Palmerston North Boys' High School

National Certificate of Educational Achievement

Level 2 Chemistry

Course Information 2019

Welcome to Level 2 Chemistry.

Course Structure

The course consists of 2 internal and 3 external Achievement Standards from level 2 NCEA course.

	Achievement Standard	I/E	Credits
2.1	91910 Carry out a practical investigation into a substance present in a consumer product using quantitative analysis	I	4
2.3	91163 Demonstrate understanding of the chemistry used in the development of a current technology (Term 2 holiday project)	I	3
2.4	91164 Demonstrate understanding of bonding, structure and energy changes	E	5
2.5	91165 Demonstrate understanding of the properties of selected organic compounds	E	4
2.6	91166 Demonstrate understanding of chemical reactivity	E	4
	Total Credits		**20**

This year you will be able to obtain an endorsement in Chemistry at the Merit or Excellence level.

You will gain an endorsement if you achieve, in a single year, 14 or more credits at Merit or Excellence level. At least 3 of these credits must come from internally assessed standards.

Resources

You will be provided with an ESA Year 12 chemistry textbook and a theory workbook.

Electronic resources and links to useful websites for each topic can be found on the PNBHS Stratus webpage.

You will be able to use the 'Bestchoice' interactive website. This website contains summary information and interactive questions for each Achievement Standard.

Throughout the year you will be using Education Perfect (purchased as part of your stationary), BestChoice and workbook exercises for homework and revision.

EducationPerfect

Practical Work:

Experiments for level 2 Chemistry will be completed and marked as necessary.

End of Topic Tests:

All school based assessments will be held as a formative assessment of student ability until external grades have been awarded. It is therefore **essential that students attempt all assessments to the best of their ability**, as these are the only grades that will stand if an aegrotat is necessary for the external grade. Accordingly, all school grades are provisional and the student's final Level 2 Chemistry grade, under normal conditions, will be awarded through their performance in the **External Examination and internally Standard only.**

INTERNAL ASSESSMENT PROCEDURES

AUTHENTICITY

All work submitted for NCEA assessment must be the student's own work. Tasks not possible to authenticate will not be set. Furthermore, students must not directly assist or provide work for others to copy as part of any assessment task.

All students have on their files an authenticity statement that they have signed. **Any cases of plagiarism will result in an immediate loss of credits and disciplinary action being taken.**

EXTENSIONS and MISSED ASSESSMENTS

Students are responsible for ensuring any work submitted electronically for an assessment is received successfully by their teacher.

Extensions will be considered by the Head of Department on an individual basis and will be granted after taking into account the following:

- The nature of the task, and the amount of time students have had to complete it;
- The timing, duration and reason for the student's absence from school.

Except in cases of extenuating circumstances, retrospective requests for extensions will not be considered.

Taking into account the above, no late work will be accepted. If assessments are missed or performance is impaired due to factors beyond the student's control then one reassessment may occur if possible.

If a student is aware that he will be absent from school on the due date of an assessment, the work must be handed in before that day.

If a student is to be absent from school on the day of an assessment task because of a scheduled school activity, the student should communicate this in advance with the relevant teacher so that appropriate arrangements can be made.

Should a student be absent from school on the due date of an assessment through illness or injury, arrangements must be made to have the assessment work **handed in at the school's main office by 10.00 a.m.** A medical certificate is also required.

If unable to hand work in as stated above, a medical certificate must be presented upon the student's return to school.

All student assessment scripts will be kept at school until they are no longer required by the school or NZQA for moderation purposes.

FURTHER ASSESSMENT OPPORTUNITIES

There will be no further assessment opportunities offered for internal Achievement Standards in Chemistry.

RE-SUBMISSION

Re-submission opportunities will be provided in some Achievement Standards that require work over an extended period.

Re-submission will only be available in cases where a minor deficiency has prevented a student from reaching the required standard.

All final decisions on re-submission will be made by the teacher under the direction of the HOD on a case-by-case basis.

APPEALS

Students have the right to appeal assessment outcomes. This needs to be discussed with the class teacher in the first instance. Students may appeal any assessment-related decision, such as decisions relating to results, missed and late assessments and breaches of the rules.

