2026 Annual Teaching Plan
Natural Sciences: Grade 9

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	**Cells as basic units of life**	**Cell structure** • the cell is the basic structural and functional unit of all living organisms. Cells can be seen under a microscope (they are microscopic) • plant and animal cells have a cell membrane, cytoplasm, nucleus, and organelles such as mitochondria, vacuoles and chloroplasts - the *cell membrane* encloses the contents of the cell. It allows specific substances to pass into and out of the cell - the *cytoplasm* is the jelly-like medium in which many chemical reactions take place - the *nucleus* contains DNA ✓ the nucleus is enclosed by a nuclear membrane (in plants and animals) ✓ DNA contains inherited characteristics, such as whether eyes are blue or brown ✓ DNA is unique to each person; this variation accounts for differences within species - *Mitochondria* are responsible for respiration to release energy from food **Differences between plant and animal cells** • plant cells differ from animal cells - plant and animal cells are enclosed by a cell membrane, and plant cells also have rigid cellulose cell walls to provide support for the plant - plant cells also contain organelles such as large vacuoles and chloroplasts. Chloroplasts contain *chlorophyll* to absorb light energy for photosynthesis (*refer to Grade 8 Life & Living*). Vacuoles in plant cells have several functions including support and storage (*Vacuoles in animal cells are small and temporary or absent*) **Cells in tissues, organs and systems** • cells come in many different shapes and sizes • cells are adapted to perform specific functions, such as muscle cells which are specialised to contract and enable movement • microscopic organisms such as bacteria, consist of a single cell. Macroscopic organisms such as humans, consist of large numbers of cells • a group of cells performing a specific function form a tissue, a group of tissues make up an organ, and organs working together in groups form systems, systems make up an organism • stem cells are cells that have the ability to divide and develop into many different cell types [*No detail required*] • Cells in tissues, organs and systems	• Video clips, laptops, tablets, smart phones, • **Lab equipment**: Basic light microscope(s) scalpels or knives, dissecting needles, forceps, microscope slides, coverslips, droppers, Petri dishes • **Perishables**: Onions, tissue paper or filter paper, distilled water, iodine solution • 3-Dimensional (3D) model of a cell, and/or pictures • Micrographs of plant and animal cells	• Draw and label a generalised plant and animal cell • Research and write about the history of the discovery of the light and electron microscopes • Tabulate the differences between plant and animal cells • Prepare and examine slides of plant and animal cells such as onion cells, cheek cells • Draw and label a few cells from each observation
1 week	**Overview of Systems in the Human Body**	*[**Note:** The intention of this topic is to provide learners with an overview of the structure and functions of organs and systems in the human body]* **Body systems** • the human body consists of several integrated systems working together including the following • **musculoskeletal system**: muscles produce body movement. The skeleton protects the body, provides support and enables movement - the main processes include contraction and relaxation of muscles, locomotion and movement - the main components include the muscles, bones, cartilage, tendons, ligaments • **excretory system:** removes waste from the blood and regulates the body's fluids - the main processes include filtration, absorption, diffusion, excretion - the main components include the kidneys, bladder, ureters • **nervous system:** receives and helps the body respond to stimuli - the main processes include hearing, seeing, feeling, tasting, smelling, sending and receiving impulses, regulating temperature	• Models or charts of different body systems • Video clips, laptops/smart phones or tablets, data bundle	• Create a poster of clearly labelled and distinguished (by colour) musculoskeletal, excretory, nervous systems within a single human body.

