Subject group overview: Sciences

Grade 6

INTERDISCIPLINARY UNIT

UNIT TITLE	**IT'S ALL IN YOUR HEAD**						Duration	11 Weeks	
Subject(s)	English, Sciences	Key Concept	Form	Related Concept(s)	English - Intertextuality, Point of view Sciences - Consequences, Function	Global Context	Identities and relationships	Global Context Exploration(s)	Transitions, Health and well-being
ATL Skills	I. Communication skill IV. Affective skills	Interdisciplinary objectives	Ai. Aii. Bi. Bii. Ci. Cii.	Subject-group objectives - Language and LIterature (English)	Ai. Aiii. Bi. Bii. Biii. Ciii. Diii. Div.		Subject-group objectives - Sciences	Ai. Aii. Aiii. Cii. Diii.	
Statement of Inquiry	Understanding how our brains develop during adolescence helps us to be responsible for our own health and happiness.								
Content	Language and Literature Content: - PEEL paragraph structure (main focus of the unit) - MLA Works Cited + In text citations - Identify vocabulary using context clues - Children's literature (student choice) for perspective and creative expressions of experiences - Memoir (Chinese Cinderella) for perseverance and creative expressions of experiences - Poetry (I, Too) for success - Creative writing reflections for inspiration Language and Lit Skills: - develop strategies for analyzing a novel - Intertextuality analysis - Structure communication for a chosen audience - Brainstorming, organizing, and synthesizing ideas for creative writing - Citing evidence from literature to support an opinion				Science content: - Outline the main functions of areas in the cerebral cortex. - List main parts of the brain that are responsible for memory and emotion. - Identify physiological signs of emotional and mental state. - Outline the changes that occur in the brain during adolescence. - Outline the stress response. - Outline neuroplasticity. Science skills: - Paraphrase text containing scientific knowledge. - Use scientific vocabulary clearly and precisely. - Apply scientific knowledge to make scientifically-supported judgments. - Apply scientific knowledge to situations. - Record observations in a table. - Interpret data and outline results.				

Subject group overview: Sciences

UNIT TITLE	**Energy & motion**						Duration	11 Weeks	
Subject(s)	Sciences	Key Concept	Change	Related Concept(s)	Energy, Transformation	Global Context	Globalization and sustainability	Global Context Exploration(s)	Human impact on the environment
ATL Skills	I. Communication skills VI. Information literacy skills	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Ci. Cii. Ciii. Civ. Cv. Di. Dii. Diii. Div.	Statement of Inquiry	The by-products of energy transformation and humans' growing need for energy helps us make decisions about how we can reduce human impact on the environment.				
Content	Factual Knowledge: In this unit, learners build on their previous knowledge of energy as something that makes things happen, to develop their knowledge of: - energy, forms of energy like chemical energy, kinetic energy, motion, thermal energy, sound energy, light energy, gravitational potential energy, elastic potential energy, and nuclear energy - energy sources renewable and non-renewable, fuel, fossil fuel, turbine - energy as something that cannot be created or destroyed - energy transfers - conservation of energy, energy flow diagram, efficiency Conceptual Knowledge: - Understand changes in energy that are a result of an event or process. - Know that energy tends to dissipate and in doing so it becomes less useful. - Recognize different energy types and energy transfers				Procedural Knowledge: - making careful observations including measurements - presenting results in the form of tables, bar charts and line graphs - using information from secondary sources - considering explanations for predictions using scientific knowledge and understanding and communicating these. - identify the steps in the scientific process. - use scientific vocabulary clearly and precisely.				

Subject group overview: Sciences

UNIT TITLE	**Kitchen chemistry**						Duration	10 Weeks	
Subject(s)	Sciences	Key Concept	Change	Related Concept(s)	Balance, Energy, Evidence, Interaction	Global Context	Globalization and sustainability	Global Context Exploration(s)	Human impact on the environment
ATL Skills	VI. Information literacy skills VII. Media literacy skills	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Ci. Cii. Ciii. Civ. Cv. Di. Dii. Diii. Div.	Statement of Inquiry	We can make predictions of the future based on the changes that are happening in the present and that have happened in the past.				
Content	Factual Knowledge: In this unit, learners build on their previous knowledge of materials and their properties to develop their knowledge of the particle theory of matter and how this can explain the properties of solids, liquids, and gases, including changes of state. - Particle, particle model, particle theory - Properties of Solid, - Properties of liquids - Properties of gases - Comparing solid, liquid and gases - Change of state, melting, boiling, freezing, condensing, evaporating - Scientific Enquiry work			Conceptual Knowledge: Understand how the particle theory of matter can be used to explain the properties of solids, liquids, and gases, including changes of state Understand the three states of matter as solid, liquid and gas in terms of the arrangement, separation, and motion of particles. Understand when an interaction occurs, there is a change in one or more energy types. Procedural Knowledge: - choosing appropriate apparatus and using it correctly - making careful observations including measurements - presenting results in the form of tables, bar charts and line graphs - recognizing results and observations that do not fit into a pattern, including those presented on a graph, chart, or spreadsheet - considering explanations for predictions using scientific knowledge and understanding and communicating these.				

