

MYP-IV Chemistry

S R #	Unit Name	Key concepts	Related concepts	Global context	Statement of Inquiry	MYP Objectives	Approaches to learning	Content	Summative Assessment Task
1	What is matter?	Change	Models	Identities and relationships Focus Exploration: Moral reasoning and ethical judgment	When matter changes we observe similarities and differences that help us build models to explain underlying relationships.	Criterion A: Knowing and understanding Criterion B: Inquiring and designing Criterion C: Processing and evaluating Criterion D: Reflecting on the impacts of science	Communication skills 1. Read critically and for comprehension; 2. make inferences and draw conclusions; 3. Give and receive meaningful feedback; 4. use appropriate forms of writing for different purposes and audiences Collaboration skills 1. Listen actively to other	1. States and properties of matter with reference to the spatial arrangement and movement of particles, and the processes occurring during changes of state 2. The Kinetic theory of particles. Interpret the cooling/heating curve of water 3. Calculate and estimate density from mass and volume data. State examples of pure and impure substances. 4. Investigate, using controlled variables, the effects of impurities of the properties of pure substances Identify examples of physical and chemical changes 5. Physical and chemical changes & characteristics.	Criteria A: Knowing and understanding e-assessment style questions: Learners will solve problems and the questions. Criterion D: Reflecting on the impacts of Science What problem or issue does your matter address? Describe the matter you selected, for example its chemical structure

							<p>perspectives and ideas, encourage others to contribute, give and receive meaningful feedback;</p> <p>2. Delegate and share responsibility for decision-making; encourage others to contribute;</p> <p>3. Practise empathy; help others succeed;</p> <p>4. encourage others to contribute;</p> <p>5. give and receive meaningful feedback</p> <p>Organization skills</p> <p>1. Select and use technology effectively</p>		<p>(state at STP) and other standardized properties. Explain how this matter is used and made available to us. Scientific knowledge always interacts with moral, ethical, social, economic, political, cultural or environmental factors in our world. Explain how your selected substance does this</p>
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							<p>and productively ;</p> <ol style="list-style-type: none">2. Plan short- and long-term assignments , meet deadlines;3. set goals that are challenging and realistic; <p>Affective skills</p> <ol style="list-style-type: none">1. Practise strategies to develop mental focus;2. practise managing self-talk;3. practise positive thinking <p>Critical-thinking skills</p> <ol style="list-style-type: none">1. Practise observing carefully in order to recognize problems;2. Interpret data; Gather		
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							<p>and organize relevant information to formulate an argument;</p> <ol style="list-style-type: none">3. test generalizations and conclusions4. draw reasonable conclusions and generalization;5. Practice observing carefully in order to recognize problems <p>Creative-thinking skills</p> <ol style="list-style-type: none">1. Use brainstorming and visual diagrams to generate new ideas and inquiries;		
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							<ol style="list-style-type: none">2. consider multiple alternatives, including those that might be unlikely or impossible;3. practise flexible thinking – develop multiple opposing, contradictory and complementary arguments;4. Practise observing carefully in order to recognize problems5. revise understanding based on new information and evidence		
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2	<p>In what ways do we utilize matter?</p>	Change	Conditions	<p>Personal and cultural expression Focus Exploration: Analysis and argument</p>	<p>Changing conditions for matter has allowed us to make attractive products that express who we are and where we are from.</p>	<p>Criterion A: Knowing and understanding Criterion D: Reflecting on the impacts of science</p>	<p>Organization skills</p> <ol style="list-style-type: none"> 1. Use appropriate strategies for organizing complex information; 2. select and use technology effectively and productively 3. Plan short- and long-term assignment to meet deadlines. 4. plan strategies and take action to achieve personal and academic goals; 5. use appropriate strategies for organizing 	<ol style="list-style-type: none"> 1. Find out how pure substances and mixtures serve our cultural needs and creative expression. 