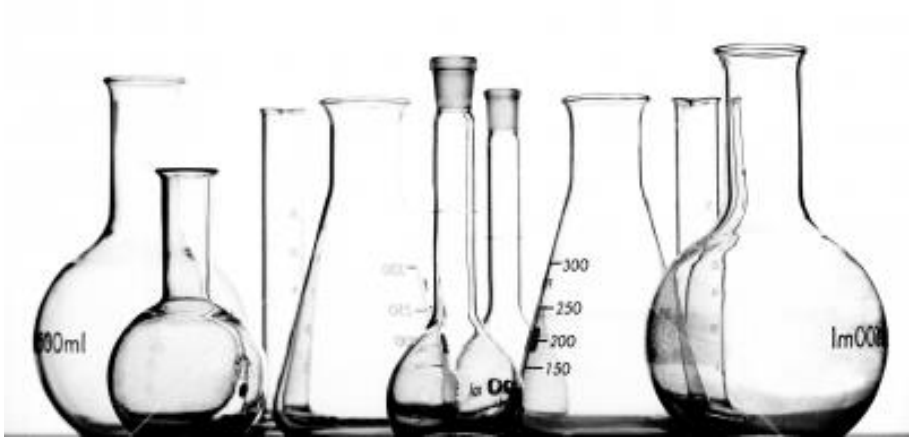
Palmerston North Boys' High School

National Certificate of Educational Achievement

Level 3 Chemistry



Course Information 2019

Welcome to Level 3 Chemistry.

Course Structure

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

	Achievement Standard	I/E	Credits
3.2	91388 Demonstrate understanding of spectroscopic data in chemistry	I	3
3.3	91389 Demonstrate understanding of chemical processes in the world around us *(optional – done in own time)*	I	3
3.4	91390 Demonstrate understanding of thermochemical principles and the properties of particles and substances	E	5
3.5	91391 Demonstrate understanding of the properties of organic compounds	E	5
3.6	91392 Demonstrate understanding of equilibrium principles in aqueous systems	E	5
3.7	91393 Demonstration understanding of oxidation-reduction processes	I	3
	Total Credits without optional 3.3		**21**
	Total Credits with optional 3.3		**24**

Endorsement in Chemistry will be obtained if a student achieved in a single year, 14 or more credits at the Merit or Excellence level. At least 3 credits must come from the internal Achievement Standard.

Resources

You will be provided with an ESA Year 13 chemistry textbook. You will need to purchase level 3 chemistry workbooks through OfficeMax.

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

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.

Practical Work:

Experiments for the level 3 will be completed 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 3 Chemistry grade, under normal conditions, will be awarded through their performance in the **External Examination and internally Standard only.**

External Assessment:

November NCEA Level 3 Chemistry External Examination (AS 3.4, 3.5, 3.6)

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.

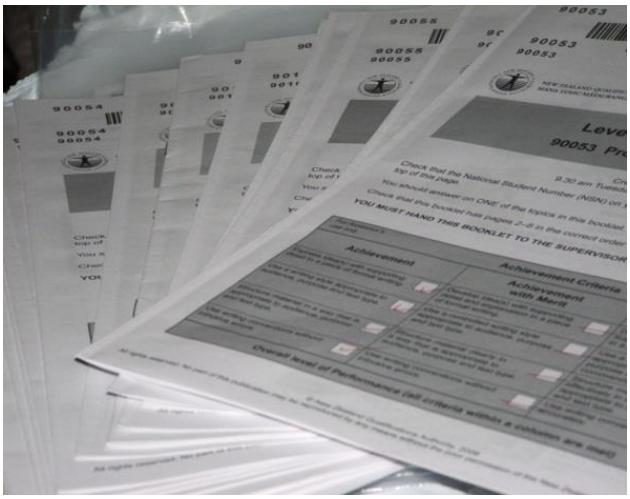
4. Candidates identified and funded as speakers of English as a Second Language are not entitled to Special Assessment Conditions even in conjunction with a specific learning disability.

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.



External Assessment:

November NCEA Level 3 Chemistry External Examination (AS 3.4, 3.5, 3.6)

Reference: www.dundeechest.com

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
• Describe • (Demonstrate understanding)	• Explain and apply (Demonstrate in-depth understanding)	• Discuss, justify, compare and contrast (Demonstrate comprehensive understanding)

Quality Assurance

1 Providers and Industry Training Organisations must be accredited by the Qualifications Authority before they can register credits from assessment against achievement standards.

2 Accredited providers and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards. Accreditation and Moderation Action Plan (AMAP)

Achievement Standards

Achievement Standards can be found on the NZQA website:

http://www.nzqa.govt.nz/ncea/assessment/search.do?query=Chemistry&view=achievements&level=03

Below are the explanatory notes associated to each Achievement Standard for the course this year.