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
		- the main components include the brain, spinal cord, nerves, ears, nose, eyes, skin, tongue		
2 weeks	**Systems in the Human Body:** • **Blood Circulatory System** • **Respiratory System**	• **blood circulatory system:** brings nutrients and oxygen to cells and removes waste products - the main processes include circulating blood between heart and lungs, and circulating blood between the heart and the rest of the body - the main components include the heart, blood vessels (arteries, veins, capillaries), blood health issues include high blood pressure, heart attacks, strokes • **respiratory system:** is responsible for supplying oxygen to the body and for removing carbon dioxide - the main processes include breathing (inhalation and exhalation), gaseous exchange (diffusion) and respiration - the main components include the nose and mouth, trachea and other air passageways, lungs, blood - health issues include asthma, lung cancer, bronchitis, asbestosis **Breathing, gaseous exchange, blood circulation and respiration** • oxygen is *inhaled* in a process called breathing • in the lungs gases are exchanged (*gaseous exchange*) between the alveoli and the surrounding capillaries by the process of *diffusion* • oxygenated blood is transported (*circulation*) from the lungs to the left side of the heart where it is pumped under high pressure to the body through the arteries *[arteries transport oxygenated blood, except for the pulmonary arteries]* • arteries subdivide to form capillaries which are in close contact with the body cells. Here, *gaseous exchange* occurs and oxygen moves into the cells by the process of *diffusion* • in the mitochondria of the cells, oxygen is combined with food in the process of *respiration* and energy is released for other body processes • carbon dioxide (by-product of *respiration*), diffuses from the cells into the capillaries for excretion, and is transported (*circulation*) in the blood to the right side of the heart by veins *[veins transport deoxygenated blood, except for the pulmonary veins]* • the heart pumps the deoxygenated blood (contains carbon dioxide), to the lungs where it is, where it diffuses into the air that is *exhaled* out of the body	• Sheep/pig heart and lungs • Stopwatch/cell phone (for timing) • Posters and models or charts of torso, heart, kidney, digestive system, lungs, etc. • Video clips, laptops/smartphones or tablets, data bundle	• Measure and compare heart rates before and after exercise. Draw a bar graph of the results. Make deductions of the findings • Create a poster with a flow chart to show the sequence of the stages from **inhaling air** to **exhaling air**. 1. Indicate what happens with gases in each of the organs that form the respiratory system. 2. Indicate what happens with each of the following gases during **inhalation** and **exhalation**: - nitrogen - oxygen - water vapour - carbon dioxide
2 weeks	**Human Reproduction System**	• **reproductive system:** produces sex cells for the purpose of continuation of the species - the main processes include growth, cell division, maturation, copulation, ejaculation, ovulation, menstruation, fertilisation, implantation - the main components include testes, ovaries, uterus - health issues include infertility, foetal alcohol syndrome, STDs **Purpose and puberty** • the main purpose of reproduction is for the gametes (male and female sex cells) to combine for the continuation of the species • puberty is the stage in the human life cycle when sexual organs mature for reproduction. This process is initiated when the pituitary gland releases hormones into the blood stream, triggering the testes and ovaries to release sex hormones (testosterone and oestrogen) • testosterone (from the testes) and oestrogen (from the ovaries) cause secondary sexual characteristics such as menstruation, breast development, pubic hair, facial hair, deepening of the male voice **Reproductive organs** • the male reproductive organs include the penis, sperm duct (*vas deferens*), testes (produces sperm cells), scrotum, urethra • the female reproductive organs include the vagina, uterus, ovaries (contain egg cells/ ova), oviducts (Fallopian tubes)	• Posters and models or charts of torso and reproductive organs	• Label diagrams and explain processes involved in human reproductive system • Draw a flow chart to show the sequence of the stages in human reproduction • Research and writing about the effects of alcohol, smoking and drug abuse on the foetus [*Relate this to the role of the placenta*] • Debate and discuss issues such as abortion, infertility, surrogacy, contraception, population control

2026 Annual Teaching Plan
Natural Sciences: Grade 9

basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
		Stages of reproduction • once a month, one of the ovaries releases a ripe egg in a process called *ovulation* • in preparation for a fertilised egg, the uterus develops a thick layer of blood • if fertilisation does not take place, *menstruation* occurs • menstruation is the breakdown of the thick layer of blood in the uterus, which is released through the vagina • the menstrual cycle is usually a 28 day cycle • during *copulation*, the erect penis is inserted into the vagina and semen is released (*ejaculation*) • *fertilisation* is the fusion of the sperm and egg, producing a zygote • if fertilisation takes place, the fertilised egg is implanted in the blood layer in the uterus, and pregnancy results • the developing embryo/foetus is attached to the uterus wall by the placenta which plays a vital role in feeding and removing waste from the foetus • the stage of pregnancy in humans (gestation) is about 40 weeks • pregnancy can be prevented by using contraceptives such as condoms to prevent the sperm reaching the egg • condoms also prevent the transmission of HIV/AIDS and other STDs (sexually transmitted diseases), if used effectively		
