glucose into starch, cellulose and other chemical compounds to enable processes such as growth and reproduction **Respiration** • food contains energy (potential energy). This energy can be released from food by a series of chemical reactions. This process is called respiration • respiration (in all living organisms) is the process by which energy is released from food in a series of chemical reactions *glucose + oxygen* → *energy + carbon dioxide + water* *[No further details are required]*	• Reference materials • A variety of leaves • Heat source/spirit or Bunsen burners • Glass containers/test tubes • Ethanol/methylated spirits • Iodine solution • White surfaces • Slaked lime (to make lime water) • Drinking straws	• Explain the requirements and products of photosynthesis • Investigate which leaves photosynthesise • Test if human breath contains carbon dioxide • Identify and explain requirements and products of respiration • Compare photosynthesis and respiration
5 weeks	Interactions and Interdependence within the Environment	**Introduction to ecology** • ecology is the study of interactions of organisms with one another and with the physical and chemical environment • scientists usually classify the study of ecological interactions into four levels; populations, communities, ecosystem and the biosphere **Ecosystems** • all ecosystems combined make up the biosphere • an ecosystem consists of an ecological community that includes all living organisms (biotic) such as plants and animals, together with the non-living (abiotic) environment such as temperature, wind, water, interacting as a system • the size of an ecosystem is not specifically defined and it usually encompasses a specific, limited area (although it can encompass the entire planet) • ecosystems are defined by the network of interactions among organisms, and between organisms and their environment • survival of individual organisms and populations depends on the its ability to cope with changes (adapt) in its habitat (the place where an organism lives) or in the ecosystem **Feeding relationships** • plants are *producers*. They make their own food • animals are *consumers*. They obtain food from plants either directly (such as herbivores) or indirectly (such as carnivores) • *herbivores:* feed on plant material (for example cows, horses) • *carnivores:* feed on other animals (living or dead). The group includes: - those that hunt other animals (*prey*) are *predators* (for example leopards)	• Pictures of different ecosystems (large and small) showing the living and non-living components • Thermometers • Hand lenses • String (for making quadrats) • Rulers/meter sticks • Sieves • Field guides for identifying plants and animals • Pictures of different local/South African organisms • Video clips • Pictures of plants and animals in different ecosystems, such as forests, oceans, deserts	• Evaluate disruptions to an ecosystem; giving causes, effects and solutions • Identify the type of interaction between organisms within an ecosystem • Identifying a food chain or food web in an ecosystem in or near the school grounds • Draw food chains and food webs (linking names with arrows) in different ecosystems • Draw and analysing energy pyramids • Describe how the different organisms are adapted to live in their specific environments • Include practical work • Extra time used for AFL reinforcement of concepts

