

Achievement Standard

Subject Reference Physics 2.6

Title Demonstrate understanding of electricity and electromagnetism

Level 2 **Credits** 5 **Assessment** External

Subfield Science

Domain Physics

Registration date 20 October 2004 **Date version published** 20 October 2004

This achievement standard involves knowledge and understanding of phenomena, concepts, principles, and relationships related to electricity and electromagnetism, and the use of appropriate methods to solve related problems.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none">Identify or describe aspects of phenomena, concepts or principles.Solve straightforward problems.	<ul style="list-style-type: none">Give descriptions or explanations in terms of phenomena, concepts, principles and/or relationships.Solve problems.	<ul style="list-style-type: none">Give concise explanations that show clear understanding in terms of phenomena, concepts, principles and/or relationships.Solve complex problems.

Explanatory Notes

- 1 This achievement standard is derived from *Physics in the New Zealand Curriculum*, Learning Media, Ministry of Education, 1994; Level 7 achievement objectives, p. 24.

- 2 Assessment will be limited to a selection from the following:

Phenomena, Concepts and Principles:

Static Electricity

Uniform electric field, electric field strength, force on a charge in an electric field, electric potential energy, and work done on a charge moving in an electric field.

DC Electricity

Parallel circuits with resistive component(s) in series with the source, circuit diagrams, voltage, current, resistance, energy, power, and voltage or current characteristics of diodes.

Electromagnetism

Force on a current carrying conductor in a magnetic field, force on charged particles moving in a magnetic field, DC motor, induced voltage generated across a straight conductor moving in a uniform magnetic field, and a simple generator.

Relationships:

$$E = \frac{V}{d} \quad F = Eq \quad \Delta E_p = Eqd \quad E_k = \frac{1}{2}mv^2$$

$$F = BIL \quad F = Bqv \quad V = BvL$$

$$I = \frac{q}{t} \quad V = \frac{\Delta E}{q} \quad V = IR \quad P = IV \quad P = \frac{\Delta E}{t}$$

$$R_T = R_1 + R_2 + \dots \quad \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$

- 3 Real life contexts will be used whenever possible. Requisite information about the context used will be supplied.
- 4 The following descriptions provide guidance on the typical level of performance for achievement, achievement with merit, and achievement with excellence. Both the complexity of the situation and problem-solving process will determine the grade.
- a Statements, descriptions and explanations can be written, diagrammatic or graphical.
- Achievement will typically involve single aspects related to phenomena, concepts or principles.
 - Achievement with merit will typically involve reasons.
 - Achievement with excellence will typically have minimal irrelevancies.

- b A physics problem involves a process(es) to find a physical quantity. A process involves: recognising the relevant concept or principle; selecting the method (eg formula, graph, diagram, logical deduction); and selecting the relevant information.
- A *straightforward problem* is one involving a single process. The relevant concept or principle will be transparent, the method will be straightforward (a formula will need no more than a simple rearrangement), and the information will be directly usable.
 - A *problem* is typically one in which the relevant concept or principle may not be immediately obvious, the method may involve the use of a complex formula or rearrangement, or the information may not be directly usable or immediately obvious.
 - A *complex problem* will typically involve more than one process. The recognition of two different concepts must be involved.
- 5 Formulae listed in this achievement standard will be supplied.
- 6 Minor computational or transcription errors will not be penalised if the process used to calculate the solution is clearly indicated and is valid.
- 7 Students should be aware of the use of appropriate significant figures and units. Both negative index (eg ms^{-2}) and slash notation (eg m/s^2) will be acceptable when writing units. Negative index notation will be used when supplying data.
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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.