An application for formal appeal must be made within five school days of the assessment being returned. Appeals must be made by parents on the official application form obtainable from Mr. Atkin.

The NCEA Co-coordinator or the Principal's Nominee will make the final decision on any appeal.

EXAMINATIONS AND OTHER ASSESSMENTS

These will occur as they are deemed appropriate. Their purpose is to:

- obtain summative information on a student's ability;
- provide a formative assessment / practice for external Achievement Standards;
- provide opportunities for summative reassessment of internally assessed Achievement / Unit Standards where possible;
- provide information (which may be comparative) on learning outcomes for students;
- Gather appropriate information for reporting purposes.

Results will be recorded as a grade:

NA or N	Standard not achieved
A	Standard achieved
M	Standard achieved with merit
E	Standard achieved with excellence

Reporting Not Achieved results: Where a student has presented work or evidence for assessment OR has been given an adequate opportunity to achieve the standard (consistent with school internal assessment procedures), the outcome of that assessment must be reported to NZQA as N, A, M or E.

SPECIAL ASSESSMENT CONDITIONS

1. Candidates with a permanent or long-term:
   - medical, physical or sensory condition and/or
   - specific learning disability that directly impacts on their ability to be assessed fairly in assessments for National Qualifications may apply for entitlement to Special Assessment Conditions.

2. NZQA grants entitlement to Special Assessment Conditions so that approved candidates may be fairly assessed and have access to assessment for National Qualifications. Special Assessment Conditions are approved so that entitled

candidates can demonstrate their knowledge, skills and understanding, without providing unfair advantage over other candidates.

3. Special assessment conditions will only be granted for candidates with a specific learning disability who can access the curriculum at the appropriate level of assessment.

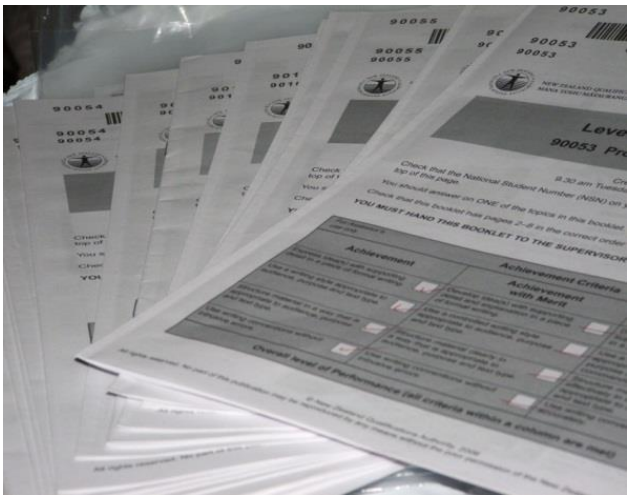
4. Candidates identified and funded as speakers of English as a Second Language are not entitled to Special Assessment Conditions even in conjunction with a specific learning disability.

Through testing and examinations the school makes every effort to identify candidates who might be eligible for Special Assessment Conditions. However, if a student is new to the school and an opportunity for testing has not been available, then applications can be made early in Term 1 via Mrs Rankin, Head of Learning Support.

Storage and Confidentiality of Student Work

Student assessment material will be stored by the Head of Chemistry, until such time as it is no longer required for moderation purposes. Student work and grades are strictly confidential and will only be shared with other students when permission is given by the owner of the work. A student may ask to see their own work at any time, but may not remove it or make copies of it.

For more information, see PNBHS NCEA POLICY & PROCEDURES. A Guide for Students & Parents found on Stratus.



Picture: www.dundeechest.com

External Assessment:

November NCEA Level 2 Chemistry External Examination (AS 2.4, 2.5, 2.6)

NCEA Achievement Standards

For all Achievement Standards the following terms, Criteria and Quality Assurance conditions apply

Terms

- *Describe* involves identifying, naming, drawing, giving characteristics of, giving an account of, and/or defining.
- *Explain and apply* involves describing as well as giving reasons for, making links between chemical concepts and/or observations.
- *Discuss* involves showing understanding by analysing, interpreting, justifying, relating, evaluating, and/or comparing and contrasting.