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
		- those that eat dead animals are *scavengers* (for example hyenas, vultures) - insectivores feed mainly on insects and other smaller invertebrates such as worms (for example earthworms) • *omnivores:* feed on plants and animals (for example humans) • *decomposers*: breakdown (decompose) the remains of dead plants and animals. They recycle important nutrients in the environment (for example bacteria, fungi, earthworms) **Energy flow: Food chains and food webs** • plants (and algae) play an important role in the ecosystem, as they capture energy from the Sun by the process of photosynthesis • this energy is passed along a food chain from producers to consumers; decomposers are the last link in this transfer of energy and release energy as heat to the environment • each stage of a food chain is called a trophic level • energy transfer and energy loss occur at each trophic level • interlinked food chains together form food webs **Balance in an ecosystem** • an ecosystem can only accommodate as many organisms as its resources (food, water and shelter) can carry, and it will fail if it does not remain in balance • this balance can be disrupted by natural and human factors - natural factors include extreme changes in patterns of weather and climate, such as floods, drought, extreme and sudden changes in temperatures - human factors include removing organisms from the ecosystem (such as poaching), human induced pollution • these factors can contribute to an imbalance in an ecosystem, seriously impacting on its components and altering its nature **Adaptations** • adaptation is the change in the structural, functional and behavioural characteristics of an organism • adaptation allows the organism to survive as it adapts to changing conditions within the environment • organisms that are unable to adapt to changes within the environment die out (become extinct) **Conservation of the ecosystem** • environmentalists and others work towards managing ecosystems, such as control of alien vegetation and preservation of wetlands • individuals can contribute to conservation in various ways, such as appropriate waste disposal (including recycling, reusing)		
2 weeks	**Micro-organisms**	**Types of micro-organisms** • micro-organisms are living things • they are too small to see with the naked eye *[they can only be seen under a microscope]* • there is a variety of micro-organisms, including Viruses, Bacteria, Protista and Fungi **Harmful micro-organisms** • some micro-organisms cause diseases, such as TB (caused by bacteria), AIDS (caused by HI virus), malaria (caused by a protest) • disease causing organisms are found almost everywhere, such as at ATMs, handrails of staircases and toilets • waterborne diseases (such as cholera and diarrhoea) account for many child deaths	• Hand lenses, or bio-viewers	• Research various infectious disease caused by viruses, bacteria, protists or fungi using sources from the library, the internet and interviews with healthcare professionals, with focus on; causes, symptoms and treatment. Write a report, prepare a poster or oral presentation. • Research various useful microorganism used in, e.g., food and food-making processes, water treatment, biotechnology research to produce alternative, renewable energy, for example, biogas and biofuels, the development of various medicines, for

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
		• effective methods of preventing the spread of diseases caused by micro-organisms include washing hands and sterilising • modern scientists such as Louis Pasteur play an important role in identifying and developing cures for some diseases **Useful micro-organisms** • some micro-organisms play an essential role in ecosystems, such as decomposing dead plant and animal matter, thereby recycling nutrients in the soil • some micro-organisms are used by people for making certain foods (such as yoghurt) and medicines (such as penicillin)		example, antibiotics • Investigating the growth of yeast under different conditions, e.g., different amounts of sugar, different temperatures, etc. • Research all the scientists who made contributions in the study of various types of microorganisms
1 week	**Remediation, revision and consolidation**			
SBA (FORMAL ASSESSMENT)		• Practical task/investigation • Test		

