Achievement Standard

Subject Reference	Physics 3.1
Title	Carry out a practical physics investigation with guidance, that leads to a mathematical relationship

Level	3	**Credits**	5	**Assessment**	Internal
Subfield	Science				
Domain	Physics				

Registration date 20 October 2005 **Date version published** 20 October 2005

This achievement standard involves carrying out a practical physics investigation that requires the graphical identification and mathematical analysis of a relationship that is non-linear. Students will gather, process and analyse data, and interpret the results.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Carry out a guided investigation that leads to a non-linear mathematical relationship.	• Carry out a guided investigation that reliably leads to a non-linear mathematical relationship.	• Carry out a guided investigation that reliably and validly leads to a non-linear mathematical relationship.

Explanatory Notes

1 This achievement standard is derived from *Physics in the New Zealand Curriculum*, Learning Media, Ministry of Education, 1994; Developing Scientific Investigative Skills and Attitudes, Level 8, pp. 42–43.

2 The aim of the investigation will be given. The aim could be to find the mathematical relationship, or a physical quantity derived from the mathematical relationship.

3 *Guidance* means the teacher sets the parameters and provides general information. Students may be given background information relevant to the physics concepts and/or theory to enable them to discuss their results. The whole process is student driven.

4 For achievement, evidence will typically include:
- data relevant to the aim based on the manipulation of the independent variable and the consideration of other variable(s) that could affect the results
- uncertainties in raw data appropriate to the measurement
- a linear graph, including an error line, based on the data and relevant to the aim
- a conclusion that links to the aim and is drawn from information calculated from the linear graph.

5 For achievement with merit, evidence will typically include:
- accurate data relevant to the aim based on the manipulation of the independent variable over a reasonable range and number of values
- a description of the control of other variable(s) that could significantly affect the results
- the use of techniques to improve the accuracy of measurements
- appropriate uncertainties in raw and plotted data
- a linear graph with error bars and appropriate error line, based on sufficient data, relevant to the aim
- a conclusion that is relevant to the aim, based on the data, and is drawn from information calculated from the linear graph, including a processed uncertainty
- a discussion that evaluates the quality of the results.

6 For achievement with excellence, evidence will typically include:
- accurate data relevant to the aim based on the manipulation of the independent variable over a reasonable range and number of values
- a description of the control of other variable(s) that could significantly affect the results
- the use of techniques to improve the accuracy of measurements
- uncertainties appropriately calculated in all processed data
- a linear graph with error bars and appropriate error line, based on sufficient data, relevant to the aim
- a conclusion that is relevant to the aim, based on the data, and is drawn from information calculated from the linear graph, including processed uncertainty
- information calculated from the linear graph is correctly rounded
- a discussion that shows critical thinking, evaluates and explains the validity of the results, and considers relevant physics theory.

Replacement Information
This achievement standard replaced AS90518.

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