MINISTRY OF EDUCATION AND DEVELOPMENT

Department of Education

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BERMUDA PUBLIC SCHOOL SYSTEM
SCIENCE PERFORMANCE STANDARDS SUMMARY

MISSION STATEMENT

The mission of the Bermuda Public School System
is to be the 1st choice in education
by providing rigorous and stimulating learning experiences
in safe, responsive environments
from which our students emerge confident and prepared
to compete and contribute locally and globally.

November 2006

Quality Education for All

Science (SC)

BERMUDA SCIENCE PERFORMANCE STANDARDS (SC)

The study of science is an intellectual and social endeavour – the application of human intelligence to figuring out how the world works.

Benchmarks for Science Literacy: Project 2061 (1993)

The *Bermuda Science Performance Standards* document is an amalgam of widely respected science documents that have been developed in many different countries, including the United Kingdom, United States and Canada. As is easily recognizable in standards documents from other jurisdictions, *Benchmarks for Science Literacy* has been used as the basis for *Bermuda Science Performance Standards.* Science in the schools provides an introduction to many different scientific disciplines from the traditional physics, chemistry and biology to geology, environmental science and meteorology. These standards are therefore wide ranging and provide the foundation for not only scientific literacy, but also the critical knowledge and skills for those who intend to study science as a requisite for their careers.

The National Science Education Standards (NSES, National Research Council, 1995) define scientific literacy as the knowledge and understanding of scientific concepts and processes which are required for participation in civic and cultural activities, economic productivity and personal decision making. The philosophy of The Bermuda Science Curriculum (Bermuda Ministry of Education, 1997) echoes the intent of the NSES statement and indicates that science education should empower all students to make informed choices concerning personal, societal, environmental and technological issues, thus fostering an appreciation and a sense of responsibility for the future.

In Bermuda, science is considered a critical component of education for *all* children and is therefore mandated as a core subject from preschool through to senior school. *The Bermuda Science Performance Standards* are not a curriculum. They provide the framework for our year-by-year science curriculum that spans the fourteen years from preschool to senior school. They expand the "what" students should know and be able to do to the "how" and "to what extent" students should demonstrate their understanding of scientific concepts and skills.

As stated in the National Curriculum for England, the standards must be "*robust enough to define and defend the core of knowledge and cultural experience and flexible enough to give teachers scope to build their teaching around it in ways that will enhance its delivery to pupils*" (The National Curriculum for England, 2000).

The Bermuda Science Performance Standards are categorized into four (4) strands, recognizable as organizers in curriculum documents of many jurisdictions:

1. **Physical Science (P)**
2. **Life Science (L)**
3. **Earth and Space Science (E)**
4. **Nature of Science (N)**

The first three strands, communicate the knowledge and concepts of science using traditional categories. The Nature of Science emphasizes the way that science and scientists work and how, together with mathematics and technology, the world has been shaped by human endeavour.

The strands are divided into standards that spiral throughout the compulsory years of the science programme in Bermuda. When the goal is deep understanding it is essential for concepts to be revisited over time. Standards are further broken down into indicators for assessment.

Students show conceptual understanding when they can:

- *use a concept accurately to explain observations and make predictions, first in familiar then unfamiliar situations*
- *represent the concept in a variety of ways including words, diagrams, charts and graphs, as appropriate*

Both aspects of understanding – explaining and representing – are required to meet the standard.

PHYSICAL SCIENCE (P)

Physical science, which consists of concepts of chemistry and physics, involves the study of matter and materials, forces and energy. There are four (4) physical science standards.

The student will produce evidence that demonstrates understanding of:

- **P1** **Matter and Materials** - their properties, components, interactions and changes
- **P2** **Force and Motion** - the relationship between force, mass and motion of an object and the nature and interaction of waves and matter
- **P3** **Energy** - the sources and forms of energy, including transmission and transformations and how energy helps explain the structure of matter and the universe
- **P4** **Forces of Nature** - gravitational, electrical and magnetic forces as the fundamental forces acting in nature

LIFE SCIENCE (L)

Life Science, which consists of concepts of biology and ecology, deals with the diversity of living organisms, their organization, life processes, relationships with one another and their environment. There are six (6) Life Science standards.

The student will produce evidence that demonstrates understanding of:

- **L1** **Diversity of Life** - the variety of living things and the processes responsible for the maintenance of life
- **L2** **Heredity** – biological traits and how they are passed on from generation to generation
- **L3** **Cells, Organs and Organ Systems** – the structure, function and reproduction of cells that maintain the organization essential for life and specialized organs systems that interact with each other to maintain internal balance
- **L4** **Interdependence of life** – relationships amongst organisms and their dependence on their environment
- **L5** **Flow of Matter and Energy** - the linking of organisms to one another and their physical setting by the transfer and transformation of matter and energy
- **L6** **Evolution of Life** – the evolution of life on earth and natural selection as an explanation of biological processes

EARTH AND SPACE SCIENCE (E)

Earth and Space Science consists of concepts of astronomy, geology, resources, meteorology and oceanography. Earth and space science involves the study of the earth, the universe, their components and interactions. There are five (5) Earth and Space Science standards

The student will produce evidence that demonstrates understanding of:

- **E1** **Astronomy** - the current scientific view of the nature, components, matter and energy sources of the universe
- **E2** **Geology** - the features of the earth's surface, how they were formed and how they are continually changing
- **E3** **Resources** -the earth's limited and varied materials that supply many of the resources that humans use
- **E4** **Meteorology** - the interactions of structures of the earth's system and the sun's energy which cause weather and climate patterns
- **E5** **Oceanography** -the features of oceans and the impact of these features on the global ecosystem

NATURE OF SCIENCE (N)

The Nature of Science strand consists of the understanding and application of scientific investigative techniques and data analysis. Nature of Science also involves the study of the interrelationships among science, technology, and society. There are three (3) Nature of Science standards.

The student will produce evidence that demonstrates understanding of:

N1 **Scientific Investigation -** People can often learn about things around them by just observing those things carefully, but sometimes they can learn more by doing something to things and noting what happens. Investigations are conducted for different reasons, which include exploring new phenomena, checking on previous results and comparing different theories. Investigations usually involve collecting evidence, reasoning, devising hypotheses, and making predictions.

N2 **Data Representation and Interpretation -** Data must be analysed in order to make sense of what has been collected. Sometimes the evidence collected might not be what you expected or might not be sufficient to draw a conclusion. Clear and accurate communication is important in doing science and an essential part of sharing an investigation order to inform others.

N3 **Designed World: Science, Technology and Society** - Over the course of the history of world exploration, humans have shaped and reshaped the world we live in by using technology in tandem with expanding science knowledge. Science cannot answer all questions and technology cannot solve all human problems or meet all human needs. Science influences society through its knowledge and world view. Technology influences society through its products and processes. Science and technology have advanced through contributions of many different people, in different cultures, at different times in history.

REFERENCES

It should be noted that there is a great deal of similarity amongst standards. The main sources for the Bermuda Performance Standards document contain hundreds of pages of detail that cannot be provided in the *Bermuda Science Performance Standards*. If further amplification of standards is required, it would appropriate to research the sources cited in this section.

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National Center on Education and Economy and the University of Pittsburg. (1995*) New Standards Performance Standards* Washington, DC and Pittsburg, PA: Hartcourt Brace
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SCIENCE (SC) PERFORMANCE STANDARDS
for
PHYSICAL SCIENCE (P)

Physical Science (P)
Physical science, which consists of concepts of chemistry and physics, involves the study of matter and materials, forces and energy.
Conceptual understanding should be demonstrated by

- *Using a concept accurately to explain observations and make predictions*
- Representing the concept in a variety of ways including words, diagrams, charts and graphs, as appropriate

	SC.P3.P	SC.P4.P	SC.P5. P	SC.P6. P	SC.M1. P	SC.M2. P	SC.M3. P	SC.S1. P	SC.S2. P
Students will produce evidence that demonstrates understanding of:									
1. Matter and Materials - their properties, components, interactions and changes	a) Materials have different properties that can be observed, described and recorded. Materials can be divided into different groups such as metal, wood, plastic, rock, glass . Materials can be used for different purposes because of their properties. b) Materials can be solid, liquid or gas. Assessment limits: • Including very basic understanding of properties • basic under standing of concepts of melting/freezing and that evaporation results in liquid "disappearing"	a) Understand the basic properties of solid, liquid, gas. Assessment limits: • solid is hard/firm • liquid flows, etc. b) Materials can be changed by heating and cooling. Heating makes things happen faster. These changes can be measured. Assessment limits: • Including terms freezing, melting, evaporating c) Materials have different properties that can be observed, described and recorded. Assessment limits: • group, identify, and order objects based on their physical properties	) Materials can be compared, grouped, ordered based on their attributes. Assessment limits: • mass, volume, temperature, length) Matter can be mixed and separated.) Matter can be composed of parts too small to see with the naked eye.	a) Sometimes matter will not change back after it has been changed. b) New materials can be made by combining two or more materials. Assessment limits: • chemical and physical changes – test concept but not terms c) Matter has mass/weight and volume. Assessment limits: • understand properties of solids and liquids	a) Matter cannot be created or destroyed, but merely changed. Assessment limits: • conservation of mass in a closed system Physical properties of matter can be measured and changed. Equal volumes of different substances usually have different weights. Assessment limits: • phase change • measurement tools rulers, graduated cylinders, balances, thermometers • density – can calculate given formula b) Materials can be classified as pure substances or mixtures, depending on their chemical and physical properties. Assessment limits: • e.g., pure substances have specific melting and boiling points no matter how much is present	) Chemical changes occur when one or more substances react together to form another substance with different properties. Assessment limits: • chemical vs. physical changes • recognition of occurrence of physical or chemical change) Chemical reactions can be represented by using appropriate symbols, formulas and chemical equations. Assessment limits: • symbols and/or formulas for substances such as water, carbon dioxide, sodium chloride, hydrogen, oxygen, nitrogen, magnesium, magnesium oxide, magnesium hydroxide (milk of magnesia), magnesium sulphate (Epsom salts) hydrochloric acid, vinegar, baking soda	a) Matter is made up of atoms that are too small to see, even using a microscope. Atoms of any element are alike, but different from atoms of other elements. Atoms are composed of a positively charged nucleus (containing neutrons and protons (+ve) and surrounded by electrons (-ve) Atoms may combine to form new molecules. b) These particles are in constant motion. Increased temperature means greater energy of motion. Assessment limits: • use of particle model – states of matter, phase changes • conservation in a closed system.	a) Matter is composed of atoms and molecules or ions. b) Atoms are composed of electrons protons and neutrons. Assessment limits: • When using the term atomic mass, also include mass number (i.e., atomic mass or mass number). c) Elements are placed in the periodic table based on the structure of their atoms. Assessment limits: • reactivity trends across period and down groups • families (alkali metals, alkaline earth metals, halogens, noble gases • coinage metals, and transition metals.	) Reactions of elements depend on the arrangement of electrons in the atom.) Compounds are formed when atoms of elements combine by gaining, losing (transferring) or sharing electrons. Assessment limits: • ionic vs. covalent bonding • ionic compounds such as sodium chloride, covalent compounds such as hydrogen, water, methane, hydrogen chloride • Lewis dot structures for electron configuration of same c) The arrangement of particles (atoms, molecules, ions) in a substance determines its structure and properties. Assessment limits: • diamond, sodium chloride, graphite, metallic bonding