Matter and materials

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
1 week	**Introduction to the Periodic Table of Element**	**Arrangement of elements on the Periodic Table** • the Periodic Table of Elements is a classification system for the elements which make up matter and materials in the world *[an element is a pure substance which cannot be broken down further]* • the Periodic Table was devised by Dmitri Mendeleev in the 1860s. He arranged the elements according to their properties in a table format • the elements of the Periodic Table are arranged into three main categories; metals, semi-metals and non-metals: - metals are arranged on the left-hand side of the table - non-metals are found on the far-right hand side of the table - semi-metals are found in the region between metals and nonmetals • each element has its own name, symbol, atomic number and position on the Periodic Table **Some properties of metals, semi-metals and non-metals** • metals are usually shiny, ductile and malleable, solid (except mercury) and have high melting and boiling points • non-metals have a variety of different properties (depending on whether they are solids or gases) • semi-metals are solids and have some properties of metals and some properties of non-metals	• Different colours of pencil / crayons • Posters, e.g., the periodic table, video players, laptops/tablets/smart phones • Laboratory Equipment and materials: Paper/plastic cups (of identical size), heat source (such as Bunsen burner or spirit lamp), matches, tripod stands, gauze wire mats, safety goggles, tongs/ pliers, ball and ring apparatus, cell/ battery, conducting wires, metal plates (electrodes), balloons, soccer ball, bicycle tyre, hand pump, small ceramic/glass dish (heat resistant) test tubes, test tube racks, measuring cylinder/large glass jar, glass containers, beakers/glass jars, evaporating dishes, wireless temperature sensor, wireless pressure sensor • Chemicals and materials: Ether, Copper (II) chloride, Potassium permanganate • Perishables and or household substances: White vinegar, water, sand, flour, oil, plastic beads or dried lentils or dried peas, or plasticine or modelling clay or playdough, paper plates, glue, sponge, polystyrene, wooden and metal blocks of the same size, tins, foil pie dishes	• Identify the names and symbols of the first 20 elements of the periodic table [learners need NOT memorise the atomic number of each element] • Identify metals, semi-metals, and non-metals on the periodic table of elements • Use beads or dried lentils or dried peas to make a 3-dimensional model of an atom • Show the atoms which make up molecules (such as O_2, H_2, N_2, H_2O, CO_2) • Draw diagrams to represent particles in a solid, a liquid and a gas, and explain them in terms of arrangement, movement, forces and spacing using the particle model of matter • Draw a table comparing the particles of gases, liquids, and solids • Do an investigation to determine whether it is possible to decompose copper chloride using electrical energy • Investigate if particles diffuse (mix) faster when they are in the liquid state or in the gaseous state • Investigate what happens when we heat and then cool candle wax • Compare objects with same volume but with different mass (by hand) in terms of their density, such as sponge, polystyrene, wooden and metal blocks of the same size • Compare the densities of different states of the same material, a solid, a liquid or a gas • Investigate which material has the highest density; sand, flour, water, or air
2 weeks	**Atoms**	**Atoms – building blocks of matter** • all matter is made up of tiny particles called atoms • an element is made up of atoms of the same kind. For example, all the atoms of an element, such as copper, are identical • an element is a substance that cannot be broken down into two or more substances by chemical means (An element cannot be changed into another element by means of a chemical reaction) • atoms of one element differ from the atoms of all other elements • all known elements are listed on the Periodic Table of the Elements **Sub-atomic particles** • atoms are made up of smaller sub-atomic particles (protons, neutrons and electrons) • the central region of the atom is called the nucleus • the nucleus is made up of positively charged particles called protons and neutral particles called neutrons • negatively charged particles called electrons move around the nucleus • atoms are neutral because the number of negatively charged particles (electrons) is equal to the number of positively charged particles (protons) **Pure substances** • elements and compounds are pure substances **Elements** • an element is a material that consists of atoms of only one kind, such as hydrogen (H), oxygen (O), carbon (C), sodium (Na) and chlorine (Cl) • all known elements are listed on the Periodic Table of Elements. They are limited in number and are the building blocks of millions of compounds • some elements on the Periodic Table of Elements form diatomic molecules for example		

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
		hydrogen (H_2), nitrogen (N_2), oxygen (O_2), chlorine (Cl_2). These are called molecules of elements • sometimes atoms react together chemically to form molecules of compounds (such as H_2O, CO_2) **Compounds** • a compound is a material that consists of atoms of two or more different elements chemically bonded together, such as water (H_2O), carbon dioxide (CO_2), salt (NaCl) • the atoms in a given compound are always combined/bonded in a fixed ratio such as, in water, where the ratio is always two hydrogen atoms (H_2) to one oxygen atom (O) • a chemical bond is the force that holds atoms together • compounds [such as water (H_2O), carbon dioxide (CO_2), salt (NaCl)] are formed by chemical reactions • compounds can be broken down in a decomposition reaction into other compounds or their original elements by heating or electrolysis. For example, electrolysis decomposes water (H_2O) to form hydrogen (H_2) and oxygen (O_2) **Mixtures of elements and compounds** • elements and compounds are often found mixed together, such as in air, sea water, rocks, and in living things • mixtures are separated by physical means; compounds can be separated by chemical means		
5 weeks	**Particle Model of Matter**	**The concept of the particle model of matter** • atoms and molecules are referred to as particles in the particle model of matter • the particle model of matter is a scientific theory used to explain that all matter (solids, liquids and gases) is made up of particles • these particles are too small to see (in a drop of water there would be many billions of water particles) • the spaces between the particles are empty [**Note:** *these spaces do not contain air, they contain nothing*] • scientists have evidence that suggests that the particles are arranged differently in a solid, liquid and a gas - in a **solid**, the particles ✓ are closely packed in a regular arrangement ✓ do not move around but vibrate against each other ✓ have strong forces holding them together ✓ have small spaces between them - in a **liquid**, the particles ✓ are loosely arranged but still quite close together ✓ can move quite fast and slide past each other ✓ have weaker forces between them ✓ have small spaces between them - in a **gas**, the particles ✓ have no particular arrangement ✓ move very fast ✓ have extremely weak forces between them ✓ have very big spaces between them compared to solids and liquids • diffusion is a process in which particles in liquids and gases move (separate and spread) from a highly-concentrated area to an area with a lower concentration of those particles		