2. Explore: the chemistry of mixtures in domestic and decorative arts; 3. how stable and unstable mixtures behave, and the advantages and disadvantages of this stability; 4. how the differences in physical properties of pure matter are used to separate mixtures; 5. tools and techniques of an analytical chemist. 6. Take action by creating a range of cosmetic products for use as personalized gifts 	<p>Various problems allow for the application of the understanding of mixtures and separation processes in daily life, and the physical properties of the substances involved. Criteria B: Planning and designing. Criteria C: Processing and evaluating Formative – Separating technique lab Summative – Chromatography lab.</p>
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							<p>complex information</p> <p>Critical-thinking skills</p> <ol style="list-style-type: none">1. Evaluate evidence and arguments; :2. Interpret data; analyse complex concepts into their constituent parts and synthesize them to3. create new understanding4. Practise strategies to prevent and eliminate bullying5. practise strategies to reduce stress and anxiety6. practise positive thinking7. Practise observing		
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							<p>carefully in order to recognize problems; interpret data;</p> <p>8. Draw Reasonable conclusions and generalizations</p> <p>Creative-thinking skills</p> <p>1. Consider multiple alternatives, including those that might be unlikely or impossible;</p> <p>2. design improvements to existing machines and technologies</p> <p>Transfer skills</p> <p>1. Apply skills and knowledge in unfamiliar situations;</p>		
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							<ol style="list-style-type: none"> 2. change the context of an inquiry to gain different perspectives 3. Make connections between subject groups and disciplines 4. Apply knowledge and skills in unfamiliar situations 		
3	How do we map matter?	Systems	Patterns	<p>Scientific and technical innovation</p> <p>Focus</p> <p>Exploration:</p> <p>Models and Methods</p>	<p>Scientific and technological innovation has allowed us to identify patterns in the properties of chemical elements and so build systems to classify them.</p>	<p>Criterion A: Knowing and understanding</p> <p>Criterion B: Inquiring and designing</p> <p>Criterion C: Processing and evaluating.</p> <p>Criteria D: Reflecting on the impacts of science</p>	<p>Communication skills</p> <ol style="list-style-type: none"> 1. Read critically and for comprehension 2. give and receive meaningful feedback 3. use a variety of speaking techniques to communicate 	<ol style="list-style-type: none"> 1. Identify properties of metals (for example, alkali metals, alkaline earth metals, rare earth metals) and non-metals (for example halogens and noble gases) 2. Outline differences between atoms and ions, and protons, neutrons and electrons 3. Investigate physical or chemical properties of a range of metals and non-metals State the origins of the names of some of the chemical elements 	<p>Learners will solve the problems and the questions</p> <p>Criteria A: Knowing and understanding</p> <p>Imagine your school is hosting an exhibition, 'The past and future of the periodic table'.</p>

							<ol style="list-style-type: none"> 4. interpret and use effectively modes of non-verbal communication 5. Make inferences and draw conclusions 6. use and interpret a range of discipline-specific terms and symbols <p>Collaboration skills</p> <ol style="list-style-type: none"> 1. Help others to succeed 2. listen actively to other perspectives and ideas; 3. encourage others to contribute 4. exercise leadership and take on a variety of 	<ol style="list-style-type: none"> 4. Organize groups of elements on a standard (medium long) periodic table, identifying periodic trends within groups and periods 5. Present a model or display that describes an alternative and chemically justified arrangement of groups of elements forming the periodic table 6. Create a game based on the periodic table to help others learn about patterns in the periodic table 	<p>Your task is to create an exhibit of an alternative representation of the periodic table. It can be linear, two-dimensional or three-dimensional. To be more than a periodic table, you should include a written description (perhaps an A3-sized poster) with your model.</p> <p>Criteria D: Reflecting on the impacts of science</p>
