

10 Science : Term 3 – Chemical World

Achievement Standard: [insert year level achievement standard. Bold the statements that will be assessed in the unit]

Year 10 Australian Curriculum Achievement Standard:

By the end of Year 10, students analyse how the periodic table organises elements and use it to make predictions about the properties of elements. They explain how chemical reactions are used to produce particular products and how different factors influence the rate of reactions. They explain the concept of energy conservation and represent energy transfer and transformation within systems. They apply relationships between force, mass and acceleration to predict changes in the motion of objects. Students describe and analyse interactions and cycles within and between Earth's spheres. They evaluate the evidence for scientific theories that explain the origin of the universe and the diversity of life on Earth. They explain the processes that underpin heredity and evolution. **Students analyse how the models and theories they use have developed over time and discuss the factors that prompted their review.**

Students develop questions and hypotheses and independently design and improve appropriate methods of investigation, including field work and laboratory experimentation. They explain how they have considered reliability, safety, fairness and ethical actions in their methods and identify where digital technologies can be used to enhance the quality of data. **When analysing data, selecting evidence and developing and justifying conclusions, they identify alternative explanations for findings and explain any sources of uncertainty.** Students evaluate the validity and reliability of claims made in secondary sources with reference to currently held scientific views, the quality of the methodology and the evidence cited. **They construct evidence-based arguments and select appropriate representations and text types to communicate science ideas for specific purposes.**

Unit Specific Information [various forms e.g. assessment focus, context, etc]

During this unit, students will develop an understanding of the chemical and physical properties of substances, and their relevance to society. This is crucial to our future with the continued globalisation of society, requiring innovative, environmentally-friendly solutions for current environmental challenges, such as global warming.

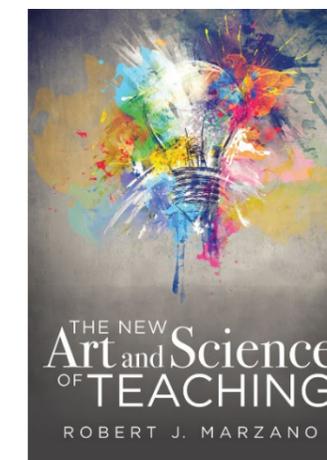
Students will understand how the structure of an atom relates to its elemental position within the periodic table, and their ability to form ionic, covalent or metallic compounds. They will also use the periodic table to make predictions about the physical properties of elements. Students will understand how the atomic theory was developed and refined over time based on the available experimental evidence.

Students will be able to represent chemical reactions as balanced chemical equations and in doing so explain how products such as metals, polymers and fuels are produced. In addition, students will investigate how the rate of a chemical reaction can be manipulated. Students will be able to analyse experimental data and explain trends using scientific theory.

Assessment Details:

Collection of Work

- Part 1: Data Test, Week 5 – unseen questions, 60min
- Part 2: Evaluation, Week 7 – unseen stimulus, 60min
- Part 3: Experimental Analysis - 3 lessons, Week 9



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| READING / VIEWING / LISTENING: Core Text 1: Oxford Digital Technologies Y10, Chapter 6 & 7 |
| COMPREHENSION SKILL FOCUS: Graphic organisers Flowcharts Different Perspectives for Reading (Buehl, p 91-93) Power Notes (Buehl, p155-157) Text Coding (Buehl, p210 -213) Magnet Words |



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| THINKING: |
| Core: |
| • Analyse |
| • Evaluate |
| • Explain |
| Others |
| • Describe |
| • Identify |
| • Summarise |



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| WRITTEN / SPOKEN / MULTI-MODAL TEXT [assessment focus] |
| HIGHLY VALUED LANGUAGE FEATURE FOCUS: Explanation, Evaluation |

