**Term 3: CHEMICAL SCIENCES & SCIENCE SKILL**
10 weeks or 30 lessons

**Year _7_ Australian Curriculum Achievement Standard:**

*Science Understanding:*
By the end of Year 7, **students describe techniques to separate pure substances from mixtures.** They represent and predict the effects of unbalanced forces, including Earth’s gravity, on motion. They explain how the relative positions of Earth, the sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of human and environmental changes on interactions between organisms and classify and organise diverse organisms based on observable differences.

*Science as human endeavour:*
Students describe situations where scientific knowledge from different science disciplines and diverse cultures has been used to solve a real-world problem. **They explain possible implications of the solution for different groups in society.**

*Science Inquiry Skills:*
Students **identify questions that can be investigated scientifically.** They **plan fair experimental methods, identifying variables to be changed and measured.** They **select equipment that improves fairness and accuracy and describe how they considered safety.** Students **draw on evidence to support their conclusions.** They **summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods.** They **communicate their ideas, methods and findings using scientific language and appropriate representations.**

See Unit 1 and Unit 2 (C2Cs) for extra details and resources

**Unit Overview:**
In this unit students differentiate between **pure substance and mixtures.** Students understand mixtures, in the form of suspensions, and solutions. Students understand and apply **range of separation methods** that include decantation, sedimentation, flotation, filtration, evaporation, and distillation. Students will identify questions and problems and develop predictions based on science knowledge and understanding. Students will collaboratively plan investigations using fair testing principles. Students will conduct accurate and reliable **investigations into the separation of mixtures** and use the collected data and data from other sources to draw conclusions about separation techniques. Students will communicate findings using factorial and procedural explanation genres in the form of scientific reports.

**Assessment Overview:**

**Task:** Summative Student Experiment (Item 3)

**Key Skill/s:**
- Comprehensively **describe and explain** scientific information, concepts and relationships
- Formulate research questions and a hypothesis to be scientifically investigated
- Modify a method that reflects fair testing principles
- Analysis of trends in data to draw conclusions about relationships between variables
- Evaluation of investigation and recommendations
- Communicate effectively, using proper sentences and grammar

**Conditions:**
- 4 lessons in class time
- Experiment conducted in groups
- Student experiment report written individually
<table>
<thead>
<tr>
<th>Guaranteed Vocabulary:</th>
<th>Design Question Three Strategy</th>
<th>Design Question Four Strategy</th>
<th>21st Century Skill:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure substance, Mixture, suspension, Solution, solvent, solute, dissolved, soluble, insoluble</td>
<td>Use concept map to explore the different types of separation</td>
<td>Teach students the hypothesis format if…then…because</td>
<td>Use of ICT for learning</td>
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<tr>
<td>Separation, Decanting, Sedimentation, Flotation, Sieving, Filtration, Evaporation, Liquid Water, solid ice, vapour gas Water, water runoff, Water treatment plant: desalination, distillation</td>
<td>Use Venn Diagram to compare mixtures and pure substances</td>
<td>Engage students in complex tasks that require students to generate and test hypotheses in collaborative groups</td>
<td>Self-regulation within a collaborative setting</td>
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<td>Water Cycle: evaporation, transpiration, condensation, precipitation</td>
<td>Use Frayer Model to represent important vocabulary</td>
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<td>Use cause and effect organisers</td>
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<thead>
<tr>
<th>Guaranteed Skills/Language Features:</th>
<th>Reading Comprehension Skill and Strategy</th>
<th>Cognitive Verbs and Key Terms:</th>
<th>ICT to Enhance Learning:</th>
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</thead>
<tbody>
<tr>
<td>Numeracy: finding the mean of a number set, graphing</td>
<td>Making Inferences 1. Connect Two (P.87) 2. Hands on Reading (P.115, P.245)</td>
<td>Explaining 1. Cause and Effect</td>
<td>Use digital simulations</td>
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<td></td>
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<td>Comparing 1. Venn Diagram</td>
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<thead>
<tr>
<th>Strands and Sub-Strands</th>
<th>Australian Curriculum Content Descriptors</th>
<th>Kirwan High Goals – Students will know and/or be able to</th>
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<tbody>
<tr>
<td>Chemical Sciences</td>
<td>Describe and explain the key characteristics of pure substance and mixtures (including suspensions &amp; solutions).</td>
<td>Describe and explain the movement of water through the Earth’s spheres (water cycle)</td>
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<td>Classify a given substance as a mixture or a pure substance.</td>
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<td>Classify a given mixture as a suspension or a solution.</td>
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<td>Describe, explain and distinguish the ways in which suspension and solution type mixtures can be separated.</td>
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<td>Select and justify the best way to separate a given mixture</td>
<td>Compare difference in water quality and their uses</td>
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<thead>
<tr>
<th>SCIENCE UNDERSTANDING</th>
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<tr>
<td>Mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques (ACSSU113)</td>
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<tr>
<td><strong>SCIENCE AS HUMAN ENDEAVOUR</strong></td>
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</table>
| **Use and influence of science** | **Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations (ACShe120)**  
| | **Science understanding influences the development of practices in areas of human activity such as industry, agriculture and marine and terrestrial resource management (ACShe121)**  
| | **People use understanding and skills from across the disciplines of science in their occupations (ACShe224)**  
| | **Describe the need for, and the influence of, using different types of science to solve problems associated with making soiled water usable for human use.**  
| | **Explain how the solutions for making water usable for human use impacts different groups in society.** |