Physical Science (P)	SC.P3.P	SC.P4.P	SC.P5. P	SC.P6. P	SC.M1. P	SC.M2. P	SC.M3. P	SC.S1. P	SC.S2. P
(continued) ***Students will produce evidence that demonstrates understanding of:***									
1. Matter and Materials - their properties, components, interactions and changes					c) Mixtures are made of elements and/or compounds and they can be separated using properties of substances from which they are made such as density, solubility, particle size and boiling point. Assessment limits: • describe techniques and filtration, distillation, decanting process • apply in new situations d) Pure substances can either be elements or compounds and cannot be broken down by physical means. Assessment limits: • name some common elements and compounds- such as carbon, oxygen, hydrogen, nitrogen, sugar, common salt, water, vinegar, coinage metals, carbon monoxide, carbon dioxide, hydrogen peroxide and terms such as gasoline and fuel	• counting atoms in a given formula • chemical reactions - reactant vs. product in a reaction • some examples of chemical reactions – dilute acid , vinegar, with calcium carbonate forming carbon dioxide; peroxide and manganese dioxide forming oxygen • acids and bases, include testing using litmus paper, pH strips or solution (broad categories only – acid range, alkaline range and neutral) (c) Burning and rusting are examples of oxidation – when oxygen is combined with another substance. Assessment limits: • burning of magnesium, carbon, wax, hydrogen, fossil fuels • using up oxygen as things burn (candle experiment • rusting – especially Bermuda context – salt air makes things rust faster.	c) About 100 different elements have been identified, out of which everything is made. Some groups of elements have similar properties. The periodic table is a classification system of elements. Assessment limits: • Mendeleev's contribution • broad structure – metals/nonmetals, groups and periods, families alkali metals, alkaline earth metals, halogens, noble gases, coinage metals • symbols for first 20 elements and coinage metals d) Chemical changes occur when one or more substances react together to form another substance with different properties. Chemical changes can be represented by using appropriate symbols, formulas and chemical equations.	c) About 100 different elements have been identified, out of which everything is made. Some groups of elements have similar properties. Some elements do not fit into any categories, such as carbon and hydrogen, the essential elements of living matter. The periodic table is a classification system of elements. c) Chemical changes occur when one or more substances react together to form another substance with different properties. Burning and rusting are examples of oxidation, when oxygen is combined with another substance. Some factors that influence reaction rates include temperature, and particle size.	c) Chemical formulas and balanced equations are used to represent chemical reactions. Assessment limits: • types of reaction include synthesis, single and double displacement, decomposition, oxidation; acid/base – neutralization • acids, bases and salt formation • full pH scale, write formulas and balance simple equations c) Factors that affect reaction rates include temperature, concentration, and particle size of the reactants, catalysts.

Physical Science (P)	SC.P3.P	SC.P4.P	SC.P5. P	SC.P6. P	SC.M1. P	SC.M2. P	SC.M3. P	SC.S1. P	SC.S2. P
(continued) ***Students will produce evidence that demonstrates understanding of:***									
1. Matter and Materials - their properties, components, interactions and changes						d) Reaction rates can be changed by certain factors. Assessment limits: • identify faster reaction rate from diagram or description • suggest how a reaction rate can be made faster	Assessment limits: • name simple compounds using standard convention e.g. oxides, chlorides • identification and counting atoms in an unfamiliar formula • word equations only terms – reactant and product; reactions include metal + acid forming hydrogen, metal carbonate+ acid forming carbon dioxide; manganese dioxide + hydrogen peroxide forming oxygen; acid +base =neutralization • chemical reactions that occur in the human body and during photosynthesis e) Some factors that influence reaction rates include temperature and particle size.		

Physical Science (P)	SC.P3.P	SC.P4.P	SC.P5. P	SC.P6. P	SC.M1. P	SC.M2. P	SC.M3. P	SC.S1. P	SC.S2. P
Students will produce evidence that demonstrates understanding of:									
2. Force and Motion - the relationship between force, mass and motion of an object and the nature and interaction of waves and matter	a) The way to change how an object is moving is to push it or pull it (apply a force). The heavier the object, the bigger the push or pull it needs to move it (understand relative positions of objects). b) Simple tools and machines apply pushes and pulls (forces) to make things move easier (include levers, ramps).				a) Unbalanced forces acting on an object will change the speed of the object or the direction in which it is traveling and sometimes its shape. The larger the force, the greater the change in motion will be. When two substances that are touching move past each other, a frictional force is produced. Assessment limits: • canceling effect of balanced forces; • gravitational force and weight- earth, space, moon • force has both magnitude and direction (e.g. use of spring scale, dropping /kicking ball) • formula speed=distance/time (apply to problem)	a) Work is the use of force to move an object. Assessment limits: • work (w)= force (f) x distance (d) • use of spring scale • energy transferred when work is done • unit joule	a) Vibrations such as sound and earthquakes set up wave like disturbances that spread away from the source much like water waves. Sound waves enter the ear causing hearing, just as emission or reflection of light waves causes 'seeing.' Light travels in a straight line and can be reflected, refracted or absorbed. Assessment limits: • recognize, compare, contrast examples b) White light can be split up into a spectrum of different colours. The human eye only responds to a narrow range of wavelengths. There are other types of radiation beyond the ends of the visible spectrum. Similarly, there are sound waves that we cannot hear – "ultrasound." c) Waves move at different speeds in different materials. Light can travel through a vacuum, but sound requires a medium to travel. (speed of sound).	a) Energy can be transmitted as waves. Assessment limits: • characteristics, nature, interactions of waves • amplitude, wavelength, frequency • various forms of electromagnetic waves • sound and light waves • speed of sound, • visible light: reflection, refraction; including angle of incidence • types of electromagnetic radiation • electromagnetic spectrum: infrared, ultraviolet, x-rays, microwaves, radio waves • colour and wavelength	a) Forces have both magnitude and direction (vectors). b) Forces cause changes in motion. The change in motion of an object is proportional to the force applied and inversely proportional to the mass of the object. c) When two objects interact, they exert equal and opposite forces on each other. Assessment limits: • Newton's Laws of Motion d) Apply formula to a problem. Assessment limits: • words and symbols in formulas (not symbols by themselves) • force = mass x acceleration • work = force x distance • power = work done/ time taken)

Physical Science (P)	SC.P3.P	SC.P4.P	SC.P5. P	SC.P6. P	SC.M1. P	SC.M2. P	SC.M3. P	SC.S1. P	SC.S2. P
Students will produce evidence that demonstrates understanding of:									
3. Energy - the sources and forms of energy, including transmission and transformations and how energy helps explain the structure of matter and the universe	a) Energy keeps things going and makes things warm. (The sun is a source of heat and light.) b) Sound is produced by vibrating objects. Sound can move through some things. Assessment limits: • glass, water, air c) Light from sources passes through some materials. Assessment limits: • very simple application • opaque vs. transparent When light cannot pass through materials, it leads to the formation of shadows. Shadows form as a result of light from the sun. Assessment limits: • only understand cause of shadow • not predicting location and length d) Light can be reflected from some surfaces.	a) Heat can be produced in many ways. Assessment limits: • rubbing – friction, burning fuels some machines that are working • mixing some things together b) Some things conduct heat and some things do not. Assessment limits: • insulators – warm clothing like wool and fat in animals and things that are not insulators • do not use term "*conductor*" c) Heat flows from warmer things to cooler things. Heat changes some matter. • taking temperature to measure how hot or how cold • adding heat to make things warmer, melting, evaporating • making and keeping things cold i.e. taking away heat d) Things that give off light also give off heat. Assessment limits: • For example light bulb, sun	a) Energy can be stored and transformed in many ways. Assessment limits: • electrical to heat, light, sound and mechanical b) Electricity travels through circuits to make things work. Electricity in circuits can produce heat, light, sound and magnetism.		a) Energy cannot be created or destroyed, only changed from one form to another. Transformations of energy usually produce heat energy. Assessment limits: • example: burning fuel gives heat and light • identifying forms of energy heat, light, sound, electrical • do not test nuclear • conversions including familiar examples such as fuel combustion in a car, electrical to sound in a CD player • food as source of energy	a) Energy cannot be created or destroyed, only changed from one form to another. Transformations of energy usually produce heat energy. Energy provides the ability to do work and exists in many forms. Assessment limits: • sound, light etc. b) Energy can be stored and transformed into the energy of motion. Assessment limits: • Understanding of kinetic v. potential energy c) Heat is transferred by collision of atoms, radiation and convection in fluids. Heat moves at different rates depending on where the objects are in relation to each other. When different parts of a substance are at different temperatures, energy is transferred from places where the temperature is higher to places where the temperature is lower. Assessment limits: • Conductors and poor conductors (insulators) • expansion and contraction • impact of heat on environment, warming atmosphere, oceans • reducing heat loss from homes	a) Energy is transferred from batteries to other components in electrical circuits. Electrical energy in circuits can produce heat, light sound and chemical changes. Components in a circuit resist a current flowing through them. Assessment limits: • Interpretation of circuit diagrams • complete circuit • understand parallel and series circuits	a) Energy cannot be created or destroyed only transformed. During many processes, energy is transferred to the environment in the form of heat. Assessment limits: • Conduction, convection, radiation • Understand of specific heat - solve problem if given formula b) Heat energy in a material consists of disordered motions of its atoms or molecules. Assessment limits: • change of phase • Kinetic theory - movement of particles	) Energy is transferred from batteries to other components in electrical circuits. Electrical energy in circuits can produce heat, light sound and chemical changes. Components in a circuit resist a current flowing through them. Assessment limits: • Understanding and application of circuits • direct/alternating current • more complicated circuits at this level • understand resistors • household circuits, wiring plugs and safety features - fuses, circuit breakers • calculation of power (current x voltage) • simple calculations related to household electric use)