Proficiency Scale / Priority Standards

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| 4 | <ul style="list-style-type: none"> • Analyse and interpret data to draw justified conclusions using scientific theory • Predict the properties of elements • Distinguish between ionic, covalent and metallic compounds • Investigate the effect of factors on chemical reactions | Students will know: <ul style="list-style-type: none"> • Atomic Structure • Arrangement of elements in the periodic table • Chemical & Physical properties of compounds (Ionic, Covalent & Metallic) • How factors affect the rate of chemical reactions |
| 3 | <ul style="list-style-type: none"> • Use the periodic table to identify elements • Construct formula for compounds • Write balanced chemical reactions • Represent atoms using Bohr and Lewis Diagrams | Students will be able to: <ul style="list-style-type: none"> • Identify elements in the periodic table • Represent atoms using Bohr & Lewis Diagrams • Construct formula & name compounds • Balancing Chemical Reactions • Analyse data to draw justified conclusions |
| 2 | <ul style="list-style-type: none"> • Identify trends in data • Recognise/recall specific vocabulary including • Describe features of atomic theory & chemical reactions | |

Learning Goals:

| Strands and Sub-Strands | Australian Curriculum Content Descriptors | Kirwan High Learning Goals |
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| Science Understanding | <p><i>Chemical Sciences</i></p> <ul style="list-style-type: none"> The atomic structure and properties of elements are used to organise them in the Periodic Table (ACSSU186) | <ul style="list-style-type: none"> Understand how atomic structure relates to the position of an element within the periodic table Understand how atoms combine to form compounds Predict the physical properties of substances based on their chemical structure |
| | <p><i>Chemical Sciences</i></p> <ul style="list-style-type: none"> Different types of chemical reactions are used to produce a range of products and can occur at different rates (ACSSU187) | <ul style="list-style-type: none"> Understand how collision theory and the law of conservation of matter applies to chemical reactions Understand that there are different types of chemical reactions including combination, decomposition and combustion reactions and link them to the production of metals, polymers and fuels. Understand that a range of factors influence the speed of a chemical reaction as per collision theory. |
| Science as a Human Endeavour | <p><i>Nature and Development of Science</i></p> <ul style="list-style-type: none"> Scientific understanding, including models and theories, is contestable and is refined over time through a process of review by the scientific community (ACSHE191) | <ul style="list-style-type: none"> Understand how the model of the atom was developed over time, based on experimental evidence using available technologies |
| Science Inquiry Skills | <p><i>Processing & Analysing Data and Information</i></p> <ul style="list-style-type: none"> Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (AC SIS203) | <ul style="list-style-type: none"> Analyse experimental data to identify and describe trends between variables Draw conclusions from data based on scientific theory |
| | <p><i>Communicating</i></p> <ul style="list-style-type: none"> Communicate scientific ideas and information for a particular purpose including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (AC SIS208) | <ul style="list-style-type: none"> Communicate in a concise and coherent manner using scientific conventions. |

Exploring Habit of Mind:

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| <p>Exploring Meaning of the HOM By the end of this unit students will be able to:</p> <p><i>Solve complex and challenging problems by applying the habit of mind of persisting.</i></p> | <p>Expanding Capacity for using the HOM By the end of this unit students will be able to:</p> <p><i>Persevere through a task to completion.</i></p> | <p>Increasing Alertness for the HOM By the end of this unit students will be able to:</p> <p><i>Develop a range of strategies to persist in challenges.</i></p> | <p>Extending Values of the HOM By the end of this unit students will be able to:</p> <p><i>Apply strategies to various situations to persist through challenges.</i></p> | <p>Building Commitment towards the HOM By the end of this unit students will be able to:</p> <p><i>Reflect and improve on their repertoire of strategies for lifelong learning.</i></p> |
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General Capabilities: This unit provides opportunities for students to engage in following capabilities:

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| <p>Literacy</p> <ul style="list-style-type: none"> ✓ Comprehending texts through listening, reading and viewing ✓ Composing texts through speaking, writing and creating ✓ Text knowledge <input type="checkbox"/> Grammar knowledge ✓ Word knowledge ✓ Visual knowledge <p>Numeracy</p> <ul style="list-style-type: none"> <input type="checkbox"/> Estimating and calculating with whole numbers <input type="checkbox"/> Recognising and using patterns and relationships ✓ Using fractions, decimals, percentages, ratios and rates <input type="checkbox"/> Using spatial reasoning ✓ Interpreting statistical information <input type="checkbox"/> Using measurement | <p>ICT</p> <ul style="list-style-type: none"> <input type="checkbox"/> Applying social and ethical protocols and practices when using ICT <input type="checkbox"/> Investigating with ICT <input type="checkbox"/> Creating with ICT <input type="checkbox"/> Communicating with ICT ✓ Managing and operating ICT <p>Critical and creative thinking</p> <ul style="list-style-type: none"> ✓ Inquiring - identifying, exploring and organising information and ideas ✓ Generating ideas, possibilities and actions ✓ Reflecting on thinking and processes ✓ Analysing, synthesising and evaluating reasoning and procedures | <p>Personal and social capability</p> <ul style="list-style-type: none"> ✓ Self-awareness ✓ Self-management ✓ Social awareness ✓ Social management <p>Ethical understanding</p> <ul style="list-style-type: none"> <input type="checkbox"/> Understanding ethical concepts and issues ✓ Reasoning in decision making and actions <input type="checkbox"/> Exploring values, rights and responsibilities <p>Intercultural understanding</p> <ul style="list-style-type: none"> <input type="checkbox"/> Recognising culture and developing respect <input type="checkbox"/> Interacting and empathising with others <input type="checkbox"/> Reflecting on intercultural experiences and taking responsibility |
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Cross Curriculum Priorities:

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| ✓ Aboriginal and Torres Strait Islander histories and cultures | ✓ Asia and Australia's engagement with Asia | ✓ Sustainability |
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Differentiation [for small groups or individuals]:

- Include increased scaffolding where necessary
- Plan open-ended lesson tasks that require higher order thinking skills from more capable students
- Make use of heterogeneous collaborative groups to gain different perspectives
- Make use of homogeneous collaborative groups to tailor tiered questions
- Attend to any individual work plan requirements
- Collect and analyse student profiles for literacy and numeracy needs

Lesson Sequence: 2020 v2

| Week | Lesson 1 | Lesson 2 | Lesson 3 | H/W |
|------|--|--|---|---|
| 1 | <p>Introduction</p> <ul style="list-style-type: none"> Assessment (Collection of work: 3 parts) Expectations Revision strategies <p>What is the world around us made up of? Atoms and states of matter Students can:</p> <ul style="list-style-type: none"> Explain that all matter exists in 3 states and is made up of atoms. Distinguish between protons, neutrons & electrons Explain the difference between an atom, element and compound <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Drawing/ Creating Models https://phet.colorado.edu/sims/html/states-of-matter-basics/latest/states-of-matter-basics_en.html https://phet.colorado.edu/en/simulation/legacy/build-a-molecule | <p>How did we figure out that the world is made of atoms?</p> <p>SHE: The history of atomic structure and electron configuration</p> <p>Students can:</p> <ul style="list-style-type: none"> Explain how scientists contributed to the development of our current understanding of atomic structure Represent atoms using dot diagrams <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Timeline of atomic theory TED Ed video: https://ed.ted.com/lessons/the-2-400-year-search-for-the-atom-theresa-doud | <p>How are the different atoms organised? → Explain how the periodic table is important to avoid disasters in everyday life</p> <p>Periodic Table Students can:</p> <ul style="list-style-type: none"> Understand that elements are arranged in the PT Identify the group number, period number, atomic number and atomic mass on the periodic table Identify the positions of metals, non-metals & metalloids in the periodic table Define the characteristics of metals, non-metals & metalloids <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Annotate periodic table Construct graphic organiser of properties of elements <p>COMPREHENSION STRATEGY:</p> <ul style="list-style-type: none"> Read pg. 232-235 (Metals, Metalloids, Non-metals) OBI 10 Science Determining Importance/Synthesising (Magnet Summary/ Text Coding Strategy) & Concept Map | <p>Homework 1</p> <p>Definitions, identify elements from periodic table</p> |
| 2 | <p>How can we use the periodic table to determine atomic structure?</p> <p>Students can:</p> <ul style="list-style-type: none"> Identify elements based on their composition using the periodic table (atomic mass, atomic number, group number, period number) Represent atoms using dot diagrams [link to position in periodic table] <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Periodic Table Game (Bingo/Guess Who) e.g. https://teachbesideme.com/periodic-table-battleship/?hootPostID=898af3f453652a1381d0188f56267bfa https://phet.colorado.edu/sims/html/build-an-atom/latest/build-an-atom_en.html | <p>How can we use the periodic table to determine electron structure? - Electron Configuration</p> <p>Students can:</p> <ul style="list-style-type: none"> Represent atoms using dot diagrams Write the electron configuration for atoms & link to their position in the periodic table (draw the first 3 periods) Explain the Octet Rule & link it to the noble gases <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Whiteboard | <p>PRACTICE/ LAB: Periodic Table and Electron Configuration</p> <p>Students can:</p> <ul style="list-style-type: none"> Practice identifying atomic and electron structure <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Flame Test (different energy emission of atoms) | <p>Homework 2</p> <p>Dot diagrams, writing electron configuration, determining charge</p> |