Achievement Criteria

Externally assessed Standards

The Achievement Criteria in each Achievement Standard is set the same.

Achievement	**Achievement with Merit**	**Achievement with Excellence**
Demonstrate understanding of…….	Demonstrate in-depth understanding of …….	Demonstrate comprehensive understanding of…….

Internally assessed Standards

The Achievement Criteria in each Achievement Standard depends on the nature of the internal. For practical based assessments, **'Carry out'** is used whereas for research based assessments **'demonstrate an understanding'** are the terms of reference.

The Achievement criteria for each Achievement Standard are given in the following pages of this booklet.

Quality Assurance

1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.

2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference 0233

Achievement Standards

Achievement Standards can be found on the NZQA website:

www.nzqa.govt.nz

Internally Assessed Standards

Achievement Standard (AS91910 Version 1)

Subject Reference	Chemistry 2.1				
Title	Carry out a practical investigation into a substance present in a consumer product using quantitative analysis				
Level	2	**Credits**	4	**Assessment**	Internal
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	29 November 2018		
Planned review date	31 December 2019	**Date version published**	29 November 2018		

This achievement standard involves carrying out a practical investigation into a substance present in a consumer product using quantitative analysis.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Carry out a practical investigation into a substance present in a consumer product using quantitative analysis.	• Carry out an in-depth practical investigation into a substance present in a consumer product using quantitative analysis.	• Carry out a comprehensive practical investigation into a substance present in a consumer product using quantitative analysis.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 7. The standard is aligned to the Nature of Science achievement objectives and the Material World achievement objectives:

- Investigating in Science – Develop and carry out investigations that extend their science knowledge, including developing their understanding of the relationship between investigations and scientific theories and models
- Communicating in Science – Use accepted science knowledge, vocabulary, symbols, and conventions when evaluating accounts of the natural world and consider the wider implications of methods of communication and/or representation employed;

and is related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education at http://seniorsecondary.tki.org.nz.

This standard is also derived from *Te Marautanga o Aotearoa*. For details of *Te Marautanga o Aotearoa* outcomes to which this standard relates, see the Papa Whakaako for the relevant learning area.

Safety procedures outlined in *Safety and Science: A Guidance Manual for New Zealand Schools*, Learning Media, Ministry of Education, 2000, should be followed: https://stanz.nzase.org.nz/app/uploads/2015/05/Safety-and-Science.pdf.

2 *Carry out a practical investigation into a substance present in a consumer product using quantitative analysis* involves:

- developing a workable plan to determine if the consumer product sample and/or titration procedure requires modification
- collecting, recording and processing a sufficient quantity of data to enable a conclusion to be reached
- determining the concentration of a substance relevant to the investigation
- describing how significant variables were controlled in the investigation.

Carry out an in-depth practical investigation into a substance present in a consumer product using quantitative analysis involves:

- using results from preliminary trials to develop a valid plan to modify the consumer product sample and/or titration procedure
- collecting, recording and processing quality data that enables a valid conclusion to be reached
- accurately determining the concentration of the standard solution; and the substance present
- explaining how control of variables improved the quality of the investigation.

Carry out a comprehensive practical investigation into a substance present in a consumer product using quantitative analysis involves:

- accurately determining the concentration of the substance in the consumer product, including correct use of significant figures and units
- justifying how modifying the consumer product sample and/or the titration procedure improved the validity and accuracy of the investigation
- evaluating the outcome of the investigation in relation to the consumer product.

3 A *practical investigation* is an activity involving planning and carrying out the investigation, collecting primary data, processing and interpreting data, and reporting on the investigation. Students may make changes to their initial method as they work through the investigation.

4 *Quantitative analysis* involves using a titration procedure to determine the concentration of a substance present in a given sample.

5 The titration must be one of:

- acid-base
- complexometric
- precipitation
- oxidation-reduction.

6 Determination of the concentration of a substance must involve the use of stoichiometric principles and both the relationships *n=m/M and c=n/V*.

7 Conditions of Assessment related to this achievement standard can be found at http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards.

Replacement Information
This achievement standard replaced AS91161.