Physical Science (P)	SC.P3.P	SC.P4.P	SC.P5. P	SC.P6. P	SC.M1. P	SC.M2. P	SC.M3. P	SC.S1. P	SC.S2. P
Students will produce evidence that demonstrates understanding of									
4. Forces of Nature - gravitational, electrical and magnetic forces as the fundamental forces acting in nature	a) Things (near the earth) fall to the ground, unless something holds them up. b) Magnets can make some things move without being touched. Assessment limits: • terms – attract and repel • north and south poles • metals that magnets attract e.g. iron	a) The earth's gravity pulls any object towards it. Gravity is the force, which pulls objects towards the earth, and this force (weight) differs in places where gravity is different.	a) A magnet pulls on things made of iron and pushes or pulls other magnets. Assessment limits: • like poles, unlike poles • north and south poles a • Attract, repel b) Materials that have been electrically charged pull on uncharged materials and may push or pull other charged materials.		a) Objects exert gravitational forces on every other object. b) The sun's gravitational pull holds the earth and other planets in orbit and holds moons in orbit around their planets.	N/A	a) Electric currents and magnets can exert a force on each other, that is, electric currents can produce magnetic forces and magnets can cause electric currents. Assessment limits: • static electricity – caused by friction; • current electricity; • magnets; • electromagnets example how to increase strength • magnetic fields - illustrations	N/A	a) Gravitational force is an attraction between masses. b) Electric forces between electrons, protons hold atoms and molecules together and are involved in all chemical reactions. Materials are electrically neutral. c) Different kinds of materials respond differently to electric forces. d) Moving electric changes produce magnetic forces and moving magnets produce electric forces. Assessment limits: • explanation magnetic effect of an electric current • application of principles of electricity and magnetism to a simple electric motor e) Large amounts of energy are released from nuclear reactions in the sun and other stars because of the strength of forces that hold the nucleus of the atom together.

SCIENCE (SC) PERFORMANCE STANDARDS
for
LIFE SCIENCE (L)

Life Science (L) consists of concepts of biology and ecology, deals with the diversity of living organisms, their organization, life processes, relationships with one another and their environment.

Conceptual understanding should be demonstrated by:

- *Using a concept accurately to explain observations and make predictions*
- *Representing the concept in a variety of ways including words, diagrams, charts and graphs, as appropriate*

	SC.P3.L	SC.P4.L	SC.P5.L	SC.P6.L	SC.M1.L	SC.M2.L	SC.M3.L	SC.S1.L	SC.S2.L
Students will produce evidence that demonstrates understanding of:									
1. Diversity of Life - the variety of living things and the processes responsible for the maintenance of life	a) Most living things need water food and air. Some things are alive (or living) and become non-living when they die. Other things have never been alive. b) Plants and animals have features that help them live in different places. Assessment limits: • habitat - includes hibiscus, skink, cahow, polar bear, cactus, penguin, etc. Plants and animals have structures that perform specific functions. Assessment limits: • plants e.g. leaf, stem, root, flower, seed, fruit • animals e.g. webbed feet for swimming, etc c) There are different kinds of plants and animals in different places. They have senses to help them to exist in their environment. d) Living things can be sorted into groups using various features. The features used for grouping depend on the purpose of grouping. Assessment limits: • Plants and animals • include birds, fish, and mammals	a) Life processes common to animals include nutrition, movement, growth and reproduction. b) Organisms need certain conditions to remain healthy. c) Plants and animals have features that help them live in different places and have structures that perform specific functions. d) Understand the difference between living and nonliving.	a) Living things can be sorted into groups using various features. The features used for grouping depend on the purpose of grouping. Assessment limits: • for example physical characteristics • understanding of sorting into smaller and smaller groups (kingdom to species) • do not test terms such as phylum etc but can use a full pictorial classification chart as stimulus for questions about each group with details of a animal and plant kingdom • animal kingdom; characteristics of animals • symmetry vs. no symmetry • vertebrates including mammals, birds, ,fish, amphibians, reptiles • invertebrates can use chart for distinguishing characteristics; general examples such as squid, snails, spiders, insects, sea anemones, jellyfish	a) Plants and animals have certain characteristics that help them live/survive in different places. Assessment limits: • habitat - identify characteristics of plants and animals and relate to the organism's habitat • land habitats - rocky coast, beach dune, coastal upland, upland forest, saltwater marsh, and fresh water marsh	a) Organisms can be grouped into plants, which use sunlight to make their own food and animals, which consume energy-rich foods. b) Similarities among organisms are used to infer how closely related the organisms are used. Details of internal and external structures are best used to classify organisms. Assessment limits: • simple classification keys • animal and plant kingdom • vertebrates and invertebrates • microscopic living things	N/A	N/A	a) Biological diversity is the variety of living things. Scientists classify organisms and give each one universally accepted scientific name. Assessment limits: • binomial nomenclature; • Linnaeus'system of classification, • taxonomic categories • Dichotomous keys	a) The great diversity of species increases the chance that at least some living things will survive after significant changes to the environment. b) Kinship can be estimated from similarities of DNA sequences.

Life Science (L)	SC.P3.L	SC.P4.L	SC.P5.L	SC.P6.L	SC.M1.L	SC.M2.L	SC.M3.L	SC.S1.L	SC.S2.L
Students will produce evidence that demonstrates understanding of:									
2. Heredity – biological traits and how they are passed on from generation to generation	N/A	a) Organisms grow from egg to adult. Assessment limits: • butterfly – Monarch • toad- same as frog • human, or other mammal • flowering plant • life cycles – order, and identify missing stage b) Some likenesses between offspring and parents are inherited. Characteristics are transferred from one generation to another. Assessment limits: • identify parent and offspring	N/A	N/A	N/A	N/A	a) In some organisms all genes come from a single parent and in others half come from each parent. Assessment limits: • DNA contains information necessary to make an organism b) In sexual reproduction a single specialized cell from a female merges with a specialized cell from a male. As the fertilized egg multiplies, the same genetic information is copied in each cell. This cell division produces a small cluster of cells that then differentiate by appearance and function to form the basic tissues of an embryo. Patterns of human development are similar to those of other vertebrates. c) Selective breeding involves breeding individuals with particular inherited characteristics. Assessment limits: • Interpretation of completed Punnett square	N/A	a) Sorting and recombination gives a variety of possible combinations. Assessment limits: • Complete and interpret Punnett square - monohybrid cross only • understanding of homozygous, heterozygous, complete dominance, genes, alleles b) Asexual reproduction produces offspring that are identical to the parent (clones). Sexual reproduction is a source of genetic variation. Assessment limits: • Information passed from parent to offspring is coded in DNA molecules • Comparison of mitosis and meiosis • ordering the phases of meiosis - pictures • Understanding of the role of meiosis

Life Science (L)	SC.P3.L	SC.P4.L	SC.P5.L	SC.P6.L	SC.M1.L	SC.M2.L	SC.M3.L	SC.S1.L	SC.S2.L
Students will produce evidence that demonstrates understanding of:									
3. Cells, Organs and Organ Systems – the structure, function and reproduction of cells that maintain the organization essential for life and specialized organs systems that interact with each other to maintain internal balance		a) The body is a system in which parts do things for other parts and for the organism as a whole. Assessment limits: • People obtain energy from food and materials for body repair and growth. • The indigestible parts of food are eliminated - mouth, stomach, large intestine, small intestine. • By breathing, people take in oxygen they need to live. • The skeletal and muscular systems help us to move (skull, ribs, backbone, muscles, joints). • The skin protects the body from harmful substances and other organisms. • The brain enables human beings to think and sends messages to other body parts to help them work properly. • Some other animals have body systems with the same functions.	a) Some living things have a single cell, but still need water, air, food, a method of getting rid of waste and an environment in which to live. Living things are made mostly of cells. b) Microorganisms are too small to be seen with unaided eye. They can be harmful but most are beneficial. c) Recognize plant cells and animal cells including the basic cell parts and functions. Assessment limits: • cell membrane – boundary • cell wall – support • nucleus – "control centre/ brain" of the cell • can use more fully labeled diagrams to respond to questions on distinguishing characteristics.		a) Cells are building blocks of all living organisms.	a) Cells are building blocks of all living organisms. In any given organism there may be many millions of cells that repeatedly divide to make more cells for growth and repair. Assessment limits: • specialized cells: animal - sperm cells, nerve cells, blood cells, egg cells or ova; plant: root hair etc • Cell functions are similar in organisms • animal cell and plant cell • structure and function of organelles including common ones: nucleus, cytoplasm, cell membrane, mitochondria ones • plant cell – cell wall, vacuole, chloroplast • basic movement of molecules in and out of the cell - diffusion, osmosis b) Humans and other animals have body systems for obtaining and providing energy, defense, reproduction and the coordination of body functions. Different body tissues and organs are made up of different kinds of cells. Assessment limits: • organization of cells to tissues to organs to organ systems • tissue - group of cells with similar structure • organs made out of tissues • different organs form organ systems • functions of different systems and their coordination with each other (digestive, respiratory, circulatory, urinary)	a) Cells are building blocks of all living organisms. In any given organism there may be many millions of cells that repeatedly divide to make more cells for growth and repair. Assessment limits: • comparison of fertilization of human and flowering plants • cells sperm and ova • parts of flower including stigma, style, ovary, stamen, anther, filament b) Humans and other animals have body systems for obtaining and providing energy, defense, reproduction and the coordination of body functions. Assessment limits: • reproductive system; • protection and support of fetus, including risk of harmful substances including drugs, viruses	a) A cell is a well-specialized and complex system. b) Cells function best under particular conditions of water and temperature. The maintenance of these conditions is called homeostasis. Basic understanding of an organism's response to changes in the environment. Assessment limits: • regulation of body temperature and water balance c) Organelles in the cells use chemical reactions to carry out life processes. Assessment limits: • cell theory • prokaryotes and eukaryotes • eukaryotic cell structure • structure and function of organelles in plant and animal cells extended to nucleolus, endoplasmic reticulum, Golgi apparatus, centrioles, ribosome • transport across cell boundaries – functions of cell membrane and cell wall	a) Humans and other animals have body systems for obtaining and providing energy, defense, reproduction and the coordination of body functions. Assessment limits: • Human male and female reproductive systems - anatomy • role of hormones • factors that affect fetal development; • flowering plants, flowers as reproductive organs structure and function - sepals and petal and stamens and carpels • wind and insect pollination e.g. dandelion and hibiscus respectively