Internally Assessed Standards

Subject Reference	Chemistry 3.2 (91388 version 2)				
Title	Demonstrate understanding of spectroscopic data in chemistry				
Level	3	**Credits**	3	**Assessment**	Internal
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	04 December 2012		
Planned review date	31 December 2019	**Date version published**	17 November 2016		

This achievement standard involves demonstrating understanding of spectroscopic data in chemistry.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of spectroscopic data in chemistry.	• Demonstrate in-depth understanding of spectroscopic data in chemistry.	• Demonstrate comprehensive understanding of spectroscopic data in chemistry.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 8. The standard is aligned to the Material World achievement objectives:

Investigate and measure the chemical and physical properties of a range of groups of substances.

Apply knowledge of chemistry to explain aspects of the natural world and how chemistry is used in society to meet needs, resolve issues, and develop new technologies.

It is also related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

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

2 *Demonstrate understanding of spectroscopic data* involves:
- identifying discrete aspects of the structure of organic molecules using teacher provided spectroscopic data.

Demonstrate in-depth understanding involves:
- determining the structure of organic molecules using spectroscopic data.

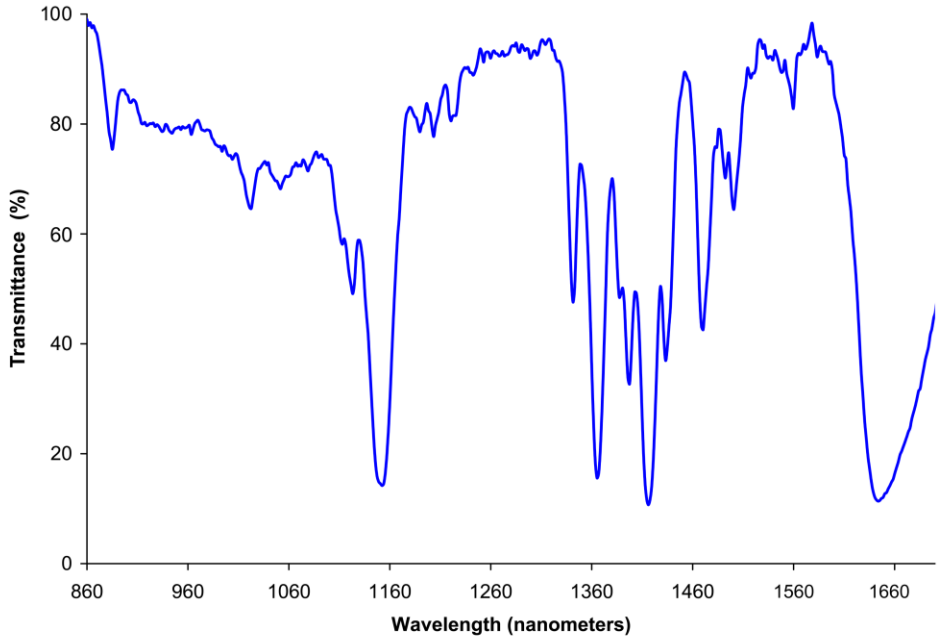
Demonstrate comprehensive understanding involves:
- justifying the structure of organic molecules by integrating spectroscopic data.

3 Spectroscopic data is limited to that collected from mass, infrared (IR) and ^{13}C nuclear magnetic resonance (NMR) spectroscopy.

4 Organic molecules are limited to alkanes, alkenes, alcohols, haloalkanes, amines, aldehydes, ketones, carboxylic acids, amides, acid chlorides and esters.

5 Aspects of structure are limited to molar mass and molecular formulae, functional groups, and the carbon framework including structural isomers.

6 Conditions of Assessment related to this achievement standard can be found at www.tki.org.nz/e/community/ncea/conditions-assessment.php.



Subject Reference	Chemistry 3.3 (optional – done in own time)				
Title	Demonstrate understanding of chemical processes in the world around us				
Level	3	**Credits**	3	**Assessment**	Internal
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	04 December 2012		
Planned review date	31 December 2019	**Date version published**	17 November 2016		

This achievement standard involves demonstrating understanding of chemical processes in the world around us.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of chemical processes in the world around us.	• Demonstrate in-depth understanding of chemical processes in the world around us.	• Demonstrate comprehensive understanding of chemical processes in the world around us.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 8. The standard is aligned to the Nature of Science achievement objectives:
Understand that scientists have an obligation to connect their new ideas to current and historical scientific knowledge.
Develop and carry out investigations that extend their science knowledge, including developing their understanding of the relationship between investigations and scientific theories and models.
Use accepted science knowledge, vocabulary, symbols, and conventions when evaluating accounts of the natural world and consider the wider implications of the methods of communication and/or representation employed.
and the Material World achievement objective:
Apply knowledge of chemistry to explain aspects of the natural world and how chemistry is used in society to meet needs, resolve issues, and develop new technologies.