Subject group overview: Sciences

<table>
<tr><td>UNIT TITLE</td><td colspan="5">What a wonderful world</td><td>Duration</td><td colspan="2">8 Weeks</td></tr>
<tr><td>Subject(s)</td><td>Sciences</td><td>Key Concept</td><td>Systems</td><td>Related Concept(s)</td><td>Evidence, Balance, Patterns</td><td>Global Context</td><td>Globalization and sustainability</td><td>Global Context Exploration(s)</td><td>Human impact on the environment, Data-driven decision-making</td></tr>
<tr><td>ATL Skills</td><td>I. Communication skills
VI. Information literacy skills
IX. Creative thinking skills</td><td>Subject-group objectives</td><td>Ai. Aiii.
Cii.
Di. Diii.
Div.</td><td>Statement of Inquiry</td><td colspan="5">Balance in ecosystems all over the planet are being upset by human activity; these changes can be observed, measured and recorded in order to recognize patterns, and these patterns can inform our decisions.</td></tr>
<tr><td>Content</td><td colspan="9">Factual Knowledge:
In this unit, learners build on their previous knowledge of sorting living things into groups and the characteristics of living things to develop their knowledge of:
- where organisms live
- how organisms interact with each other and the environment
- the influences humans have on the natural environment
- variation within a species.
- Outline the components of ecosystems.
- food chain, draw a food chain, energy flow, producer, consumer, decomposer, predator, prey, herbivore, omnivore, carnivore, detritivore
- Describe the polar and rainforest ecosystems.
- Interpret food chains and food webs.
- Outline the relationships between living and nonliving components of the polar and rainforest ecosystems.
- List examples of stresses on food webs (e.g., longline fishing, ocean acidification, overfishing) and suggest implications of these stressors.

Conceptual Knowledge:
Understand how plants maintain a balance in the ecosystem by providing nutrients to all living organisms in either a direct or indirect manner.
In order to conceptually understand equilibrium, students will:I
- interpret graphs (e.g., glacier thickness, carbon dioxide concentration in the atmosphere, ocean temperatures, sea levels) and make judgments on whether or not the system is at equilibrium.
- manipulate a system's input and output in order to establish equilibrium

In order to understand increased carbon dioxide as a major human impact, students will:
- draw cause-and-effect connections between global warming, climate change, increased carbon dioxide concentration, ocean warming, ocean acidification, rising sea levels.
- annotate a diagram of the carbon dioxide cycle

In order to understand that evidence and patterns are essential to scientific decision-making, students will:
- Collate evidence of human impact by selecting relevant graphs from NASA

Procedural Knowledge:
- presenting conclusions using different methods
- using information from secondary sources
- presenting results in the form of tables, bar charts and line graphs
- identifying appropriate evidence to collect and suitable methods of collection
- making careful observations including measurements

In order to understand ecosystems, students will:
- Outline the components of ecosystems.
- Describe the polar and rainforest ecosystems.
- Interpret food chains and food webs.
- Outline the relationships between living and nonliving components of the polar and rainforest ecosystems.
- List examples of stresses on food webs (e.g. longline fishing, ocean acidification, overfishing) and suggest implications of these stressors.</td></tr>
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Subject group overview: Sciences

Grade 7

UNIT TITLE	Models of Matter						Duration	12 Weeks	
Subject(s)	Sciences	Key Concept	Change	Related Concept(s)	Evidence, Patterns	Global Context	Scientific and technical innovation	Global Context Exploration(s)	Methods, Products
ATL Skills	III. Organization skills IV. Affective skills V. Reflection skills XI. Subject specific skills	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Ci. Cii. Ciii. Civ. Cv. Diii. Div.	Statement of Inquiry	By changing matter, we can identify patterns in properties that help us to make models, and the models help us invent new kinds of materials.				
Content	Content: Mixtures: homogeneous or heterogeneous. Balancing chemical equations. Reactants and products identification. Molar mass calculation. Law of mass conservation. Application of the state symbols (s), (l), (g) and (aq) in equations. Explanation of observable changes in physical properties and chemical changes.								

UNIT TITLE	Who are we?						Duration	16 Weeks	
Subject(s)	Sciences	Key Concept	Relationships	Related Concept(s)	Evidence, Patterns	Global Context	Identities and relationships	Global Context Exploration(s)	Identity formation, Mathematical identities, modelling versus reality, equations and variations, the mathematics of epidemics on social media, Relationships —causation and correlation (including spurious correlations), Anthropometry
ATL Skills	VIII. Critical thinking skills IX. Creative thinking skills	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Ci. Cii. Ciii. Di Dii. Diii.	Statement of Inquiry	Because scientists understand the relationship between genes and inherited characteristics, we can use genetic patterns as evidence for identification and decision-making.				
Content	Concepts: A gene is a heritable factor that consists of a length of DNA and influences a specific characteristic. A gene occupies a specific position on a chromosome. Various specific forms of a gene are alleles. Alleles differ from each other by one or only a few bases. New alleles are formed by mutation. The Genome is the whole of the genetic information of an organism.				Applications and skills: The causes of genetic illness. Comparison of the number of genes in humans with other species. Use of a lab simulation to determine differences in the spring in Drosophila Melanogaster. Comparison of the number of genes in humans with other species. Skill: Use of a database to determine differences in the base sequence of a gene in two species.				