2 weeks	**Digestive System**	• **digestive system:** breaks down food into dissolved nutrients that can be absorbed into the blood stream and transported to cells throughout the body - the main processes include ingestion, digestion absorption and egestion - the main components include the mouth, oesophagus, stomach, intestines, liver - health issues include ulcers, *anorexia nervosa*, diarrhoea, liver cirrhosis **Healthy diet** • a healthy diet (eating plan) requires different components including proteins, carbohydrates, fats and oils, vitamins and minerals, fibre and water • disorders of the digestive system can be related to inappropriate eating plans **The alimentary canal and digestion** • the alimentary canal is composed of the mouth, oesophagus, stomach, small intestine, large intestine, rectum and anus • digestion is the breakdown of food into a usable dissolved form There are two types of digestion: - mechanical digestion involves the physical breaking, crushing and mashing of food - chemical digestion involves the mixing food with digestive enzymes and hydrochloric acid *[no detail of the enzymes required]* • the structure of each part of the alimentary canal is adapted to its function *[no detail required]*	• Pictures of eating disorders • Video clips • Samples of food • Iodine solution • White paper • Ethanol (pure alcohol)	• Investigate to test for the presence of starch, fats and oils in food • Discuss a variety of unhealthy dietary components such as additives, and the harmful effects of some diets such as eating too much fast food and diets developed for weight loss
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	**Compounds**	**Briefly review and revise** concepts dealt with in Grade 8, focusing on compounds **The Periodic Table** *[**Note:** use the Periodic Table of Elements as a reference tool in the topics that follow]* • the elements can be classified into metals, non-metals and semi metals • the elements found in groups (vertical columns) have similar chemical properties • each element on the Periodic Table (in its own block) has an atomic number (smaller number), mass number (larger number), name and symbol • a formula/e is ratio of the symbols of the elements and number of atoms for each symbol in a compound **Names of compounds** • many compounds are named according to their elements, such as sodium chloride (table salt) which is made of the elements sodium and chlorine. But others have common names such as water and ammonia • some compounds have names such as carbon monoxide (CO), carbon dioxide (CO_2), sulfur trioxide (SO_3). In these compounds: - ***mono***xide- tells us that ***one*** oxygen atom has combined with the carbon atom - ***di***oxide- tells us that ***two*** oxygen atoms have combined with the carbon atom - ***tri***oxide- tells us that ***three*** oxygen atoms have combined with the sulfur atom	• Posters, e.g. the Periodic Table, Video clips, laptops/tablets/smart phones • **Laboratory equipment and materials:** Heat source (such as Bunsen burner or spirit lamp), matches, safety goggles, tongs/pliers, test tubes, test tube racks, glass containers, beakers/glass jars, evaporating tins, dropper, clamp, retort stand, iron filings, wireless carbon dioxide gas sensor, wireless temperature sensor, wireless pressure sensor, pH sensor • **Chemicals and materials:** Universal indicator, bromothymol blue or phenolphthalein, magnesium ribbon, magnesium oxide powder, sodium hydroxide, hydrochloric acid, steel wool, dish • **Perishables** and/or household substances: Vinegar, tartaric acid, lemon, soap, bicarbonate of soda, liquid soap, tea, rooibos, coffee, milk, fruit juices, fizzy drinks, plastic beads, beans, plasticine or playdough, red cabbage, red onion, turmeric	• Distinguish between pure substances and mixtures • Distinguish between elements and compounds • Identify the relevant elements, mentioned in the reactions studied, on the Periodic Table of Elements • Make models of compounds using beads, beans, or plasticine or playdough. • Write the names and the formulae (chemical symbols) of ALL the substances for every studied reaction. Write their balanced equations • Describe the neutralisation of an acid with a base using pH • Investigate a selection of household substances (such as water, tea and rooibos, coffee, milk, fruit juices, vinegar, tartaric acid, washing powder, bicarbonate of soda, salt water) to test whether they are acids, bases or neutrals using universal indicator and at least one other indicator (such as red cabbage water, red onion water, turmeric water, bromothymol blue, phenolphthalein). Record results (colour change) on a table and draw conclusions (acid, base or neutral) • Informal practical task/investigation based on teacher demonstrations
