

A2 Unit G485: Fields, Particles and Frontiers of Physics

Assessed with a 2 hour, 100 mark paper where all questions are answered.

Module 1: Electric and magnetic fields

This module introduces the laws developed by Coulomb, Faraday and Lenz. The application of these laws is used to demonstrate how science has benefited society with important devices such as generators and transformers. Transformers are at the heart of many electrical items in our homes that use mains electricity.

- 5.1.1 Electric fields
- 5.1.2 Magnetic fields
- 5.1.3 Electromagnetism

Module 2: Capacitors and exponential decay

This module introduces the basic properties of capacitors and how they are used in electrical circuits. The use of capacitors as a source of electrical energy is then developed.

This module also introduces the mathematics of exponential decay that is used when studying the decay of radioactive nuclei in module 3.

- 5.2.1 Capacitors

Module 3: Nuclear physics

This module shows how knowledge and understanding of ideas about the basic structure of the atom lead to an explanation of radioactivity, nuclear fission and fusion. The development of the theory illustrates how scientific ideas are modified and also the tentative nature of scientific knowledge. These ideas are then developed to explore whether fission and fusion are acceptable methods for the production of our electrical power needs in the future.

- 5.3.1 The nuclear atom
- 5.3.2 Fundamental particles
- 5.3.3 Radioactivity
- 5.3.4 Nuclear fission and fusion

Module 4: Medical imaging

This module shows how the development of the application of physics in medical imaging has led to a number of non-invasive techniques. The nature of X-rays is considered to explain the operation of CAT scans. The basic operation of MRI scanners and the principles behind ultrasound scans are used to show the applications of physics in the medical world.

This module shows how science has benefited society and informs decision making.

- 5.4.1 X-rays
- 5.4.2 Diagnostic methods in medicine
- 5.4.3 Ultrasound

Module 5: Modelling the universe

This module demonstrates how theories are developed as more experimental evidence becomes available. The nature of the origins of the universe and its possible future are studied.

- 5.5.1 Structure of the universe
- 5.5.2 The evolution of the universe