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
		• diffusion is faster in gases compared to liquids *[the concept of diffusion also applies in Life & Living, see Respiratory System Grade 9]* **Change of state** • heating and cooling can cause a material to change state • the solid material first changes to a liquid (melting) when heated, and then it changes to a gas (evaporating or boiling) on further heating • the gas first changes to a liquid (condensing) when cooled, and then it changes to a solid (freezing or solidifying) when cooled further • as a solid material is heated, the movement of the particles increases which enables them to move past each other and form a liquid • the particles move much further apart from each other when the material changes from the liquid to the gas state **Density, mass and volume** • the density of a material describes the amount of mass in a given volume of that material **Density and states of matter** • in general, gases are less dense than liquids and liquids are less dense than solids *[water is an exception as ice is less dense than water and therefore it floats]* **Density of different materials** • some materials have low density and some have high density. For example a loaf of bread has a lower density than a clay brick of the same size • the individual particles making up one material may have different masses compared to the individual particles making up another material. In addition, there are spaces between the particles • the density of a material will depend on the kind of particles it is made up of and the size of the spaces between them • a material which has lower density will float on a liquid which has higher density, for example oil (lower density) will float on water (higher density) **Expansion and contraction of materials** • solids, liquids and gases tend to expand when heated and contract when cooled • particles of liquids and gases are in a state of constant motion • as a material is heated, the movement of the particles increases and they move further apart, therefore the material expands • as a material is cooled, the movement of the particles decreases and they move closer together, therefore the material contracts • when a material expands or contracts, the size and number of particles does not change. Instead, it is only the *spaces* between the particles that get bigger or smaller - during expansion, the spaces between the particles get bigger - during contraction, the spaces between the particles get smaller **Pressure** • a gas exerts a pressure because of the collisions of the particles with each other and against the sides of the container • pumping more gas into a container increases the number of gas particles in the container. This increases the number of collisions and therefore increases the pressure *[**Note:** heating also increases the pressure by giving the particles more energy, making them move faster, and collide with greater force. We do not have to deal with this aspect of pressure in this grade]*		
1 week	**Chemical**	**Reactants and products**		

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
	Reactions	• substances can react with each other to form products with different chemical properties • in a chemical reaction, the substances that react with one another are called the *reactants* • in a chemical reaction, the substances that are produced are called the *products* of the reaction • in reactions, re-arrangement of the atoms takes place, to form different products • during a chemical reaction, chemical bonds (a bond is a force that holds atoms together) of the reactants break and new bonds form to produce the products • indigenous knowledge includes some examples of useful chemical reactions such as fermentation in brewing [which produces carbon dioxide and ethanol (alcohol)] *[The concept of chemical reactions is developed in Grade 9]*		
1 week	**Remediation, revision and consolidation**			
SBA (FORMAL ASSESSMENT)		• Practical task/investigation • Test		