1 week	**Chemical Reactions**	**Chemical equations to represent reactions** • chemical reactions can be represented with models • chemical reactions are usually represented with symbols such as in chemical equations: For example: $C + O_2 \longrightarrow CO_2$ $2H_2 + O_2 \longrightarrow 2H_2O$ • the subscript number indicates the number of atoms of an element found in the formula • the numbers in front of the compounds indicate the ratio in which the molecules react. For example two molecules of hydrogen react with one molecule of oxygen to form water, therefore the ratio is 2:1 (H:O) • no atoms are lost or gained in the reaction, they are simply rearranged **Balanced equations** • chemical equations must be written as balanced chemical equations. The total number and type of atoms of the reactants is the same as in the products. The above equations are therefore balanced in the following way: $4Fe + 3O_2 \longrightarrow 2Fe_2O_3$ (brown rusty coating) $2Mg + O_2 \longrightarrow 2MgO$ (white powder) • another example is copper reacting with oxygen to form copper oxide. This is a very slow reaction - *word equation*: *copper + oxygen* ⟶ *copper oxide* - *chemical equation*: $2Cu + O_2 \longrightarrow 2CuO$ *[Learners are not required to write the formulae/symbols for other word equations]* ***Note:*** Grade 9 learners must write the names and the formulae (chemical symbols) of ALL the substances for every reaction that follows. *They must also identify the relevant elements, mentioned in the reactions, on the Periodic Table of Elements*		

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
2 weeks	**Reaction of Metals with Oxygen**	**The general reaction of metals with oxygen** • some metals react with oxygen during burning (combustion) • when a metal reacts with oxygen, a metal oxide is formed as a product. The general equation for this type of reaction is always: *metal + oxygen* ⟶ *metal oxide* **Reaction of iron with oxygen** • when the metal iron is burnt in air (which contains oxygen), the reaction forms iron oxide as a product - word equation: iron + oxygen iron oxide - chemical equation: $Fe + O_2 \longrightarrow Fe_2O_3$ **Reaction of magnesium with oxygen** • when the metal magnesium is burnt in air (which contains oxygen), the reaction forms magnesium oxide as a product - word equation: magnesium + oxygen magnesium oxide - chemical equation: $Mg + O_2 \longrightarrow MgO$ **Formation of rust** • rusting is a slow chemical reaction of iron metal, with oxygen and moisture (water) to form a complex compound part of which is iron oxide. • rust (a form of corrosion) only occurs at the surface of the iron exposed to the air • steel (which consists mostly of iron) is an essential material in modern construction. Equipment and structures can rust, and weaken **Ways to prevent rusting** • iron and steel can be painted to keep away moisture and oxygen • iron and steel can be coated with a thin layer of chromium or zinc (metals which do not rust) This is done by an electroplating technique which is a form of electrolysis		
1 week	**Reactions of Non-Metals with Oxygen**	**The general reaction of non-metals with oxygen** • non-metals react with oxygen to form non-metal oxides • when any non-metal is burnt in excess oxygen, the general equation is always: non-metal + oxygen non-metal oxide **Reaction of carbon with oxygen** • when the non-metal carbon is burnt in oxygen, carbon dioxide is produced - word equation: *carbon + oxygen* ⟶ *carbon dioxide* - chemical equation: $C + O_2 \longrightarrow CO_2$ **Reaction of sulfur with oxygen** • another example is sulfur reacting with oxygen to form sulfur dioxide - word equation: sulfur + oxygen ⟶ sulfur dioxide • chemical equation: $S + O_2 \longrightarrow SO_2$		
1 week	**Acids & Bases, and Ph Value**	**The concept of pH value** • pH is a measure of how acidic or basic a substance is. The pH scale ranges from 1 to 14 • acids have a pH in the range of 1 to 7. Strong acids have very low pH values • bases have a pH in the range of 7 to 14. Strong bases have very high pH values • a neutral substance has a pH of 7 • we use chemical indicators (such as universal indicator, litmus paper, red cabbage water, red onion water, turmeric water, bromothymol blue, phenolphthalein) to tell us whether a substance is an acid, base or neutral • universal indicator has the ability to indicate the full range of pH values on the pH scale by colour		

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
		changes - acids change the colour of universal indicator towards the yellow, orange and red colours - bases change the colour of universal indicator towards the blue and purple colours • neutral substances (pH 7), change the colour of universal indicator to green		
1 week	Reactions of Acids with Bases: Part I	**Neutralisation and pH** • acids and bases react together, we call this a neutralisation reaction • a base reacts with an acid, to make it less acidic/neutral • an acid reacts with a base, to make it less basic/neutral • acids commonly used in the laboratory include sulphuric acid (H_2SO_4) and hydrochloric acid (HCl) • after reacting an acid and a base together, the resultant pH will vary based on the strength of the acid and base reactants • non-metal oxides tend to be acidic (low pH) • bases (high pH) include metal oxides, metal hydroxides, metal carbonates		
