

## CERTIFICATE IV IN ADULT TERTIARY PREPARATION (10765NAT)

### PHYSICS

The Physics Specialisation applies to those who require foundation Physics knowledge and skills for entrance to tertiary study in a relevant discipline or field.

*There are three units of study within the Physics Specialisation.*

#### **ATPPHY001 - Unit 1:**

*Demonstrate the application of motion and force to physics problems.*

This unit describes the performance outcomes, skills and knowledge required to apply the concepts of motion and force when conducting practical investigations and solving physics problems. It requires the ability to understand fundamentals of measurement, vectors, kinematics and dynamics. Organising and representing ideas and information using scientific language and conventions is required.

#### **ATPPHY001 - Performance Criteria:**

<b>1. Perform force and motion calculations</b>	<ul style="list-style-type: none"><li>1.1 Identify and apply the fundamental quantities of measurement.</li><li>1.2 Convert among units in the metric system.</li><li>1.3 Perform calculations using significant figures, scientific notation, and order of magnitude.</li><li>1.4 Explore and describe the components of vectors and scalars.</li><li>1.5 Identify and apply formulas in routine scientific calculations.</li></ul>
<b>2. Develop solutions for vector problems</b>	<ul style="list-style-type: none"><li>2.1 Identify procedures, concepts, principles and technology to be used to develop a solution.</li><li>2.2 Apply the problem solving process to formulate a plan to solve the problem.</li><li>2.3 Select and apply physics information and theory to calculate a solution.</li><li>2.4 Analyse the validity of the result, make judgments and draw conclusions.</li></ul>
<b>3. Collect and analyse data to answer physics questions</b>	<ul style="list-style-type: none"><li>3.1 Select and use scientific equipment to observe force and motion physics.</li><li>3.2 Follow equipment and problem instructions to collect data as required.</li><li>3.3 Organise and present collected data in required format.</li><li>3.4 Analyse data and perform calculations to predict future motion.</li><li>3.5 Report findings using scientific format, language, conventions and technology related to physics.</li></ul>

**ATPPHY001 – Performance Evidence:**

- Analyse motion graphically by comparing and contrast vectors and scalars providing descriptions and examples
- Add vectors “head to tail” and resolve vectors into parallel and perpendicular components
- Solve problems involving:
  - Displacement
  - Velocity
  - Acceleration using equations of motion
  - Vectors
  - The inclined plane and force
  - Weight and friction
- Recorded accurate qualitative and quantitative observations during practical activities
- Analysed data to explain observations, identify trends, and perform calculations in physics
- Represented scientific information, including data, in a variety of formats

**ATPPHY001 – Knowledge Evidence:**

- Measurement
  - Fundamental quantities
  - Significant figures
  - Scientific notation
  - Order of magnitude
- Vectors
- Kinematics and Dynamics
  - Displacement, velocity and acceleration
  - Equations of motion
  - Vertical motion
  - Force
- Problem Solving Process
- Knowledge of hazards associated with equipment used in laboratory/practical environments
- Strategies to assess the reliability of data and to account for errors
- Communicating using physics terminology, language, conventions and technology appropriate for audience and purpose

### **ATPPHY002 - Unit 2:**

*Demonstrate the application of mechanics and optics to physics problems.*

This unit describes the performance outcomes, skills and knowledge required to apply the concepts of mechanics and optics when conducting laboratory investigations and solving physics problems. It requires the ability to understand fundamentals of mechanics, gravitational forces, wave motion and optics. Organising and representing ideas and information using scientific language and conventions in a physics context is required.

### **ATPPHY002 - Performance Criteria:**

<b>1. Perform mechanical physics calculations</b>	1.1 Identify and apply quantities of mechanics and optics. 1.2 Perform calculations using mechanics, gravitational forces, wave motion and optics equations. 1.3 Compare and contrast transverse and longitudinal waves. 1.4 Describe key terminology relating to mechanics and optics. 1.5 Identify and apply formulas in routine scientific calculations.
<b>2. Develop solutions to mechanics and optics problems</b>	2.1 Identify procedures, concepts, principles and technology to be used to develop a solution. 2.2 Formulate a plan to solve the problem. 2.3 Select and apply mechanics and optics information and theory to calculate a solution. 2.4 Analyse the validity of the result, make judgments and draw conclusions.
<b>3. Conduct practical mechanics experiments</b>	3.1 Select and use scientific equipment to observe mechanics physics. 3.2 Collect mechanics data as outlined in the experiment procedures. 3.3 Analyse and evaluate scientific data to draw conclusions, explain observations and identify trends involving mechanics. 3.4 Organise and report findings using scientific language, conventions, format and technology appropriate to the audience and purpose.

