

Physics Units 1 & 2

Contents

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Series contents

This series comprises **fourteen content workbooks**, five cumulative **topic tests**, and a **practice-examination booklet**, covering the complete VCAA Physics Units 1 & 2 course as set out in the *VCE Physics Study Design (from 2023)*. Each content workbook follows the same structure: concise theory, scaffolded and unscaffolded worked examples, graded practice questions, a compact answer key, and fully-worked solutions. Each topic test comprises **Test A** (multiple-choice) and **Test B** (written responses), taken under scientific-calculator conditions with the house formula sheet, cumulative over the chapters of that topic. Chapters 10–13 present the Unit 2 Area of Study 2 options; each option subtopic closes with an assessed Option task. All Units 1 & 2 assessment is school-based — there is no external examination at this level — so the six practice papers deliberately mirror the VCE Physics Units 3 & 4 examination structure.

Unit 1: How is energy useful to society?

Area of Study 1 — How are light and heat explained?

Chapter 1 — Electromagnetic radiation and the wave model (52 pp)

1A Describing waves: amplitude, wavelength, period and frequency · 1B Electromagnetic waves and the electromagnetic spectrum · 1C Refraction, Snell's Law and total internal reflection · 1D Dispersion, rainbows and mirages · 1E Optical fibres and communication

Chapter 2 — Thermal energy and radiation (49 pp)

2A Temperature, thermal energy and heat transfer · 2B Specific heat capacity and latent heat · 2C Wien's Law and thermal radiation · 2D Climate change and global warming

Topic 1 Test A (multiple-choice) and Test B (written responses), with fully-worked solutions, are included at the end of this workbook.

Area of Study 2 — How is energy from the nucleus utilised?

Chapter 3 — Radiation from the nucleus (57 pp)

3A Nuclear stability and the forces in the nucleus · 3B Alpha, beta and gamma radiation, and decay equations · 3C Half-life and modelling radioactive decay · 3D Decay series diagrams · 3E The effect of radiation on humans, and radiation dose · 3F Medical radioisotopes in therapy

Chapter 4 — Nuclear energy (54 pp)

4A Mass–energy conversion and the binding energy curve · 4B Fission chain reactions · 4C Comparing fusion and fission · 4D Nuclear energy as an energy source for Australia

Topic 2 Test A (multiple-choice) and Test B (written responses), with fully-worked solutions, are included at the end of this workbook.

Area of Study 3 — How can electricity be used to transfer energy?

Chapter 5 — Modelling electricity (57 pp)

5A Charge, current, potential difference, energy and power · 5B Analogies for electric current and potential difference · 5C Meters and the kilowatt-hour · 5D Resistance, I–V graphs and ohmic devices · 5E Equivalent resistance of combined series and parallel circuits · 5F Voltage dividers

Chapter 6 — Using electricity safely (64 pp)

6A Power transfer in series and parallel circuits · 6B Household electrical systems as DC circuit models · 6C Non-ohmic components and transducers · 6D Energy transfers and transformations in common devices · 6E Safety devices and electric shock

Topic 3 Test A (multiple-choice) and Test B (written responses), with fully-worked solutions, are included at the end of this workbook.

Unit 2: How does physics help us to understand the world?

Area of Study 1 — How is motion understood?

Chapter 7 — Modelling motion (32 pp)

7A Vectors, scalars and the parameters of motion · 7B Motion graphs and non-uniform motion · 7C Straight-line motion under constant acceleration

Chapter 8 — Forces and motion (65 pp)

8A Momentum and change in momentum · 8B Newton's three laws of motion · 8C The force due to gravity and the force-vector convention · 8D Adding and resolving forces · 8E Impulse and momentum conservation in collisions · 8F Torque and equilibrium

Chapter 9 — Energy and motion (59 pp)

9A Work done by a force · 9B Hooke's Law and ideal springs · 9C Mechanical energy transfers and conservation · 9D Power and efficiency · 9E Case study: applying motion concepts

Topic 4 Test A (multiple-choice) and Test B (written responses), with fully-worked solutions, are included at the end of this workbook.

Area of Study 2 — Options: How does physics inform contemporary issues and applications in society?

Chapter 10 — Options: communicating physics, climate, nuclear and medical physics (69 pp)

10A Communicating physics: evidence, sources and representations · 10B Communicating physics: societal context and justifying a stance · 10C Option 2.1: How does physics explain climate change? · 10D Option 2.2: How do fusion and fission compare as viable nuclear energy power sources? · 10E Option 2.6: How is radiation used to maintain human health?

Chapter 11 — Options: forces, materials and motion (54 pp)

11A Option 2.3: How do heavy things fly? · 11B Option 2.4: How do forces act on structures and materials? · 11C Option 2.5: How do forces act on the human body? · 11D Option 2.11: How can performance in ball sports be improved?

Chapter 12 — Options: light, sound and electricity in the body and the home (69 pp)

12A Option 2.8: How can human vision be enhanced? · 12B Option 2.9: How is physics used in photography? · 12C Option 2.10: How do instruments make music? · 12D Option 2.7: How does the human body use electricity? · 12E Option 2.12: How can AC electricity charge a DC device?

Chapter 13 — Options: astrophysics, particles and contemporary research (72 pp)

13A Option 2.13: How do astrophysicists investigate stars and black holes? · 13B Option 2.14: How can we detect possible life beyond Earth's Solar System? · 13C Option 2.16: How do particle accelerators work? · 13D Option 2.17: How does physics explain the origins of matter? · 13F Option 2.18: How is contemporary physics research being conducted in our region?

Area of Study 3 — How do physicists investigate questions?

Chapter 14 — Scientific investigation (112 pp)

14A Scientific methodologies and investigation design · 14B Generating primary data: accuracy, precision, resolution and validity · 14C Health, safety and ethical guidelines · 14D Aims, hypotheses, models, theories and laws · 14E Analysing and evaluating primary data · 14F The logbook and authentication of primary data · 14G Communicating findings: report conventions and key findings

Topic 5 Test A (multiple-choice) and Test B (written responses), with fully-worked solutions, are included at the end of this workbook.

Practice examinations

Chapter 15 — Practice Examinations (134 pp)

Six complete practice examinations with fully-worked solutions, cumulative over the Units 1 & 2 core content (the options chapters, Chapters 10–13, are not examined): two easier, two medium and two harder. Each paper carries a house formula sheet and mirrors the VCE Physics Units 3 & 4 examination structure — 15 minutes reading time plus 2 hours 30 minutes writing time; Section A (20 multiple-choice questions, 20 marks) and Section B (short- and extended-answer questions, 100 marks), for a total of 120 marks. There is no external examination at Units 1 & 2; these practice papers follow house convention and are not a VCAA requirement.

This series comprises ≈ 1003 pages across sixteen booklets.