Achievement Standard (AS91163 Version 2)

Subject Reference	Chemistry 2.3				
Title	Demonstrate understanding of the chemistry used in the development of a current technology				
Level	2	**Credits**	3	**Assessment**	Internal
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	17 November 2011		
Planned review date	31 December 2019	**Date version published**	20 November 2014		

This achievement standard involves demonstrating understanding of the chemistry used in the development of a current technology.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of the chemistry used in the development of a current technology.	• Demonstrate in-depth understanding of the chemistry used in the development of a current technology.	• Demonstrate comprehensive understanding of the chemistry used in the development of a current technology.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 7. The standard is aligned to the Nature of Science achievement objectives and the Material World achievement objectives, and is related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

This standard is also derived from Te Marautanga o Aotearoa. For details of Te Marautanga o Aotearoa achievement objectives to which this standard relates, see the Papa Whakaako for the relevant learning area.

2 *Demonstrate understanding* involves processing and interpreting information to provide an account of the chemistry used in the development of a current technology. This includes the

use of chemistry vocabulary, symbols and conventions. This may also include an account of the historical development of the technology.

Demonstrate in-depth understanding involves making and explaining links between the chemistry and the development of the technology using chemistry vocabulary, symbols and conventions.

Demonstrate comprehensive understanding involves an evaluation of how the chemistry influenced the development of the technology.

3 *Current technology* means technology in use today. The historical aspect can encompass the whole of human history. Examples could include conducting polymers, nanotechnology, cosmetics, pharmaceuticals, paints, polymers, catalytic converters, fabric and fibre technology, and alloys.

4 This standard requires the use of chemistry vocabulary, symbols and conventions including, where appropriate, names, formulae and equations.

5 Conditions of Assessment related to this achievement standard can be found at http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards.

Externally Assessed Standards

Achievement Standard (AS91164 Version 2)

Subject Reference	Chemistry 2.4				
Title	Demonstrate understanding of bonding, structure, properties and energy changes				
Level	2	**Credits**	5	**Assessment**	External
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	17 November 2011		
Planned review date	31 December 2019	**Date version published**	20 November 2014		

This achievement standard involves demonstrating understanding of bonding, structure, properties and energy changes.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of bonding, structure, properties and energy changes.	• Demonstrate in-depth understanding of bonding, structure, properties and energy changes.	• Demonstrate comprehensive understanding of bonding, structure, properties and energy changes.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 7. The standard is aligned to the Nature of Science achievement objectives and the Material World achievement objectives, and is related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

This standard is also derived from Te Marautanga o Aotearoa. For details of Te Marautanga o Aotearoa achievement objectives to which this standard relates, see the Papa Whakaako for the relevant learning area.

2 Procedures outlined in *Safety and Science*: *a Guidance Manual for New Zealand Schools,* Learning Media, Ministry of Education, 2000 should be followed.

3 *Demonstrate understanding* involves describing, identifying, naming, drawing, calculating, or giving an account of bonding, structure and properties of different substances and the energy

involved in physical and chemical changes. This requires the use of chemistry vocabulary, symbols and conventions.

Demonstrate in-depth understanding involves making and explaining links between the bonding, structure and properties of different substances and the energy involved in physical and chemical changes. This requires explanations that use chemistry vocabulary, symbols and conventions.

Demonstrate comprehensive understanding involves elaborating, justifying, relating, evaluating, comparing and contrasting, or analysing links between bonding, structure and properties of different substances and the energy involved in physical and chemical changes. This requires the consistent use of chemistry vocabulary, symbols and conventions.

4 *Bonding, structure and energy changes* are limited to:

- ionic, covalent and metallic bonding
- intermolecular forces (the distinction between the different types of intermolecular forces is not required)
- Lewis structures, shape and polarity of simple molecules. Simple molecules have no more than four electron pairs about any atom (including multiple-bonded species)
- molecular, ionic, metallic and covalent network substances
- exothermic and endothermic reactions including energy (enthalpy) changes associated with differing amounts of substances and changes of state and enthalpy changes associated with the making and breaking of chemical bonds
- calculations of energy changes using $\Delta_r H$ and reaction stoichiometry, and bond enthalpy.

5 *Properties* are limited to hardness, malleability, ductility, electrical conductivity, melting and boiling points and solubility.