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Energy and change

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
1 week	**Static Electricity**	**Friction and static electricity** • friction (rubbing) between certain materials (such as plastic, perspex, glass, nylon, wool, silk) transfers electrons between the atoms of the two materials being rubbed together • the electrons move from one material causing a positive charge on its surface, and causing a negative charge on the surface of the other material *[It is only the electrons that are transferred, protons and neutrons do not move]* • objects/materials with same/like charges repel each other • objects/materials with opposite/unlike charges attract each other • a discharge of the electrons causes the sparks or shock of static electricity, especially when the air is dry	• Reference materials • Video clips from the internet • Plastic or perspex rods or rulers • Pieces of wool/nylon/silk fabric • Small pieces of paper	• Observe what happens and describe in terms of same or opposite charge on the materials when: - Rubbing a plastic or perspex ruler with a piece of wool or nylon or silk fabric • Bringing the ruler close to small pieces of tissue paper or sawdust
2½ weeks	**Energy Transfer in Electrical Systems**	**Circuits and current electricity** • a circuit is a system for transferring electrical energy • a closed circuit is needed to make a device work, such as making a bulb light up (*refer to Grade 6 Energy & Change*) • a circuit is a complete conducting pathway for electricity and has a number of components connected together: • from one terminal at the source of energy (cell/battery); along conducting material (wires); through the device (filaments of incandescent bulbs); and back to the other terminal of the source of energy (cell/battery) **Components of a circuit** • conducting wires are usually made of metal and carry electricity over a short or long distance • switches provide a convenient way of controlling electrical circuits • cells/batteries are chemical systems that are sources of energy - cells store chemical substances (potential energy) - when the circuit is completed, the chemicals react together to produce an electric current - an electric current is the flow of charges (kinetic energy) along a conductor • **resistors** are made of materials that resist/oppose the flow of electrical current in a circuit - resistors in a circuit have an influence on the amount of electric current flowing in that circuit - some resistors (including bulb filaments, heating wires, elements in kettles/heaters/geysers/stoves) can heat up to provide useful output energy ✓ a light bulb such as a torch bulb, contains a resistance wire called a filament. The filament heats up to be white hot when connected in a circuit. The resistance wire is connected to two contact points - the one end to the screw part (casing) and the other end to the solder knob at the bottom. The two contacts are separated by an insulator **Effects of an electric current** • a current can heat a resistance wire (such as a bulb filament) - an electrical current transfers energy to the particles in a bulb filament, producing light that the filament emits - circuits can overheat if a short circuit occurs: ✓ **fuses** are special wires which break the circuit when they overheat and melt. These are safety devices that reduce the danger when using electricity ✓ **a short circuit** can occur when an electric current takes the path of lowest resistance, for example when a conductor is connected directly to both terminals of a cell/battery	• Electrical circuit diagrams • Cells/batteries • Circuit boards • Torch bulbs • Switches • Resistors (steel wool or nichrome wire) • Copper wires • Steel wires • Copper (II) chloride • Magnetic compasses • Other (available) input and output devices	• Draw and interpreting an electrical circuit diagram and the symbols used in it • Investigate the heating effect of a current by using a resistance wire (such as a strand of steel-wool/nichrome wire) • Investigate the current strength at all points in a series circuit • Investigate the magnetic effect of a current in a wire bent into a coil • Investigate electrolysis of copper (II) chloride solution

