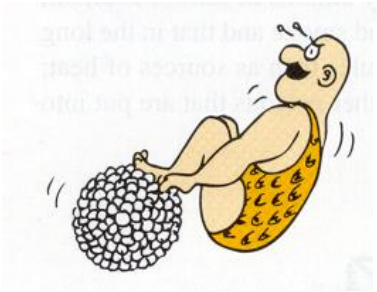
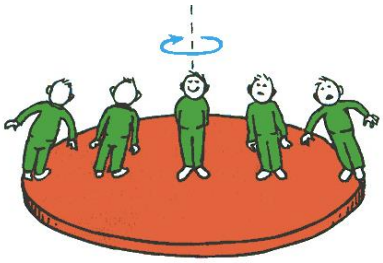


Year 13 PHYSICS NCEA Level 3 2021



This course is based on the Physics in New Zealand Curriculum Document. The textbook used is "Year 13 Physics Study Guide, NCEA Level 3", by Pauline Bendall, published by ESA Publications (NZ) Ltd and "sciPAD Level 3 Physics" workbook.

Translational Motion – 3.4.1

Momentum and Centre of Mass

- Motion, equations of motion, forces.
- Energy, work and power, momentum, impulse.
- Centre of mass, collisions.

Forces and their Effects

- Adding forces, circular motion and gravity.
- Newton's Law of Gravitation, gravitational field strength and satellites.
- The conical pendulum, curved roads and banking.

Rotational Motion – 3.4.2

Rotation and Torque

- Types of motion, angular measurements and displacement, angular velocity/acceleration.
- Graphs of motion, equations of rotational motion.
- Torque and angular acceleration.
- Rotational inertia.

Angular Momentum and Rotational Kinetic Energy

- Angular momentum, linear and angular momentum.
- Rotational kinetic energy.

Oscillation and SHM – 3.4.3

Oscillatory Motion

- Simple harmonic motion.
- The importance and features of SHM, SHM and circular motion, the reference circle.
- Displacement/velocity/acceleration during SHM.
- Acceleration and displacement.

Examples of SHM

- Mass on a spring.
- The simple pendulum.
- Rotational SHM.

Energy and SHM

- Equations for total energy, graphs of energy vs. displacement or time.
- Damped simple harmonic motion, and its uses.
- Forced oscillations, resonance.

Waves – 3.3.1

Travelling & Standing Waves

- Displacement (position and time graphs), period and frequency, phase.
- The oscilloscope.
- Types of wave motion.
- How a standing wave is formed, nodes and antinodes.
- Forms of standing waves, modes of vibration.
- Frequency of a stretched string, musical scales, timbre and beats.

Wave Behaviour – 3.3.2

Diffraction, Interference and the Doppler Effect

- Diffraction of light waves, interference of waves.
- The diffraction grating.
- The Doppler Effect.

DC Electricity – 3.6.1

Current, Voltage and Resistance

- Voltage, resistance, series and parallel connections, power.
- Ohm's law, non-Ohmic conductors, diodes.
- Internal resistance of voltage sources, measuring EMF and internal resistance.

Kirchhoff's Laws

- Kirchhoff's Current Law.
- Kirchhoff's Voltage Law.

Capacitors

- What a capacitor does.
- Factors which determine capacitance, area and the separation of the plates
- The Capacitor Construction formula, the Dielectric constant.
- Networks of capacitors, energy stored in a capacitor, charging and discharging.

Induction – 3.6.2

Magnetic Fields

- Magnetic field strength, the magnetic field of a current carrying wire.
- The coil or solenoid, B for different solenoid currents, B at different positions.
- Uses of magnetic fields.

Induction

- Lenz's Law.
- Magnetic flux and induction.
- Generating alternating current, the bicycle dynamo, and the microphone.

Transformers and Inductance

- The transformer and efficiency of a transformer, the induction coil.
- Transmission of electricity, mutual inductance, self-inductance.
- Inductance: energy stored, changing current.

