

# **National Certificate of Educational Achievement**

## **2013 Assessment Report**

### **Physics Level 1**

- 90937 Demonstrate understanding of aspects of electricity and magnetism**
- 90938 Demonstrate understanding of aspects of wave behaviour**
- 90939 Demonstrate understanding of aspects of heat**

## COMMENTARY

In the examination for 90937, Demonstrate understanding of aspects of electricity and magnetism, candidates had more opportunities to express their understanding of the subject matter in explanation type questions rather than numerical type questions.

In the examination for 90938, Demonstrate understanding of aspects of wave behaviour, the examination covered a wide range of the subject matter. The examination gave candidates sufficient opportunity to prove their understanding of concepts in a number of contexts. Candidates found some parts of the examination challenging.

In the examination for 90939, Demonstrate understanding of aspects of heat, the questions covered a wide range of the subject matter – there were questions that require explanation type answers, and others which covered the mathematical nature of the standard.

## STANDARD REPORTS

### **90937 Demonstrate understanding of aspects of electricity and magnetism**

#### **ACHIEVEMENT**

**Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:**

- drew partially correct circuit diagrams for resistors in series and parallel
- calculated the total resistance of two resistors in series
- recognised how voltage splits in series and parallel circuits
- recognised that iron is magnetic material and it is attracted to magnets
- used the right hand grip rule to identify the polarity of a solenoid
- calculated the current flowing in a circuit
- described the concept of charging by friction
- described the law of charges; like charges repel and unlike charges attract.

#### **NOT ACHIEVED**

**Candidates who were awarded Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:**

- used incorrect symbols to draw circuit diagrams
- did not show an understanding of concepts of voltage, current and power
- could not differentiate ideas in static electricity from that in magnetism, for example, used ideas in static electricity to explain magnetic effects
- described static electricity in terms of protons or positive electrons
- used formulae and data incorrectly to solve one step problems
- were unable to describe basic concepts in physics correctly.

## **ACHIEVEMENT WITH MERIT**

**In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:**

- drew circuit diagrams for resistors in series and parallel with the correct symbols
- explained that an increase in voltage causes an increase in power for a given situation
- explained the idea of induced magnetism in soft iron
- carried out simple two step calculations involving electric circuits
- explained how magnets could be identified using the rule that like poles repel
- explained how the change in current through a solenoid would change the field strength
- explained the mechanics of charging by friction in a given situation
- explained the function of a variable resistor in an electromagnetic separator
- related magnetic polarity change to the change in the direction of current.

## **ACHIEVEMENT WITH EXCELLENCE**

**In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:**

- linked the change in power to the change in both current and voltage
- explained why repulsion is a valid test to distinguish a magnet from an iron bar
- used static electricity ideas to explain why clothes stick together after being dried in an electric dryer
- explained the effectiveness of electrostatic spraying in terms of charged particles
- explained the function of a variable resistor in an electromagnetic separator and stated how a change in the direction of current affects the magnetic polarity.

## **90938 Demonstrate understanding of aspects of wave behaviour**

### **ACHIEVEMENT**

**Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:**

- recalled the colours of the spectrum in the correct order
- recognised that white light was made up of many colours and that orange and blue light had different wavelengths / frequencies
- defined the term period and calculated the period of a wave from the data given
- identified diffraction as the phenomenon taking place for a given situation
- recognised that sound is a longitudinal wave and radio wave is a transverse wave
- identified the amplitude and wavelength of a given wave
- located the image of an object formed by a plane mirror
- used  $t=d/v$  or  $v=f\lambda$  to solve one step problems.

## **NOT ACHIEVED**

**Candidates who were awarded Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:**

- did not understand the meaning of the terms period and frequency
- failed to recall the colours of the spectrum in the correct order
- were unable to differentiate the characteristics of sound waves from radio waves
- failed to locate the position of the image formed by a plain mirror for a given situation
- used formulae and data incorrectly to solve one-step problems
- did not identify diffraction as the phenomenon in a given situation
- defined refraction without any reference to light entering or exiting another medium.

## **ACHIEVEMENT WITH MERIT**

**In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:**

- understood that white light contained a mixture of wavelengths/ frequencies
- explained a similarity and a difference between orange and blue light
- defined the term period and calculated the period of waves for a given situation
- drew correct diagram/explained diffraction of waves around a wall
- explained how frequency/ wavelength of a wave affects the process of diffraction
- described the differences between radio waves and sound waves
- explained that air particles vibrate causing compressions and rarefactions in the air as the cause of energy transfer by sound waves
- were able to complete a ray diagram showing the reflected ray, the normal ray and locate the position of an image of an object in front of a plane mirror
- recognised the phenomenon refraction in a given situation and explained why it occurred.

## **ACHIEVEMENT WITH EXCELLENCE**

**In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:**

- explained that different wavelengths/ frequencies is the cause of dispersion of white light through a prism
- applied the concept of critical angle correctly to given situation to predict the path of a ray in the prism
- explained that orange light travels faster than blue light in a prism because it has a longer wavelength/smaller frequency than blue light
- carried out calculations that involve multiple steps correctly
- explained why waves of higher frequency diffract less for a given set up
- explained how sound energy is propagated in air
- constructed a ray diagram to show how the virtual image of a person is formed behind a mirror for a given situation
- drew an accurate ray diagram to show the refraction of light through a glass block and explained why refraction occurs.

## **90939 Demonstrate understanding of aspects of heat**

### **ACHIEVEMENT**

**Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:**

- identified and described a method of heat transfer in a medium
- identified one feature of a solar cooker for efficient cooking
- stated that trapped air is a poor conductor of heat
- defined temperature in terms of hotness
- carried out one step simple calculations
- stated that particles moved faster as the water temperature increased/ water evaporated as the its temperature increases
- identified metal as a better conductor than fabric
- stated evaporation of sweat cools a body.

### **NOT ACHIEVED**

**Candidates who were awarded Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:**

- did not correctly identify heat transfer method in a given situation
- failed to select the relevant data when calculating specific heat capacity or latent heat
- had difficulty in correctly rearranging formulae to solve numerical problems
- described the meaning of the term temperature incorrectly
- did not know that the metal in a chair is a better conductor than the fabric
- did not know that cool feeling of a body is caused by evaporation of sweat.

### **ACHIEVEMENT WITH MERIT**

**In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:**

- identified and described a method of heat transfer in two or more media
- identified one feature of a solar cooker and explained why it promotes efficient cooking
- explained why trapped air is a poor conductor of heat
- defined temperature in terms of kinetic energy of particles
- carried out numerical problems related to heat capacity and latent heat which involved two easy steps
- explained that absorption of energy causes increase in temperature and hence the change of state
- explained why the metal in a chair is a better conductor than fabric
- explained why evaporation of sweat causes the cooling effect
- related smaller mass to lower heat energy and ignition temperature.

## **ACHIEVEMENT WITH EXCELLENCE**

**In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:**

- explained the features of a solar cooker that lead to efficient cooking
- explained the importance of greenhouse effect in the design of a solar cooker
- solved multi-step problem that involved specific heat capacity, latent heat concepts and power
- explained evaporation in terms of latent heat capacity
- explained why small twigs catch fire faster than a log in terms of mass and heat capacity.