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							<p>roles within groups</p> <ol style="list-style-type: none">5. practise empathy <p>Organization skills</p> <ol style="list-style-type: none">1. Bring necessary equipment and supplies to class2. understand and use sensory learning preferences (learning styles)3. select and use technology effectively and productively4. Practise empathy5. encourage others to contribute; help others succeed <p>Reflection skills</p> <p>Critical-thinking skills</p> <ol style="list-style-type: none">1. Practise observing		
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							<p>carefully in order to recognize problems</p> <ol style="list-style-type: none">2. interpret data3. draw reasonable conclusions and generalizations <p>Creative-thinking skills</p> <ol style="list-style-type: none">1. Consider multiple alternatives, including those which might be unlikely or impossible2. create novel solutions to authentic problems3. create original works and ideas, use existing works and		
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							ideas in new ways		
4	How do atoms bond?	Relationships	Evidence	Identities and relationships Focus Exploration: Attitudes	Chemical and physical properties provide evidence of the relationships both between and within atoms.	Criterion A: Knowing and understanding Criterion B: Inquiring and designing Criterion C: Processing and evaluating ◆ Criterion D: Reflecting on the impacts of science	Communication skills 1. Negotiate ideas and knowledge with peers and teachers 2. write for different purposes 3. Take effective notes in class 4. Give and receive meaningful feedback 5. Use appropriate forms of writing for different purposes and audiences 6. paraphrase accurately and concisely Collaboration skills	1. Describe properties of metals, ionic solids, covalent molecular substances and covalent molecular network solids 2. Outline bonding relationships between groups of elements in the periodic table, developing understanding of periodic trends 3. Identify examples of polar molecules (liquids) 4. Suggest how inter- and intramolecular forces explain different types of chemical interactions between particles (molecules, ions or atoms) 5. Evaluate the bonding relationships between parts of a complex synthetic molecule and its function, presenting findings in a mode that reflects the audience who will use it 6. State names and chemical formulas of molecules 7. Identify the numbers of atoms of different elements represented in the symbolic	Use the Internet to find a slime recipe. Consider PVC slime, washable glue slime, or gak. Source the ingredients and conduct preliminary tests of its physical properties. Your hypothesis should link an independent variable with the effects you plan to measure (dependent variable), and your scientific reasoning should include an explanation of

							<ol style="list-style-type: none"> 1. Build consensus 2. Help others succeed 3. Practise empathy 4. help others to succeed 5. encourage others to contribute <p>Organization skills</p> <ol style="list-style-type: none"> 1. Keep an organized and logical system for information files/notebooks 2. understand and use sensory learning preferences (learning styles) 3. Plan short- and long-term assignments 4. meet deadlines 5. set goals that are 	<p>representation of a chemical compound</p> <ol style="list-style-type: none"> 8. Present formulas for the chemical compounds by valency and chemical symbols 9. Describe the relationship between the charge of an ion in solution and its migration towards the oppositely charged electrode 10. Investigate how a measurable property of a slime changes in response to a condition that changes bonding between its molecules 	<p>changed bonding in the slime.</p> <p>Criteria B: Planning and designing.</p> <p>Criteria C: Processing and evaluating</p>
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							<p>challenging and realistic;</p> <p>6. use appropriate strategies for organizing complex information</p> <p>Critical-thinking skills</p> <p>1. Evaluate evidence and arguments;</p> <p>2. identify trends and forecast possibilities;</p> <p>3. Practise observing carefully in order to recognize problems</p> <p>4. revise understanding based on new information and evidence</p> <p>5. Recognize and evaluate</p>		
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							Propositions Information literacy skills <ol style="list-style-type: none"> 1. Make connections between various sources of information 		