1 week	Reactions of Acids with Bases: Part II	**The general reaction of an acid with a metal oxide (base)** • when metals react with *oxygen*, they tend to form oxides which are bases *(see reactions of metals with oxygen)* • when any acid reacts with a metal oxide, the products formed are *a salt* and *water*. The type of salt formed will depend on the specific acid and metal oxide used in that reaction • the general equation is always: *acid + metal* ⟶ *oxide salt + water* *Example*: - word equation: hydrochloric acid + magnesium oxide magnesium chloride + water - balanced chemical equation: $2HCl + MgO \longrightarrow MgCl_2 + H_2O$ **Applications** • burning wood and fossil fuels releases carbon dioxide and sulfur dioxide into the atmosphere. These combine with water in the atmosphere to produce acid rain • limestone ($CaCO_3$) is used in agriculture to make soil less acidic		
2 weeks	**Remediation, revision and consolidation**			
SBA (FORMAL ASSESSMENT)	• Practical task/investigation • Test			

Energy and change

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
2 weeks	**Forces**	**Types of forces** • a force is a push or pull (or twist) exerted upon an object • force is measured in units called newtons (N) • forces that two objects exert on each other always act in pairs • a force can change the shape, direction and speed of an object • all forces acting on objects can be placed into two broad groups: - contact forces - field forces **Contact forces** • a contact force (including friction, tension, compression) results when two bodies are in contact (touch) with each other **Field forces (non-contact forces)** • field forces result from action-at-a-distance between two bodies • common examples of field forces include gravitational, magnetic and electrostatic forces - **Gravitational force:** gravity is the force of attraction (pull) that objects/bodies have on one another due to their masses. For example the attraction of Sun and planets, Earth and Moon, Earth and objects on the surface (people and things) ✓ objects with greater mass have more gravitational pull on each other ✓ force decreases as distance between the objects increases *(refer to Grade 7 Planet Earth & Beyond)* ✓ force of gravity is measured in newtons (N) ✓ the weight of an object is the gravitational force exerted on it by the Earth (or the Moon, or another planet). It is also measured in newtons (N) o the mass of the object stays the same no matter where it is determined o however, the weight of an object will change when weighed in different places with different gravitational force such as on Earth compared to the Moon • **Magnetic force:** magnets attract magnetic substances including iron, steel, cobalt, nickel - all magnets have two ends/poles (north & south) ✓ opposite poles attract and like poles repel each other (magnetism is the push or pull force) ✓ just like a bar magnet, the Earth has a magnetic field (north and south poles) • **Electrostatic force:** When certain materials are rubbed together, they can acquire an electrostatic charge as a result of the loss or gain of electrons *[**Note**: only the electrons are transferred, protons cannot move]* - during rubbing, 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 - objects which have like charge (+ and + or - and -) repel (push) each other and those with unlike charge (+ and -) attract (pull) each other *(refer to Gr 8 Energy & Change)* - charged objects in an electrostatic system possess potential energy. The energy comes from the work done during rubbing - a thunder cloud becomes charged by the rubbing together of air and water particles moving past each other in the atmosphere ✓ a lightning strike occurs when there is a massive discharge (release of charge) between the thunder cloud and the ground. Lightning is a giant spark of electricity • safety precautions should be considered during thunder and lightning storms	• **Laboratory equipment:** Wireless light sensor, and wireless temperature sensor, wireless pressure sensor, wireless voltage and current sensors, bar magnets, metal paper clips, spring balance, triple beam balance or electronic scale, iron, aluminium, steel, glass rod, PVC rod, plastic ruler, curved watch glasses, Perspex rods, Van de Graaff generator • **Materials:** Wooden or metal blocks (sponge or piece of foam, balls of the same volume, different masses (one set per pair), wooden blocks with different known masses or mass pieces, wooden block with a hook, calculator, hammer, feathers, two balls of the same mass, different volumes (one set per pair) • **Perishables:** Balloons, putty or play dough, graph paper, plastic, piece of knitted fabric (wool), cloth (wool or nylon) • Video clips, laptops/tablets/smart phones	• Explain and demonstrate the two broad groups of forces • Demonstrate and explain the similarities and differences between gravitational, magnetic and electrostatic forces • Make a table of the differences between mass and weight • Give the scientific explanation of how lightning occurs • Construct the circuit with the cell, the ammeter, 1 bulb and the switch in series. Draw a circuit diagram • Investigate the effect of the number of cells connected in series on current and potential difference. Write a hypothesis for this investigation. Record the readings on the ammeter and voltmeter in the table and draw a graph of the results. Draw conclusions and make deductions about the findings • Investigate the relationship between the potential difference across the battery and the potential difference across the resistors in a series circuit; - how the length of a conductor affects the resistance; - the current and potential difference in a circuit when adding cells in parallel; - the current strength when adding resistors in parallel circuits; - the relationship between the potential difference across the battery; and - the potential difference across the resistors in a parallel circuit • Identify series and parallel circuits in electrical wiring in homes, cars and toys. Draw the plan for wiring a house. Draw series and parallel circuit diagrams • Identify fuses, circuit breakers, earthing and Earth leakage systems in real circuits, or on circuit diagrams • Measure voltages across resistors and the current through them accurately • Explain advantages and disadvantages for series and parallel circuits • Draw and interpret various circuit diagrams • Distinguish between series and parallel