Subject group overview: Sciences

UNIT TITLE	**Light and Sound**						Duration	8 Weeks	
Subject(s)	Sciences	Key Concept	Relationships	Related Concept(s)	Energy, Form	Global Context	Scientific and technical innovation	Global Context Exploration(s)	Digital life, Virtual environments and the Information Age
ATL Skills	VI. Information literacy skills VII. Media literacy skills	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Ci. Cii. Ciii. Civ. Cv. Diii. Div.	Statement of Inquiry	Understanding the relationship between different forms of wave energy helps us better communicate.				
Content	Content: - Sound carries energy, and this can be transferred to other objects. Waves are a powerful model for explaining properties of sound, including reflection (echoes). Sounds start as vibrations in materials. The waves spread from the source in all directions. Sound can be modeled as a longitudinal wave, where the vibrations travel back and forth, in the same direction as the energy. Use a diagram to explain how sound vibrations spread out from their source and also reflect. Draw and interpret wave diagrams showing wavelength, amplitude and frequency. Sound carries energy, and this can be transferred to other objects. Sound waves spread from the source in all directions. Sound energy is transferred into movement energy when it enters the middle ear. This movement is transferred through several different parts until it reaches the inner ear. Use my understanding of how the ear works to explain specific hearing loss. Use models of the ear to explain how sound and light transfer energy to our sensory cells. Light comes in different colours, which combine to make white light. Waves are a powerful model for explaining the properties of light, including reflection, changing direction in different materials (refraction) and spreading out around obstacles (diffraction). Light travels in straight lines and transfers energy. Colours of light are primary or secondary. Light travels faster than sound. Light can be focused to form an image. Deduce the effects of coloured filters and lights on the appearance of coloured objects. Use ideas about waves to explain how light reflects, refracts or diffracts. Use ideas about light to work out how to correct specific sight problems. Use ideas about waves and reflection or refraction to design or adapt a device that uses light or sound, and explain how it works.								

Subject group overview: Sciences

Grade 8

UNIT TITLE	**Species at War Part 1 - Pathogens**						Duration	6 Weeks	
Subject(s)	Sciences	Key Concept	Global Interactions, Relationships	Related Concept(s)	Evidence	Global Context	Scientific and technical innovation, Globalization and sustainability	Global Context Exploration(s)	The biological revolution, Consequences and responsibility, Principles and discoveries, Human impact on the environment, Diversity and interconnection, Data-driven decision-making
ATL Skills	I. Communication skills:	Subject-group objectives	Ai. Aii. Aiii. Ci. Cii. Di. Dii. Diii. Div.	Statement of Inquiry	Relationships exist between species that may be beneficial or harmful. Understanding these relationships is essential for balance in ecosystems and protecting the well being of humanity.				
Content	Factual Knowledge: In this unit, learners build on their previous knowledge of health, the characteristics of living things and cells to develop their knowledge of: - how some microorganisms can be useful to humans, but others are harmful - microorganism, bacteria, virus, fungi, yeast - decay, decomposer - disease, pathogen, symptom, treatment. - the use of microorganisms in food production - how micro-organism activity can cause decay - the work of Louis Pasteur and other scientists studying the human body - pasteurization, fermentation - identification of microbe types and microscope use - pathogens and their modes of entry into hosts - identify the types of microbes and know examples of the diseases caused. - transfer of pathogens Conceptual Knowledge: - know a pathogen as a disease-causing organism - understand transmissible disease as a disease in which the pathogen can be passed from one host to another - Understand the consequences of cholera bacterium infection -causing production of a toxin that causes secretion of chloride ions into the small intestine, causing osmotic movement of water into the gut, causing diarrhea, dehydration, and loss of ions from the blood - importance of the following in - Understand the relationships between the importance of a clean water supply, hygienic food preparation, good personal hygiene, waste disposal, sewage treatment and controlling the spread of disease.				Procedural Knowledge: - demonstrate knowledge of how to select and safely use techniques, apparatus, and materials - plan experiments and investigations - make and record observations, measurements, and estimates - manipulate numerical and other data - use information to identify patterns, report trends and form conclusions - present reasoned explanations for phenomena, patterns, and relationships - make predictions based on relationships and patterns - interpret and evaluate experimental observations and data - evaluate methods and suggest possible improvements.			

Subject group overview: Sciences

UNIT TITLE	**Species at War - Part 2 Pandemics, Vaccines and the Immune System**						Duration	6 Weeks	
Subject(s)	Sciences	Key Concept	Global Interactions, Relationships	Related Concept(s)	Evidence, Models	Global Context	Scientific and technical innovation, Globalization and sustainability	Global Context Exploration(s)	Opportunity, Risk, Consequences and responsibility, Principles and discoveries, Human impact on the environment, Diversity and interconnection, Data-driven decision-making
ATL Skills	VII. Media literacy skills IX. Creative thinking skills	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Biv. Ci. Cii. Ciii. Civ. Cv. Di. Dii. Diii. Div.	Statement of Inquiry	Relationships exist between species that may be beneficial or harmful. Understanding these relationships is essential for balance in ecosystems and protecting the well being of humanity.				
Content	Factual Knowledge: In this unit, learners build on their previous knowledge of disease, pathogens and spread of disease to develop their knowledge of: - defense against infectious diseases - immune system - the body defense limited to skin, hairs in the nose, mucus, stomach acid and white blood cells - active immunity by antibodies production - passive immunity - pandemics - process of vaccination Conceptual Knowledge: - know each pathogen has its own antigens, which have specific shapes - understand antibodies as proteins that bind to antigens leading to direct destruction of pathogens or marking of pathogens for destruction by phagocytes - understand the relationship between specific antibodies that have complementary shapes which fit specific antigens - evidence the role of vaccination in controlling the spread of covid-19 by studying the data shared by WHO. - Understand the importance of global interaction in preparation of vaccines against infectious diseases. Procedural Knowledge: - locate, select, organize, and present information from a variety of sources - translate information from one form to another - manipulate numerical and other data - use information to identify patterns, report trends and form conclusions - present reasoned explanations for phenomena, patterns, and relationships - make predictions based on relationships and patterns - solve problems, including some of a quantitative nature.								