Life Science (L)	SC.P3.L	SC.P4.L	SC.P5.L	SC.P6.L	SC.M1.L	SC.M2.L	SC.M3.L	SC.S1.L	SC.S2.L
Students will produce evidence that demonstrates understanding of:									
Interdependence of life – relationships amongst organisms and their dependence on their environment	a) Animals eat plants or other animals for food. Assessment limits: • predator, prey b) Animals use plants for shelter and nesting.	a) Living organisms modify their environment to meet their needs. Assessment limits: • use examples of commonly known Bermudian organisms	N/A	a) Animals and plants depend on each other in many ways. Assessment limits: • Interpret food chains and simple food webs • basic roles – producers, consumers, and decomposers Some insects and various other organisms depend on dead plants for food. Organisms interact with one another in various ways. Assessment limits: • carrying of pollen • dispersal of seed b) Changes in an organism's habitat have varying impacts. These impacts can be positive or negative.	a) In all environments – fresh water, marine, forest etc- organisms with similar needs may compete with each other for resources (food, space, water, air, shelter). The growth and survival of organisms depend on the physical conditions. In Bermuda many of the species are at the extreme limits of their geographical distribution. Assessment limits: • endemic and naturalized plants and animals • introduced and invasive species in Bermuda b) Some organisms are better suited to survive in certain environments due to their characteristics. Assessment limits: • do not test the term adaptation at this level c) A species is at risk when there is a mismatch of adaptation and the environment. Assessment limits: • Bermuda – how did organisms get here and survive – flotsam, jetsam, flying, swimming, storm, ships etc. • risk of invasive species in Bermuda • species at risk - the cahow, tree frog, green turtle, cane toad and skink • food chains and food webs including local examples d) Bermuda, as a small oceanic island, the land and water ecosystems are especially at risk due to the pressure of development. e) Organisms can be categorized as producers, consumers and decomposers of organic matter.	a) In all environments – fresh water, marine, forest etc- organisms with similar needs may compete with each other for resources (food, space, water, air, shelter). The growth and survival of organisms depend on the physical conditions. Assessment limits: • Bermuda's 6 land habitats – listed in curriculum document • main species in each habitat • physical isolation and impact on species in habitats b) As a small oceanic island, the land and water ecosystems are especially at risk due to the pressure of development. c) Organisms can be categorized as producers, consumers and decomposers of organic matter.	a) In all environments – fresh water, marine, forest etc. - organisms with similar needs may compete with each other for resources (food, space, water, air, shelter). The growth and survival of organisms depend on the physical conditions. In Bermuda many of the species are at the extreme limits of their geographical distribution. As a small oceanic island, the land and water ecosystems are especially at risk due to the pressure of development. b) Coral reefs are physical structures produced by organisms. Corals need light and warm temperatures, thus grow in shallow, clear, warm waters. Vast numbers of species live on coral reefs and have evolved special symbiotic relationships. Assessment limits: • marine habitats – coral reefs, sea grass and mangrove forests • function of reef systems and risk to reef systems locally and globally • over fishing, fish pot ban, interpreting data of fish catch, invasive species e.g. lion fish • rocky coast as a habitat – structure and organisms that live there c) Ocean food chains are threatened by over fishing by people. As the large predatory fish stocks such as tuna, shark and swordfish decline, smaller fish near the base of the ocean food web are taken. This is a serious international problem that threatens the health of the oceans.	N/A	a) Ecosystems can be reasonably stable, but can change. Assessment limits: • levels of organization – species, populations, communities, ecosystems, biomes • change due to climate or appearance of new species • basic concept of succession b) Humans alter equilibrium in an ecosystem.

Life Science (L)	SC.P3.L	SC.P4.L	SC.P5.L	SC.P6.L	SC.M1.L	SC.M2.L	SC.M3.L	SC.S1.L	SC.S2.L
Students will produce evidence that demonstrates understanding of									
4. Flow of Matter and Energy - the linking of organisms to one another and their physical setting by the transfer and transformation of matter and energy	a) Plants and animals need water. Animals need food and plants need light.	a) Food can be traced back to plants. Plants get their food from the sun. b) Organisms grow, die and decay.			a) Food provides fuel and building material for all organisms. Plants make their own food by using energy directly from sunlight. Animals eat other organisms to obtain energy. b) All organisms depend on two main interconnected food webs, one in the ocean, the other on land. This becomes an indefinite cycle as organisms decompose after death returning material to the environment. Assessment limits: • Interpret food chains and simple food webs e.g. algae, tadpole, duck/crane c) Matter is transferred from one organism to another organism repeatedly. The amount of matter remains the same, although it might change in form and location. d) Energy can change from one form to another in living things. Animals oxidize their food and get energy, releasing some of it as heat. Almost all food energy comes from sunlight originally.	a) Food provides fuel and building material for all organisms. Plants make their own food by using energy directly from sunlight. Animals eat other organisms to obtain energy. All organisms depend on two main interconnected food webs one in the ocean, the other on land. This becomes an indefinite cycle as organisms decompose after death returning material to the environment. Assessment limits: • Interpret food chains and simple food webs • focus on land food webs • e.g .ant, lizard, kiskadee • decomposing matter, cockroach, toad g) Matter is transferred from one organism to another organism repeatedly. The amount of matter remains the same, although it might change in form and location. Assessment limits: • closed system Energy can change from one form to another in living things. Animals oxidize their food and get energy, releasing some of it as heat. Almost all food energy comes from sunlight originally.	a) Food provides fuel and building material for all organisms. Plants make their own food by using energy directly from sunlight. Animals eat other organisms to obtain energy. b) All organisms depend on two main interconnected food webs in the ocean, the other on land. This becomes an indefinite cycle as organisms decompose after death returning material to the environment. Assessment limits: • Interpret food chains and simple food webs • focus on marine food webs c) Matter is transferred from one organism to another organism repeatedly. The amount of matter remains the same, although it might change in form and location.	N/A	a) Limiting factors such as water, energy, oxygen and minerals, determine the amount of life that an ecosystem can support. Assessment limits: • energy flow – producers, consumers • feeding relationships – food chains, food webs, • trophic levels • ecological pyramids – energy pyramid, biomass pyramid, pyramid of numbers b) The sun is the source of most of the energy resources on earth. These resources are being burned by people and this stored energy is being transferred back into the environment as heat and carbon dioxide. Assessment limits: • fossil fuels – oil, gas, coal • cycles of matter – water cycle , nutrient cycles including nitrogen cycle, carbon cycle c) The impact of humans on ecosystems depends on factors such as population size, levels of consumption and waste, technological and industrial processes (social and economic factors). The principle of sustainable development is critical to survival. d) The transfer of chemical elements through food webs - the continual impact of energy from sun light to maintain the process. Assessment limits: • photosynthesis, respiration

Life Science (L)	SC.P3.L	SC.P4.L	SC.P5.L	SC.P6.L	SC.M1.L	SC.M2.L	SC.M3.L	SC.S1.L	SC.S2.L
Students will produce evidence that demonstrates understanding of									
6. Evolution of Life – the evolution of life on earth, natural selection as an explanation of biological processes	a) Different plants and animals have different external features. These features help them to live in different places. b) Some kinds of organisms that once lived on earth have completely disappeared. Assessment limits: • skeleton, fossils,. dinosaur		a) Individuals of the same kind differ in their characteristics. This can help them to continue to survive and reproduce. b) Fossils can be compared to one another and to organisms that are alive today.		N/A	a) The way in which cells function is similar in all living organisms. b) Thousands of layers of sedimentary rock provide evidence for the long history of earth and its life forms. Fossils of more recently formed rock layers are more likely to contain fossils resembling existing species.	a) Some individuals with certain traits are more likely to survive and reproduce than others. Changes in the environment can affect survival. b) Patterns in human development are similar to that of other vertebrates. Similarities among organisms are found in internal features as well. This infers a degree of relatedness. c) People can control some characteristics of plants and animals by selective breeding. This means that the descendants are different from their ancestors.	a) Biological classifications are based on how organisms are related. b) Living things evolve over time. Natural selection and its evolutionary consequences provide a scientific explanation for the fossil record of ancient life forms and striking molecular similarities observed among the diverse species of living organisms. c) The millions of different species of plants, animals and microorganisms that live on earth today are related by descent from common ancestors.	N/A

SCIENCE (SC) PERFORMANCE STANDARDS
for
EARTH AND SPACE SCIENCE (E)