½ week	**Electric Cells as Energy**	**Electric cells** • a cell is a system in which certain chemical reactions can cause the flow of electricity through an	• **Laboratory equipment:** Wireless light sensor, wireless temperature sensor,	

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
	Systems	external circuit • cells are a source of electricity • a battery is a group of cells that are connected together	wireless pressure sensor, wireless voltage and current sensors, ammeters, 250 ml beakers, copper electrode, zinc electrode, crocodile clips, • **Materials:** Zinc strips, nails,, copper strips or coins, LED bulbs, insulated copper conducting wires, copper sulphate, zinc sulphate, sodium sulphate, a U tube (this can be made from a plastic tube which is bent) or filter paper soaked in the salt bridge solution, graphite rod or graphite pencil, torches, light bulbs, batteries (AA), 1,5 V cells, metre rulers • **Perishables:** Lemons (or potatoes), salt (sodium chloride), cotton wool • Video clips, laptops/tablets/smart phones	circuits in the wiring of the home, cars and toys and explain the differences • Describe the national energy supply grid and the impact of electricity generation on the environment • Practise how to connect 3-pin plugs
1½ weeks	**Resistance**	**Uses of resistors** • conductors (even good conductors) heat up when current passes through them: some energy is 'lost'/'wasted' as heat. All conductors have some resistance • a resistor is a conducting material selected to control the current or to provide useful energy transfer, such as in bulbs, rheostats, motors, light sensitive diodes, light emitting diodes **Factors that affect resistance in a circuit** • type of material: different conducting materials have different resistance to an electric current • thickness of the conductor: thinner wires have more resistance than thicker wires • length of the conductor: longer wires have more resistance than shorter wires • temperature of the conductor: generally hotter conductors (metals) have higher resistance than colder conductors		
2 weeks	**Series and Parallel Circuits**	**Series circuits** • when ***cells*** are connected together in series, the total voltage is the sum of the voltages (potential differences) of individual cells • ***resistors*** can be connected in series in a circuit • the total voltage across the battery is the same as the sum of the voltages across each of the resistors - a resistor with higher resistance will have higher voltage across it - a resistor with lower resistance will have a lower voltage across it • the current is the same when measured at any point in a given series circuit • the total current *decreases* with each resistor added in series to the circuit **Parallel circuits** • when ***cells*** (of same voltage) are connected in parallel, the voltage across them is the same as for one cell. • ***resistors*** can be connected in parallel in a circuit • the voltage is the same across each resistor connected in parallel • The total current through the battery is the same as the sum of the currents through the resistors • the total current in the circuit *increases* with each resistor added in parallel • the lighting system in our homes is usually connected in parallel. If one light bulb fuses (filament breaks), the rest of the lights remain on because they are each connected in their own parallel pathway, to the mains circuit • resistors are manufactured to have accurate resistances to control current • for two circuits with the same total voltage: - the current will be bigger in a circuit with low resistance - the current will be smaller in a circuit with high resistance		
½ week	**Safety with Electricity**	**Safety practices** • parallel connections can cause overload on mains circuits • circuit breakers, fuses and earth leakage systems are used as safety devices • many appliances have a 3-pin plug as a safety device to connect to the main circuit • the 3-pin plug has a live wire, neutral wire and an earth wire - the earth wire is connected to the metal case of the appliance, such as in a kettle. The earth wire is connected via the wall plug to an earth cable in the ground - the earth cable has almost zero resistance, so if the metal casing of an appliance becomes		

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
		charged due to a fault, the charge is safely discharged to the ground • illegal connections to the ESKOM mains supply can be dangerous, and are regarded as energy theft		