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		• a current causes a magnetic field (such as in electromagnets) - an electric current can be used for making temporary magnets known as electromagnets. Moving charges (current) in a conductor (such as a wire), cause a magnetic field around it • an electric current can cause a chemical reaction in a solution, this process is called electrolysis - water can be broken down by electrolysis to produce oxygen and hydrogen gas • copper(II) chloride solution can be broken down to copper metal and chlorine gas. Copper is deposited on one electrode (cathode) and chlorine gas is formed as bubbles at the other electrode (anode)		
2 weeks	**Series and Parallel Circuits**	**Series circuits** • a series circuit provides only one pathway for the current passing through it. The current is the same everywhere in the circuit but every time a resistor is added in series, the overall current in the circuit decreases **Parallel circuits** • a parallel circuit provides two or more pathways for the current passing through it, but the overall current increases when more resistors are added in parallel	• Cells/batteries • Circuit boards • Torch bulbs • Switches • Resistors (various conducting wires, steel wool or nichrome wires) • Copper wires • Steel wires	• Investigate the heating effect of a current by using a resistance wire (such as a strand of steel-wool/nichrome wire) • Investigate which metals offer the most resistance • Investigate the magnetic effect of a current in a wire bent into a coil • Investigate the effects of connecting more resistors into the series and parallel circuits. • Investigate how different metals conduct electricity differently
2½ weeks	**Visible Light**	**Radiation of light** • light is emitted from luminous objects such as the Sun and light bulbs, and is transferred by radiation • light travels in straight lines • light travels through empty space at a speed of 300 000 kilometres per second (the distance from the Sun to Earth is 150 million kilometres) (*refer to Grade 7 Energy and Change*) **Spectrum of visible light** • white light consists of a spectrum (range) of different frequencies and wavelengths - violet, indigo, blue, green, yellow, orange, red. All these colours make up the spectrum of visible light [***Note****: NO further detail on wavelengths and frequencies is required at this level*] • a rainbow is seen when light falls on water droplets in the air and is refracted and dispersed into the different colours (violet, indigo, blue, green, yellow, orange, red) seen in the rainbow • the light at the violet, indigo, blue range of the spectrum has the highest frequency (shortest wavelength) and orange and red light has the lowest frequency (longest wavelength) **Opaque and transparent substances** • light cannot pass through opaque surfaces (such as metal, clay, bricks, wall paint, cardboard), therefore it is either absorbed or reflected • opaque substances cast shadows on the side facing away from the light source • light passes through transparent substances (such as glass, clear plastic, cellophane, clean water), therefore some of the light is absorbed, some is reflected, but most passes through **Absorption of light** • light can be absorbed by surfaces of some materials • light is absorbed differently by different materials	• Video clips from the internet about the electromagnetic spectrum • Pinhole camera (if available), or tinfoil (to make a pinhole camera) • Cardboard box (shoe box) • Tissue paper • Glue • Pin • Light source • Triangular prism • Cut-out cardboard shapes • Mirror • Aluminium foil • Parallel sided prism • Cardboard with a narrow slit or glass • Pencil or ruler • Clear container with water	• Investigate the relationship between the angles of incidence and reflection • Investigate if light change direction when it passes through a glass block • Investigate the refraction of light as it enters water • Draw diagrams to show how shadows are cast by opaque objects • Draw a ray diagram to show the change in direction of light rays at a smooth reflector (such as a mirror) • Draw a ray diagram to show the changes in direction of light rays reflected off a rough surface (such as crumpled aluminium foil) • Draw a ray diagram of a triangular prism and a magnifying glass (lens) to show dispersing and focusing of light • Make colour spinning wheels

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Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
		• a material has colour because it absorbs some of the colours in the spectrum (some of the frequencies) and reflects other colours • the frequencies that are absorbed do not reach the eye - a red object (such as a wall painted red) reflects the frequencies we see as red and absorbs other frequencies/colours such as violet, indigo, blue, green - a black object (such as a black pot) absorbs all of the frequencies/colours and therefore looks black [*links to absorption of heat by matt black surfaces: Grade 7*] - a white object (such as white paper) reflects all of the frequencies/colours and therefore looks white [*links to reflection of heat by shiny silver or white surface Grade 7*] **Reflection of light** • light is reflected off most surfaces, including mirrors • light can change its direction when it is reflected • in reflection, the angle of incidence and the angle of reflection are equal • the angles of incidence and reflection are measured from the normal which is a line perpendicular to the surface *[actual measurement of angles not included here]* • on smooth surfaces, all light is reflected in the same direction • on rough surfaces, reflected light is scattered **Seeing light** • the frequencies/colours that are reflected enter the eye • specialised receptor cells in the eye's retina are stimulated by specific frequencies (colours) • in the eye, light energy is converted to electrical nerve impulses • impulses travel to the brain and the brain interprets them as our perceptions of light • the frequencies/colours of light that are absorbed by the surface of an object do not reach the eye **Refraction of light** • light can be refracted by transparent substances • light can change its direction when it is refracted • light entering a transparent medium (such as glass, water, perspex) at an angle, changes direction towards the normal in that medium • light travelling out of the medium (back into the air) changes direction away from the normal • a triangular prism is able to refract and disperse white light into the colours observed in a rainbow • a lens is able to refract and focus light		
1 week	**Remediation, revision and consolidation**			
SBA (FORMAL ASSESSMENT)		• Project • Test		