AC Circuits – 3.6.3

AC in Resistors and Capacitors

- AC in a resistor, voltage and current, power, the rms. value of AC.
- Sample results.
- Rectification, AC/voltage and current in a capacitor, factors affecting the reactance of a capacitor
- The phase relationship between VC and VR

AC in Inductors and LCR Circuits

- AC in an inductor, factors affecting the reactance of an inductor.
- The phase relationship between V_L and V_R.
- Impedance, the LCR Series Circuit.
- Impedance, the resonant frequency, radio receivers, LCR circuit and SHM

The Course offered is NCEA level 3 Physics.
HIBS is offering five Achievement Standards.

Unit	Achievement Standard	Description	Internal/External Examination	Credits
3.2	AS91522	Demonstrate understanding of the application of physics to a selected context	Internal	3
3.3	AS91523	Demonstrate understanding of wave systems	External	4
3.4	AS91524	Demonstrate understanding of mechanical systems	External	6
3.5	AS91525	Demonstrate understanding of Modern Physics	Internal	3
3.6	AS91527	Demonstrate understanding of electrical systems	External	6

Year 13 Timeline

The following units will have an internal, (non-credit), end of unit examination which will take place at the conclusion of each unit of work, and an external end of year examination.

Achievement Standard	Sub topic	Week	Internal/External Examination
3.3 Demonstrate understanding of wave systems	3.3.1 3.3.2	Term 3 week 6 – 10	External
3.4 Demonstrate understanding of mechanical systems	3.4.1 3.4.2 3.4.3	Term 2 week 1 – 10	External
3.6 Demonstrate understanding of electrical systems	3.6.1 3.6.2 3.6.3	Term 1 week 1 - 11	External

The internal component of the subject will be assessed as follows:

Term	Achievement Standard	Internal/ External Examination	Assessment	Date
Term 2	**3.2** Demonstrate understanding of the application of physics to a selected context	Internal	Report	**Week 9** **Friday 2nd July** **NO REASSESSMENT**
Term 3	**3.5** Demonstrate understanding of Modern Physics	Internal	Exam	**Week 5** **Wednesday 25th August** **NO REASSESSMENT**

2021 Term/Week Planner and Calendar

W	Month	Date	Topic	Assessment	Assessment/Notes
1	February	1-5	Start 3.6		Thurs th February – Year 7 & 13 Friday 1st February Full School
2	February	9-12			Waitangi Day Monday 8th
3	February	15-19			
4	February	22-26			
5	March	1-5			
6	March	9-12			
7	March	15-19			
8	March	22-26			
9	March/April	29-1			Good Friday 2nd April
10	April	7-9			Easter Mon/Tue, 5th/6th
11	April	12-16		3.6 Topic Test (15th)	
	April	19-23			
	April	26-30			Anzac Day holiday 27th April
1	May	3-7	Start 3.4		
2	May	10-14			
3	May	17-21			ToD 11th May
4	May	24-28			
5	May/June	31-4			
6	June	8-11			Queen's Birthday 7th June
7	June	14-18			
8	June	21-25			
9	July	28-2		3.2 Internal (2nd Jul)	
10	July	5-9		3.4 Topic Test	
	July	12-16			
	July	19-23			
1	July	26-30	Start 3.5		
2	August	2-6			ToD 5th August
3	August	9-13			
4	August	16-20			
5	August	23-27		3.5 Internal (25th)	
6	August/September	30-3	Start 3.3		
7	September	6-11			Tournament week
8	September	13-17			
9	September	20-24			
10	September/October	27-1		3.3 Topic Test	
	October	4-8			
	October	11-15			
1	October	18-22			IEE
2	October	26-29			Labour Day 25th Oct
3	November	1-5			
4	November	8-12			
5	November	15-19			
6	November	22-26			
7	November/December	29-3			ToD 1st December
8	December	6-10			

Appealing Internal Results in NCEA Assessments

Assessment results received by a student may be subject to appeal.

1. For each assessment event the criteria for Achievement, Merit and Excellence will be made clear to the student.

2. On receipt of the marked assessment, students will be reminded of their right of appeal and be given the opportunity to discuss their grade with the class teacher / subject marker.