Earth and Space (E) science consists of concepts of astronomy, geology, resources, meteorology and oceanography. Earth and space science involves the study of the earth, the universe, their components and interactions.
Conceptual understanding should be demonstrated by:

- *Using a concept accurately to explain observations and make predictions*
- *Representing the concept in a variety of ways including words, diagrams, charts and graphs, as appropriate*

	SC.P3.E	SC.P4.E	SC.P5.E	SC.P6.E	SC.M1.E	SC.M2.E	SC.M3.E	SC.S1.E	SC.S2.E
Students will produce evidence that demonstrates understanding of:									
1. Astronomy - the current scientific view of the nature, components, matter and energy sources of the universe		a) Our sun is one of many stars. There are stars smaller and larger than the sun. b) The sun is a source of light and casts shadows on objects on earth. Assessment limits: • basic understanding of sun and shadows • shadows cast at noon vs. early morning or evening • appropriate shape of shadows c) The Earth is one of the planets that orbit the sun. The Earth is the third planet from the sun. d) The earth orbits around the sun and the moon orbits around the Earth. e) Days, months and years are related to the movement of the Earth and the moon. The rotation of the Earth every 24 hours produces a day and night cycle. The moon orbits the Earth. The shape of the moon looks different every day, but looks the same in about 28 days. f) A telescope can help people see distant objects better that they can with unaided eyes. Some stars and planets can only be seen with telescopes.	N/A	N/A	a) The sun is a medium sized star located near the edge of a disc shaped galaxy called the Milky Way. The sun is the closest star to earth. b) The universe contains billions of galaxies and each galaxy contains billions of stars. c) Telescopes show the characteristics of objects close to earth such as the moon and they are part of important technologies that can show that there are many more stars in the sky than one can see with the unaided eye. Satellites are an important kind of technology that have been put into orbit around the earth to send information from place to place, monitor earth's weather and other conditions, observe the universe. d) The sun and the stars are light sources. Planets are seen by reflected light. Light from the sun takes a few minutes to reach the earth. Light from the next star takes a few years to reach the earth. e) Nine planets of different size, composition and physical features rotate the sun in nearly circular orbits. Assessment limits: • gravitational pull of the sun, • tides and gravity pull of moon and sun f) Earth is orbited by one moon, artificial satellites and debris. Earth's moon orbits around the earth in a 28 day cycle. Moon phases describe what part of the moon is lighted by the sun and how much of that is seen from earth. Other planets have more than one moon and other kinds of objects, including ice particles, orbiting them.	N/A	a) The sun and the stars are light sources. Planets are seen by reflected light.	a) The universe has evolved over billions of years and will continue to evolve. b) Stars were condensed by gravity out of clouds of molecules of the lightest elements until nuclear fusion of light elements into heavier ones began to occur. Assessment limits: • Fusion released great amounts of energy over millions of years. • Eventually some stars exploded producing clouds of heavy elements from which other stars and planets could later condense. • This process of star formation and destruction continues c) The stars differ from one another in size, temperature and age, but appear to be made up of the same elements that are found on earth. Assessment limits: • Hertzsprung – Russell diagram as stimulus for questions • making comparisons and interpreting diagrams d) The bodies of the solar system are bound together by gravitational force. This force of attraction is exerted by every object on every other object. Assessment limits: • organization of solar system • characteristics of planets • sun as star, moon, tides, eclipses d) Increasingly sophisticated technologies and subsequent analysis by mathematical modeling are being used to explore our universe and beyond. This includes the search for evidence of life elsewhere from earth. Assessment limits: • cameras, binoculars, telescopes, satellites, space probes	N/A

Earth and Space (E)	SC.P3.E	SC.P4.E	SC.P5.E	SC.P6.E	SC.M1.E	SC.M2.E	SC.M3.E	SC.S1.E	SC.S2.E
Students will produce evidence that demonstrates understanding of									
2. Geology - the features of the earth's surface, how they were formed and how they are continually changing	a) Landforms are features of a country. Bermuda landforms include caves, hills, cliffs, wetlands (including marshes), islands. Landforms in other countries – deserts, valleys, rivers, lake and mountains. Landforms are changed by wind and water. b) Earth's materials include solid rocks that come in many shapes and sizes from large boulders to pebbles and grains of sand. c) Animals and plants can change the earth. Assessment limits: • environment and surroundings	a) The earth has changed over time. Waves, wind, water and ice are always acting on the earth. They erode rocks and soil. This can happen in seasonal patterns. Assessment limits: • e.g., the loss of beach sand during storms	a) Rocks consist of different combinations of materials. b) When rocks break and are weathered smaller rocks are formed. c) Soil consists of rocks and remains of plants and can contain living organisms or their remains.		a) Oceanic islands such as Bermuda are formed by volcanic activity along ocean floor.	a) The earth is mostly rock. Assessment limits: • rock vs. mineral • weathering of rocks - chemical/physical weathering • explanation of the impact of weathering and erosion on rocks • cave formation, disintegration of cliff faces and walls, degradation of building materials • the rock cycle - rock forming processes • Types of rock sedimentary – particularly limestone, metamorphic, igneous b) The rock cycle includes the formation, weathering, sedimentation and reformation of rock. The forms of material change, but the total amount stays the same. Rocks are usually found in layers with the oldest at the bottom. Thousands of layers of sedimentary rock can give evidence to the long history of the changing surface of the earth and its life forms.	a) The earth is mostly rock. Three quarters of the earth's surface is covered by a layer of water, some of which is frozen. Earth is surrounded by a blanket of air. The interior of the earth is hot. Heat flow and the movement of material within the earth cause earthquakes and volcanic eruptions and create mountains and ocean basins. Oceanic islands, such as Bermuda, are formed by volcanic activity along ocean floor. Assessment limits: • Earth layers - crust, mantle, inner core, outer core • identification of layers and recognize basic characteristics • formation of Bermuda using ridge and adapted hot spot theories • limestone caps and reefs • conditions for coral growth; • function of reef system - barrier/protection from storm surge, tsunami;, food source , beauty	N/A	a) Water is stored and moves in pervious sediments and rocks called aquifers (water bearers). Assessment limits: • In Bermuda there are different rock formations which have different hydrologic characteristic. These rocks are the container for the groundwater • Fresh groundwater is found in five separate areas in Bermuda (in approximately 20% of the island). • Fresh ground water occurs in lens-shaped bodies (Gyhen-Herzberg lens) that are laterally surrounded and underlain by a zone of brackish ground water which is a mixture of fresh groundwater and seawater

Earth and Space (E)	SC.P3.E	SC.P4.E	SC.P5.E	SC.P6.E	SC.M1.E	SC.M2.E	SC.M3.E	SC.S1.E	SC.S2.E
(continued) ***Students will produce evidence that demonstrates understanding of***									
2. Geology - the features of the earth's surface, how they were formed and how they are continually changing							b) Waves, wind, water and ice reshape the earth's surface, such as removing evidence of the volcanic seamount that formed Bermuda. Bermuda is capped by sandy limestone rocks that are sedimentary deposits. Sandy beaches preceded beach dune formation in Bermuda. Beach sand is Bermuda can be pink due to the remains of an animal that has coloured its calcium carbonate skeleton red. Some changes in the earth's surface are caused by sudden events such as earthquakes, volcanoes and in Bermuda, hurricanes. However, other changes happen over long periods of time. c) Matching coastlines and similarities in rock types and life forms suggest that today's continents are separated parts of what was long ago a single continent.		b) The Bermudian hydrologic cycle shows the paths and processes involved in the passage of water from the atmosphere to the ocean. Recharge of the lens is basically from rainwater. Assessment limits: • Rainfall percolates through the soil and limestones to the water table. • Rainfall lands on marshes which are outcroppings of the groundwater reservoir. • Rainfall lands on the roofs and is passed into storage tanks. • Some roads have drainage wells for excess rainwater. This water reaches the water table. • Rainwater from other roads evaporates or runs off into land area • Discharge is loss due to pumping, plant usage, tidal action seepage into the marshes etc. • Waste disposal is from individual household cesspits.

Earth and Space (E)	SC.P3.E	SC.P4.E	SC.P5.E	SC.P6.E	SC.M1.E	SC.M2.E	SC.M3.E	SC.S1.E	SC.S2.E
Students will produce evidence that demonstrates understanding of									
3. Resources -the earth's limited and varied materials that supply many of the resources that humans use	a) The earth provides water, plants for animals to eat, resources to build with and habitats.	a) Earth's resources include air, water, soil, minerals and fuels. b) Living things need a clean environment to survive including clean air and water etc.			a) Human decisions have changed the earth's land, oceans and atmosphere. Bermuda as an oceanic island is especially unique and vulnerable. b) The sun is the ultimate source of most of the earth's energy resources and these resources are not renewable.	a) Humans benefit from the earth's resources such as water, air, soil and trees. b) Human decisions have changed the earth's land, oceans, and atmosphere. Bermuda as an oceanic island is especially unique and vulnerable. Assessment limits: • focus on land	a) Human decisions have changed the earth's land, oceans and atmosphere. Bermuda as an oceanic island is especially unique and vulnerable. Assessment limits: • focus on marine • threats to health of reefs, seagrass beds and mangrove forests b) The sun is the ultimate source of most of the earth's energy resources and these resources are not renewable.	N/A	a) The earth has limited resources some of which are non renewable. b) The local and global environment is affected by national policies and practices relating to energy use, waste disposal, ecological management, manufacturing and population. c) In Bermuda sustainable development is of critical importance since there is a limited land mass. Assessment limits: • management of lands • reclaiming of land • groundwater • waste management techniques etc. d) Fresh (drinking) water is a limited resource in Bermuda. Assessment limits: *The sources are:-* • Term potable (drinkable) water • rainwater collected in household and other tanks • treated well water from government-licensed wells • reverse osmosis plants – use of brackish water • water pollution • water treatment methods- filtering, screening, disinfecting (boiling, chemical treatment including chlorination)

