# Achievement Standard

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| **Subject Reference** | Physics 1.5 | | | | |
| **Title** | Demonstrate understanding of heat transfer and nuclear physics | | | | |
| **Level** | 1 | **Credits** | 3 | **Assessment** | External |
| **Subfield** | Science | | | | |
| **Domain** | Physics | | | | |
| **Status** | Registered | **Status date** | 5 November 2007 | | |
| **Planned review date** | 28 February 2009 | **Date version published** | 5 November 2007 | | |

This achievement standard involves demonstrating knowledge and understanding of heat transfer and nuclear physics and the use of appropriate methods to solve related problems.

**Achievement Criteria**

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|---|
| • Identify or describe aspects of phenomena, concepts or principles. | • Give descriptions or explanations in terms of phenomena, concepts, principles and/or relationships. | • Give explanations that show clear understanding in terms of phenomena, concepts, principles and/or relationships. |
| • Solve straightforward problems. | • Solve problems. | • 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 6 achievement objectives, p. 16.

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

**Phenomena, Concepts and Principles:**

*Heat Transfer*
Temperature, heat energy, rate of heat transfer, latent heat, specific heat capacity, conduction, convection, radiation, insulation.

*Nuclear Physics*
Atomic structure, the conservation of atomic number and mass number. Isotopes, fission reactions, the nuclear reactor, fusion reactions.

**Relationships:**

$$P = \frac{E}{t} \qquad Q = mc\Delta T \qquad Q = mL$$

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 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.
- 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 listed in 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 valid.

7 Students must be aware of the appropriate use of units. Both negative index (eg m $s^{-2}$) and slash notation (eg m/$s^2$) 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 NZQA 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