Subject group overview: Sciences

<table>
<tr><td>UNIT TITLE</td><td colspan="5">Gr. 8 Saves the World - United Nations Sustainable Development Goals (SDGs) Scientific Journalism and Interdisciplinary Project</td><td>Duration</td><td colspan="2">3 Weeks</td></tr>
<tr><td>Subject(s)</td><td>Sciences</td><td>Key Concept</td><td>Creativity, Global Interactions</td><td>Related Concept(s)</td><td>Environment</td><td>Global Context</td><td>Personal and cultural expression, Globalization and sustainability</td><td>Global Context Exploration(s)</td><td>Critical literacy, Human impact on the environment, Diversity and interconnection, Consumption, Conservation, Urban planning, Strategy and infrastructure, Data-driven decision-making</td></tr>
<tr><td>ATL Skills</td><td>I. Communication skills
II. Collaboration skills
VI. Information literacy skills</td><td>Subject-group objectives</td><td>Ai. Aiii.
Bi.
Ci. Cii. Ciii.
Di. Dii. Diii. Div.</td><td>Statement of Inquiry</td><td colspan="4">The UN SDGs are the most significant issues facing the world today. Scientific journalism has a key role to play in investigating the levels of awareness and understanding of the UN SDGs in the community. Through creativity the design of surveys and execution of interviews can create a product which can contribute to awareness and advocacy surrounding the world's largest lesson plan/UN SDGs.</td></tr>
<tr><td>Content</td><td colspan="9">Factual Knowledge: In this unit, learners build on their previous knowledge of species, environment, ecosystem and energy to develop their knowledge of:
- Climate change
- Desertification and land degradation
- Biodiversity
- Chemical and waste
- Sustainable development
- Water and sanitation
- Technology
- United Nations Sustainable Development Goals (SDGs)

Conceptual Knowledge:
- Understand the need for peace and prosperity for people and the planet, now and into the future UN has 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global interaction.
- Understand the need to save our environment. We must protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Procedural Knowledge:
- locate, select, organize and present information from a variety of sources
- translate information from one form to another
- manipulate numerical and other data
- use information to identify patterns, report trends and form conclusions
- present reasoned explanations for phenomena, patterns, and relationships
- make predictions based on relationships and patterns
- solve problems, including some of a quantitative nature.

Grade 8 Saves the World Complete Presentation - http://bit.ly/2PF0qNZ</td></tr>
</table>

Subject group overview: Sciences

UNIT TITLE	Materials Science 1 - Making Concrete (Acids, Bases and Neutralization)						Duration	3 Weeks	
Subject(s)	Sciences	Key Concept	Change	Related Concept(s)	Interaction, Consequences	Global Context	Scientific and technical innovation	Global Context Exploration(s)	Opportunity, Risk, Consequences and responsibility, Industrialization and engineering
ATL Skills	I. Collaboration skills	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Biv. Ci. Cii. Ciii. Civ. Cv.	Statement of Inquiry	A change in matter is a consequence of energy differences between substances. Scientists and technicians make use of this to create a range of innovative products.				
Content	Factual Knowledge: In this unit, learners build on their previous knowledge of acids to develop their knowledge of: - how to tell if a solution is an acid or an alkali - using a pH scale - neutralization and some of its applications. - acid, acidic, ocean acidification, alkali, alkaline, base, neutral, neutralization, - indicator, universal indicator, litmus, pH scale, concentrated, dilute. - Concrete - Quarrying limestone Conceptual Knowledge: - Understand that all substances have chemical properties and physical properties. - Understand that the acidity or alkalinity of a substance is a chemical property and is measured by pH. - Know use of indicators (including Universal Indicator and litmus) to distinguish between acidic, alkaline, and neutral solutions. - Know tests to identify hydrogen, carbon dioxide and oxygen gases. - Understand neutralization reactions in terms of change of pH. - Understand the consequences of ocean acidification. - Understand the interactions of materials used in concrete. - Understand consequences of quarrying limestone to create cement for concrete				Procedural Knowledge: - suggesting ideas that may be tested - outlining plans to carry out investigations, considering the variables to control, change or observe - making predictions referring to previous scientific knowledge and understanding - identifying appropriate evidence to collect and suitable methods of collection - choosing appropriate apparatus and using it correctly - making careful observations including measurements - using information from secondary sources - making conclusions from collected data, including those presented in a graph, chart, or spreadsheet - recognizing results and observations that do not fit into a pattern, including those presented in a graph, chart, or spreadsheet. **Reconstructors 1 Concrete Presentation - https://goo.gl/2oG5uR**				

Subject group overview: Sciences

UNIT TITLE	**Materials Science Part 2 - Metals**						Duration	2 Weeks	
Subject(s)	Sciences	Key Concept	Change	Related Concept(s)	Consequences, Interaction	Global Context	Scientific and technical innovation	Global Context Exploration(s)	Opportunity, Risk, Consequences and responsibility, Industrialization and engineering
ATL Skills	Social - II. Collaboration skills: Working effectively with others	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Biv. Ci. Cii. Ciii. Civ. Cv. Diii. Div.	Statement of Inquiry	A change in matter is a consequence of energy differences between substances. Scientists and technicians make use of this to create a range of innovative products.				
Content	Factual Knowledge: In this unit, learners build on their previous knowledge of the properties of materials and develop their ideas on: - the differences between metals and nonmetals - chemical reactions - word equations. - metal, non-metal, metal fatigue - metal recycling - the reactions of metals confined to sodium, magnesium, zinc, iron, copper, silver, and gold. - Periodic Table - density, malleability, ductility, combustion - corrosion, rusting, oxidation, galvanizing. Conceptual Knowledge: - Understand that all matter is made of atoms, with each different type of atom being a different element. - Understand classification of elements into metals, nonmetals and metalloids. - Know that the Periodic Table presents the known elements in an order. - Know metals and non-metals as the two main groupings of elements. - Understand how recycling aluminum interacts with the economy and environment. - Understand the consequences of metal mining on the environment. - Understand the consequences of metal fatigue. - Understand how rusting changes the physical and chemical properties of metals.			Procedural Knowledge: - testing predictions with reference to evidence gained - planning investigations to test ideas - identifying important variables; choosing which variables to change, control and measure - making predictions using scientific knowledge and understanding - using a range of equipment correctly - comparing results with predictions - presenting conclusions to others in appropriate ways - presenting results as appropriate in tables and graphs. **Reconstructors 2 - Metals Materials Science Presentation - https://goo.gl/AX3v2b**				