Earth and Space (E)	SC.P3.E	SC.P4.E	SC.P5.E	SC.P6.E	SC.M1.E	SC.M2.E	SC.M3.E	SC.S1.E	SC.S2.E
Students will produce evidence that demonstrates understanding of									
4. Meteorology - the interactions of structures of the earth's system and the sun's energy which cause weather and climate patterns	a) The sun heats water, earth and air and water can be liquid or solid and can change back and forth powered by the sun.	N/A	N/A	a) When liquid water disappears, it turns into a gas and can form again as a liquid when cooled. If the temperature is below freezing a solid (ice) will form. Assessment limits: • Understanding of terms and processes of the water cycle b) The earth is surrounded by a layer of air and water vapour which under various conditions produces different kinds of weather. Clouds and fog consist of tiny droplets of water. When air moves we feel it as wind. c) Weather and seasons result from interactions of sunlight and earth's land, water and air masses. Assessment limits: • includes weather conditions, such as temperature, rainfall, etc.	N/A	N/A	a) Solar energy causes ocean and air currents. These currents impact upon weather patterns and climate. b) Water cycles throughout the earth system. It evaporates from the surface of the earth, rises, cools, condenses into rain or snow and falls again to the surface of the earth, collecting in rivers, lakes, soil and rock. Much of it flows back to the ocean. c) Weather can be described and studied in terms of properties of the atmosphere. Assessment limits: • factors that cause weather • reading simple weather maps • air masses, high and low pressure, fronts • severe weather conditions such as hurricanes	N/A	a) The transfer of energy in and out of the atmosphere (such as in the water cycle) affects weather and climate. Living things are adapted to their surroundings, including the contents of the atmosphere retained by the planets gravity and the water cycle which is influenced by the intensity of the sun's radiation. b) Water dissolves minerals and gases and carries them to the oceans via the water cycle.

Earth and Space (E)	SC.P3.E	SC.P4.E	SC.P5.E	SC.P6.E	SC.M1.E	SC.M2.E	SC.M3.E	SC.S1.E	SC.S2.E
Students will produce evidence that demonstrates understanding of									
5. Oceanography - the features of oceans and the impact of these features on the global ecosystem	a) Oceans are large bodies of salt water that cover most of the earth's surface. and support many forms of life. Assessment limits: • e.g., fish, whales, coral reefs, crabs, b) Many basic characteristics of the ocean can be observed. Assessment limits: • waves • high and low tides • saltiness • living things in ocean, etc. c) Bodies of Earth's waters include ocean (sea), bay or cove, harbour, pond, river. Assessment limits: • Also understanding of related terms such as seashore, beach		a) Oceans provide evidence of earth's change over time. Assessment limits: • e.g., presence of fossils	a) Physical properties of the ocean can be measured and affect the global ecosystem. The ocean is a large body of water that influences weather.	a) Most of the earth's surface is covered by water. Earth is the only planet that has liquid water on its surface. b) People have a significant impact on the ocean environment and ocean life.	N/A	a) Most of the earth's surface is covered by water. Earth is the only planet that has liquid water on its surface. b) The open ocean regulates earth's climate, conditions of the atmosphere and provides food and many other resources. c) Coastal peoples of every culture developed a large amount of practical knowledge about the ocean and its organisms. As people gained skills in seamanship and navigation, this knowledge increased. Increasingly sophisticated technologies are being used to explore the oceans. d) People have a significant impact on the ocean environment and ocean life.	N/A	a) Oceans currents affect climate and therefore life on earth. b) Earth's oceans are ever changing bodies of water. Assessment limits: • impact of global warming • melting of icecaps and sea level rise • impact on Bermuda's water-front properties c) People have a significant impact on the health of the oceans. Assessment limits: Bermuda issues include • preservation of the coral reef, • over-fishing, • pollution of the inshore waters, • cruise ship capacity, • sewage outfalls from large businesses and hotels • increased use of leisure craft

SCIENCE (SC) PERFORMANCE STANDARDS
for
NATURE OF SCIENCE (N)

Nature of Science (N) ***consists of the understanding and application of scientific investigative techniques and data analysis. Nature of Science also involves the study of the interrelationships between science, technology, and society.***									
	SC.P3.N	**SC.P4.N**	**SC.P5.N**	**SC.P6.N**	**SC.M1.N**	**SC.M2.N**	**SC.M3.N**	**SC.S1.N**	**SC.S2.N**
Students will produce evidence that demonstrates understanding of									
3. Scientific Investigation - People can often learn about things around them by just observing those things carefully, but sometimes they can learn more by doing something to things and noting what happens. Investigations are conducted for different reasons, which include exploring new phenomena, checking on previous results and comparing different theories. Investigations usually involve collecting evidence, reasoning, devising hypotheses, and making predictions.	a) Planning an investigation Assessment limits: • Generate an idea from question or from observation. /Identify testable question (I think worms live best in dark, damp soil). • Order steps in a plan for an investigation/ match set-up to experiment. • Draw or identify what might happen in an investigation • Understand that if conditions are the same, results are usually very similar.	a) Planning an investigation Assessment limits: • recognise some ways of finding things out from a scientifically testable question • Order steps in a plan for an investigation/ match set-up to experiment. • "guess" /predict what might happen in a simple investigation • decide when fresh observations should be made (if descriptions and findings are different) • Understand that if conditions are the same, results are usually very similar.	e) Planning an investigation Assessment limits: • Suggest some ways of finding things out through scientific investigation • Order steps in a plan for an investigation /match set-up to experiment. • Make simple prediction where outcome might be obvious • Recognize/describe simple cause and effect relationship (more complex relationships) • Recognize when comparisons might not be fair because some conditions are not kept the same • Understand that results of investigations are seldom exactly the same, but if differences are large, the observations should be made again • Determine whether it was a fair or unfair test	d) Planning an investigation Assessment limits: • Plan an investigation and understand the need for the test to be fair. Identify factors that make a test fair • Make appropriate predictions which are reasonable but outcome is not known • Recognize when comparisons might not be fair because some conditions are not kept the same • Understand that results of investigations are seldom exactly the same, but if differences are large, the observations should be made again / evaluate similar experiments and predict different results based on procedures	a) Planning an investigation Assessment limits: • Select a question that can be answered by an investigation involving one factor • Make a prediction about the outcome using scientific knowledge • Choose appropriate equipment • Write a method for the investigation	a) Planning an investigation Assessment limits: • Select a question that can be answered by an investigation involving one or two factors • Use science knowledge to predict effect of *variable* (term *variable* not testable) • Choose equipment capable of measuring to 1/10ths as appropriate • Write/evaluate clear step by step procedure for investigation	a) Planning an investigation Assessment limits: • Identify appropriate question being tested • Make a prediction about the outcome supported by data, science knowledge, or research • Choose equipment as in level M2 (capable of measuring to 1/10ths as appropriate) • Write/evaluate clear step by step procedure for investigation	a) Planning an investigation Assessment limits: • Use scientific knowledge and understanding to convert ideas into a form that can be investigated • Support predictions with scientific reasons (from books, Internet or other sources) • Understand concept of bias • Write/evaluate clear step by step procedure for investigation	a) Planning an investigation Assessment limits: • Use scientific knowledge and understanding to convert ideas into a form that can be investigated • Support predictions with scientific reasons (from books, Internet or other sources) • Understand concept of bias • write/evaluate clear step by step procedure for investigation

Nature of Science (N)	SC.P3.N	SC.P4.N	SC.P5.N	SC.P6.N	SC.M1.N	SC.M2.N	SC.M3.N	SC.S1.N	SC.S2.N
Students will produce evidence that demonstrates understanding of									
1. Scientific Investigation People can often learn about things around them by just observing those things carefully, but sometimes they can learn more by doing something to things and noting what happens. Investigations are conducted for different reasons, which include exploring new phenomena, checking on previous results and comparing different theories. Investigations usually involve collecting evidence, reasoning, devising hypotheses, and making predictions.	b) Obtaining evidence for investigation Assessment limits: • Identify simple tools for measurement including ruler, graduated beaker/measuring cup/thermometer/balance; Match tool to the property it can measure; read scales/dials on simple tool to determine magnitude of property being measured (e.g., which object weighs the most). • Observe things (make/compare observations) • Understand that observing and reporting is different from personal opinion. In doing science it is important to reach your own conclusions from your findings.	b) Obtaining evidence for investigation Assessment limits: • Identify appropriate tools for task including magnifier, spring scale, balance, thermometer/ match tool to the property it can measure. • Choose the most accurate or precise measuring procedure (measure length to the nearest cm; mass to the nearest gram, volume to the nearest ml or litre, temperature to the nearest degree Celsius, time to the nearest minute) • Support findings with data found in investigation, books, articles and databases • Identify best/most reliable sources to be used and expect others to do the same	b) Obtaining evidence for investigation Assessment limits: • Select instruments to measure distance, volume, mass and temperature *(measure to accuracy in P4)* • Choose the most accurate or precise measuring procedure. • Locate scientific information from sources including books, databases, CD -ROMS, articles in magazines • Understand fact v. opinion -distinguish factual/ scientifically accurate v. fictional resources	b) Obtaining evidence for investigation Assessment limits: • Choose appropriate scales/instruments to measure (including g vs kg; cm vs metres/km) • Distinguish between actual observations and speculation – • Locate scientific information from sources including books, databases, CD-ROMS, articles in magazines	b) Obtaining evidence for investigation Assessment limits: • Recognize the need to make additional observations and measurements when they are too different • Use a range of apparatus with increasing precision • *(refer to curriculum Science Toolbox)* • Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates and temperature • Record measurements and observations on charts	b) Obtaining evidence for investigation Assessment limits: • Select what to measure • Make series of observations and measurements/ record clearly and accurately on charts • Use a range of apparatus with increasing precision (nearest $1/10^{th}$) • Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates and temperature *(refer to curriculum Science Toolbox)* • Know when to repeat measurements (when they are too different/ until they are considered correct (consistent) • Calculate and record averages as required. • Make further predictions based on patterns in results	b) Obtaining evidence for investigation Assessment limits: • Identify variables in an experiment and indicate which variables should be controlled • Measure appropriate quantities / determine the number of measurements, record and average as required /record clearly and accurately on charts • Use a range of apparatus with increasing precision (nearest $1/10^{th}$) • Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates and temperature *refer to curriculum Science Toolbox)* • Know when to repeat measurements (when they are too different for example). Calculate and record averages as required. • Make further predictions based on patterns in results	b) Obtaining evidence for investigation Assessment limits: • Vary key variables • Determine number of observations or measurements to be made • Select and manipulate a range of apparatus to help to obtain precise evidence • Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates and temperature • Repeat results to obtain average readings	b) Obtaining evidence for investigation Assessment limits: • vary key variables • determine number of observations or measurements to be made • Select and manipulate a range of apparatus to help to obtain precise evidence • Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates and temperature • Repeat results to obtain average readings