It is also 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.

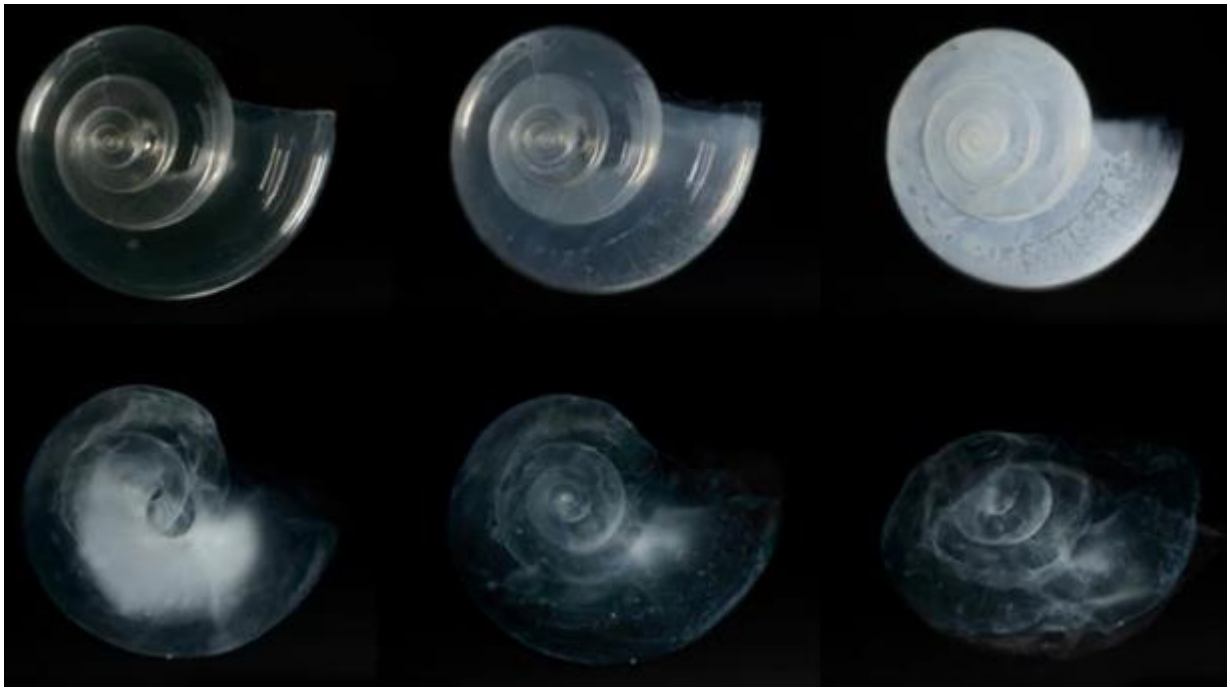
2 *Demonstrate understanding* involves processing and interpreting given information to identify, describe, and give an account of chemical processes occurring in the natural world or developed in response to an issue or need. The account given must be supported by the use of chemistry vocabulary, symbols, conventions, and equations.

Demonstrate in-depth understanding involves making and explaining links between chemical processes, and the consequences of the chemical processes for the environment or people. This requires explanations that integrate chemistry vocabulary, symbols, conventions, and equations.

Demonstrate comprehensive understanding involves an evaluation of the impact of, and issues that have arisen from, the chemical processes. This involves elaborating on, comparing and contrasting, or analysing the links between the chemical processes and their consequences. This requires the consistent integration of chemistry vocabulary, symbols, conventions, and equations.

3 *Chemical processes in the world around us* include either the chemistry related to an environmental issue or the chemistry involved in the development of new technology to meet a societal need. Examples of environmental issues may include an aspect of the greenhouse effect, ozone depletion, acidification of oceans, acid rain, volcanic eruptions, or pollution. Examples of technologies may include an aspect of polymers, energy production, pharmaceuticals, or food production.

4 Conditions of Assessment related to this achievement standard can be found at www.tki.org.nz/e/community/ncea/conditions-assessment.php.



www.climatechangenews.com/2017/05/15/ocean-acidification-global-warmings-forgotten-crisis/

Subject Reference	Chemistry 3.7 (91393 version 2)				
Title	Demonstrate understanding of oxidation-reduction processes				
Level	3	**Credits**	3	**Assessment**	Internal
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	04 December 2012		
Planned review date	31 December 2019	**Date version published**	17 November 2016		

This achievement standard involves demonstrating understanding of oxidation-reduction processes.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of oxidation-reduction processes.	• Demonstrate in-depth understanding of oxidation-reduction processes.	• Demonstrate comprehensive understanding of oxidation-reduction processes.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 8. The standard is aligned to the Material World achievement objective:

Investigate and measure the chemical and physical properties of a range of groups of substances.