5	What are the impacts of chemical industry?	Change	Interaction	Globalization and sustainability Focus Exploration: Human impact on the environment	Chemical industry has brought change that affects global interactions with positive and negative environmental impacts.	Criterion A: Knowing and understanding Criterion B: Inquiring and designing Criterion C: Processing and evaluating Criterion D: Reflecting on the impacts of science	Communication skills <ol style="list-style-type: none"> 1. Negotiate ideas and knowledge with peers and teachers 2. make inferences and draw conclusions 3. Use and interpret a range of discipline-specific terms and symbols 4. Use and understand and use mathematical notation 5. organize and depict 	<ol style="list-style-type: none"> 1. Case studies involving chemical environmental pollution 2. Present relevant information in the local community about how wastes should be safely disposed of 3. Investigate systematically combinations of ionic solutions for their potential to form precipitates (ionic compounds with low solubility), as an example of a type of chemical reaction 4. Formulate balanced chemical equations 'by inspection' –balancing chemical equations is an application of the law of conservation of mass 5. Identify colour changes associated with a range of indicators of acids and bases 	Individually, students research and promote how a category of waste can be disposed of safely. Criteria A: Knowing and understanding Criteria D: Reflecting on the impacts of science

							<p>information logically</p> <p>Collaboration skills</p> <ol style="list-style-type: none"> 1. Listen carefully to other perspectives and ideas <p>Organization skills</p> <p>Affective skills</p> <ol style="list-style-type: none"> 1. Mindfulness - practise focus and Concentration 2. Keep an organized and logical system of information files/notebooks 3. understand and use sensory learning preferences (learning styles) <p>Critical-thinking skills</p> <ol style="list-style-type: none"> 1. Interpret data 2. revise understanding 	<ol style="list-style-type: none"> 6. Describe the relationship between the pH scale and hydrogen ion concentration in a solution 7. Investigate the relationship between the concentration of an acid or a base and the pH measured in a serial dilution Investigate acid–base reactions experimentally, for example: formation of salts, by reacting (a) acids and carbonates, (b) metal oxides and acids, and (c) metals with acids 8. Compare the corrosive effects of acids and bases and identify examples of uses of salts Investigate how a factor affects the solubility of an ionic compound <p>Service learning</p> <p>Students create a poster on responsible waste disposal as part of their Summative Assessment. This will involve extensive research, such as asking to speak to the owner/ manager and offering to help.</p>	
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							<p>ng based on new information and evidence</p> <ol style="list-style-type: none">3. Gather and organize relevant information to formulate an argument4. evaluate and manage risk5. propose and evaluate a variety of solutions6. Revise understandi ng based on new information and evidence <p>Transfer skills</p> <ol style="list-style-type: none">1. Apply knowledge and skills to unfamiliar situations2. make connections		
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							<p>between subject groups and disciplines</p> <p>3. change the context of an inquiry to gain different perspectives</p>		
6	<p>What are the determinants of chemical change?</p>	Change	<p>Movement, transfer</p>	<p>Orientation in space and time</p> <p>Focus</p> <p>Exploration: Displacement and exchange</p>	<p>Physical and chemical change requires the transfer of kinetic energy between particles of matter over time and affects the space they occupy</p>	<p>Criterion A: Knowing and understanding</p> <p>Criterion B: Inquiring and designing</p> <p>Criterion C: Processing and evaluating</p> <p>Criterion D: Reflecting on the impacts of science</p>	<p>Communication skills</p> <p>1. Make inferences and draw conclusions</p> <p>Organization skills</p> <p>2. Select and use technology effectively and productively</p> <p>Media literacy skills</p> <p>3. Understand the impact of media representations and modes of presentation</p> <p>4. seek a range of perspectives from</p>	<p>1. Identify similarities between the movement of particles and familiar experiences with the motion of a ball</p> <p>2. how particle/kinetic theory may explain a range of familiar phenomena</p> <p>3. Interpret kinetic theory as described by the Maxwell–Boltzmann distribution curve to explain a range of phenomena involving state changes</p> <p>4. Identify and interpret evidence of diffusion in a gas .</p> <p>5. The effect of temperature on the rate of a reaction Investigate the effect of surface textures on the rate of a reaction</p> <p>6. the mole concept and complete chemical</p>	<p>Investigate the effect of surface textures on the rate of a reaction.</p> <p>Criteria B: Planning and designing.</p> <p>Criteria C: Processing and evaluating</p>