Planet Earth and beyond

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
3 weeks	The Solar System	**The Sun** • the Sun is like all other stars – it produces large amounts of heat and light continuously • the energy in our Sun comes from powerful nuclear reactions during which hydrogen gas changes into helium gas • Table of facts about the Solar System **Objects around the Sun** • a variety of objects orbit the Sun - eight planets and their moons, rocky asteroids, outer dwarf planets and many distant icy and dusty objects in the Kuiper Belt and Oort Cloud, at the edge of the Solar System • all the planets and other objects in the Solar System have their own special features including size, distance from the Sun, number of moons known, composition, surface temperature, time it takes for one orbit around the Sun • comets from the Oort Cloud come close to the Sun from time to time • the Solar System looks like a flat disc or plate. The Sun spins (rotates) at the centre and the planets and all other objects orbit around it in the same direction • gravity is the force that keeps all these objects in their stable, predictable orbits around the Sun **Earth's position in the Solar System** • the Earth is the third planet from the Sun • the Earth is the only planet that is known to support life • the conditions that support life on Earth include: - temperature: Earth's distance from the Sun provides the ideal temperature range - water is a liquid, gas or solid in Earth's temperature range - sunlight provides the energy in the food chain • oxygen: early life forms and algae produced enough oxygen for the evolution of more sophisticated life forms	• Reference materials • Video clips from the internet showing: - surface of the Sun - movement of the planets around the Sun - meteors, asteroids, comets • Table of facts about the Solar System	• Constructing a model of the Solar System showing relative distances of the planets from the Earth and relative sizes of planets • Interpreting a table of facts about the Solar System • Comparing and writing about the conditions on other planets in our Solar System including their special features • Presenting a fact sheet about any object found in our Solar System • Writing about why the conditions on Earth are ideal for life • Demonstrating the shape of the Milky Way Galaxy with a spiral shape • Drawing spiral arms to represent the Milky Way Galaxy and placing our Solar System in the outer edges of the spiral to show our location in the galaxy
3 weeks	Beyond the Solar System	**The Milky Way Galaxy** • our Solar System is in the Milky Way Galaxy • a galaxy is a collection of stars held together by their mutual gravity • our Sun is only one of billions of stars in the Milky Way Galaxy • the Milky Way Galaxy is in the shape of a spiral with many arms • our Sun is located towards the edge of the Milky Way Galaxy in one of the spiral arms • from the Earth, looking towards the centre of the Milky Way Galaxy, we see a hazy path of light across the sky • ancient Greeks described it as spilled milk **Our nearest star** • the Sun is the nearest star to Earth • the star called *Alpha Centauri* is the nearest easily visible star to the Sun (it is the brighter of the two Pointers of the Southern Cross constellation) • *Alpha Centauri* is 4,2 light years away from our Solar System **Light years, light hours and light minutes** • people use light years to measure distances to stars and other objects beyond the Solar System • a light year is the distance that light travels in one year		