It is also related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

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

2 *Demonstrate understanding* involves describing oxidation-reduction processes and may involve calculations. This requires the use of chemistry vocabulary, symbols, and conventions.

Demonstrate in-depth understanding involves making and explaining links between oxidation-reduction processes, observations, equations and calculations. This requires explanations that use chemistry vocabulary, symbols, and conventions.

Demonstrate comprehensive understanding involves comparing and contrasting, and justifying, links between oxidation-reduction processes, observations, equations and calculations. This requires the consistent use of chemistry vocabulary, symbols, and conventions.

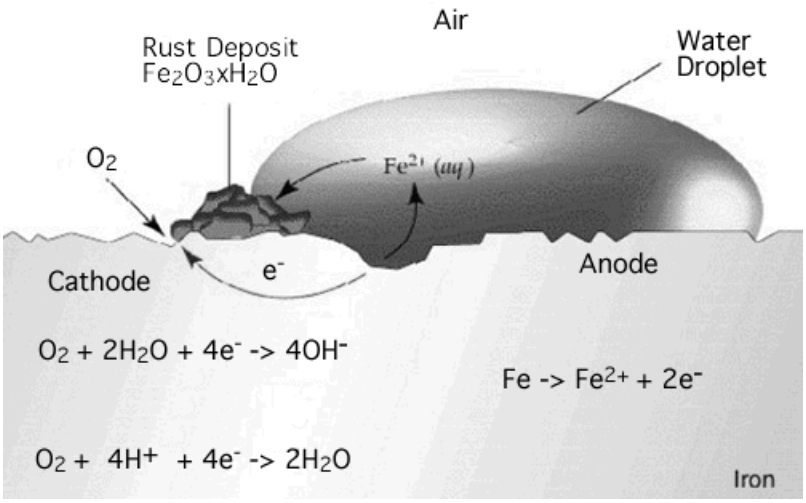
3 *Oxidation-reduction processes* involve the use of the relative strengths of oxidants and reductants. This includes the use of reduction potentials and spontaneity of reactions.

4 *Processes* include reactions in electrochemical and electrolytic cells.

5 Calculations are limited to those involving electrode potentials.

6 Conditions of Assessment related to this achievement standard can be found at www.tki.org.nz/e/community/ncea/conditions-assessment.php.

Replacement Information
This achievement standard replaced AS90696.



External Achievement Standards

Subject Reference	Chemistry 3.4 (91390 version 2)				
Title	Demonstrate understanding of thermochemical principles and the properties of particles and substances				
Level	3	**Credits**	5	**Assessment**	External
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	04 December 2012		
Planned review date	31 December 2019	**Date version published**	17 November 2016		

This achievement standard involves demonstrating understanding of thermochemical principles and the properties of particles and substances.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of thermochemical principles and the properties of particles and substances.	• Demonstrate in-depth understanding of thermochemical principles and the properties of particles and substances.	• Demonstrate comprehensive understanding of thermochemical principles and the properties of particles and substances.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 8. The standard is aligned to the Material World achievement objectives:

Investigate and measure the chemical and physical properties of a range of groups of substances.

Relate properties of matter to structure and bonding.

Develop an understanding of and use the fundamental concepts of chemistry (for example, equilibrium and thermochemical principles) to interpret observations.

It is also related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

2 *Demonstrate understanding* involves describing, identifying, naming, drawing, and giving an account of the properties of particles, the properties of substances they form, and

thermochemical principles. This requires the use of chemistry vocabulary, symbols, and conventions and may include related calculations.

Demonstrate in-depth understanding involves making and explaining links between the properties of particles, the properties of substances they form, thermochemical principles, and related calculations. 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 the properties of particles, the properties of substances they form, thermochemical principles, and related calculations. This requires the consistent use of chemistry vocabulary, symbols, and conventions.

3 *Properties of particles* are limited to:

- electron configuration of atoms and ions of the first 36 elements (using *s,p,d* notation)
- periodic trends in atomic radius, ionisation energy, and electronegativity, and comparison of atomic and ionic radii
- Lewis structures and shapes (up to six electron pairs about the central atom for molecules and polyatomic ions, including those with multiple bonds), polarity of molecules
- attractive forces between atoms, ions, and molecules. These will include ionic bonds, covalent bonds, and intermolecular attractions due to temporary dipoles and permanent dipoles (including hydrogen bonding).