Subject group overview: Sciences

<table>
<tr><td>UNIT TITLE</td><td colspan="5">Materials Science Part 3 - Polymers + Innovation Convention Project</td><td>Duration</td><td colspan="2">4 Weeks</td></tr>
<tr><td>Subject(s)</td><td>Sciences</td><td>Key Concept</td><td>Change</td><td>Related Concept(s)</td><td>Consequences, Interaction</td><td>Global Context</td><td>Scientific and technical innovation</td><td>Global Context Exploration(s)</td><td>Opportunity, Risk, Industrialization and engineering</td></tr>
<tr><td>ATL Skills</td><td>II. Collaboration skills</td><td>Subject-group objectives</td><td>Ai. Aii. Aiii.
Bi. Bii. Biii. Biv.
Ci. Cii. Ciii. Civ.
Di. Dii. Diii.</td><td>Statement of Inquiry</td><td colspan="5">A change in matter is a consequence of energy differences between substances. Scientists and technicians make use of this to create a range of innovative products.</td></tr>
<tr><td>Content</td><td colspan="9">Factual Knowledge: In this unit, learners build on their previous knowledge of the properties of materials and develop their ideas on:
- Polymers
- Monomers
- Natural polymers
- Synthetic polymers and its impact on environment
- Inorganic polymers
- Organic polymers
- Intermolecular forces
- Properties of polymers

Conceptual Knowledge:
- Understand a polymer is a large molecule or a macromolecule which essentially is a combination of interactions between many subunits or monomers.
- Understand different polymers have different properties and different uses.
- Understand the consequences of overuse of synthetic polymers like plastic has on the environment.
- Explore what changes can be done individually to reduce plastic consumption.

Procedural Knowledge:
- demonstrate knowledge of how to select and safely use techniques, apparatus, and materials
- plan experiments and investigations
- make and record observations, measurements, and estimates
- interpret and evaluate experimental observations and data
- evaluate methods and suggest possible improvements.</td></tr>
</table>

Subject group overview: Sciences

UNIT TITLE	**Energy!**						Duration	10 Weeks	
Subject(s)	Sciences	Key Concept	Systems	Related Concept(s)	Energy, Transformation	Global Context	Scientific and technical innovation	Global Context Exploration(s)	Systems, Methods, Ingenuity and progress, Industrialization and engineering
ATL Skills	V. Reflection skills VIII. Critical thinking skills	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Biv. Ci. Cii. Ciii. Civ. Cv. Di. Dii. Diii. Div.	Statement of Inquiry	We use systems to help us with a variety of tasks by transferring and transforming energy.				
Content	Factual Knowledge: learners build on their previous knowledge of chemical reactions and energy transfers to develop their knowledge of: - exothermic and endothermic reactions and processes - the thermal (heat) energy transfer processes of conduction, convection, and radiation - cooling by evaporation. - Open system & closed system - Electricity, Static electricity - Series and parallel circuits - Current, voltage, resistance, and Ohm's Law - Power and energy, Alternative energy production, nuclear energy Conceptual Knowledge: - Know that energy is conserved, meaning it cannot be created or destroyed. - Know that thermal energy will always transfer from hotter regions or objects to colder ones, and this is known as heat dissipation. - Understand thermal transfer by the processes of conduction, convection, and radiation. - Know how current divides in parallel circuits. - Understand how to measure current and voltage in series and parallel circuits and describe the effect of adding cells and lamps. - Know how to calculate resistance (resistance = voltage / current) and describe how resistance affects current. - Use diagrams and conventional symbols to represent, make and compare circuits that include cells, switches, resistors (fixed and variable), ammeters, voltmeters, lamps, and buzzers. - Understand how energy transformation is done by a wind turbine generator. - Understand how earth acts as an open system of energy.				Procedural Knowledge: - selecting ideas and producing plans for testing based upon previous knowledge, understanding and research - suggesting and using preliminary work to decide how to carry out an investigation - deciding which measurements and observations are necessary and what equipment to use - deciding which apparatus to use and assessing any hazards in the laboratory - making sufficient observations and measurements to reduce error and make results more reliable - using a range of materials and equipment and controlling risks - making observations and measurements - choosing the best way to present results - describing patterns (correlations) seen in results - interpreting results using scientific knowledge and understanding - drawing conclusions - evaluating the methods used and refining for further investigations - explaining results using scientific knowledge and understanding; communicating this clearly to others. **Energy! All in one presentation - https://goo.gl/cytjWa**				

