Achievement Standard

Subject Reference	Chemistry and Biology 1.4				
Title	Demonstrate understanding of how the physical properties of materials inform their use				
Level	1	**Credits**	4	**Assessment**	External
Subfield	Science				
Domain	Science - Core				
Status	Approved	**Status date**	December 2023		
Planned review date	December 2028	**Date version published**	December 2023		

Purpose Statement

Students are able to demonstrate understanding of how the physical properties of materials inform their use.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of how the physical properties of materials inform their use	• Explain how the physical properties of materials inform their use	• Evaluate how the physical properties of materials inform their use

Explanatory Notes

1 *Demonstrate understanding of how the physical properties of materials inform their use* involves:
- describing the use of materials with reference to physical properties
- describing the physical properties of materials, with reference to the arrangement of particles and the relative strength of attractive forces between the particles.

Explain how the physical properties of materials inform their use involves:
- explaining the physical properties and use of the materials in relation to the arrangement of particles and the relative strength of attractive forces between them.

Evaluate how the physical properties of materials inform their use involves:
- evaluating how materials behave when used, by linking physical properties to the arrangement of particles in the materials and the relative strength of attractive forces between these particles.

2 For the purpose of this achievement standard, *materials* are groups of substances which share structural similarities.

Types of materials are limited to:
- molecular substances, such as water and iodine
- metallic solids, such as lead pipe, magnesium alloy wheels, and copper wire
- ionic materials, such as nitrate fertilizers and salt
- natural and synthetic polymers, such as DNA, proteins, and non-stick coatings on cookware
- covalent networks, such as diamond and graphite.

3 For the purpose of this achievement standard, *physical properties* are characteristics of matter which can be observed or measured without changing the chemical composition of the matter.

Examples of physical properties include:
- density
- thermal and electrical conductivity
- melting and boiling points
- solubility in water
- malleability and hardness.

4 For the purpose of this achievement standard, *particles* are the constituent components of materials.

Particles are limited to:
- atoms
- ions
- molecules
- electrons.

5 Refer to the NCEA glossary for Māori, Pacific, and further subject-specific terms and concepts.

6 This achievement standard is derived from the Science Learning Area at Level 6 of *The New Zealand Curriculum:* Learning Media, Ministry of Education, 2007.

Replacement Information

This achievement standard and AS92020-AS92022 replaced AS90925-AS90934.

Quality Assurance

1 Schools and institutions must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.

2 Schools and institutions with consent to assess must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference 0233