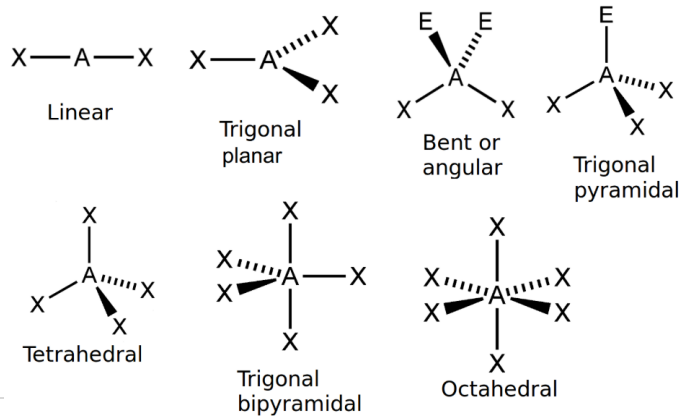
4 *Properties of substances* are limited to:

- melting point, boiling point and solubility
- enthalpy and entropy changes associated with spontaneity in chemical reactions (entropy calculations are not required).

5 *Thermochemical principles* include:

- specific heat capacity
- phase changes
- $\Delta_c H°$, $\Delta_f H°$, $\Delta_r H°$, $\Delta_{vap} H°$, $\Delta_{sub} H°$, and $\Delta_{fus} H°$
- Hess's Law including application of $\Delta_r H = \Sigma\Delta_f H$((products) – $\Sigma\Delta_f H$(reactants)) and related calculations.

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/subjects/.



Subject Reference	Chemistry 3.5 (91391 version 2)				
Title	Demonstrate understanding of the properties of organic compounds				
Level	3	**Credits**	5	**Assessment**	External
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	04 December 2012		
Planned review date	31 December 2019	**Date version published**	17 November 2016		

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

Achievement Criteria

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

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 8. The standard is aligned to the Material World achievement objectives:

Investigate and measure the chemical and physical properties of a range of groups of substances.
Relate properties of matter to structure and bonding.
Develop an understanding of and use the fundamental concepts of chemistry (for example, equilibrium and thermochemical principles) to interpret observations.

It is also related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

2 *Demonstrate understanding* involves naming using IUPAC conventions (no more than eight carbons in the longest chain) and/or drawing structural formulae of organic compounds and giving an account of their physical properties and/or reactivity.
This requires the use of chemistry vocabulary, symbols, and conventions.

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

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

3 *Organic compounds* are limited to those containing one or more of the following functional groups: alkene, haloalkane, amine, alcohol, aldehyde, ketone, carboxylic acid, ester (including triglycerides), acyl chloride, and amide.

4 Structure includes functional groups and isomerism (constitutional isomers and stereoisomers).

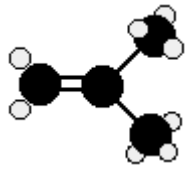
5 Reactivity of organic compounds is limited to:

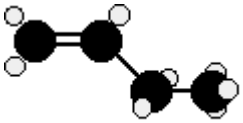
- substitution reactions using the following reagents: concentrated HCl, HBr, $SOCl_2$, NaOH, KOH (in alcohol or aqueous solution), concentrated NH_3, primary amines, primary alcohols/H^+, H_2O/H^+, H_2O/OH^- (Substitution reactions include esterification, condensation, hydrolysis, and polymerisation.)
- oxidation reactions using the following reagents: MnO_4^-/H^+, $Cr_2O_7^{2-}/H^+$, Tollens', Fehling's and Benedict's. Reduction of aldehydes and ketones with $NaBH_4$
- elimination reactions using the following reagents: KOH in alcohol and concentrated H_2SO_4 (includes major and minor products from asymmetric alcohols and haloalkanes)
- polymerisation reactions involving formation of polyesters and polyamides including proteins
- addition reactions of alkenes (used for the identification of the products of elimination reactions).

6 Physical properties of organic compounds may be used to distinguish between organic compounds and are limited to:

- solubility
- melting point and boiling point
- rotation of plane-polarised light.

7 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/subjects/.





Subject Reference	Chemistry 3.6 (91392 version 2)				
Title	Demonstrate understanding of equilibrium principles in aqueous systems				
Level	3	**Credits**	5	**Assessment**	External
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	04 December 2012		
Planned review date	31 December 2019	**Date version published**	17 November 2016		

This achievement standard involves demonstrating understanding of equilibrium principles in aqueous systems.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of equilibrium principles in aqueous systems.	• Demonstrate in-depth understanding of equilibrium principles in aqueous systems.	• Demonstrate comprehensive understanding of equilibrium principles in aqueous systems.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 8. The standard is aligned to the Material World achievement objectives:

Investigate and measure the chemical and physical properties of a range of groups of substances.

Relate properties of matter to structure and bonding.

Develop an understanding of and use the fundamental concepts of chemistry (for example, equilibrium and thermochemical principles) to interpret observations.

It is also related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

2 *Demonstrate understanding* involves describing, identifying, and giving an account of aqueous systems using equilibrium principles. This requires the use of chemistry vocabulary, symbols, and conventions and may include related calculations.