**ATPPHY002 – Performance Evidence:**

- Completed calculations and solved physics problems involving:
  - Projectile motion
  - Circular motion
  - Newton's laws of motion, weight and friction
  - Work and energy
  - Momentum and impulse
  - Newton's Law of Universal Gravitation
  - Kinetic, gravitational, elastic potential energy
  - Snell's Law
  - Plane mirror, concave and convex mirrors and lens
  - Optics
- Drawn and labelled ray diagrams of:
  - Plane mirrors, convex and concave mirrors
  - Concave and convex lenses
- Collected and analysed data to explain observations, identify trends, and perform calculations in physics

**ATPPHY002 – Knowledge Evidence:**

- Mechanics including:
  - Projectile Motion
  - Circular motion
  - Energy, work and power
  - Momentum and impulse
- Gravitational Forces including:
  - Kinetic, gravitational and elastic potential energy
  - Newton's law of Universal Gravitation
- Wave Motion and Optics including: - The characteristics of waves
  - Transverse and longitudinal waves
  - Wave equation
  - Properties of plane mirrors, convex and concave mirrors and lenses
  - The laws for reflection and refraction including Snell's Law
- Mechanics and optics language, conventions and technology appropriate for audience and purpose

### **ATPPHY003 - Unit 3:**

*Demonstrate the application of theory to electromagnetism and nuclear physics problems.*

This unit describes the performance outcomes, skills and knowledge required to apply the concepts of electromagnetism and nuclear physics when conducting laboratory investigations and solving physics problems. It requires the ability to understand fundamentals of electricity laws and principles, electromagnetism and atomic and nuclear physics. Organising and presenting ideas and information using scientific language and conventions in a physics context is required.

### **ATPPHY003 - Performance Criteria:**

<p><b>1. Investigate the fundamentals of electromagnetics and nuclear physics</b></p>	<p>1.1 Identify the equations of electromagnetism and nuclear physics.</p> <p>1.2 Identify and explore the relationship between Ohms law and resistor colour codes.</p> <p>1.3 Explore and describe the key concepts of nuclear physics.</p> <p>1.4 Draw and label magnetic and electrical fields.</p>
<p><b>2. Develop solutions for electromagnetism and nuclear physics problems</b></p>	<p>2.1 Identify procedures, concepts, principles and technology to be used to develop a solution.</p> <p>2.2 Apply the problem solving process to formulate a plan to solve the problem.</p> <p>2.3 Select and apply relevant electromagnetism and nuclear physics information and theory to calculate a solution.</p> <p>2.4 Analyse the validity of the result, make judgments and draw conclusions.</p> <p>2.5 Use mathematical language, conventions and technology to organise and present results.</p>
<p><b>3. Conduct electromagnetism experiments</b></p>	<p>3.1 Select and use scientific equipment.</p> <p>3.2 Follow instructions to complete practical experiment.</p> <p>3.3 Analyse and evaluate scientific data and draw conclusions, explain observations and identify trends.</p> <p>3.4 Organise and report the findings using scientific language conventions, format and technology relevant to electromagnetism.</p>

### **ATPPHY003 – Performance Evidence:**

- Sketched and calculate electric and magnetic fields
- Completed calculations and solved physics problems applying
  - The first law of electrostatics
  - Coulomb's Law
  - Ohm's Law
- Demonstrated use of standard resistor colour code
- Calculated resistance in series and parallel circuits
- Connected a simple circuit to measure resistance, voltage and current using scientific equipment
- Described properties of alpha, beta particles and gamma rays
- Completed calculations involving
  - Energy levels of the atom
  - Photoelectric effect and the Compton effect
  - Radioactive decay and half-life
- Balanced radioactive reactions
- Compared nuclear fission and fusion reactions
- Represented scientific information, including data, in a variety of formats

### **ATPPHY003 – Knowledge Evidence:**

- Electricity laws and principles including
  - The first law of electrostatics
  - Properties of Electric Force and Electric Field Strength
  - Coulomb's Law
  - Ohm's Law
- Electromagnetism including
  - Magnetic fields and magnetic field strength
  - The right hand rule
  - Faraday's and Lenz's Laws
- Atomic and Nuclear Physics including:
  - Atomic number and Mass number
  - The Photoelectric effect
  - The Compton effect
  - Photons
  - Properties of alpha, beta and gamma radiation
  - Radioactivity
  - Nuclear reactions (nuclear fission and fusion)
- Practical procedures that include
  - Connecting a simple circuit
  - Calculate the magnetic field of the earth
- Electromagnetic and nuclear physics terminology, language, conventions and technology appropriate for audience and purpose