

Achievement Standard

Subject Reference	Physics 2.4		
Title	Demonstrate understanding of mechanics		
Level	2	Credits	6
		Assessment	External
Subfield	Science		
Domain	Physics		
Status	Registered	Status date	17 November 2011
Planned review date	31 December 2020	Date version published	20 November 2014

This achievement standard involves demonstrating understanding of mechanics.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Demonstrate understanding of mechanics. 	<ul style="list-style-type: none"> Demonstrate in-depth understanding of mechanics. 	<ul style="list-style-type: none"> Demonstrate comprehensive understanding of mechanics.

Explanatory Notes

- This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 7; and is related to the material in the *Teaching and Learning Guide for Physics*, Ministry of Education, 2010 at <http://seniorsecondary.tki.org.nz>. The standard is aligned to the achievement objectives *Physical Inquiry and Physics Concepts* in the Physical World strand and *Communicating in Science* in the Nature of Science strand.

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 writing statements that show an awareness of how simple facets of phenomena, concepts or principles relate to a described situation.

Demonstrate in-depth understanding involves writing statements that give reasons why phenomena, concepts or principles relate to a described situation. For mathematical solutions, the information may not be directly usable or immediately obvious.

Demonstrate comprehensive understanding involves writing statements that demonstrate understanding of connections between concepts.

- 3 Written statements include mathematical solutions and/or descriptions. Descriptions may include graphs or diagrams.
- 4 Assessment is limited to a selection from the following:

Motion:

- constant acceleration in a straight line
- free fall under gravity
- projectile motion
- circular motion (constant speed with one force only providing centripetal force).

Force:

- force components
- vector addition of forces
- unbalanced force and acceleration
- equilibrium (balanced forces and torques)
- centripetal force
- force and extension of a spring.

Momentum and Energy:

- momentum
- change in momentum in one dimension and impulse
- impulse and force
- conservation of momentum in one dimension
- work
- power and conservation of energy
- elastic potential energy.

Relationships:

$$v = \frac{\Delta d}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t}$$

$$v_f = v_i + at \qquad d = v_i t + \frac{1}{2} at^2$$

$$d = \frac{v_i + v_f}{2} t \qquad v_f^2 = v_i^2 + 2ad$$

$$a_c = \frac{v^2}{r}$$

$$p = mv$$

$$\Delta p = F\Delta t$$

$$E_p = \frac{1}{2} kx^2$$

$$E_k = \frac{1}{2} mv^2$$

$$\Delta E_p = mg\Delta h$$

$$W = Fd$$

$$P = \frac{W}{t}$$

$$F = ma$$

$$\tau = Fd$$

$$F = -kx$$

$$F_c = \frac{mv^2}{r}$$

- 5 Assessment Specifications for this achievement standard can be accessed through the Physics Resources page found at <http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/ncea-subject-resources/>.
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Replacement Information

This achievement standard replaced AS90255 and unit standard 6379.

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