| **SCIENCE INQUIRY SKILLS** |
|-------------------|---------------------------------|
| **Questioning & predicting** | **Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSI124)**  
| | **Identify research questions that**  
| | a) **Inform the research for the rational of the investigation**  
| | b) **Inform the rational and the hypothesis of the investigation**  
| | c) **Focuses the planning and conducting of the investigation**  
| | **Focuses the processing and analysing of the data**  
| | **Planning and conducting**  
| | **Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSI125)**  
| | **In fair tests, measure and control variables, and select equipment to collect data with accuracy appropriate to the task (ACSI126)**  
| | **Processing and analysing and information**  
| | **Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships, including using digital technologies as appropriate (ACSI129)**  
| | **Summarise data, from students’ own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions (ACSI130)**  
| | **Use given algorithms to process raw data**  
| | **Analyse experimental data to**  
| | a) **Identify trends, patterns and relationships using given representation styles**  
| | b) **Identify and describe inconsistencies in results**  
| | **Summarise data to draw relevant conclusions**  
| | **Evaluating**  
| | **Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method (ACSI131)**  
| | **Use scientific knowledge and findings from investigations to evaluate claims**  
| | **Reflect on modified methods and identify improvements, to evaluate quality and reliability of the data collected**  
| | **Evaluate evidence-based claims using relevant background research**  
| | **Communicating**  
| | **Communicate ideas, findings and solutions to problems using scientific language and representations using digital technologies as appropriate (ACSI133)**  
| | **Select appropriate scientific language, genre conventions and representation for a junior Student Experimental Report by**  
| | a) **Use of scientific drawing conventions**  
| | b) **Use of meaningful scientific vocabulary**  
| | c) **Forming simple Factorial Explanations with cause and effect sequence**  
| | **Use appropriate bibliography conventions** |
**Possible Habit of Mind: QUESTIONING AND PROBLEM POSING**

<table>
<thead>
<tr>
<th>Exploring Meaning of the HOM</th>
<th>Expanding Capacity for using the HOM</th>
<th>Increasing Alertness for the HOM</th>
<th>Extending Values of the HOM</th>
<th>Building Commitment towards the HOM</th>
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<tbody>
<tr>
<td>By the end of this unit students will be able to:</td>
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<tr>
<td>Generate hypotheses</td>
<td>Apply understanding of hypotheses in everyday contexts</td>
<td>Recognise a hypothesis in formal and informal registers</td>
<td>Apply understanding of hypotheses in novel contexts</td>
<td>Recognise the importance and usefulness of generating hypotheses to solve both every day and complex problems</td>
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</table>

**General Capabilities:** This unit provides opportunities for students to engage in following capabilities:

- **Literacy**
  - Comprehending texts through listening, reading and viewing
  - Composing texts through speaking, writing and creating
  - Text knowledge
  - Grammar knowledge
  - Word knowledge
  - Visual knowledge

- **Numeracy**
  - Estimating and calculating with whole numbers
  - Recognising and using patterns and relationships
  - Using fractions, decimals, percentages, ratios and rates
  - Using spatial reasoning
  - Interpreting statistical information
  - Using measurement

- **ICT**
  - Applying social and ethical protocols and practices when using ICT
  - Investigating with ICT
  - Creating with ICT
  - Communicating with ICT
  - Managing and operating ICT

- **Critical and creative thinking**
  - 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

- **Personal and social capability**
  - Self-awareness
  - Self-management
  - Social awareness
  - Social management

- **Ethical understanding**
  - Understanding ethical concepts and issues
  - Reasoning in decision making and actions
  - Exploring values, rights and responsibilities

- **Intercultural understanding**
  - Recognising culture and developing respect
  - Interacting and empathising with others
  - Reflecting on intercultural experiences and taking responsibility

**Cross Curriculum Priorities:**

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia’s engagement with Asia
- Sustainability

**Differentiation [for small groups or individuals]:**

1. Individualise formative assessment tools provided with oxford big ideas
2. Include increased scaffolding around assigned formative assessment task where needed
3. Plan open-ended lesson tasks that require higher order thinking skills from more capable students
4. Make use of heterogeneous collaborative groups to gain different perspectives
5. Make use of homogeneous collaborative groups to tailor tiered questions
6. Attend to any individual work plan requirements
7. Collect and analyse student profiles for literacy and numeracy needs
### Term 3, 2020 Lesson Sequence:
Each week ideally has at least 1 comprehension/writing and 1 Practical/Hands on focused lesson.

