

## Achievement Standard

|                            |   |                               |                  |
|----------------------------|---|-------------------------------|------------------|
| <b>Subject Reference</b>   | Physics 3.5                                 |                               |                  |
| <b>Title</b>               | Demonstrate understanding of Modern Physics |                               |                  |
| <b>Level</b>               | 3   | <b>Credits</b>                | 3                |
|                            |   | <b>Assessment</b>             | Internal         |
| <b>Subfield</b>            | Science                                     |                               |                  |
| <b>Domain</b>              | Physics                                     |                               |                  |
| <b>Status</b>              | Registered                                  | <b>Status date</b>            | 4 December 2012  |
| <b>Planned review date</b> | 31 December 2020                            | <b>Date version published</b> | 17 November 2016 |

This achievement standard involves demonstrating understanding of Modern Physics.

### Achievement Criteria

| Achievement  | Achievement with Merit  | Achievement with Excellence  |
|--|---|--|
| <ul style="list-style-type: none"> <li>Demonstrate understanding of Modern Physics.</li> </ul> | <ul style="list-style-type: none"> <li>Demonstrate in-depth understanding of Modern Physics.</li> </ul> | <ul style="list-style-type: none"> <li>Demonstrate comprehensive understanding of Modern Physics.</li> </ul> |

### Explanatory Notes

- 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>.

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.

- 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](http://www.tki.org.nz/e/community/ncea/conditions-assessment.php).
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### Replacement Information

This achievement standard replaced unit standard 6396 and AS90522.

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### Quality Assurance

- 1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.
- 2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference

0233