6 Assessment Specifications for this achievement standard can be accessed through the Chemistry Resources page found at http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/ncea-subject-resources/.

Replacement Information

This achievement standard replaced unit standard 8944 and AS90308.

Achievement Standard (AS91165 Version 2)

Subject Reference	Chemistry 2.5				
Title	Demonstrate understanding of the properties of selected organic compounds				
Level	2	**Credits**	4	**Assessment**	External
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	17 November 2011		
Planned review date	31 December 2019	**Date version published**	20 November 2014		

This achievement standard involves demonstrating understanding of the properties of selected organic compounds.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of the properties of selected organic compounds.	• Demonstrate in-depth understanding of the properties of selected organic compounds.	• Demonstrate comprehensive understanding of the properties of selected organic compounds.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 7. The standard is aligned to the Nature of science achievement objectives and the Material World achievement objectives, and is related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

This standard is also derived from Te Marautanga o Aotearoa. For details of Te Marautanga o Aotearoa achievement objectives to which this standard relates, see the Papa Whakaako for the relevant learning area.

2 Procedures outlined in *Safety and Science*: *a Guidance Manual for New Zealand Schools,* Learning Media, Ministry of Education, 2000 should be followed.

3 *Demonstrate understanding* involves naming and/or drawing structural formulae of selected organic compounds (no more than eight carbons in the longest chain) and giving an account of

their chemical and physical properties. This requires the use of chemistry vocabulary, symbols and conventions.

Demonstrate in-depth understanding involves making and explaining links between structure, functional groups and the chemical properties of selected organic compounds. This requires explanations that use chemistry vocabulary, symbols and conventions.

Demonstrate comprehensive understanding involves elaborating, justifying, relating, evaluating, comparing and contrasting, or using links between the structure, functional groups and the chemical properties of selected organic compounds. This requires the consistent use of chemistry vocabulary, symbols and conventions.

Selected organic compounds are limited to: alkanes, alkenes, alkynes, haloalkanes, primary amines, alcohols, and carboxylic acids.

Properties are limited to:

- constitutional and geometric (*cis and trans*) isomers
- classification of alcohols and haloalkanes as primary, secondary or tertiary
- solubility, melting and boiling points
- chemical reactions.

4 Chemical reactions are limited to:

- addition reactions of alkenes with H_2/Pt, Cl_2, Br_2, H_2O/H^+ (conc. H_2SO_4/H_2O) and hydrogen halides (including identification of major and minor products on addition to asymmetric alkenes), polymerisation
- substitution reactions of:
  - alkanes with halogens (limited to monosubstitution)
  - alcohols with hydrogen halides, PCl_3, PCl_5, $SOCl_2$
  - haloalkanes with ammonia and aqueous potassium hydroxide
- oxidation of:
  - primary alcohols to form carboxylic acids with MnO_4^-/H^+ or $Cr_2O_7^{2-}/H^+$
  - alkenes with MnO_4^-
- elimination of (including identification of major and minor products for asymmetric reactants):
  - water from alcohols
  - hydrogen halides from haloalkanes
- acid–base reactions of carboxylic acids and amines.

5 Assessment Specifications for this achievement standard can be accessed through the Chemistry Resources page found at http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/ncea-subject-resources/.

Replacement Information

This achievement standard replaced AS90309.

Achievement Standard (AS91166 Version 2)

Subject Reference	Chemistry 2.6				
Title	Demonstrate understanding of chemical reactivity				
Level	2	**Credits**	4	**Assessment**	External
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	17 November 2011		
Planned review date	31 December 2019	**Date version published**	20 November 2014		

This achievement standard involves demonstrating understanding of chemical reactivity.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of chemical reactivity.	• Demonstrate in-depth understanding of chemical reactivity.	• Demonstrate comprehensive understanding of chemical reactivity.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 7. The standard is aligned to the Nature of Science achievement objectives and the Material World achievement objectives; and is related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

This standard is also derived from Te Marautanga o Aotearoa. For details of Te Marautanga o Aotearoa achievement objectives to which this standard relates, see the Papa Whakaako for the relevant learning area.