							<p>multiple and varied sources</p> <p>Critical-thinking skills</p> <ol style="list-style-type: none"> 1. Practise observing carefully in order to recognize problems 2. draw reasonable conclusions and generalizations 3. interpret data <p>Transfer skills</p> <ol style="list-style-type: none"> 1. Inquire into different contexts to gain a different perspective 2. Apply skills and knowledge in unfamiliar situations 3. Use effective learning strategies in 	<p>calculations involving molar quantities</p> <ol style="list-style-type: none"> 7. Calculate the amounts (moles) of a variety of substances in further examples of types of chemical reaction: (a) gas produced during the decomposition of water by electrolysis (b) the synthesis reaction between oxygen and iron (c) moles of hydrogen ions, $H^+(aq)$, in an acid standardized using titration 8. Formulate equations for exothermic and endothermic reactions, including ΔH 	
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							subject groups and discipline		
							4. apply skills and knowledge in unfamiliar situations		

MYP-V Chemistry

S R #	Unit Name	Key concepts	Related concepts	Global context	Statement of Inquiry	MYP Objectives	Approaches to learning	Content	Summative Assessment Task
1	What's inside the nucleus?	Systems	Evidence	Orientation in space and time Focus Exploration: Exchange and interaction	Evidence from physical properties such as masses of nuclei has helped to elaborate our systems for classifying matter and explained the distribution of elements on Earth and elsewhere in the universe.	Criterion A: Knowing and understanding Criterion D: Reflecting on the impacts of science	Communication skills 1. Use appropriate writing for different purposes and audiences 2. use a variety of media to communicate with a range of audiences 3. Write for different	3. Suggest how isotope ratios inform understanding about a person's movements 4. Calculate the numbers of neutrons and protons to describe atomic structure (including isotopes) 5. Outline examples and uses of stable isotopes 6. Outline types of isotope radioactivity and decay and examples of uses of unstable isotopes. 7. Analyse nuclear decay in a range of ionic compounds	Individually, students use the medium of science journalism to narrate a case Study featuring the application of a stable or unstable isotope to resolve a problem. The opening story is cited as a

							<p>purposes; structure information in summaries, essays and reports</p> <ol style="list-style-type: none"> 4. Understand and use mathematical notation 5. organize and depict information logically 6. Negotiate ideas and knowledge with peers and teachers 7. write for different purposes 8. use a variety of media to communicate with a range of audiences <p>Collaboration skills</p> <ol style="list-style-type: none"> 1. Delegate and share responsibility 	<p>which naturally contain potassium-40</p> <ol style="list-style-type: none"> 8. Present a case study in which a stable or unstable isotope is an example for reflecting on the impacts of science Analyse data from (a) radioactive decay models and (b) radiation intensity models 9. Suggest how components of smoke alarms, which contain the α-emitter americium-241, may be recycled 10. Calculate the density of mass in atoms and nuclides 11. Interpret complex texts about the origin of different elements, using a three-level guide 	<p>model. Criteria D: Reflecting on the impacts of science</p>
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							<p>y in decision making</p> <ol style="list-style-type: none">2. negotiate effectively <p>Organization skills</p> <ol style="list-style-type: none">1. Select and use technology effectively and productively2. use appropriate technologies for organizing complex information3. Use appropriate strategies for organizing complex information <p>Critical-thinking skills</p> <ol style="list-style-type: none">1. Draw reasonable conclusions and generalizations2. consider ideas from		
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							<p>different perspectives</p> <ol style="list-style-type: none">3. Interpret data4. evaluate evidence and arguments5. Recognize unstated assumptions and bias6. recognize and evaluate proposition7. use models and simulations to explore complex systems and issues <p>Creative-thinking skills</p> <ol style="list-style-type: none">1. Combine knowledge, understanding and skills to create products or solutions;2. Make unexpected		
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							and unusual connections between objects and/or ideas		