Demonstrate in-depth understanding involves using equilibrium principles to explain properties of aqueous systems. This requires explanations that use chemistry vocabulary, symbols, and conventions and may include related calculations.

Demonstrate comprehensive understanding involves elaborating, justifying, relating, evaluating, comparing and contrasting, or analysing properties of aqueous systems in terms of equilibrium principles. This requires the consistent use of chemistry vocabulary, symbols, and conventions and may include related calculations.

3 *Aqueous systems* are limited to those involving sparingly soluble ionic solids and acidic and basic solutions (in which proton transfer occurs).

4 *Equilibrium principles in aqueous systems* are limited to qualitative descriptions and/or calculations involving:

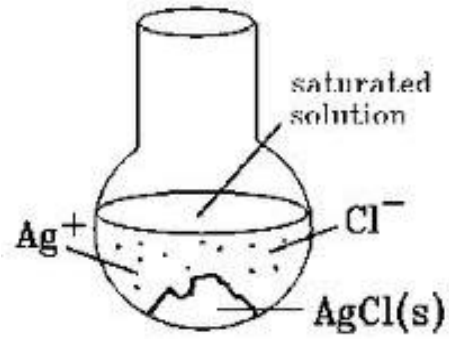
- relative concentrations of dissolved species
- sparingly soluble ionic solids
  - relating solubility to K_s
  - solubility of solids in water and in solutions already containing one of the ions A or B (a common ion) or due to the formation of a complex ion, or the reaction of a basic anion with added acid
  - predicting precipitation or dissolution
- acidic and basic solutions (includes buffers)
  - acid/base strength, K_a (pK_a)
  - concentration of species present in weak acidic and/or basic solutions (includes buffers)
  - relating concentration of species to pH and conductivity
  - titration curves to represent an acid-base system including selection of indicators (titrations of weak acids with weak bases are excluded).

5 Sparingly soluble ionic solids are limited to AB, A_2B and AB_2 types where neither of the ions A nor B reacts further with water.

6 Acidic and basic solutions are monoprotic acids, bases, salts, and buffers (those in which the extent of reaction is small so that the equilibrium concentration of a dissolved weak acid or base can be approximated by the initial concentration).

7 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/subjects/.

Reference: www.www2.ucdsb.on.ca



Level 3 Chemistry Timeline 2019

Term 1: 28th Jan – 12th April

Week 1	2	3	4	5	6	7	8	9	10	11
3.7 REDOX internal (3)		CAMP	3.7 REDOX cont'd		3.5 Properties of organic compounds external (5)					

Term 2: 29th April – 5th July

Week 1	2	3	4	5	6	7	8	9	10
3.2 Spectroscopy internal (3)				3.4 Particles and thermochemistry external (5)					

NOTE: Optional Internal 3.3 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
3.6 Aqueous Chemistry external (5)							Aqueous/exams	exams	Aqueous

Term 4: 14thOct – 5thDec

Week 1	2	3	4	5	6	7	8
revision	revision	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.....

3.2 Demonstrate understanding of spectroscopic data in chemistry (91388)

• Interpret a ^{13}C NMR spectrum	
• Recognise the number of different carbon environments in a molecule and link these to the ^{13}C NMR spectrum	
• Interpret an infrared spectrum	
• Link each of the main peaks in an IR spectrum to their correct functional group	
• Distinguish between two compounds based on their infrared spectra	
• Interpret a mass spectrum	
• Calculate the molar mass of a compound based on the mass spectrum provided	
• Identify the main peaks (molecular ion peak and base peak)	

3.3 Demonstrate understanding of chemical processes in the world around us (91389)

• Collect information about the chemical process	
• Process and interpret information collected and record notes	
• Describe the comprehensively the consequences of the chemical processes for the environment and/or the people involved	
• Consider political, economic and future aspects of the chemical process(es) and discuss these from more than one view-point	
• Link findings to research and/or technologies in other scientific fields e.g. ecology, earth sciences etc	
• Use chemistry vocabulary extensively to describe the chemical process(es) integrating and explaining chemical equations where particularly possible	
• Evaluate the discovery with respect to its use in society. Consider any challenges the new technology might present/introduce	
• Compare and contrast the process(es) used to meet the needs, resolve issues and/or develop new technologies for the environment or people	