2 Procedures outlined in *Safety and Science*: *a Guidance Manual for New Zealand Schools,* Learning Media, Ministry of Education, 2000 should be followed.

3 *Demonstrate understanding* involves describing, identifying, naming, drawing, calculating, or giving an account of chemical reactivity. This requires the use of chemistry vocabulary, symbols and conventions.

Demonstrate in-depth understanding involves explaining chemical reactivity. This requires explanations that use chemistry vocabulary, symbols and conventions.

Demonstrate comprehensive understanding involves elaborating, justifying, relating, evaluating, comparing and contrasting, or analysing chemical reactivity. This requires the consistent use of chemistry vocabulary, symbols and conventions.

Chemical reactivity is limited to rates of reaction and equilibrium principles.

4 Rates of reaction involve:
- factors affecting rates of reaction – restricted to changes in concentration, temperature, surface area, and the presence of a catalyst
- using collision theory to explain the factors (includes activation energy).

5 *Equilibrium principles* are limited to:
- the dynamic nature of equilibrium
- the effect of changes in temperature, concentration, pressure, or addition of a catalyst on equilibrium systems
- the significance of the equilibrium constant (K_c) for homogeneous systems. This may involve calculations
- the nature of acids and bases in terms of proton transfer
- properties of aqueous solutions of strong and weak acids and bases including ionic species. The properties are restricted to conductivity, rate of reaction, and pH
- calculations involving K_w and pH (restricted to strong acids and bases).

6 Assessment Specifications for this achievement standard can be accessed through the Chemistry Resources page found at http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/ncea-subject-resources/.

Replacement Information
This achievement standard replaced AS90310.

Level 2 Chemistry Timeline 2018

Term 1: 28th Jan – 12th April

Week 1	2	3	4	5	6	7	8	9	10	11
2.6 Chemical Reactivity external (4)								2.1 Quantitative (4) - Theory		

Term 2: 29th April – 5th July

Week 1	2	3	4	5	6	7	8	9	10
2.1 (cont'd) - Practical				2.4 Structure, Bonding and Thermochemistry external (5)					

NOTE: Internal 2.3 is given as a holiday exercise at the end of term 2. Due date is the end of the first week back.

Term 3: 22nd July – 27th Sept

Week 1	2	3	4	5	6	7	8	9	10
2.5 Organic Chemistry external (4)							Organic/exams	exams	Revision

Term 4: 14th Oct – 5th Dec

Week 1	2	3	4	5	6	7	8
Revision			NCEA examinations				Prize-giving

Specific Learning Outcomes

Below is the list of learning outcomes for each Achievement Standards. As you complete each item, tick the box.

You should be able to.....

2.1 Carry out Quantitative Analysis (91161)

• Write word equations and balanced symbol chemical equations	

- Write word and balanced symbol equations related to observations of experiments
- Carry out practical exercises to calculate the amount of substance (in moles)
- Use the equation $n = \frac{m}{M}$ to calculate n, m and M when given the other two variables

Volumetric Analysis	
• Use a balance, pipette, burette, wash bottle, conical flask to carry out a titration correctly	
• Define the following terms: titration, equivalence point, endpoint, concordant results, aliquot, indicator, titre, stoichiometric equation	
• Carry out a range of titrations and calculate the concentrations of unknown solutions using concordant titres within a range of 0.2 mL	
• Calculate the concentration of an unknown solution using stoichiometry	
• Develop a workable plan to determine if the consumer product sample and/or titration procedure requires modification	
• Collect, record and process a sufficient quantity of data to enable a conclusion to be reached	
• Accurately determining the concentration of the substance in the consumer product, including correct use of significant figures and units	
• justify how modifying the consumer product sample and/or the titration procedure improved the validity and accuracy of the investigation	
• evaluating the outcome of the investigation in relation to the consumer product.	