3. All appeals should be written on the appeals form which is available from the classroom teacher.

4. Appeals must be made within one week from the time the assessment is returned to the student.

5. Each student will be required to sign off his result to indicate his agreement with the grade allocated.

6. Where the student and class teacher / marker are unable to reach an agreement on the allocated grade the matter will be passed to the HOD for final judgment.

7. When the HOD is also the class teacher / marker the decision may be referred to the Director of Curriculum.

Late Work and Student Absence

Unless covered in the procedures outlined below, NCEA Internal assessment work that is submitted after the assessment date will NOT be marked.

1. Clear instructions of the timing of an assessment event and the date for submission of work will be given in writing.

2. Notice of at least one week must be given for assessment events.

Absence:

(a) Absence for reasons which are beyond the student's control (e.g. sickness or bereavement).

A student's absence during an assessment event needs to be supported by documentation (e.g. doctor's certificate) within three school days of returning in order to be regarded as legitimate.

A student who is legitimately absent from an assessment event will be given the opportunity of assessment at the earliest convenient time for the teacher. If this is not possible within one week of the original assessment event, then it is likely that the student will have lost the opportunity for this assessment and must apply for reassessment (see Reassessment Policy). Alternatively, a teacher may be able to use existing evidence to award a grade.

(b) Absence because of school trips (e.g. field trips, sports or music events)

Assignment and project work which is due during the period of absence must be submitted prior to the student being away.

Tests and in-class assessments will be treated in the same manner as for (a) above.

(c) "Self-interest" absence (e.g. family holidays, non-school sports or music events).

Assignment and project work which is due during the period of absence must be submitted prior to the student being away.

Students will receive no grade for any tests or in-class assessments missed. They may apply for reassessment if it is available.

(d) "Wilful" absence or refusal to hand in work for assessment.

Students will be withdrawn from that standard with no further opportunities for reassessment.

Breaches of Rules and Misconduct in Assessment

[A] Authentication of a Student's Work

Assessments submitted by a student must be the student's own work.

1. A student may be required to discuss his assessments with the teacher or HOD to clarify any concerns that have arisen regarding the authenticity of the work.

2. A student may be required to submit plans, drafts, worksheets or log-books used in the preparation of the final copy of an assessment or be told to retain them until work has been assessed.

3. On submission of work, a student is to acknowledge in writing all resources used and the names and status of any person quoted.

4. Just before, upon, or after submission of an assessment, a student may be asked to demonstrate his skills, knowledge and understanding of the work by discussion with the teacher or a report to the class.

5. A student (and/or his parents) may be asked to sign a declaration at the time of submission that the work is the student's own.

6. Students must not copy the assessment work of others nor provide undue assistance to other students during an assessment.

[B] Misconduct during an Assessment Event

The behaviour of a student must not hinder others in the assessment process.

The supervisor of an assessment event has the authority to remove a student who they believe has interfered with or impeded another student during that assessment event.

[C] Consequences

Where a student breaches any of the above procedures or others laid out by the School or Department, the student will be referred to the Director of Curriculum. The consequence will be no grade awarded and no further opportunity for assessment in that standard during that calendar year.

Reassessment for the Attainment of Credit in the NCEA

[A] Formal Reassessment

When it is feasible, students will be given more than one opportunity to achieve in an internally assessed Achievement Standard or Unit Standard.

1. Not all internally assessed Achievement Standards and Unit Standards are available for formal reassessment. Students will be informed verbally and via a handout at the start of the year, which standards are available for reassessment.

2. After receiving their results, students will be informed of any reassessment opportunity which might be available.

3. Any reasonable costs involved in reassessment are to be met by the student.

4. The opportunity is for reassessment, not for re-teaching.

5. The reassessment event will have the same assessment criteria as the original assessment event but will differ in content.