<table>
<thead>
<tr>
<th>Week</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
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<tbody>
<tr>
<td>1</td>
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</table>
| 13/7 | **INTRODUCTION TO CHEMISTRY**  
- Reiterate rules and expectations  
- Set up notebooks for term 3  
- Introduce pure substances and mixtures | **PURE SUBSTANCES V MIXTURES**  
- Describe and explain the key characteristics of Pure substance and Mixtures  
- Classify a given substance as a mixture or a pure substance  
- Meaningful use of scientific vocabulary  
- Extension: link to the periodic table P.118-126 OBI | **PRACTICAL – PURE SUBSTANCES V MIXTURES**  
- Justify whether samples are Pure Substances or Mixtures  
- Concepts of reactivity and why mixtures can be exciting  
- Create a mixture to meet a specific purpose – e.g. sherbet |
| 2    |       |       |       |
| 20/7 | **SOLUTIONS V SUSPENSIONS – DESCRIBE AND EXPLAIN**  
- Describe and explain the key characteristics:  
  - Clear/opaque  
  - Particle size  
  - sedimentation  
- Meaningful use of scientific vocabulary  
SW1 pg 295-297  
Questions pg 298 | **PRACTICAL - SOLUTIONS V SUSPENSIONS**  
- Identify solutions and suspensions  
- Create solutions and suspensions  
SW1: Pg 299  
- Solubility, temperature and particle size | |
| 3    |       |       |       |
| 27/7 | **SEPARATING MIXTURES – DESCRIBE AND EXPLAIN**  
- Describe, explain and distinguish the ways in which suspension and solution type mixtures can be separated using household equipment.  
- Select and justify the best way to separate a given mixture  
- Meaningful use of scientific vocabulary  
- Simple Factorial Explanations with cause and effect sequence  
P.129-134 OBI  
P.137-145 OBI  
SW1: pg 300-310 | **PRACTICAL- SEPARATING MIXTURES**  
Students select appropriate equipment and sequence of steps to separate a mixture  
- Plan steps  
- Justify strategy  
Conduct test | |
| 4    |       |       |       |
| 3/8  | **REAL WORLD EXAMPLES OF MIXTURE SEPARATION**  
Eg. Oil spills, food and drink production, water quality  
- Research and create a poster | **PRACTICAL: SCIENTIFIC METHOD – FAIR TESTING**  
- Plan a fair and safe experiment about separating mixtures.  
- Select the most suitable equipment to collect accurate measurements of variables for experiments about mixture separation | |
<table>
<thead>
<tr>
<th>Day</th>
<th>Activity</th>
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</table>
| 5    | CREATING A HYPOTHESIS  
- Identify questions about separating mixtures that can be investigated using the scientific principles of fair testing  
- Make predictions about separating mixtures in the form of a justified hypothesis |
| 6    | FORMATIVE ASSESSMENT **similar to final assessment but with dry mix  
Testing  
Graphing |
| 7    | WATER FILTRATION  
Natural processes  
Artificial filtration |
| 8    | Catch-up/extension lesson  
HAND OUT ASSESSMENT  
Students design filter |
| 9    | ASSESSMENT  
Students conduct test  
Film justification  
ASSESSMENT  
Writeup report component |
| 10   | Extension – mini experiments – hypothesis, test, graph, conclude  
e.g. does running with an umbrella slow you down?  
do people run faster with shorter stride lengths? |
| 14/9 | |

**CREATE AN ACCURATE GRAPH**  
- Summarise data from different sources by constructing tables and graphs.  
- Describe the trend of graphed data.  
- Explain the relationship between the independent and dependent variables of graphed data  
- Graph data collected from experiments. (OBI7, pg.129), (OBI7, pg.122)

**FORMATIVE ASSESSMENT **similar to final assessment but with dry mix  
- Filter a dry mixture (soil, metal, salt etc) through a pvc run modified with filters/magnets etc.  
- How does the mass of individual items collected change with the number of passes through the separation tube?  
- Planning and justifying strategy (verbal, unrecorded- check against prof. scale)

**WATER CYCLE**  
- Sources of water  
- Sources of pollution

**WATER FILTRATION**  
Natural processes  
Artificial filtration

**WATER CYCLE**  
Catch-up/extension lesson- Hand out assessment to sports academy students going on camp.

**HAND OUT ASSESSMENT**  
Students design filter

**ASSESSMENT**  
Video component due  
Report due