2.3 Demonstrate understanding of the chemistry used in the development of a current technology (91163)

• Collect information about a current technology	
• Process and interpret information collected and record notes	
• Describe the development of the technology in-depth	
• Give a comprehensive description of the history of the development of the technology	
• Explain with a reasons why a particular development path was pursued	
• Link the development of the technology to related current or historical chemistry knowledge	
• Use chemistry vocabulary extensively to describe the development of the technology	
• Evaluate the discovery with respect to its use in society. Consider any challenges the new technology might present/introduce	

2.4 Demonstrate understanding of bonding, structure and energy changes (91164)

• Classify raw materials as elements, compounds or mixtures.	
• Name and write formulae for common household substances	
• Give explanations as to why a substance is an element, compound or mixture	
• Describe the structure of an atom and draw labelled diagrams showing the position of protons, neutrons and electrons	
• Define atomic number and mass number and use ${}^{A}_{Z}X$ notation	
• Calculate the number of protons, neutrons and electrons in a neutral atom using mass number and atomic number	
• Write electron configurations for the first 20 elements and their ions	
• Know the name and formulae for common ions	
• Identify ionic compounds from their name and formula	
• Write formulae for a range of ionic compounds	
Types of solids and their structure and properties	
• Describe the structure of metallic solids	
• Use the structure of metallic solids to explain their properties	
• Describe the structure of ionic solids	
• Use their structure to explain the properties of ionic solids	
• Describe the structure of covalent network solids	

• Use the structure of covalent network solids to explain their properties	
• Define inter- and intra-molecular solids	
• Describe the structure of covalent molecular solids	
• Use the structure of covalent molecular solids to explain their properties	
• Describe how to distinguish between the melting points and electrical conductivity of a range of types of solids	
• Compare and contrast the properties of different types of solids using their structures and bonding	
Bonding	
• Draw Lewis diagrams for the first 20 elements	
• Define and recognise covalent bonding between atoms and molecules	
• Draw Lewis diagrams for a range of molecules containing no more than four electron pairs	
• Define the terms: electronegativity, dipole, polar and nonpolar, covalent bonding	
• Describe the trend in electronegativity across a period and down a group	
• Use differences in electronegativity to identify polar bonding	
• Identify, draw and name the shape of simple molecules from Lewis diagrams	
• Use bond polarity, bond dipoles and bonding and non-bonding electron pairs to explain why molecules have different shapes and bond angles	
• Distinguish between polar and nonpolar molecules	
• Carry out an experiment to distinguish between polar and nonpolar molecules	
• Carry out an experiment to determine the solubility of polar and non-polar substances	
Energy changes	
• Distinguish between endothermic and exothermic reactions	
• Draw and label reaction profiles for endothermic and exothermic reactions	
• Explain the significance of the magnitude of ΔH	
• Define ΔH as enthalpy of products – enthalpy of reactants	
• Carry out a range of exothermic and endothermic reactions	
• Use ΔH values to calculate energy changed in reactions	
• Use mole relationships in balanced equations to calculate heats of reactions for known masses of fuel	
• Carry out an experiment to calculate the heat of combustion of a range of fuels	

2.5 Demonstrate understanding of the properties of selected organic compounds (91165)

Organic compounds	
Classify a range of substances as organic or inorganic	
Name some common organic compounds and describe their use	
Identify selected functional groups: alkenes, alkyne, haloalkanes, alcohols, amines and carboxylic acid	
Classify organic compounds from their structural and molecular formulae	
Use IUPAC nomenclature to name and draw a range of organic compounds	
Define empirical, molecular, structural and general formulae	
Identify, name and draw structural(constitutional) and geometric isomers	
Construct 3-D models of organic compounds	
Hydrocarbons –alkanes, alkenes and alkynes	
Describe the source of hydrocarbons (alkanes, alkenes, alkynes)	
Describe the physical properties of hydrocarbons and give reasons for them (physical state, odour, melting point and boiling point, solubility in water, density, conductivity, polarity)	
Describe the physical properties of alkanes and relate to their bonding	
Write balanced equations for the combustion of alkanes	
Distinguish between complete and incomplete combustion	
Graph melting point versus carbon chain length and identify and explain trends	
Describe and write equations for common reactions of alkanes (combustion, cracking, chlorination, bromination)	
Carry out an experiment to crack alkanes to form alkenes	
Carry out a range of experiments to compare the reactions of alkanes and alkenes (bromine water, potassium permanganate, UV light)	
Describe and write equations for common reactions of alkenes (addition of hydrogen, halogens, hydrogen halides and water, oxidation, polymerisation)	
Use Markovinkoff's rule to identify major and minor products from addition reactions	
Produce ethane by dehydrating ethanol	
Identify monomers and polymers produced from addition polymerisation	
Classify reactions as addition or substitution and write associated equations	
Write an equation for the formation of ethyne from calcium carbide	
Describe and write equations for common reactions of alkynes (addition of hydrogen, halogens, hydrogen halides and water, oxidation, polymerisation)	
Make ethyne and carry out chemical tests for saturation	
Haloalkanes	
Name a range of haloalkanes	
Write equations for the formation of haloalkanes through substitution of alkanes and addition to alkenes and alkynes	