[B] Use of Other Evidence

In certain situations, in particular where the further evidence required is minimal, teachers may use their professional judgment to use evidence gathered in other ways, i.e. the teacher may:

1. Have the student provide further written evidence from the same task, for example, by developing an answer further.

2. Use evidence from work during the teaching programme, where this is valid, authentic and meets the criteria.

3. Talk to the student to elicit evidence that may not have been provided in the activity.

4. Use evidence from other assessment procedures rather than requiring the student to repeat the entire formal assessment.

Derived Grades

In the case of external assessment:

1. Candidates who have been prevented from sitting examinations, or who consider that their performance in an external assessment has been seriously impaired because of exceptional circumstances beyond their control, may apply to the New Zealand Qualifications Authority to be granted a result through **derived grades**.

2. To establish derived grades, the school mock examination grades will be used, NOT end of unit test results.

3. In the event of a candidate being unable to sit the school mock examinations, there will be no opportunity to obtain derived grades.

4. An applicant for derived grade consideration must:

    - Complete the New Zealand Qualifications Authority's application form and submit it to the school by the closing date. These forms are available from the school or from the NZQA website.
    - Supply a copy of their admission slip with the application.
    - Supply appropriate medical or documentary evidence.

Achievement Standard

Subject Reference		Physics 3.2		Version 2	
Title		Demonstrate understanding of the application of physics to a selected context			
Level	3	**Credits**	3	**Assessment**	Internal
Subfield	Science				
Domain	Physics				
Status	Registered	**Status date**	4 December 2012		
Planned review date	31 December 2019	**Date version published**	17 November 2016		

This achievement standard involves demonstrating understanding of the application of physics to a selected context.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of the application of physics to a selected context.	• Demonstrate in-depth understanding of the application of physics to a selected context.	• Demonstrate comprehensive understanding of the application of physics to a selected context.

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 Using physics in the Physical World strand, and Communicating in science in the Nature of Science strand; and is related to the material in the *Teaching and Learning Guide for Physics*, 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 relating the key physics ideas to the selected context.

Demonstrate in-depth understanding involves explaining how or why the key physics ideas relate to the selected context.

Demonstrate comprehensive understanding involves linking key physics ideas together to provide a coherent picture of the physics relevant to the selected context.

3 The *selected context* involves physics ideas at curriculum Level 8. The context may be technological, biological, or astronomical.

4 It is expected that the physics knowledge required for this standard will be different from that required for AS91527 (Physics 3.7).

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

Achievement Standard

Subject Reference	Physics 3.3	**Number**	AS91523	**Version**	1
Title	Demonstrate understanding of wave systems				
Level	3	**Credits**	4	**Assessment**	External
Subfield	Science				
Domain	Physics				
Status	Registered	**Status date**		4 December 2012	
Planned review date	31 December 2016	**Date version published**		4 December 2012	

This achievement standard involves demonstrating understanding of wave systems.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of wave systems.	• Demonstrate in-depth understanding of wave systems.	• Demonstrate comprehensive understanding of wave 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 Physical inquiry and physics concepts in the Physical World strand and Communicating in science in the Nature of Science strand, and is related to the material in the *Teaching and Learning Guide for Physics*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

2 *Demonstrate understanding* involves showing an awareness of how simple facets of phenomena, concepts, or principles relate to a given situation.

Demonstrate in-depth understanding involves giving explanations for phenomena, concepts, or principles that relate to a given situation.

Demonstrate comprehensive understanding involves connecting concepts or principles that relate to a given situation.

3 *Wave systems* include mathematical solutions and/or written descriptions. Written descriptions may include graphs or diagrams.

4 Assessment is limited to a selection from the following:

Interference (quantitative) of electromagnetic and sound waves, including multi-slit interference and diffraction gratings; standing waves in strings and pipes; harmonics; resonance; beats; Doppler Effect (stationary observer for mechanical waves).