2	Why do electrons matter?	Relationships	Interaction, function	Identities and relationships Focus Exploration: Consciousness and mind	Protons define the identity of an element, but its relationship and interaction with other elements is a function of its outer electrons.	Criterion A: Knowing and understanding Criterion B: Inquiring and designing Criterion C: Processing and evaluating Criterion D: Reflecting on the impacts of science	Communication skills 1. Organize and depict information logically 2. Interpret and use effectively modes of non-verbal communication 3. Interpret and use a range of discipline-specific terms and symbols 4. Organize and depict information logically 5. Use and interpret a range of discipline-specific	1. Suggest how the properties of fireworks come from their chemistry State the colour (visible radiation) emitted from heated atoms in flame tests 2. Calculate the energy carried by photons (light waves) from the compounds in the flame tests, based on the flame colour of the cation 3. Outline links between chemistry and physics 4. Select columns in data sheets (spreadsheets) to investigate periodic trends, including valency patterns 5. Present electron configurations of atoms using electron shell notation, dot and cross diagrams and Lewis shell diagrams 6. Summarize the results of single displacement reactions 7. Analyse electrochemicals in the voltaic cell and in redox reactions	Learners will solve various problems allow for application of understanding of the octet rule, valence electrons and redox chemistry. Criteria A: Knowing and understanding

							<p>terms and Symbols</p> <p>6. Write for different purposes; organize and depict information logically</p> <p>Collaboration skills</p> <ol style="list-style-type: none"> 1. Delegate and share responsibility for decision making 2. help others succeed 3. encourage others to contribute <p>Organization skills</p> <ol style="list-style-type: none"> 1. Use appropriate strategies for organizing complex information 2. Create plans to prepare for summative assessments 	<ol style="list-style-type: none"> 8. Determine the reactivity series of metals experimentally 9. Describe corrosion protection as a redox reaction Outline conditions in which corrosion of metal objects in the environment is minimized 10. Present a formal essay reflecting on the impacts of redox chemistry in a case study involving metal oxidation or reduction 11. Demonstrate the extraction of copper metal from copper(II) oxide 12. Outline processes used for the extraction of metals 	
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							<p>(examinations and performances)</p> <p>3. set goals that are challenging and realistic)</p> <p>Affective skills</p> <p>1. Perseverance – demonstrate persistence and perseverance</p> <p>Reflection skills</p> <p>2. Consider content: What did I learn about today? What don't I yet understand? What questions do I have now?</p> <p>Critical-thinking skills</p> <p>3. Interpret data</p> <p>4. revise understanding based on</p>		
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							<p>new information and evidence</p> <ol style="list-style-type: none">5. recognize and evaluate propositions6. Practise observing carefully to recognize problems7. evaluate evidence and arguments <p>Creative-thinking skills</p> <ol style="list-style-type: none">1. Create novel solutions to authentic problems2. create original works and ideas3. use existing works and ideas in new ways. <p>Transfer skills</p> <ol style="list-style-type: none">1. Apply skills and		
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							<p>knowledge in unfamiliar situations</p> <ol style="list-style-type: none">2. make connections between subject groups and disciplines3. Change the context of an inquiry to gain different perspectives4. Apply skills and knowledge to unfamiliar situations5. inquire in different contexts to gain a different perspective6. combine knowledge, understanding and skills to create products and solutions		
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							Information literacy skills <ol style="list-style-type: none"> 1. Researching information to be informed and inform others 		
