

Achievement Standard

Subject Reference Physics 3.3

Title Demonstrate understanding of wave systems

Level 3 **Credits** 4 **Assessment** External

Subfield Science

Domain Physics

Status Registered **Status date** 20 October 2005

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This achievement standard involves knowledge and understanding of phenomena, concepts, principles and/or relationships related to wave systems, 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 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 8, achievement objectives, p. 32.

2 Assessment will be limited to a selection of the following:

Phenomena, concepts and principles of wave systems:

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

Relationships:

$$d \sin \theta = n \lambda$$

$$n \lambda = \frac{dx}{L}$$

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

- 3 Real life situations will be used wherever 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 level.
 - 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 and convey full understanding clearly.
 - 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); 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.
 - For achievement with merit, 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 applicable to this achievement standard will be supplied.
- 6 Minor computational or transcription errors will not be penalised if the process used to determine the solution is clearly indicated and is valid.
- 7 Students must be aware of the appropriate use of significant figures and units. Both negative index (eg m s^{-2}) and slash (eg m/s^2) notation will be acceptable when writing units. Negative index notation will be used when supplying data.

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) reference

0226