Nature of Science (N)	SC.P3.N	SC.P4.N	SC.P5.N	SC.P6.N	SC.M1.N	SC.M2.N	SC.M3.N	SC.S1.N	SC.S2.N
Students will produce evidence that demonstrates understanding of									
3. Data Representation and Interpretation - Data must be analysed in order to make sense of what has been collected. Sometimes the evidence collected might not be what you expected or might not be sufficient to draw a conclusion. Clear and accurate communication is important in doing science and an essential part of sharing an investigation order to inform others.	b) Summarising and organising data Assessment limits: • Observe and describe things using sight and other senses • Draw pictures to portray features of things being described • Describe and compare things in terms of number (counting whole numbers) colour, size (comparative big –small), motion • Organize data using pictures, tallies and simple tables/ choose table design/ identify row/column headings and title for table. • Create pictographs and bar graphs from data collected • Interpret/describe pictures of things, situations, events	a) Summarising and organising data Assessment limits: • Make observations and describe and compare things in terms of number, colour, size, texture, motion, weight etc. • Create tally charts, pictographs and bar graphs (choose table design/identify row/column headings and title for table) • Make comparisons between objects and events • Identify patterns/ trends in data • Compare things and describe observations clearly and use a simple table • Draw/describe pictures to portray features of things being described	a) Summarising and organising data Assessment limits: • Record observations (with more detail and in other ways than P3/P4) • Organize and display data in a variety of forms (tables, bar graphs, pictographs) • Describe simple patterns/ extrapolate based on simple trends in data.	a) Summarising and organising data Assessment limits: • Organize and display data in a variety of forms (tables, bar graphs, line graphs) • Present observations clearly and use tables and bar charts and line graphs	a) Summarising and organising data Assessment limits: • Represent data and results in multiple ways such as numbers, tables, graphs; diagrams • Make double bar charts and pie charts • Read bar graphs, line graphs and pie charts	a) Summarising and organising data Assessment limits: • Summarise and organize data in tables and line and bar graphs; represent data and results in multiple ways such as numbers, tables, graphs, diagrams. • Read bar graphs, pie charts and line graphs	a) Summarising and organising data Assessment limits: • Summarise and organize data in tables and line and bar graphs; represent data and results in multiple ways such as numbers, tables, graphs, diagrams. • Read bar graphs, pie charts and line graphs • Choose appropriate scales for charts and line graphs	a) Summarising and organising data Assessment limits: • Represent data and results in multiple ways such as numbers, tables, graphs, diagrams. • Select the best way of displaying your evidence; represent data with pie charts, graphs, tables, histograms etc. • Create table of results with clear headings and correct units)	a) Summarising and organising data Assessment limits: • Represent data and results in multiple ways such as numbers, tables, graphs, diagrams. • Select the best way of displaying your evidence; represent data with pie charts, graphs, tables, histograms etc. • Create table of results with clear headings and correct units)

Nature of Science (N)	SC.P3.N	SC.P4.N	SC.P5.N	SC.P6.N	SC.M1.N	SC.M2.N	SC.M3.N	SC.S1.N	SC.S2.N
Students will produce evidence that demonstrates understanding of									
Data Representation and Interpretation *(continued)* **2. Data must be analysed in order to make sense of what has been collected. Sometimes the evidence collected might not be what you expected or might not be sufficient to draw a conclusion. Clear and accurate communication is important in doing science and an essential part of sharing an investigation order to inform others.**	b) Analyzing evidence and making conclusions Assessment limits: • interpret pictorial results including pictographs and bar graphs • Identify most accurate information from reading, pictures and careful • Match conclusion to procedure and results.	b) Analyzing evidence and making conclusions Assessment limits: • interpret tally charts, pictographs and bar graphs. Say whether findings are what is expected/draw simple conclusions from data presented • Interpret/explain pictures of things, situations, events	b) Analyzing evidence and making conclusions Assessment limits: • Interpret, describe, and explain what has been found out from data presented in graphs (tables, bar graphs and pictographs) Interpret different graphical representations for sets of data • Use diagrams to help explain things. Make comparisons using diagrams • Use numerical data to describe and explain things, events • Use facts to support conclusions. Understand observations are needed to develop explanations. • Develop follow-up questions for investigation (results of experiment generate new questions for further study) • Use simple models to predict changes in real systems. Understand importance of scale in models. Compare parts of model with real system.	b) Analyzing evidence and making conclusions Assessment limits: • Analyse data represented in a graph (double bar graphs, simple pie charts • Make predictions based on data/Use data patterns to draw conclusions • Use diagrams to help explain things. Make comparisons using diagrams • Use science knowledge/data to support conclusions • Evaluate or identify strengths and weaknesses of claims or conclusions based on data/results • Develop follow-up questions for investigation (results of experiment generate new questions for further study) • Use simple models to predict changes in real systems/ understand importance of scale in models/ compare parts of model with real system	b) Analyzing evidence and making conclusions Assessment limits: • analysing evidence and making conclusi • Identify and explain a pattern • Interpret bar graphs, line graphs and pie charts • Draw conclusion based on gathered data • Support conclusions with evidence from experiments or research • Evaluate investigation (suggest what might have caused errors and identify ways to improve investigation)	b) Analyzing evidence and making conclusions Assessment limits: • Compare related data sets • Interpret bar graphs, pie charts and line graphs • Identify and explain a pattern • Draw a conclusion related to the question being investigated • Relate conclusion to science knowledge • Support conclusions with evidence from experiments or research • Evaluate investigation (describe and explain errors and improvement; suggest further investigations)	b) Analyzing evidence and making conclusions Assessment limits: • Compare related data sets • Interpret pie charts and line graphs • Identify measurements and observations that do not seem to fit the pattern • Draw appropriate conclusions that fit the evidence • Recognise whether the data collected is sufficient for conclusions drawn • Support conclusions with evidence from experiments or research • Use scientific knowledge to explain evidence • Evaluate investigation • (describe and explain errors and improvement; suggest further investigations)	b) Analyzing evidence and making conclusions Assessment limits: • Identify trends or patterns in results (*best fit graphs, multi-line graphs, multiple data sets).* • Use graphs to determine relationships between variables • Explain whether you have enough evidence to draw a conclusion • Explain whether results are consistent with original prediction • Draw a meaningful conclusion based on evidence in outcome • Support conclusions with evidence from experiments or research • Evaluate investigation (*redesign investigation if necessary – how might the method be improved to obtain more evidence to support the conclusion*)	b) Analyzing evidence and making conclusions Assessment limits: • Identify trends or patterns in results (*best fit graphs, multi-line graphs, multiple data sets.* • Use graphs to determine relationships between variables • Explain whether you have enough evidence to draw a conclusion • Explain whether results are consistent with original prediction • Draw a meaningful conclusion based on evidence in outcome • Support conclusions with evidence from experiments or research • Evaluate investigation (*redesign investigation if necessary – how might the method be improved to obtain more evidence to support the conclusion*)