Classify haloalkanes as primary, secondary or tertiary	
Describe and write equations for common reactions of haloalkanes (alcohol formation, amine formation, elimination to form alkenes)	
Name a range of primary amines	
Describe and write equations for the formation of amines from haloalkanes	
Describe the physical properties of amines	
Write equations for the reactions of amines with water and acids	
Carry out a range of experiments to identify the physical and chemical properties of amines	
Alcohols	
Classify alcohols as primary, secondary, tertiary	
Describe the physical properties of alcohols	
Name and write the formula for a range of alcohols	
Plot boiling point vs. chain length for a range of alcohols and explain any trends	
Write equations for common reactions of alcohols (combustion, oxidation and ester formation)	
Carry our experiments to oxidise 1°, 2°, 3°alcohols and identify products	
Write equations for the reaction of alcohols with a range of halogenating reagents (Lucas reagent, hydrogen bromide, thionyl chloride ($SOCl_2$), phosphorus trichloride (PCl_3), phosphorus pentachloride (PCl_5)	
Write equations for elimination reactions of alcohols with concentrated sulfuric acid	
Carboxylic acids	
Describe the physical properties of carboxylic acids	
Name and write the formula for a range of carboxylic acids	
Write equations for a range of reactions of carboxylic acids with bases, metals, carbonates and alcohols	
Name, draw and classify a range of organic compounds	
Complete and balance a range of organic reactions	
Use experimental observation and data to identify reactants and products of common organic reactions	
Identify reactants and products in reaction schemes	

2.6 Demonstrate understanding of chemical reactivity (91166)

Rates of reaction	

Describe how temperature, concentration, surface area and catalysts affect the rate of reaction	
Use collision theory to explain changes in reaction rate related to temperature, concentration, surface area and catalysts	
Define activation energy	
Draw and label reaction profiles to represent catalysed and uncatalysed reactions	
Chemical Equilibrium	
Classify reactions as reversible and irreversible	
Define chemical equilibrium and give examples and experimental observations of equilibrium systems	
Define equilibrium constant K_c and reaction quotient, Q	
Describe the significance of the size of the equilibrium constant	
Write equilibrium expressions and calculate equilibrium constants and reaction quotients	
Describe the effect of changing temperature, pressure, concentration, surface area and catalyst on equilibrium	
Acids and Bases	
Describe how acids and bases can be experimentally identified	
Write dissociation equations for acids and bases	
Identify conjugate acid-base pairs	
Distinguish between strong acids and bases and weak acids and bases	
Define neutralisation and give examples of neutralisation reactions	
Define K_w and use the ionic product expression to calculate H_3O^+ and OH^- concentrations in solution	
Define pH and calculate pH using $pH=-\log[H_3O^+]$	
Use pH meters or indicator paper to determine the pH of common household substances	
Experimentally distinguish between strong and weak acids and bases	

My Assessment Progress

Record all end of unit test and examination results here for your own reference

Achievement Standard	Credits	Grades	
		Internal Assessments	
		Formative Test	Summative Assessment
2.1	**4**		
2.3	**3**		
		External Assessments	
		Formative Test	End of Year Examination
2.4	**5***		
2.5	**4***		
2.6	**4***		

* Provisional Credits only.

Grades sent to NZQA reflect the best achievement of a student in the assessments of the given Standard.

Grades are: N= Not Achieved A= Achieved M= Achieved with Merit
E= Achieved with Excellence

References: *www.odt.co.nz*

A Copy of this booklet can be found on the Stratus Level 2 Chemistry page.