<table>
<tr><th>Duration</th><th>CAPS Topics</th><th>Core Concepts, Skills and Values</th><th>Resources to Enhance Learning</th><th>Informal Assessment</th></tr>
<tr><td></td><td></td><td>• one light year is equal to about 10 trillion kilometres (km)
• Alpha Centauri is 42 trillion km away
• a light hour is the distance that light travels in one hour
• our Solar System has a diameter of about 13 light hours
• a light minute is the distance that light travels in one minute
• the Earth is about 8 light minutes away from the Sun
Beyond the Milky Way Galaxy
• our Milky Way Galaxy is only one of billions of galaxies scattered across the Universe
• the size of the observable Universe is estimated to be about 28 billion light years
• galaxies have various shapes and sizes</td><td></td><td></td></tr>
<tr><td>2 weeks</td><td>Looking into Space</td><td>Early viewing of space
• people can see planets and stars in the night sky
• stars can be arranged into visible constellations
• different cultures have identified and named certain constellations
• some constellations have stories linked to them
Telescopes
• people can see more details in the sky when they use a telescope
• a telescope forms an image of the object and magnifies it (makes it look bigger)
• there are different types of telescopes including:
- optical telescopes receive light and focus it by refraction (using lenses) or reflection (using mirrors) such as SALT (Southern Africa Large Telescope), and the Hubble Space telescope
- radio telescopes receive radio waves and focus them by reflection (typically using a metal receiving dish) such as the SKA (Square Kilometre Array)
• good conditions for looking into space include cloudless skies with limited light and air pollution
• South Africa has many locations that meet these requirements</td><td></td><td></td></tr>
<tr><td>1 week</td><td colspan="4">Remediation, revision and consolidation</td></tr>
<tr><td colspan="2">SBA (FORMAL ASSESSMENT)</td><td colspan="3">• Test</td></tr>
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Science Process Skills

The teaching and learning of Natural Sciences involve the development of a range of process skills that may be used in everyday life, in the community and in the workplace. Learners also develop the ability to think objectively and use a variety of forms of reasoning while they use these skills. Learners can gain these skills in an environment that taps into their curiosity about the world, and that supports creativity, responsibility and growing confidence.

The following are the cognitive and practical process skills that learners will be able to develop in Natural Sciences:

1. ***Accessing and recalling information*** – being able to use a variety of sources to acquire information, and to remember relevant facts and key ideas, and to build a conceptual framework.
2. ***Observing*** – noting in detail objects, organisms and events.
3. ***Comparing*** – noting similarities and differences between things.
4. ***Measuring*** – using measuring instruments such as rulers, thermometers, clocks and syringes (for volume).
5. ***Sorting and classifying*** – applying criteria in order to sort items into a table, mind-map, key, list or other format.
6. ***Identifying problems and issues*** – being able to articulate the needs and wants of people in society.
7. ***Raising questions*** – being able to think of, and articulate relevant questions about problems, issues, and natural phenomena.
8. ***Predicting*** – stating, before an investigation, what you think the results will be for that particular investigation.
9. ***Hypothesising*** – putting forward a suggestion or possible explanation to account for certain facts. A hypothesis is used as a basis for further investigation which will prove or disprove the hypothesis.
10. ***Planning investigations*** – thinking through the method for an activity or investigation in advance. Identifying the need to make an investigation a fair test by keeping some things (variables) the same whilst other things will vary.
11. ***Doing investigations*** – this involves carrying out methods using appropriate apparatus and equipment, and collecting data by observing and comparing, measuring and estimating, sequencing, or sorting and classifying. Sometimes an investigation has to be repeated to verify the results.
12. ***Recording information*** – recording data from an investigation in a systematic way, including drawings, descriptions, tables and graphs.
13. ***Interpreting information*** – explaining what the results of an activity or investigation mean (this includes reading and understanding maps, tables, graphs). A Translation Task requires learners to make sense of information and convert the information into a different format e.g., from information captured on a table into a graph format and or written format.
14. ***Communicating*** – using written, oral, visual, graphic and other forms of communication to make information available to other people.
15. The ***Scientific Process*** is a way of investigating things about the world. Scientists use this process to find out about the world and to solve problems. The steps that make up the scientific process are not necessarily in order (sequential), and may include:

    Step 1: Identify a problem and develop a question. What is it you want to find out?

    Step 2: Form a hypothesis. A hypothesis is your idea, answer, or prediction about what will happen and why.

    Step 3: Design an activity or experiment. Do something that will help you test your idea or prediction to see if you were right.

    Step 4: Observe/note changes/reactions (e.g., through measuring), and record your observations (e.g., onto a table). What were the results of your activity or experiment? Write about what happened.

    Step 5: Make inferences about the observations recorded in the tables, graphs, drawings, photographs. Make some conclusions. What did you find out? Do your results support your hypothesis? What did you learn from this investigation?