3	How are environmental systems sustained by their chemistry?	Systems	Balance	Globalization and sustainability Focus Exploration: Population and demography	Balancing the chemical inputs and outputs of Earth's systems is a prerequisite to sustain an environment that is hospitable to human life.	Criterion A: Knowing and understanding Criterion B: Inquiring and designing Criterion C: Processing and evaluating Criterion D: Reflecting on the impacts of science	Collaboration skills <ol style="list-style-type: none"> 1. Help others succeed 2. delegate and share responsibility for decision making Communication skills <ol style="list-style-type: none"> 1. Use appropriate forms of writing for different purposes and audiences 2. Structure information in summaries, essays and reports Organization skills	<ol style="list-style-type: none"> 1. Identify causes of Earth's changing atmosphere 2. Outline how processes carried out by living organisms (photosynthesis and denitrification) have changed the composition of Earth's atmosphere 3. Evaluate information about Earth's systems, including the atmosphere (characteristics of gases, atmospheric composition) Interpret the carbon cycle, emissions and environmental implications Interpret the nitrogen cycle, and nutrient (phosphate) cycles 4. Evaluate the feasibility of populating another planet, either by providing technical solutions or terraforming its systems. 5. Evaluate the feasibility of populating another planet, either by providing technical solutions or terraforming its systems 6. Evaluate the feasibility of populating another planet, either by providing technical solutions or terraforming its systems 7. Evaluate the feasibility of populating another planet, either by providing technical solutions or terraforming its systems 8. Evaluate the feasibility of populating another planet, either by providing technical solutions or terraforming its systems 9. Evaluate the feasibility of populating another planet, either by providing technical solutions or terraforming its systems 10. Evaluate the feasibility of populating another planet, either by providing technical solutions or terraforming its systems 	Individually, students reflect on the impacts of science by researching and reporting on the feasibility of populating another planet, either by providing technical solutions or by terraforming its systems. Criteria D: Reflecting on the impacts of Science

							<ol style="list-style-type: none"> 1. Select and use technology effectively and productively 2. Plan short- and long-term assignments 3. meet deadlines 4. bring necessary equipment and supplies to class 5. Create plans to prepare for summative assessments (examinations and performances) <p>Information literacy skills</p> <ol style="list-style-type: none"> 1. Access information to be informed and inform others 	<ol style="list-style-type: none"> 11. Compare the emissions caused by the combustion of different solid fuels 13. Design an experimental inquiry into the impacts, on an organism or mineral, of dissolved pollutants in water 15. Compare environmental footprints of brands of bottled drinking water and suggest alternatives 16. Suggest how different cycles of the Earth are linked 17. Describe and explain the catalytic cycle of ozone depletion using a performance art (dance or mime) 18. Identify features of the Montreal protocol that contributed to its success 19. Service learning 20. Students devise a mime, short play, performance poem or other performance to dramatize the importance of the Montreal and Kyoto protocols. They should perform the pieces to another class, or in a school 	
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							<ol style="list-style-type: none"> 2. understand and use technology systems 3. Make connections between various sources of information <p>Critical-thinking skills</p> <ol style="list-style-type: none"> 1. Recognize unstated assumptions and bias 2. interpret data 3. draw reasonable conclusions and generalizations 4. Gather and organize relevant information to formulate an argument <p>Transfer skills</p> <ol style="list-style-type: none"> 1. Make connections between subject 	<p>assembly. Learners record the video and post them on Toddle.</p>	
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							groups and disciplines		
4	How can our energy resources be accessed fairly?	Change	Energy	Fairness and development Focus Exploration: Human capability and development	Global exploitation of energy resources relies on energetic changes in chemical reactions; global development depends on the fair and equitable exchange of those resources.	Criterion A: Knowing and understanding Criterion B: Inquiring and designing Criterion C: Processing and evaluating Criterion D: Reflecting on the impacts of science	Communication skills 1. Make inferences and draw conclusions; organize and depict information logically Collaboration skills 2. Help others succeed 3. encourage others to contribute 4. negotiate effectively Organization skills 1. Plan strategies and take action to achieve personal and academic goals 2. select and use technology effectively	1. Evaluate a factor that affects the length of time for which a candle burns in a closed environment. 