Subject group overview: Sciences

Grade 9

UNIT TITLE	**Atomic Structure and Bonding**						Duration	12 Weeks	
Subject(s)	Sciences	Key Concept	Change	Related Concept(s)	Patterns	Global Context	Scientific and technical innovation	Global Context Exploration(s)	Models, Methods, Products, Consequences and responsibility
ATL Skills	III. Organization skills V. Reflection skills	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Biv. Ci. Cii. Ciii. Civ. Cv. Di. Dii. Diii. Div.	Statement of Inquiry	Changes in chemical bonding leads to patterns of physical properties.				
Content	Content: Atoms contain a positively charged dense nucleus composed of protons and neutrons (nucleons). Negatively charged electrons occupy the space outside the nucleus. The mass spectrometer is used to determine the relative atomic mass of an element from its isotopic composition. Positive ions (cations) form by metals losing valence electrons. Negative ions (anions) form by non-metals gaining electrons. The number of electrons lost or gained is determined by the electron configuration of the atom. The ionic bond is due to electrostatic attraction between oppositely charged ions. Under normal conditions, ionic compounds are usually solids with lattice structures. A covalent bond is formed by the electrostatic attraction between a shared pair of electrons and the positively charged nuclei. Lewis (electron dot) structures show all the valence electrons in a covalently bonded species. The “octet rule” refers to the tendency of atoms to gain a valence shell with a total of 8 electrons. Heat is a form of energy. Temperature is a measure of the average kinetic energy of the particles. Total energy is conserved in chemical reactions. Chemical reactions that involve transfer of heat between the system and the surroundings are described as endothermic or exothermic. The enthalpy change (ΔH) for chemical reactions is indicated in kJ mol-1. ΔH values are usually expressed under standard conditions, given by ΔH°, including standard states.						Skills: Use of the nuclear symbol notation to deduce the number of protons, neutrons, and electrons in atoms and ions. Calculations involving non-integer relative atomic masses and abundance of isotopes from given data, including mass spectra. Describe the formation of ions Define cations and anions Explain why metals form positively charged ions and nonmetals form negatively charged ions Explain ionic bonding as the electrostatic attraction between oppositely charged ions Determine the physical properties of ionic substances such as solubility, comparative melting point, and boiling point, the electrical conductivity of solids and liquids, and brittleness. Explain why ionic substances conduct electricity when molten, but not solid. Explain why ionic substances are brittle. Describe covalent bonding as the sharing of electrons. Sketch Lewis Dot structures for molecules. Explain the physical properties of molecular substances: low melting points and boiling points; brittle, do not conduct electricity.		

Subject group overview: Sciences

UNIT TITLE	**What issues do large organisms face?**						Duration	6 Weeks	
Subject(s)	Sciences	Key Concept	Relationships	Related Concept(s)	Environment, Form, Function	Global Context	Orientation in space and time	Global Context Exploration(s)	Migration, Displacement and exchange, Scale, Evolution
ATL Skills	VIII. Critical thinking skills IX. Creative thinking skills	Subject-group objectives	Ai. Aiii. Bi. Ci. Cii. Di. Dii. Diii. Div	Statement of Inquiry	The size of organisms determines their distribution in space and time, and the form and function of specialized structures in large organisms develop from their relationships with the environment.				
Content	Content: Evolution occurs when the heritable characteristics of a species change. The fossil record provides evidence for evolution. Selective breeding of domesticated animals shows that artificial selection can cause evolution. The evolution of homologous structures by adaptive radiation explains similarities in structure when there are differences in function. Natural selection can only occur if there is variation among members of the same species. Mutation, meiosis and sexual reproduction cause variation between individuals in a species.			Application: Development of melanistic insects in polluted areas. Comparison of the pentadactyl limb of mammals, birds, amphibians, and reptiles with different methods of locomotion. Application: Evolution of antibiotic resistance in bacteria.				

Subject group overview: Sciences

UNIT TITLE	**Motion**						Duration	12 Weeks	
Subject(s)	Sciences	Key Concept	Change	Related Concept(s)	Balance, Movement	Global Context	Scientific and technical innovation	Global Context Exploration(s)	Mathematical puzzles, Principles and discoveries
ATL Skills	I. Communication skills II. Collaboration skills VI. Information literacy skills X. Transfer skills	Subject-group objectives	Bi. Bii. Biii. Biv. Ci. Cii. Ciii. Civ. Cv. Di. Dii. Diii. Div.	Statement of Inquiry	Changes in motion, resulting from unbalanced forces, can be predicted through mathematical relationships				
Content	Content: - Distance is a scalar quantity that refers to "how much ground an object has covered" during its motion. - Displacement is a vector quantity that refers to "how far out of place an object is"; it is the object's overall change in position. - Speed (a scalar) is the rate at which distance is covered, and is measured in units of distance divided by time. • Average speed is the total distance covered divided by the time interval. - Velocity (a vector) is speed with a direction. • Velocity is constant only when speed and direction are both constant. - Acceleration (a vector) is the rate at which velocity is changing with respect to time. • An object accelerates when its speed is increasing, its speed is decreasing, and/or when its direction is changing. • Acceleration is measured in units of speed divided by time. - An object in free fall is falling under the influence of gravity alone when air resistance does not affect its motion. • An object in free fall has a constant acceleration of about 10 m/s2. • The acceleration of all objects in free fall is the same, regardless of their mass. - Distance - Time graphs. The slope of a d-t graph describes the speed. - Speed - Time graphs. The slope of a speed - time graph describes acceleration. The area under a speed - time graph is equal to distance. - Newton's First Law of Motion – Inertia (FNET = 0): • An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force. • Inertia is the tendency an object has to resist its change in state of motion. • Mass is dependent on the inertia of an object or the more inertia an object has the more mass it has. - Newton's Second Law of Motion: FNET = ma OR a = FNET / m : • An object accelerates – changes speed and/or direction – when a net force acts on it. • The acceleration of an object is directly proportional to the net force acting on it. • The acceleration of an object is inversely proportional to the mass of the object. • Acceleration is in the same direction of the net force. • When an object moves with a constant velocity while an applied force acts on it, an equal and opposite force, usually friction, must also act to balance the applied force. • At terminal velocity, the force of air resistance balances the force of gravity. - Newton's Third Law of Motion – Action and Reaction: • An interaction between two things produces a pair of forces. • Interacting things exert forces on each other. • The two interacting forces are called the action force and the reaction force. • Action and reaction forces are equal in strength and opposite in direction. - Momentum and Impulse (collisions): • The momentum of an object is the product of its mass and its velocity. p = mv; • Impulse is average force multiplied by the time during which it acts. • Impulse = FΔt; • Impulse = change in momentum OR Ft = Δ(mv) Skills: Plot relationships between distance and time Calculate distance, time, and acceleration in movement								