| Week | Lesson 1 | Lesson 2 | Lesson 3 | H/W |
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| 3 | <p>What happens when metals and non-metals bond? Ionic Compounds</p> <p>→ Introduce the 3 different types of compounds (ionic, covalent & metallic)</p> <p>→ explain how common ionic compounds are and how they are used (and bonds broken) in every day, e.g. cooking</p> <p>Students can:</p> <ul style="list-style-type: none"> Define ionic bonding (transfer of electrons between a metal & non-metal) [link to position in periodic table] Identify the charge of ions based on their valence electrons Distinguish between cations and anions <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> https://www.youtube.com/watch?v=zpaHPXVR8WU https://www.learner.org/interactives/periodic/bonding/ <ul style="list-style-type: none"> https://pbslm-contrib.s3.amazonaws.com/WGBH/arct15/SimBucket/Simulations/chemthink-ionicbonding/content/index.html | <p>If metals and non-metals bond, how much of each one is needed (added) and how are they called? Ionic Compounds</p> <p>Students can:</p> <ul style="list-style-type: none"> Draw electron dot diagrams to show the transfer of electrons in ionic bonding Write ionic formula Name ionic compounds Explain how ions form a solid lattice structure <p>Engagement & Extension Ideas:</p> <p>https://www.youtube.com/watch?v=vfYnhnfdD0&t=24s</p> | <p>PRACTICE/ LAB: Ionic Compounds</p> <p>Students can:</p> <ul style="list-style-type: none"> Practice writing formula & naming ionic compounds <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Creating Ionic Compounds Ionic compounds and their solubility <p>OR EXTENSION!</p> <p>What happens when two non-metals bond? Covalent Compounds</p> <p>Students can:</p> <ul style="list-style-type: none"> Define covalent bonding (sharing of electrons between 2 non-metals) [link to position in periodic table] Explain how covalent compounds form molecular structures. Distinguish between ionic and covalent substances <p>Engagement & Extension Ideas:</p> <p>--> how covalent compounds are used in engineering</p> <ul style="list-style-type: none"> https://www.youtube.com/watch?v=h24UmH38_LI https://www.youtube.com/watch?v=0HfN3CvXP2M | <p>Homework 3</p> <p>Write formula, name ionic compounds, and covalent bonds</p> |
| 4 Athletics Carnival (Fri) | <p>What happens when two metals bond? Metallic Compounds</p> <p>Students can:</p> <ul style="list-style-type: none"> Represent the atomic structure of metals Link the structure of metals to their function (electrical conductivity, high melting point, shiny, hard) <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> link to real life application ie: copper wires <p>COMPREHENSION STRATEGY</p> <ul style="list-style-type: none"> Read pg. 244 – 247 (Properties of Compounds) OBI 10 Science https://www.youtube.com/watch?v=S08qdOTd0w0 <p>Determining Importance/Synthesising (Magnet Summary/ Text Coding Strategy) & Concept Map</p> | <p>LAB: Reactivity of Metals</p> <p>Students can:</p> <ul style="list-style-type: none"> Explain the reactivity of elements based on their position in the periodic table Conduct an experimental investigation to determine the reactivity of metals [OBI g. 233] <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Prac handout to complete (aim & method provided, results & discussion questions to complete) | <p>ATHLETICS CARNIVAL</p> | <p>Homework 4</p> <p>Identify ionic, covalent & metallic compounds</p> |