2. Describe patterns found in the flashpoints in the combustion of fuels. 3. Outline the energy changes during combustion reactions. 4. Present strategies that promote safety from building fires 5. Identify fuels fit for different purposes 6. Demonstrate a simple fuel cell experimentally 7. Describe changes during endothermic and exothermic 8. reactions using energy level diagrams, using calculations to quantify thermal energy produced or absorbed, or as thermochemical equations. Investigate the relationship between the identity of a metal ion and the current generated in a Daniell cell experimentally 9. Investigate a variable that controls energy production	Independently , students investigate and report on a variable that affects the Energy produced in a circuit which includes a 'fruit battery'. Criteria B: Planning and designing Criteria C: Processing and evaluating

							<p>and productively</p> <p>Reflection skills</p> <ol style="list-style-type: none"> 1. Consider ethical, cultural and environmental implications <p>Media literacy skills</p> <p>Critical-thinking skills</p> <ol style="list-style-type: none"> 2. Gather and organize relevant information to form an argument 3. interpret data consider ideas from multiple perspectives 4. identify trends and forecast possibilities <p>Creative-thinking skills</p> <ol style="list-style-type: none"> 1. Create novel solutions to authentic problems <p>Transfer skills</p>	<p>in a circuit including a 'fruit battery'</p> <ol style="list-style-type: none"> 10. Calculate enthalpy changes (ΔH) using bond energy tables and experimental measurements. 11. Compare exothermic reactions with explosive exothermic reactions. 12. Investigate factors that affect how hand-warmers work by independently developing a hypothesis and testing it experimentally 	
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							<ul style="list-style-type: none"> 2. Apply skills and knowledge to unfamiliar situations 3. compare conceptual understanding across multiple subject groups and disciplines 4. make connections between subject groups and disciplines 		
5	How can we shift the balance of a reaction?	Change	Balance	<p>Orientation in space and time</p> <p>Focus Exploration: Displacement and change</p>	Change in the balance called chemical equilibrium is affected by the collisions of particles in space and time	<p>Criterion A: Knowing and understanding</p> <p>Criterion B: Inquiring and designing</p> <p>Criterion C: Processing and evaluating</p> <p>Criterion D: Reflecting on the impacts of science</p>	<p>Communication skills</p> <ul style="list-style-type: none"> 1. Read critically and for Comprehension; 2. use and interpret a range of discipline-specific terms and symbols 3. Make inferences 	<ul style="list-style-type: none"> 1. State the role of enzymes as catalysts in biological contexts Investigate the role of a catalyst (manganese(IV) oxide) 2. Experimentally investigate independently a factor that affects the efficiency of a catalyst chosen by the student Solve problems reflecting on collision theory and factors affecting reaction rates, including graphical representations of reaction kinetics 	Independently, students develop a Hypothesis, conduct and report on an investigation into a factor that affects the behaviour of a catalyst, for example

							<p>and draw conclusion</p> <p>Organization skills</p> <ol style="list-style-type: none"> 1. planning short- and long term assignments <p>Information literacy skills</p> <ol style="list-style-type: none"> 2. Present information in a variety of formats and platforms; process data and report results 3. Make connections between various sources of information 4. present information in a variety of formats and platforms 5. understand and implement intellectual 	<ol style="list-style-type: none"> 3. Investigate mathematically the relationship between surface area and the number of divisions in a cube of fixed volume 4. Present quantitative data analysis for observations on the reaction between sodium thiosulfate and hydrochloric acid 	<p>a transition metal oxide or an enzyme.</p> <p>Criteria B: Planning and designing</p> <p>Criteria C: Processing and evaluating</p>
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							<p>property rights</p> <p>Critical-thinking skills</p> <ol style="list-style-type: none">1. Analyse complex concepts and projects into their constituent parts and synthesize with new understanding2. interpret data <p>Transfer skills</p> <ol style="list-style-type: none">1. change the context of an inquiry to gain different perspectives		
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