Subject group overview: Sciences

INTERDISCIPLINARY UNIT

UNIT TITLE	**ADAPTING TO CHANGES**						Duration	12 Weeks	
Subject(s)	Sciences, Design	Key Concept	Change, Development	Related Concept(s)	Sciences - Transformation Design- Ergonomics	Global Context	Fairness and development	Global Context Exploration(s)	Human capability and development, Imagining a hopeful future
ATL Skills	I. Communication skills II. Collaboration skills VI. Information literacy skills X. Transfer skills	Interdisciplinary objectives	Ai. Aii. Bi. Bii. Ci. Cii.	Subject-group objectives - Science	Bi. Bii. Biii. Biv. Ci. Cii. Ciii. Civ. Dv.		Subject-group objectives - Design	Ai. Aii. Aiii. Aiv. Bi. Bii. Biii. Biv. Ci. Cii. Ciii. Civ. Di. Dii. Diii. Div.	
Statement of Inquiry	Humans develop products that change the quality of life of others in order to contribute to a more hopeful future.								
Content	Science content, knowledge and skills: Concepts: Natural selection can only occur if there is variation among members of the same species. Adaptations are characteristics that make an individual suited to its environment and way of life. Skills: To adopt the nature of science as the human face of science, because scientists often work in areas, or produce findings, that have significant ethical and political implications. These areas include cloning, genetic engineering of food and organisms, stem cell and reproductive technologies, nuclear power, weapons development (nuclear, chemical, and biological), transplantation of tissue and organs.						Design content, knowledge and skills: Research on existing products that help to make the quality of life better for living things Determine which products would best help to inform and solve the design situation SWOT analysis of products and research, synthesize information to inform the ideas for the design solution Develop design specifications to guide the design solution ideas and by which the solution will be evaluated Develop varied ideas to solve the problem Present ideas to explain the process, materials and choices for the ideas and the final solution Test the solution and get feedback to improve the solution Make revisions to ideas, design specification and the solution creation to further improve.	

Subject group overview: Sciences

Grade 10

UNIT TITLE	**Life is Beautiful (Biology)**						Duration	12 Weeks	
Subject(s)	Sciences	Key Concept	Systems	Related Concept(s)	Function, Interaction	Global Context	Identities and relationships, Globalization and sustainability	Global Context Exploration(s)	Happiness and the good life, Physical, psychological and social development, Transitions, Health and well-being, Lifestyle choices, Self-esteem, Human impact on the environment, Consumption
ATL Skills	II. Collaboration skills III. Organization skills	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Biv. Ci. Cii. Ciii. Civ. Cv. Di. Dii. Diii. Div.	Statement of Inquiry	Photosynthesis and respiration form a system of energy transformation that humans can manipulate to their advantage. A healthy body can be maintained when there is knowledge about choices and consequences.				
Content	Factual Knowledge: In this unit, learners build on their previous knowledge of the characteristics common to all living things to develop their knowledge of: - structure of a plant cell with an animal cell, - Movement into and out of cells - the need of plants for carbon dioxide, water, and light for photosynthesis and that this process makes biomass and oxygen - the importance of water and mineral salts to plant growth. - photosynthesis, word equation, chlorophyll, chloroplasts, glucose, sugar, starch, biomass, cell, cytoplasm - xylem, phloem, stomata, air space, cuticle - wilt, turgid, flaccid, diffusion - minerals, nitrogen, potassium, phosphorus, deficiency. - Transpiration, xylem, phloem - carbohydrates, fats, and proteins - Human nutrition - the constituents of a balanced diet and the functions of various nutrients - the effects of nutritional deficiencies - the relationship between diet and fitness - the organs and functions of the alimentary canal - the function of enzymes. - Digestive system - Excretion in humans - Respiration - Gas exchange in humans				Conceptual Knowledge: Know that photosynthesis occurs in chloroplasts and is the process by which plants make carbohydrates, using the energy from light. Understand the pathway of water and mineral salts from the roots to the leaves in flowering plants, including absorption in root hair cells, transport through xylem and transpiration from the surface of leaves. Know that plants require minerals to maintain healthy growth and life processes (limited to magnesium to make chlorophyll and nitrates to make protein). Understand that carbohydrates and fats can be used as a store of energy in animals, and animals consume food to obtain energy and nutrients. Understand the constituents of a balanced diet for humans as including protein, carbohydrates, fats and oils, water, minerals (limited to calcium and iron) and vitamins (limited to A, C and D), and describe the functions of these nutrients. Understand the structure of the human excretory (renal) system and its function (limited to kidneys filtering blood to remove urea, which is excreted in urine). Understand how the structure of the human respiratory system is related to its function of gas exchange (in terms of lung structure and the action of the diaphragm and intercostal muscles) and understand the difference between breathing and respiration. Know that aerobic respiration occurs in the mitochondria of plant and animal cells and gives a controlled release of energy. Understand how human growth, development and health can be affected by lifestyle, including diet and smoking. Understand how body systems interact to maintain homeostasis. Procedural Knowledge: - discussing the importance of developing empirical questions which can be investigated, collecting evidence, developing explanations, and using creative thinking - making predictions using scientific knowledge and understanding - testing predictions with reference to evidence gained - taking appropriately accurate measurements - using a range of equipment correctly - presenting results as appropriate in tables and graphs - identifying trends and patterns in results (correlations) - comparing results with predictions - discussing explanations for results using scientific knowledge and understanding and communicating these clearly to others - making predictions using scientific knowledge and understanding - discussing and controlling risks to themselves and others - interpreting data from secondary sources. **Photosynthesis and Respiration Review - https://goo.gl/UYTVnN** **Nutrition and Reproduction Review - https://goo.gl/5wjFeq**				