3.7 Demonstrate understanding of oxidation-reduction processes (91393)

Oxidation-Reduction Reactions	
• Define the terms oxidation, reduction, oxidant, oxidising agent, reductant, reducing agent, spectator ion	
• Recognise oxidation and reduction reactions from symbols and word equations	
• Recognise and identify the colour of a range of oxidants and reductants and any associated colour changes	
• Calculate oxidation numbers and use them to recognise oxidation and reduction	
• Write balanced half equations and full equations for a range of redox reactions	
• Carry out a range of redox reactions, make observations and write equations	
Electrochemical Cells	
• Define the following terms: electrolyte, anode, cathode, salt bridge	
• Distinguish between spontaneous and non-spontaneous reactions	
• Write ionic equations to describe the reactions occurring in an electrochemical cell	
• Label diagrams of electrochemical cells to show cell contents, electrode polarity and direction of electron flow	
• Construct a series of electrochemical cells to show cell contents, electrode polarity and direction of electron flow.	
• Construct a series of electrochemical cells and measure the resulting voltage	
• Calculate cell voltages using E^o values from data books	
• Represent electrochemical cells using IUPAC conventions	
• Use E^o values to predict if a reaction will occur spontaneously	
• Describe and label the functions of the key features of electrochemical cells including lead-acid and dry cells	
Electrolytic Cells	
• Describe the process of electrolysis	
• Carry out the electrolysis of a copper chloride solution	
• Label and define the role of the anode and cathode in an electrolytic cell	
• Write ion-electron half equations for reactions occurring at anode and cathode	
• Carry out an experiment to electroplate copper onto a brass surface	

3.4 Demonstrate understanding of thermochemical principles and the properties of particles and substances (91390)

Structure of Atoms	
• Define the following terms: atoms, element, compound, ion isotope, allotrope, molecule, ionic compound, molecular compound, covalent bond, ionic bond, metallic bond, polar bond, non-polar bond, polar molecule, non-polar molecule	
• Write electron configurations for elements and ions with atomic numbers 1-36 using s, p, d notation	
• Identify s, p, d blocks of elements on the periodic table	
Periodic Trends	
• Define ionisation energy and describe associated periodic trends	
• Use successive ionisation energies to describe and explain the structure of an atom	
• Define the term 'atomic radius' and explain periodic trends both across a period and down a group of the Periodic Table.	
• Define the term 'ionic radius' and explain periodic trends both across a period and down a group of the Periodic Table	
• Define the term 'electronegativity' and describe the associated periodic trends	
• Use electronegativities to predict bond type	
Shapes of Molecules	
• Draw Lewis diagrams for a range of molecules and polyatomic molecules which have up to six pairs around the central atom, including multiple bonds	
• Explain polar bonding and how it influences the properties of a range of compounds	
• Carry out a series of experiments to explore the properties of water due to hydrogen bonding	
• Draw and predict the shape of a range of polyatomic molecules and ions	
• Use electronegativities and the shape of a molecule to explain its polarity	
Bonding	
• Identify the type of intermolecular forces (hydrogen bonds, van der waals' forces, dispersion forces, temporary and permanent dipole-dipole forces) found in a range of molecules	
• Explain why the various intermolecular forces, temporary dipoles, permanent dipoles and hydrogen bonding occur	
• Explain how intermolecular forces influence the physical properties of a compound	
Thermochemical Principles	
• Define the terms enthalpy, heat content, H, exothermic, endothermic, conservation of energy, thermochemical equation, activation energy	
• Define enthalpy change for a reaction	

• Draw labelled reaction profile diagrams for exothermic and endothermic reactions	
• Identify whether reactions are exothermic or endothermic from the magnitude of ΔrH	
• Define entropy and predict entropy changes	
• Distinguish between spontaneous and non-spontaneous reactions	
• Describe enthalpy and entropy changes associated with spontaneity of reactions	
• Define and explain molar heat of vapourisation ($\Delta_{vap}H$) and molar heat of fusion ($\Delta_{fus}H$)	
• Define melting point and boiling point	
• Explain why different substances have different melting points and boiling points and solubility by relating to their inter-and intra-molecular bonding	
• Experimentally determine the melting point and freezing point of a pure substance	
• Use Hess's Law to calculate enthalpy changes	
• Use bond energies to calculate enthalpy changes	

3.5 Demonstrate understanding of the properties of organic compounds (91391)

Classifying, Naming and Drawing	
• Classify and distinguish between the following compounds: alkane, alkene, alkyne, haloalkane, ester, carboxylic acid, alcohol, aldehyde, ketone, amine, primary amide and acyl chloride	
• Name and draw compounds of the above groups containing 8 or less carbon atoms	
• Recognise the above functional groups in more complex compounds	
• Identify and classify a range of organic reactions as addition, substitution, condensation, elimination and redox	
• Defines the terms empirical, molecular, structural and condensed structural formula	
• Distinguish between constitutional(structural) isomerism (chain, positional and functional group) and stereoisomerism (geometric and optical)	
• Draw and name isomers of organic compounds up to 8 carbon atoms	
• Relate the properties of different isomers of the same compound to their intermolecular forces	
Alkanes, Alkenes and Alkynes	
• Compare the physical and chemical properties of alkanes and alkenes	
• Write equations for common reactions of alkanes and alkenes	
• Distinguish between substitution and addition reactions	
Alcohols	
• Classify alcohols as primary, secondary or tertiary	
• Explain the physical properties of isomeric alcohols using their intermolecular	