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Students will produce evidence that demonstrates understanding of									
3. The Designed World -Over the course of the history of world exploration, humans have shaped and reshaped the world we live in by using technology in tandem with expanding science knowledge. Science cannot answer all questions and technology cannot solve all human problems or meet all human needs. Science influences society through its knowledge and world view. Technology influences society through its products and processes. Science and technology have advanced through contributions of many different people, in different cultures, at different times in history.	a) Things found in nature are different from those that are made by humans. New products and systems can be developed to help solve problems, but there could be desirable or undesirable consequences. Assessment limits: • Objects are made of particular materials (for example wood, metal, paper, stone, plastic, glass) • Certain designs are better than others for a particular purpose/. People all throughout history invented tools. Tools of today are different from those of the past. Tools are used to do things better or more easily including hammers, screwdrivers, pens, pencils magnifiers, containers • To make something work it is good to follow directions (Select order for a simple process)	a) Things found in nature are different from those that are made by humans. New products and systems can be developed to help solve problems, but there could be desirable or undesirable consequences. Assessment limits: • Some kinds of materials are natural and some are man-made/Some materials can be used again and some cannot • People all throughout history invented tools. Tools of today are different from those of the past *for example* - *stone hammers bound with leather straps and steel hammers;* - *development of tools including telescopes for seeing things far away* - *rocketry for exploration of outer space* - *X-ray to see bones* - *Stethoscopes* • Technology has made it possible to repair and sometimes replace body parts. • Identify the most appropriate design for a particular purpose/ Improve solution/design to solve a problem.	a) Things found in nature are different from those that are made by humans. New products and systems can be developed to help solve problems, but there could be desirable or undesirable. Assessment limits: • Developments in science and technology can result in things used in our everyday lives (e.g., microscopes, binoculars for observing things too small to see) • Science knowledge changes as new discoveries are made (interpret or analyze timelines of scientific events). • When people want to develop or expand things , they should figure out ahead of time how it might affect other people and other living things (e.g., more electricity used, fossil fuels, air pollution near electrical companies; some energy sources cost less than others and some cause more pollution than others)	a) Things found in nature are different from those that are made by humans. New products and systems can be developed to help solve problems, but there could be desirable or undesirable consequences. Assessment limits: • Some kinds of materials (natural and man made) can be changed to make them more useful • *for example* • wood, clay, animal skin, wool, cotton, metal, glass • Some resources are nearly unlimited while others are very limited in supply. Some can be renewed within a short timeframe while others would require hundreds/thousands of years. *for example* - *Understand importance of conservation* • Safety and impact on the environment must be considered when using/designing new technologies	b) Things found in nature are different from those that are made by humans. New products and systems can be developed to help solve problems, but there could be desirable or undesirable consequences. Assessment limits: • Plants growth require sunshine, air, water – things made by humans require an idea, resources and a design. • Satellites as communication – when unusable, resulting in "space junk"; pesticides for plant growth can harm environment).	a) Things found in nature are different from those that are made by humans. New products and systems can be developed to help solve problems, but there could be desirable or undesirable consequences. Assessment limits: • Engines can decrease travel time, increase productivity, lessen need for manual labour • More and better vehicles– problem of disposal of them in Bermuda, increased fuel consumption damaging to fragile ecosystem, increased air pollution)	a) Things found in nature are different from those that are made by humans. New products and systems can be developed to help solve problems, but there could be desirable or undesirable consequences. Assessment limits: • tape recorders and digital TV's and play stations are applications of sound and light technology • Selective breeding and long distance food transportation increase productivity, but affect risks and costs for producing food • increased water traffic including ferries, personal water craft, jet skis - damage to the marine ecosystem – sea grass beds, reefs, fuel exhaust pollution)	a) Things found in nature are different from those that are made by humans. New products and systems can be developed to help solve problems, but there could be desirable or undesirable consequences. Assessment limits: • Applications of technology – communications, transportation, manufacturing and construction • formation of plastics, new fuels, synthetic fibres, pharmaceuticals, • Science and mathematics attend to result in advances in technology (e.g., binary system to digital machines such as laptop computers, digital cameras, compact disc players) • Increased use of energy in more industrialized countries leads to rapid depletion of Earth's energy resources and heightened environmental risks from fossil and nuclear fuels.	a) Things found in nature are different from those that are made by humans. New products and systems can be developed to help solve problems, but there could be desirable or undesirable consequences. Assessment limits: • Applications of technology – communications, transportation, manufacturing and construction • formation of plastics, new fuels, synthetic fibres, pharmaceuticals, • Science and mathematics attend to result in advances in technology (e.g., binary system to digital machines such as laptop computers, digital cameras, compact disc players) • Waste management includes considerations of quantity, safety, degradability and cost. Waste disposal problems are political, economic as well as technical • different ways of obtaining, transforming and distributing energy have different environmental consequences

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Students will produce evidence that demonstrates understanding of									
The Designed World *(continued)* **3. Over the course of the history of world exploration, humans have shaped and reshaped the world we live in by using technology in tandem with expanding science knowledge. Science cannot answer all questions and technology cannot solve all human problems or meet all human needs. Science influences society through its knowledge and world view. Technology influences society through its products and processes. Science and technology have advanced through contributions of many different people, in different cultures, at different times in history.**	• People burn fuels or use electricity to cook their food and warm their houses. People can save money by turning off machines, appliances or lights when they are not using them • *Many materials can* be recycled or used again, sometimes in different forms	• When people want to build something new they should figure out ahead of time how it might affect other people and the environment. (cars and pollution, more waste and problem of disposal, re-using or recycling) • People try to conserve energy in order to slow down depletion of resources and/or to save money.	• Identify repeated elements in sequences in designs, structures, sounds, and events; identify symmetry in a design/structure; identify possible solution and analyze the effectiveness of solution.	• Technology has given some people better transportation, communications, nutrition, health care, entertainment. Technologies often have drawbacks as well as benefits (pesticides can affect other living things inadvertently) • Identify repeated elements in sequences in designs, structures, sounds, and events; identify symmetry in a design/structure; identify possible solution and analyze the effectiveness of solution.				• Decisions to develop and use technologies often put environmental and economic concerns in direct competition (for example, preservation of open space and wetlands vs. housing and improvement of roads)	• Increased use of energy in more industrialized countries leads to rapid depletion of Earth's energy resources and heightened environmental risks from fossil and nuclear fuels. • Decisions to develop and use technologies often put environmental and economic concerns in direct competition (for example, preservation of open space and wetlands vs. housing and improvement of roads)
	b) Important contributions to the advancement of science, mathematics and technology have been made by different kinds of people in different cultures in different times. Assessment limits: • Identify science careers that involve science (doctor, veterinarian, astronaut, etc.).	b) Important contributions to the advancement of science, mathematics and technology have been made by different kinds of people in different cultures in different times. Assessment limits: • Identify science careers that involve science (doctor, veterinarian, nurse, etc.).	b) Important contributions to the advancement of science, mathematics and technology have been made by different kinds of people in different cultures in different times. Assessment limits: • Identify science careers that involve science (doctor, veterinarian, nurse, etc.).	b) Important contributions to the advancement of science, mathematics and technology have been made by different kinds of people in different cultures in different times. Assessment limits: • Identify science careers that involve science (doctor, veterinarian, nurse, etc.).	b) Important contributions to the advancement of science, mathematics and technology have been made by different kinds of people in different cultures in different times. Assessment limits: • Scientists differ in what phenomena they study and how they go about their work. (astronomer, biologist, conservationist – deals with at risk organisms and habitats etc.)	b) Important contributions to the advancement of science, mathematics and technology have been made by different kinds of people in different cultures in different times. Assessment limits: • Scientists differ in what phenomena they study and how they go about their work. (e.g., geologist studying rocks and minerals; specialist doctors treating patients)	b) Important contributions to the advancement of science, mathematics and technology have been made by different kinds of people in different cultures in different times. Assessment limits: • Scientists differ in what phenomena they study and how they go about their work. (meteorologist, oceanographer, and other careers associated with science such as electrician)	b) Important contributions to the advancement of science, mathematics and technology have been made by different kinds of people in different cultures in different times. Assessment limits: • Science disciplines differ from one another in what is studied, techniques used and outcomes sought, but they are all part of the same scientific enterprise.	c) Important contributions to the advancement of science, mathematics and technology have been made by different kinds of people in different cultures in different times. Assessment limits: • Science disciplines differ from one another in what is studied, techniques used and outcomes sought, but they are all part of the same scientific enterprise.

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Students will produce evidence that demonstrates understanding of									
The Designed World *(continued)* **3. Over the course of the history of world exploration, humans have shaped and reshaped the world we live in by using technology in tandem with expanding science knowledge. Science cannot answer all questions and technology cannot solve all human problems or meet all human needs. Science influences society through its knowledge and world view. Technology influences society through its products and processes. Science and technology have advanced through contributions of many different people, in different cultures, at different times in history.**	c) Diet, exercise, disease and toxic substances influence the physical health of individuals. Science has contributed to health and health technologies. Assessment limits: • When you are healthy (exercise, get rest and eat well) you have the energy to do things.(Recognise general food groups) • Some diseases are caused by germs and some are not/ Washing one's hands with soap and water reduces the number of germs that can be passed onto other people. • Some things in the environment make people sick. • Vaccinations protect people from certain diseases and medicines help people who are sick to recover.	c) Diet, exercise, disease and toxic substances influence the physical health of individuals. Science has contributed to health and health technologies. Assessment limits: • Humans must eat certain kinds of food to grow and develop healthy bodies. • Some diseases are caused by germs and some are not/ Washing one's hands with soap and water reduces the number of germs that can be passed onto other people. • Some poisons in the environment make people sick. • Vaccinations protect people from certain diseases and medicines help people who are sick to recover.	c) Diet, exercise, disease and toxic substances influence the physical health of individuals. Science has contributed to health and health technologies. Assessment limits: • Humans must eat certain kinds of food to grow and develop healthy bodies. • Some diseases are caused by germs and some are not. Washing one's hands with soap and water reduces the number of germs that can be passed onto other people. • Some things in the environment make people sick. Tobacco, alcohol and other drugs can harm human beings and other living things. • Vaccinations protect people from certain diseases and medicines help people who are sick to recover.	c) Diet, exercise, disease and toxic substances influence the physical health of individuals. Science has contributed to health and health technologies. Assessment limits: • Humans must eat certain kinds of food to grow and develop healthy bodies. • Some diseases are caused by germs and some are not. Washing one's hands with soap and water reduces the number of germs that can be passed onto other people. • Some things in the environment make people sick. Tobacco, alcohol and other drugs can harm human beings and other living things. • Vaccinations protect people from certain diseases and medicines help people who are sick to recover.	c) Diet, exercise, disease and toxic substances influence the physical health of individuals. Science has contributed to health and health technologies. Assessment limits: • Micro-organisms, viruses, bacteria, safe handling of food and water.	c) Diet, exercise, disease and toxic substances influence the physical health of individuals. Science has contributed to health and health technologies. Assessment limits: • importance of good dietary habits, vitamins and minerals; disease, medicines and vaccinations; transplants and replacement of body parts; blood transfusions; harmful substances in the environment – soil, air and water; avoidance of toxic substances.	c) Diet, exercise, disease and toxic substances influence the physical health of individuals. Science has contributed to health and health technologies. Assessment limits: • as M2 – include movement across the placenta, risks to unborn child, technologies that help sight and hearing; medical technologies such as ultrasound, radiation techniques for cancer patients.	(physics, chemistry, biology, ecology; environmental science, meteorology and related careers; what kinds of processes are studied in the discipline by the scientists – other careers – forensic scientist, medical laboratory technician) c) Diet, exercise, disease and toxic substances influence the physical health of individuals. Science has contributed to health and health technologies. Assessment limits: • (pertaining to S1 concepts)	(physics, chemistry, biology, ecology; environmental science, meteorology and related careers; what kinds of processes are studied in the discipline by the scientists – other careers – forensic scientist, medical laboratory technician) c) Diet, exercise, disease and toxic substances influence the physical health of individuals. Science has contributed to health and health technologies. Assessment limits: • waste management, water purification and potable water from seawater or brackish. water) • knowledge of genetics is opening new fields of health care (geneticists).