Relationships:

$$d \sin\theta = n\lambda \qquad n\lambda = \frac{dx}{L}$$

$$f' = f \frac{v_w}{v_w \pm v_s}$$

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

Achievement Standard

Subject Reference	Physics 3.4	**Number**	AS91524	**Version**	1
Title	Demonstrate understanding of mechanical systems				
Level	3	**Credits**	6	**Assessment**	External
Subfield	Science				
Domain	Physics				
Status	Registered	**Status date**	4 December 2012		
Planned review date	31 December 2016	**Date version published**	4 December 2012		

This achievement standard involves demonstrating understanding of mechanical systems.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of mechanical systems.	• Demonstrate in-depth understanding of mechanical systems.	• Demonstrate comprehensive understanding of mechanical 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 Physical inquiry and physics concepts in the Physical World strand and Communicating in science in the Nature of Science strand, and is related to the material in the *Teaching and Learning Guide for Physics*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

2 *Demonstrate understanding* involves showing an awareness of how simple facets of phenomena, concepts, or principles relate to a given situation.

Demonstrate in-depth understanding involves giving explanations for phenomena, concepts, or principles that relate to a given situation.

Demonstrate comprehensive understanding involves connecting concepts or principles that relate to a given situation.

3 *Mechanical systems* include mathematical solutions and/or written descriptions. Written descriptions may include graphs or diagrams.

4 Assessment is limited to a selection from the following:

Translational Motion
Centre of mass (1 and 2 dimensions); conservation of momentum and impulse (2 dimensions only).

Circular Motion and Gravity
Velocity and acceleration of, and resultant force on, objects moving in a circle under the influence of 2 or more forces, Newton's Law of gravitation, satellite motion.

Rotating Systems
Rotational motion with constant angular acceleration; torque; rotational inertia; conservation of angular momentum; conservation of energy.

Oscillating Systems
The conditions for Simple Harmonic Motion, angular frequency, variation of displacement, velocity and acceleration with time, phasor diagrams, reference circles, damped and driven systems, resonance, conservation of energy.

Relationships

$d = r\theta$ $\quad v = r\omega$ $\quad a = r\alpha$ $\quad \omega = \dfrac{\Delta\theta}{\Delta t}$

$\alpha = \dfrac{\Delta\omega}{\Delta t}$ $\quad \omega = 2\pi f$ $\quad E_{K(ROT)} = \frac{1}{2}\mathrm{I}\omega^2$

$\omega_f = \omega_i + \alpha t$ $\quad \theta = \dfrac{(\omega_i + \omega_f)}{2}t$ $\quad \omega_f{}^2 = \omega_i{}^2 + 2\alpha\theta$ $\quad \theta = \omega_i t + \frac{1}{2}\alpha t^2$

$\tau = \mathrm{I}\alpha$ $\quad L = mvr$ $\quad L = \mathrm{I}\omega$ $\quad F_g = \dfrac{GMm}{r^2}$

$T = 2\pi\sqrt{\dfrac{l}{g}}$ $\quad T = 2\pi\sqrt{\dfrac{m}{k}}$

$y = A\sin\omega t$ $\quad v = A\omega\cos\omega t$ $\quad a = -A\omega^2\sin\omega t$ $\quad a = -\omega^2 y$

$y = A\cos\omega t$ $\quad v = -A\omega\sin\omega t$ $\quad a = -A\omega^2\cos\omega t$

$$x_{COM} = \frac{m_1x_1 + m_2x_2}{m_1 + m_2}$$

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

Achievement Standard

Subject Reference		Physics 3.5		**Number**	AS91525	**Version**	1
Title		Demonstrate understanding of Modern Physics					
Level	3	**Credits**	3	**Assessment**	Internal		
Subfield	Science						
Domain	Physics						
Status	Registered		**Status date**		4 December 2012		
Planned review date	31 December 2016		**Date version published**		4 December 2012		

This achievement standard involves demonstrating understanding of Modern Physics.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of Modern Physics.	• Demonstrate in-depth understanding of Modern Physics.	• Demonstrate comprehensive understanding of Modern Physics.

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 Physical inquiry and physics concepts in the Physical World strand and Communicating in science in the Nature of Science strand, and is related to the material in the *Teaching and Learning Guide for Physics*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

2 *Demonstrate understanding* involves showing an awareness of how simple facets of phenomena, concepts, or principles relate to a given situation.