1 week	**Energy and the National Electricity Grid**	**Electricity generation** • a power station is a system for generating electricity • most power stations in South Africa use coal as a fuel to boil water • the steam from the water turns a turbine which turns a generator, which produces electricity • there are other alternative sources of energy besides coal, the internet that can be used to drive turbines and generators including wind, falling water (hydroelectric), sun-heated steam, nuclear fission, waves in the sea **Nuclear power in South Africa** • a nuclear power station such as Koeberg in the Cape, uses • radioactive fuel, the radioactivity produces heat by nuclear fission. The heat is then used to boil water to produce steam • the steam from the water turns a turbine which turns a generator, that produces electricity. The electricity is then channelled into the national electricity grid • spent nuclear fuel (nuclear waste) is still radioactive and remains so for many hundreds of years, therefore it needs to be properly disposed of so it is not a danger to life for years to come **National electricity grid** • the national grid is a network of interacting parts (a system): change in one part of the grid affects other parts of the grid - power stations feed electrical energy into the national grid at high voltages - power lines carry electricity at high voltages - transformers step down the voltage for local distributors and consumers: 15% of energy is wasted due to heating of transmission lines and transformer *[No details are* required *of alternating current or step-down transformers]* • power surges and grid overload can disrupt the power supply		
1½ week	**Cost of Electrical Power**	**The cost of power consumption** • electrical power is the rate of electrical energy supply • electrical power is measured in units called watts (W) or kilowatts (kW) *[one watt of power is equal to one joule of energy supplied in a second (I watt = 1 joule per second)]* • consumers pay for the quantity of power they use - quantity of electrical power used is measured in kWh (kilowatt hours) - the cost to the consumer is calculated in the following way: *cost = power rating of the appliance × the number of hours it was used × the unit price of electricity* • the energy consumption of different appliances (such as incandescent and compact fluorescent lamps) varies • there are also alternative appliances/systems such as solar heating panels for heating water		
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
1 week	**The Earth as a System**	**Spheres of the Earth** • the Earth can be understood as a complex system where all the parts (called spheres) interact with each other • four spheres interact on or near the surface of the Earth: - the lithosphere consists of solid rock and soil - the hydrosphere consists of water in all its forms - the atmosphere is a layer of gases around the Earth • the biosphere consists of all living plants and animals and their interactions with rocks, soil, air and water	• Laboratory equipment and materials, e.g. wireless light sensor, wireless temperature sensor, wireless CO2 sensor • Video clips, laptops/tablets/smart phones	• Writing to explain the interaction between the sphere's lithosphere, hydrosphere, atmosphere, biosphere • Worksheet (translation task) on the lithosphere • Writing and make labelled drawings to explain the rock cycle • Making a model to show the greenhouse effect • Investigating and reporting on the impact of global warming • Reading about how metal is extracted from ore • Investigating/demonstrating how lead is extracted from ore by heating lead oxide on a carbon block • Illustrating physical separation processes used in mining (hand sorting or sifting stones from sand) • Researching and writing about a mining activity in South Africa Sequencing, explaining and presenting an information poster on the birth, life and death of stars
1½ weeks	**Lithosphere**	**Lithosphere** • the Earth consists of four concentric layers called the inner core, outer core, mantle and crust *(link to Grade 7 Social Sciences)* • the lithosphere ('*lith*' means '*rock*') has three layers: the solid outermost part of the mantle, the crust and the soil • different combinations of elements and compounds form minerals such as copper, gold and hematite (iron oxide) in the crust **The rock cycle** • the rock cycle is the natural continuous process in which rocks form, are broken down and re-form over long periods of time • there are three rock types: igneous, sedimentary and metamorphic rocks • the rock cycle can be explained in the following steps: - molten rock from the mantle (magma) pushes up through the crust - pools of magma cool down slowly in the crust to form igneous rocks, like granite - some magma escapes to the surface as a volcano - this magma cools down rapidly to form igneous rocks, like pumice stone - rocks on the surface of the Earth are weathered by heat, cold, wind and water to form smaller particles - wind and water transport these particles to flood plains and the sea by erosion - the particles are laid down as sediments - the sediments are covered by more layers **The rock cycle** – explained in steps • the pressure of many layers turns the lower layers into sedimentary rock like sandstone • hot magma heats the surrounding rock and changes its chemical structure to form metamorphic rock like slate from shale or marble from limestone • some rock is pushed below the crust, melts and becomes magma again		
1½ weeks	**Mining of Mineral Resources**	**Extracting ores** • people extract valuable minerals from the lithosphere • rock that contains high concentrations of a valuable mineral is called an ore • the ore is removed from the crust by mining • some minerals can be used in their natural form such as sand, potash, diamonds **Refining minerals** • some other minerals require a chemical or physical process to extract the required material such as iron from iron-ore (chemical) or gold from gold-ore (physical) • knowledge of iron and copper extraction is thousands of years old		