| Week | Lesson 1 | Lesson 2 | Lesson 3 | H/W |
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| 5 | <p>REVISION</p> <p>Students can:</p> <ul style="list-style-type: none"> Apply their understanding of atomic structure & the periodic table to solve problems <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Paired Games/Quizzes Revision Sheet | <p style="text-align: center;">SUMMATIVE - COLLECTION OF WORK Part 1 – DATA TEST</p> | <p>How can you create a chemical reaction? Chemical Reactions</p> <p>Students can:</p> <ul style="list-style-type: none"> Represent chemical reactions using words & symbols Explain the Law of Conservation of Matter Write balanced chemical equations <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Link types of chemical reactions to everyday examples eg: combustion – fireworks/burning fuel in cars Hands on modelling/diagrams for lower students https://www.youtube.com/watch?v=2S6e11NBwiw <p>COMPREHENSION STRATEGY</p> <ul style="list-style-type: none"> Read pg. 257 – 268 (Types of Reactions – Precipitation, Acid & Metals, Decomposition, Synthesis, Combustion) OBI 10 Science Determining Importance/Synthesising (Magnet Summary/ Text Coding Strategy) & Concept Map | <p>Homework 5</p> <p>Revision Sheet</p> |
| 6 | <p>How can you tell what products you'll get from a chemical reaction? (and make sure not to destroy something?)</p> <p>Balancing Equations</p> <p>Students can:</p> <ul style="list-style-type: none"> Write balanced chemical equations <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Write balanced equations from text Use hands-on models to represent reactions http://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical-equations_en.html https://www.youtube.com/watch?v=bSlqA8nedGQ | <p>What types of Chemical Reactions are there?</p> <p>Students can:</p> <ul style="list-style-type: none"> Understand there are different types of reactions that are used for different purposes [focus on combination, decomposition & combustion] Represent chemical reactions using words & symbols Explain the Law of Conservation of Matter Write balanced chemical equations <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Link types of chemical reactions to everyday examples eg: combustion – fireworks/burning fuel in cars Hands on modelling/diagrams for lower students | <p>SKILLS: How can you scientifically evaluate claims made about chemical reactions?</p> <p>Students can:</p> <ul style="list-style-type: none"> Evaluate claims (examine, determine significance, appraise; and correct statement) Apply their understanding of the different types of reactions that are used for different purposes [combination, decomposition & combustion] Apply their knowledge of the Law of Conservation of Matter and how to write balanced chemical equations <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Evaluate PPT (provided by Susie) | <p>Homework 6</p> <p>Writing word equations & balanced chemical reactions</p> |

