

Achievement Standard

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| Subject Reference | Physics 3.1 | | |
| Title | Carry out a practical investigation to test a physics theory relating two variables in a non-linear relationship | | |
| Level | 3 | Credits | 4 |
| | | Assessment | Internal |
| Subfield | Science | | |
| Domain | Physics | | |
| Status | Registered | Status date | 4 December 2012 |
| Planned review date | 31 December 2020 | Date version published | 17 November 2016 |

This achievement standard involves carrying out a practical investigation to test a physics theory relating two variables in a non-linear relationship.

Achievement Criteria

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|---|
| <ul style="list-style-type: none"> Carry out a practical investigation to test a physics theory relating two variables in a non-linear relationship. | <ul style="list-style-type: none"> Carry out an in-depth practical investigation to test a physics theory relating two variables in a non-linear relationship. | <ul style="list-style-type: none"> Carry out a comprehensive practical investigation to test a physics theory relating two variables in a non-linear relationship. |

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 Investigating 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.

- Carry out a practical investigation* involves:

 - collecting data relevant to the aim based on the manipulation of the independent variable over a reasonable range and number of values
 - determining appropriate uncertainties in raw data
 - using graphical analysis, including a consideration of uncertainties, from which the equation of the relationship/value of the physics quantity can be determined

- providing a conclusion that states the equation of the relationship/value of the physics quantity as determined from the graph and includes a comparison with the physics theory.

Carry out an in-depth practical investigation involves:

- describing the control of other variable(s) that could significantly affect the results
- using techniques to improve the accuracy of measurements
- determining uncertainties in one of the variables expressed in the graphical analysis
- graphical analysis which expresses the uncertainty in the relationship consistent with the uncertainty in the data
- providing a conclusion that makes a quantitative comparison between the physics theory and the relationship/quantity obtained from the experimental data which includes consideration of uncertainties.

Carry out a comprehensive practical investigation involves a discussion which addresses issues critical to the practical investigation, such as:

- the other variable(s) that could have changed and significantly affected the results, and how they could have changed the results
- the limitations to the theory's applicability both in the practical situation and/or at extreme values of the independent variable
- any unexpected outcomes of the processing of the results and a suggestion of how they could have been caused and the effect they had on the validity of the conclusion.

- 3 A *practical investigation* is an activity that includes gathering, processing and interpreting data.
- 4 The variables under investigation should have a non-linear relationship according to a physics theory provided in the task.
- 5 Conditions of Assessment related to this achievement standard can be found at www.tki.org.nz/e/community/ncea/conditions-assessment.php.

Replacement Information

This achievement standard replaced unit standard 6395 and AS90774.

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