Subject group overview: Sciences

UNIT TITLE	Cracking the Code of Chemistry						Duration	8 Weeks	
Subject(s)	Sciences	Key Concept	Relationships	Related Concept(s)	Evidence, Patterns	Global Context	Orientation in space and time	Global Context Exploration(s)	Constraints and adaptation
ATL Skills	VIII. Critical thinking skills IX. Creative thinking skills X. Transfer skill	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Biv. Ci. Cii. Ciii. Civ. Cv. Di. Dii. Diii. Div.	Statement of Inquiry	The language of chemistry allows scientists to create models of a dynamically transformative, yet delicately balanced world.				
Content	Content: - Atoms of different elements combine in fixed ratios to form compounds, which have different properties from their component elements. - Mixtures contain more than one element and/or compound that are not chemically bonded together and so retain their individual properties. - Mixtures are either homogeneous or heterogeneous. - The mole is a fixed number of particles and refers to the amount, n, of substance. - Masses of atoms are compared on a scale relative to 12C and are expressed as relative atomic mass (Ar) and relative formula/molecular mass (Mr). - Molar mass (M) has the units g mol-1. - The empirical formula and molecular formula of a compound give the simplest ratio and the actual number of atoms present in a molecule respectively. - Reactants can be either limiting or excess. - The experimental yield can be different from the theoretical yield. - Avogadro's law enables the mole ratio of reacting gases to be determined from volumes of the gases. - The molar volume of an ideal gas is a constant at specified temperature and pressure. - The molar concentration of a solution is determined by the amount of solute and the volume of solution. - A standard solution is one of known concentration.				Application of Skills: Deduction of chemical equations when reactants and products are specified. • Application of the state symbols (s), (l), (g) and (aq) in equations. • Explanation of observable changes in physical properties and temperature during changes of state • Calculation of the molar masses of atoms, ions, molecules and formula units. • Solution of problems involving the relationships between the number of particles, the amount of substance in moles and the mass in grams. • Interconversion of the percentage composition by mass and the empirical formula. • Determination of the molecular formula of a compound from its empirical formula and molar mass. • Obtaining and using experimental data for deriving empirical formulas from reactions involving mass changes. • Solution of problems relating to reacting quantities, limiting and excess reactants, theoretical, experimental and percentage yields. • Calculation of reacting volumes of gases using Avogadro's law. • Solution of problems and analysis of graphs involving the relationship between temperature, pressure and volume for a fixed mass of an ideal gas. • Solution of problems relating to the ideal gas equation.			

Subject group overview: Sciences

UNIT TITLE	**Reach for the stars**						Duration	13 Weeks	
Subject(s)	Sciences	Key Concept	Relationships	Related Concept(s)	Models	Global Context	Scientific and technical innovation	Global Context Exploration(s)	Models, Principles and discoveries
ATL Skills	VI. Information literacy skills VII. Media literacy skills	Subject-group objectives	Ai. Aii. Aiii. Bi. Bii. Biii. Biv. Di. Dii. Diii. Div.	Statement of Inquiry	The development of scientific tools and techniques stem from (and give rise to) new discoveries, all of which allow us to refine our models--from the solar system to the nature of matter.				
Content	Content: Key to this unit are the definitions of model, law and theory Model - A visual or mathematical representation of natural phenomena that allows accurate predictions Law - A quantitative or qualitative description of what drive natural phenomena Theory - An explanation for the nature of something, e.g. Newton's and Einstein's theories of gravity, Quantum Field Theory or String Theory as explanations for the nature of matter. - Astronomical tools from history (a variety from different time periods and geographical locations) - The nature of science--and why astronomy is a science, but astrology is not - Historical models of the solar system--Aristotle, Ptolemy, Copernicus, Newton - Newton's and Kepler's models of planetary motion (conceptually) - Newton's law of universal gravitation (mathematically) and Einstein's theory of special relativity (conceptually) - Mathematical equations of stellar characteristics--absorption/emission spectra, Wien's displacement law (blackbody radiation) - Astronomical redshift, Hubble's law - The discovery of subatomic particles, elementary particles and the development of the standard model of physics - Quantum field theory and string theory				Skills: - Apply various mathematical equations in order to calculate unknown quantities - Use absorption or emission spectra to identify elements - Interpret a blackbody spectrum graph to deduce the temperature of a star - Interpret shifts in emission or absorption spectra--blueshift or redshift - Estimate recession velocity--from spectra or a graph showing Hubble's constant - Estimate Hubble's constant graphically - Interpret the gradient of a graph, e.g. speed of light from wavelength and frequency				