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
		- iron ore was heated with charcoal to make lumps of iron - South African archaeological sites in KwaZulu Natal and Limpopo provide evidence for this • modern processes mix coke (a form of carbon made from coal) and other metals with iron to produce steel **Mining in South Africa** • there is large scale mining activity in South Africa • this activity has significant environmental impacts such as - creation of mine dumps - pollution of water resources - damage to places with high tourist or cultural heritage value • loss of farming and wild life environments		
1½ weeks	**Atmosphere**	**Atmosphere** • the atmosphere is the mixture of gases held around the Earth by gravity • this mixture is known as air and consists of nitrogen (78%), oxygen (21%), carbon dioxide (less than 1%), and other gases, including water vapour (1%) • the density of the gas particles decreases as the distance from the Earth increases (the further away from the Earth, the thinner the air) • the atmosphere has four layers: troposphere, stratosphere, mesosphere, thermosphere • each layer has a different temperature gradient • temperature gradient is how much the temperature changes with height above sea level (altitude) **Troposphere** • this layer extends from sea level to about 10 km above the surface of the Earth • it contains more than 70% of the mass of the atmosphere (particles closest together) and it has the greatest density • the temperature decreases as the distance from the surface increases (the further away from the Earth, the colder the air) • weather occurs in this layer • all animals and plants live in this layer **Stratosphere** • this layer extends from about 10 km to about 50 km above the Earth's surface • the air in the stratosphere is very thin compared to the air in the troposphere • some aeroplanes fly as high as the stratosphere • the stratosphere includes a band of ozone gas (O_3) which absorbs ultraviolet radiation from the Sun • this absorption of ultraviolet radiation increases the temperature of the stratosphere – as a result, the further away from the Earth, the warmer the air becomes • too much ultraviolet radiation interferes with life on Earth (human health, photosynthesis, life cycles and sizes of populations of species) **Mesosphere** • this layer extends from about 50 – 80 km above the Earth's surface • the air is extremely thin and very cold • there is still enough air in this layer to burn up small rocks and dust entering from space • burning rocks are visible from the Earth and known as 'shooting stars' **Thermosphere** • this layer starts above 80 km from the Earth (the thermosphere slowly diminishes at about 350		

Duration	CAPS Topics	Core Concepts, Skills and Values	Resources to Enhance Learning	Informal Assessment
½ week	Birth, Life and Death of Star	km and space begins after that. Satellites orbit much further away) • the International Space Station (ISS), where astronauts work in space orbits the Earth at a height of about 370 km • the lowest part of the thermosphere absorbs ultraviolet radiation and dangerous X-rays from the Sun • it also reflects radio waves back to Earth for TV and radio broadcasts **The greenhouse effect** • the greenhouse effect is a natural phenomenon – it warms the atmosphere sufficiently to sustain life • greenhouse gases trap the ultraviolet radiation which then warms the air closest to the surface of the Earth (like inside a greenhouse) • the most common greenhouse gases are carbon dioxide, water vapour and methane • an increase in greenhouse gases leads to global warming • global warming is an increase in the average temperature of the atmosphere • global warming is a potentially life threatening problem on Earth. It can lead to: - climate change - rising sea levels - food shortages • mass extinctions **The birth of a star** • stars exist for a finite period of time • stars form inside huge clouds of gas and dust called *nebulae*, far out in space • these *nebulae* (huge amounts of dust and gas) are pulled together by gravity and slowly collapse • as they contract they heat up • once the temperature is high enough a nuclear fusion reaction begins, that changes hydrogen to helium • this reaction radiates large amounts of energy into space **Life of a star** • stars change in their appearance over billions of years • stars that look blue are hotter and usually younger than stars that appear red • our Sun is about half way through its life cycle – it is a medium-sized yellow star with a lifespan of about 9 billion years • for most of their life, stars change hydrogen to helium • later, towards the end of their life, stars like the Sun will swell up to form a 'red giant' **Death of a star** • at some point the nuclear reaction runs out of fuel • for stars like the Sun, the core of the star contracts to become a 'white dwarf' • for stars like the Sun, the outer gases of the star are ejected into space, where they form an expanding cloud around the white dwarf called a *planetary nebula* • *planetary nebulae* are lit up by their central white dwarf star and are beautiful objects to observe		
3 weeks	Remediation, revision and consolidation			
SBA (FORMAL ASSESSMENT)	• Test			

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?