Achievement Standard

Subject Reference	Physics 2.1				
Title	Take measurements of physical quantities and analyse data graphically to determine a relationship				
Level	2	**Credits**	4	**Assessment**	Internal
Subfield	Science				
Domain	Physics				
Status	Expiring			**Status date**	17 November 2011

This achievement standard is expiring. Assessment against the standard must take place before the expiry date set out below.

Expiry date	31 December 2012	**Date version published**	17 November 2011

This achievement standard requires the use of instruments to take measurements of physical quantities and the use of graphical techniques in analysing data to determine the relationship between two variables.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Use instruments to take measurements of physical quantities.	• Use instruments to take measurements of physical quantities using techniques that increase accuracy.	• Use instruments to take measurements of physical quantities using techniques that increase accuracy. Justify the techniques used to increase the accuracy of the measurements.
• Use graphical techniques in analysing data to determine the type of relationship between two variables.	• Use graphical techniques in analysing data to determine the equation of a linear relationship and the value of a physical quantity.	• Use graphical techniques in analysing data to determine the equation of a non-linear relationship and the value of a physical quantity.

Explanatory Notes

1 This achievement standard is derived from *Physics in the New Zealand Curriculum*, Learning Media, Ministry of Education, 1994; Level 7, 'Developing Scientific Investigative Skills and Attitudes', pp. 42-43, and 'The Place of Mathematics in Physics', p. 9.

2 Assessment will include the *use of instruments* that:
- have the potential for a parallax error
- require a zero error correction or reading
- have more than one scale to select from.

Proficiency must be demonstrated in the measurement of at least three different physical quantities and using at least three different types of measuring instrument.

3 Students will be expected to be familiar with graphs representing the following relationships: linear, square, inverse, inverse square. Familiarity with exponential and log graphs is not required.

4 The following descriptions provide guidance on the typical level of performance expected for achievement, achievement with merit, and achievement with excellence.

a *Measuring instruments*
- For achievement, instruments are set up and connected or operated in order to take a measurement. A unit is recorded along with the measurement.
- For achievement with merit, techniques that improve accuracy of measurements could include - the observer and/or the instrument placement, zero error correction, averaging repeated measurements, number of repeated readings sufficient for purpose. Techniques could be observed, stated or obvious from the data measurements. Appropriate use of significant figures is demonstrated in the measured value.
- For achievement with excellence, justification of each technique should involve a rationale for using the technique involved in the context of the measurements being made.

b *Graphical Techniques*
- For achievement, graphical techniques could include - data plotted correctly, choice of appropriate axes and scales, axes labelled with quantities and units, a line of best fit. The shape of the graph is used to suggest the type of relationship.
- For achievement with merit, data is plotted. A gradient, and where relevant an intercept, is calculated and a mathematical relationship between the two variables is stated. A physical quantity, with its unit, is determined from the gradient or intercept.
- For achievement with excellence, the data from a non-linear graph is processed to enable a linear graph to be constructed. A gradient, and where relevant an intercept, is calculated and a mathematical relationship between the two variables is stated. From this linear graph a physical quantity, with its unit, is determined from the gradient.

Replacement Information
This achievement standard and unit standard 6386 have been replaced by AS91168.

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 0226