forces	
• Identify and names the oxidation products of primary, secondary and tertiary alcohols when reacted with common oxidants	
• Write equations for common reactions of alcohols: combustion, oxidation and halogenating agents	
Haloalkanes	
• Classify haloalkanes as 1, 2 or 3	
• Write balanced equations to show the formation of a haloalkane from alcohols, alkanes and alkenes	
• Describe the physical properties of haloalkanes	
• Explain the term 'nucleophilic substitution and write equations to show how alcohols, alkenes and amines can be produced from haloalkanes	
Amines	
• Name amines and classify them as primary, secondary or tertiary	
• Explain the physical properties of amines using their intermolecular forces	
• Write equations for the reaction of amines with water and acids	
Aldehydes and Ketones	
• Name and draw structures of aldehydes and ketones	
• Write equations for the formation of aldehydes and ketones from primary and secondary alcohols	
• Describe the physical properties of aldehydes and ketones and explain them using their intermolecular forces	
• Describe how aldehydes and ketones can be distinguished experimentally	
Carboxylic Acids and Derivatives	
• Name and draw structure of carboxylic acids	
• Write equations to show how carboxylic acids are formed (oxidation or alcohols, hydrolysis of esters).	
• Describe the physical properties of carboxylic acids and explain them using their intermolecular forces	
• Write equations for the reaction of carboxylic acids with water, metals, carbonates, bases,PCl_3, PCl_5, $SOCl_2$ and ammonium carbonate	
• Name and draw structures of esters	
• Write equations for the formation of esters	
• Describe the physical properties of esters	
• Write equations for the hydrolysis of esters and their reaction with ammonia to form amides	
• Describe the structure of fats	
• Names and draw structures of acyl chlorides	
• Describe the physical properties of acyl chlorides	

• Write equations for the reaction of acyl chlorides with water, ammonia solution, primary amines and alcohols	
• Identify and name primary amides	
• Describe how amides are prepared	
• Describe the physical properties of amides	
• Write equations for the hydrolysis of amides with aqueous acids and alkalis	
Polymers	
• Distinguish between addition and condensation polymers	
• Name some polymers formed from addition reactions	
• Identify the monomers that make up a range of polymers	
• Describe the structure of protein and carbohydrates	
• Describe properties of amino acids	
• Explain how protein and carbohydrates undergo hydrolysis	
Reaction Schemes	
• Name reagents and write equations for individual steps in an organic reaction scheme	

3.6 Demonstrate understanding of equilibrium principles in aqueous systems (91392)

Dissolution Reactions	
• Write definitions or explanations for the following terms: equilibrium constant expression, solute, saturated solution, solubility, and solubility product	
• Explain the significance of the magnitude of K_c	
• Calculate solubilities in gL^{-1} and $molL^{-1}$	
• Write expressions for equilibrium constant and solubility products	
• Calculate solubility product constants for AB, AB_2 and A_2B type salts	
• Use solubility products to predict precipitation	
• Carry out an experiment to observe the common ion effect	
• Use the common ion effect to predict equilibrium concentrations of ions	
Acid-Base Reactions	
• Identify common acid-base reactions	
• Define acids as proton donors and bases as proton acceptors	
• Identify conjugate acid-base pairs	
• Compare the properties of weak and strong acids and bases	
• Experimentally determine the relative concentrations of species in aqueous solutions of salts	
• Predict the relative concentrations of species in aqueous solution	

• Determine experimentally the K_a of ethanoic acid	
• Define K_a and pK_a	
• Describe the significance of the magnitude of K_a and pK_a	
• Define the term amphiprotic and give examples of amphiprotic substances	
• Use ka to classify acids as weak or strong	
• Write Ka and Kw expressions	
• Calculate pH and Ka values of aqueous solutions of acids and bases	
• Write and balance neutralisation equations	
• Calculate the pH of weak acids and bases	
• Calculate the pH of salt solutions	
• Prepare a buffer and experimentally determine the effect of adding an acid or base	
• Explain how a buffer system functions	
• Calculate the pH of a buffer solution	
• Select appropriate indicators for acid-base titrations	
• Construct a titration curve from experimental measurements	
• Sketch the shape of titration curves for strong acids/strong base, strong acid/weak base and weak acid/strong base reactions	
• Define the following terms: species, soluble, insoluble, precipitated, concentrated acid, dilute acid, strong acid, weak acid, titration, end-point, equivalence point, indicator, indicator range	

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
3.2	**3**		
3.3	**3**		
3.7	**3**		
		External Assessments	
		Formative Test	End of Year Examination
3.4	**5***		
3.5	**5***		
3.6	**5***		

* 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

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