VCE Physics Units 1 and 2: 2016–2022; Units 3 and 4: 2016–2023

Study Summary

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| **Please Note: This study summary includes excerpts from the VCE Physics Study Design. The summary is not a substitute for the VCE Study Design. Users are advised to consult the VCAA website to view the full accredited study design and other resources.** |

Staged implementation

The accreditation period for the revised study design for Units 1 and 2 begins 1 January 2016.
The accreditation period for the revised study design for Units 3 and 4 begins 1 January 2017.

Scope of study

Physics seeks to understand and explain the physical world, both natural and constructed. It examines models and ideas used to make sense of the world and which are sometimes challenged as new knowledge develops.

VCE Physics provides students with opportunities to investigate questions related to selected areas within the discipline including atomic physics, electricity, fields, mechanics, thermodynamics, quantum physics and waves. Students also have options for study related to astrobiology, astrophysics, bioelectricity, biomechanics, electronics, flight, medical physics, nuclear energy, nuclear physics, optics, sound and sports science.

An important feature of VCE Physics is the opportunity for students to undertake a range of inquiry tasks both collaboratively and independently. Inquiry methodologies can include laboratory experimentation, local and remote data logging, simulations, animations and literature reviews. Investigation in physics is diverse and may include: the design, building, testing and evaluation of a device; the investigation of the operation of a device; creating a solution to a scientific or technological problem; and the investigation of a physical phenomenon. Students pose questions, formulate hypotheses, collect and analyse data, evaluate methodologies and results, justify conclusions, make recommendations and communicate their findings.

As well as an increased understanding of scientific processes, students develop capacities that enable them to critically assess the strengths and limitations of science, respect evidence-based conclusions and gain an awareness of the ethical, social and political contexts of scientific endeavours.

Rationale

Physics is based on observations, experiments, measurements and mathematical analysis with the purpose of finding quantitative explanations for phenomena occurring from the subatomic scale through to the planets, solar systems and galaxies in the Universe. Whilst many scientific understandings in Physics have stood the test of time, many other areas continue to evolve. In undertaking this study, students develop their understanding of the role of careful and systematic experimentation, and modelling, in the development of theories and laws. They undertake practical activities and apply physics principles to explain and quantify both natural and constructed phenomena.

In VCE Physics students develop their inquiry, analytical and communication skills. They apply critical and creative thinking to analyse contemporary physics-related issues, and communicate their views from an informed position.

Structure

The study is made up of four units:

Unit 1: What ideas explain the physical world?

Unit 2: What do experiments reveal about the physical world?

Unit 3: How do fields explain motion and electricity?

Unit 4: How can two contradictory models explain both light and matter?

Each unit contains three areas of study.

Entry

There are no prerequisites for entry to Units 1, 2 and 3. Students must undertake Unit 3 prior to undertaking Unit 4. Students entering Unit 3 without Units 1 and/or 2 may be required to undertake additional preparation as prescribed by their teacher. Units 1 to 4 are designed to a standard equivalent to the final two years of secondary education. All VCE studies are benchmarked against comparable national and international curriculum.

Unit 1: What ideas explain the physical world?

In this unit students explore some of the fundamental ideas and models used by physicists in an attempt to understand and explain the world. They consider thermal concepts by investigating heat and assessing the impact of human use of energy on the environment. Students evaluate common analogies used to explain electricity and investigate how electricity can be manipulated and utilised. They examine current scientifically accepted theories that explain how matter and energy have changed since the origins of the Universe.

Students undertake quantitative investigations involving at least one independent, continuous variable.

Unit 2: What do experiments reveal about the physical world?

This unit requires that students undertake a core study related to motion, one option from a choice of twelve options, and a student-designed investigation related to motion and/or one of the twelve options.

In this unit, students explore the power of experiments in developing models and theories. They make direct observations of physics phenomena and examine the ways in which phenomena that may not be directly observable can be explored including through indirect observations. Students investigate the ways in which forces are involved both in moving objects and in keeping objects stationary. They choose one of twelve options related to astrobiology, astrophysics, bioelectricity, biomechanics, electronics, flight, medical physics, nuclear energy, nuclear physics, optics, sound and sports science.

Students design and undertake investigations involving at least one independent, continuous variable. A student-designed practical investigation related to content drawn from Area of Study 1 and/or Area of Study 2 is undertaken in Area of Study 3.

Unit 3: How do fields explain motion and electricity?

In this unit, students explore the importance of energy in explaining and describing the physical world. They examine the production of electricity and its delivery to homes. Students consider the field model as a construct that has enabled an understanding of why objects move when they are not apparently in contact with other objects. They explore the interactions, effects and applications of gravitational, electric and magnetic fields including the design and operation of particle accelerators. Students use Newton’s laws and Einstein’s theories to investigate and describe motion.

Students design and undertake investigations involving at least two independent variables, with at least one of the independent variables being continuous. A student-designed practical investigation related to waves, fields or motion is undertaken either in Unit 3 or Unit 4, or across both Unit 3 and Unit 4. The findings of the investigation are presented in a scientific poster format.

Unit 4: How can two contradictory models explain both light and matter?

Light and matter – which initially seem to be quite different – have been observed as having similar properties. In this unit, students explore the use of wave and particle theories to model the properties of light and matter. They examine how the concept of the wave is used to explain the nature of light and analyse its limitations in describing light behaviour. Students further investigate light by using a particle model to explain its behaviour. A wave model is also used to explain the behaviour of matter which enables students to consider the relationship between light and matter. Students are challenged to think beyond the concepts experienced in everyday life to study the physical world from a new perspective.

Students design and undertake investigations involving at least two continuous independent variables. A student-designed practical investigation related to waves, fields or motion is undertaken either in Unit 3 or Unit 4, or across both Unit 3 and Unit 4. The findings of the investigation are presented in a scientific poster format.

Assessment

Satisfactory completion

The award of satisfactory completion for a unit is based on a decision that the student has demonstrated achievement of the set of outcomes specified for the unit. This decision will be based on the teacher’s assessment of the student’s performance on assessment tasks designated for the unit.

Levels of achievement

Units 1 and 2

Procedures for the assessment of levels of achievement in Units 1 and 2 are a matter for school decision.

Units 3 and 4

The Victorian Curriculum and Assessment Authority will supervise the assessment of all students undertaking Units 3 and 4. In the study of VCE Physics the student’s level of achievement will be determined by School-assessed Coursework as specified in the VCE Physics study design and external assessment.

Percentage contributions to the study score in VCE Physics are as follows:

* Unit 3 School-assessed Coursework: 21 per cent
* Unit 4 School-assessed Coursework: 19 per cent
* End-of-year examination: 60 per cent.