| Week | Lesson 1 | Lesson 2 | Lesson 3 | H/W |
|------|--|--|---|---|
| 7 | <p>PRACTICE: Chemical Reactions/ Balancing Equations</p> <p>Students can:</p> <ul style="list-style-type: none"> Understand there are different types of reactions that are used for different purposes [focus on combination, decomposition & combustion] Represent chemical reactions using words & symbols Explain the Law of Conservation of Matter Write balanced chemical equations <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Link types of chemical reactions to everyday examples eg: combustion – fireworks/burning fuel in cars Hands on modelling/diagrams for lower students https://phet.colorado.edu/sims/html/concentration/latest/concentration_en.html | <p>REVISION</p> <p>Students can:</p> <ul style="list-style-type: none"> Apply their understanding of types of chemical reactions and how to write balanced equations Apply their understanding of the Law of Conservation of Matter <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Paired Games/Quizzes Revision Sheet | <p>SUMMATIVE - COLLECTION OF WORK Part 2 – Evaluation of Claim (IA3)</p> | <p>Homework 7</p> <p>Revision</p> |
| 8 | <p>How can you control the rate of a reaction? (how not to destroy things with chemicals) - Reaction Rates</p> <p>Students can:</p> <ul style="list-style-type: none"> Explain how chemical reactions occur using collision theory Explain how a range of factors (temperature, concentration & surface area) influence the speed of a reaction <p>Engagement & Extension:</p> <ul style="list-style-type: none"> Link to controlling reaction rates in mining/manufacturing https://www.youtube.com/watch?v=OttRV5ykP7A https://phet.colorado.edu/en/simulation/legacy/reactions-and-rates Use balloons in a fixed space to model reaction rate variables (some balloons taped together, others single, masking tape) <p>COMPREHENSION STRATEGY</p> <ul style="list-style-type: none"> Pg. 281-286 (Factors affecting Rates of Reaction) OBI 10 Science Determining Importance/Synthesising (Magnet Summary/ Text Coding Strategy) & Concept Map | <p>COMPULSORY LAB: Reaction Rate Experiment Disappearing Cross Experiment</p> <p>Students can:</p> <ul style="list-style-type: none"> Conduct an experiment to determine how concentration affects the reaction rate Construct a scientifically accurate graph of results Interpret & explain the trend in the graph using scientific theory <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Prac report handout (complete results & discussion section) Only one run through per group, collate class results for averages/ data analysis | <p>STUDENT FREE DAY</p> | <p>Homework 8</p> <p>Reaction Rates & Experiment Analysis Questions (fair test, forming hypothesis, analysing data)</p> |

| Week | Lesson 1 | Lesson 2 | Lesson 3 | H/W |
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| 9 | <p>COMPULSORY LAB: Reaction Rate - Continued: Disappearing Cross Experiment</p> <p>Students can:</p> <ul style="list-style-type: none"> Analyse (trend, error bars) and interpret (link to scientific theory, e.g. collision theory) data Evaluate (accuracy/ validity and systematic vs random error) the experimental process <p>Engagement & Extension:</p> <ul style="list-style-type: none"> Students allowed to work in small groups during experimentation stage | <p>SUMMATIVE - COLLECTION OF WORK Part 3 – Analysis of Experimental Data (IA2)</p> <p>Students can:</p> <ul style="list-style-type: none"> Conduct an experiment to determine how concentration affects the reaction rate Construct a scientifically accurate graph of results <p>Engagement & Extension Ideas:</p> <ul style="list-style-type: none"> Students allowed to work in small groups during experimentation stage | <p>SUMMATIVE - COLLECTION OF WORK Part 3 – Analysis of Experimental Data (IA2)</p> <p>Students can:</p> <ul style="list-style-type: none"> Construct a scientifically accurate graph of results Interpret & explain the trend in the graph using scientific theory <p>Engagement & Extension Ideas:</p> <p>Students work individually under exam conditions</p> | |
| 10 | <p>SUMMATIVE - COLLECTION OF WORK Part 3 – Analysis of Experimental Data (IA2)</p> <p>Students can:</p> <ul style="list-style-type: none"> Construct a scientifically accurate graph of results Interpret & explain the trend in the graph using scientific theory <p>Engagement & Extension Ideas:</p> <p>Students work individually under exam conditions</p> | <p>Catch - up for Term assessments (Part 1 to 3) Extension work</p> | <p>Introduction to Term 4 (Earth and Space Science)</p> | |