Demonstrate in-depth understanding involves giving explanations for phenomena, concepts, or principles that relate to a given situation.

Demonstrate comprehensive understanding involves demonstrating understanding of connections between concepts or principles that relate to a given situation.

3 Examples of phenomena, concepts, or principles of Modern Physics include:

- the Bohr model of the hydrogen atom: the photon; the quantisation of energy; discrete atomic energy levels; electron transition between energy levels; ionisation; atomic line spectra, the electron volt
- the photoelectric effect
- wave-particle duality
- qualitative description of the effects of the strong interaction and Coulombic repulsion, binding energy and mass deficit; conservation of mass-energy for nuclear reactions
- qualitative treatment of special and general relativity
- qualitative treatment of quarks and leptons.

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

Achievement Standard

Subject Reference	Physics 3.6	**Number**	AS91527	**Version**	1
Title	Demonstrate understanding of electrical systems				
Level	3	**Credits**	6	**Assessment**	External
Subfield	Science				
Domain	Physics				
Status	Registered	**Status date**	4 December 2012		
Planned review date	31 December 2016	**Date version published**	4 December 2012		

This achievement standard involves demonstrating understanding of electrical systems.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of electrical systems.	• Demonstrate in-depth understanding of electrical systems.	• Demonstrate comprehensive understanding of electrical 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 Physical inquiry and physics concepts in the Physical World strand and Communicating in science in the Nature of Science strand, and is related to the material in the *Teaching and Learning Guide for Physics*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

2 *Demonstrate understanding* involves showing an awareness of how simple facets of phenomena, concepts, or principles relate to a given situation.

Demonstrate in-depth understanding involves giving explanations for phenomena, concepts, or principles that relate to a given situation.

Demonstrate comprehensive understanding involves connecting concepts or principles that relate to a given situation.

3 *Electrical systems* include mathematical solutions and/or written descriptions. Written descriptions may include graphs or diagrams.

4 Assessment is limited to a selection from the following:

Resistors in DC Circuits
Internal resistance; simple application of Kirchhoff's Laws.

Capacitors in DC Circuits
Parallel plate capacitor; capacitance; dielectrics; series and parallel capacitors; charge/time, voltage/time and current/time graphs for a capacitor; time constant; energy stored in a capacitor.

Inductors in DC Circuits
Magnetic flux; magnetic flux density; Faraday's Law; Lenz's Law; the inductor; voltage/time and current/time graphs for an inductor; time constant; self inductance; energy stored in an inductor; the transformer.

AC Circuits
The comparison of the energy dissipation in a resistor carrying direct current and alternating current; peak and rms voltage and current; voltage and current and their phase relationship in LR and CR series circuits; phasor diagrams; reactance and impedance and their frequency dependence in a series circuit; resonance in LCR circuits.

Relationships:

$E = \frac{1}{2}QV$ $\quad Q = CV$ $\quad C = \frac{\varepsilon_o \varepsilon_r A}{d}$ $\quad C_T = C_1 + C_2 + \ \ldots$ $\quad \tau = RC$

$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \ldots$ $\quad \phi = BA$ $\quad \varepsilon = -L\frac{\Delta \mathrm{I}}{\Delta t}$ $\quad \varepsilon = -\frac{\Delta \phi}{\Delta t}$

$\frac{N_p}{N_s} = \frac{V_p}{V_s}$ $\quad E = \frac{1}{2}L\,\mathrm{I}^2$ $\quad \tau = \frac{L}{R}$

$\mathrm{I} = \mathrm{I}_{MAX} \sin \omega t$ $\quad V = V_{MAX} \sin \omega t$ $\quad \mathrm{I}_{MAX} = \sqrt{2}\,\mathrm{I}_{rms}$

$V_{MAX} = \sqrt{2} V_{rms}$ $\quad X_C = \frac{1}{\omega C}$

$X_L = \omega L$ $\quad V = \mathrm{I}Z$ $\quad \omega = 2\pi f$

$f_0 = \frac{1}{2\pi\sqrt{LC}}$

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