AS and A Level

Physics B (Advancing Physics)

Switching to OCR from Eduqas

Introduction

We are really proud of our GCE Physics B (Advancing Physics) qualification. Whether taking on the AS or the full A Level, this fantastic course is a great qualification for those with an interest in the subject and range of possible career paths which might follow.

Why choose Physics B?

- OCR Physics B (Advancing Physics) is the leading alternative physics specification, with its origins in a collaboration between the Institute of Physics and the Institution of Engineering and Technology.
- The course content covers the basis of how things work, from the constituent parts of atoms to the extent of the universe
- The course integrates the concepts studied with a range of practical experiments throughout each topic giving the course both an academic and practical focus, setting the scene for further study at degree level
- The course places knowledge and understanding firmly in the context of problem solving of real applications of physics and technology.

Our offer

- Our A Level Physics team are passionate about both physics and education. With industrial, engineering, teaching and assessment experience, they are fully committed to supporting centres' delivery of Physics B.
- We have produced a wide range of support materials, from our handbooks (including practical and maths skills handbooks) to delivery guides, lesson elements, practical activities, candidate exemplars and more.
- You can also follow and interact with our Subject Advisors on Twitter (@ocr_science)

Textbook comparison

We have not included a textbook comparison in this switching document as there are a number of textbooks available for each exam board's qualifications, and the order and organisation of content within these textbooks can vary. However, similarities in content across exam boards mean that it is possible to use any textbook for the core content of any board's qualifications. The specification can be used to identify relevant content, as well as that which is not required for a specific qualification. If you need further clarification on any specific content, you can email our Subject Advisor team at science@ocr.org.uk.

Support from OCR

We offer a range of support to teachers of our qualifications. This includes:

- A dedicated Subject Advisor team, with teaching and assessment experience, available to answer your queries and support your delivery of our qualifications. You can contact us by email at science@ocr.org.uk or by phone on 01223 553998.
- Monthly newsletters highlighting new resources, CPD courses, and other news about our qualifications.
- A wide range of support materials, including handbooks covering practical and mathematical skills, delivery guides, lesson elements, practical activity suggestions, candidate exemplar resources, and more.
- Free access to ExamBuilder, our mock assessment service that allows you to create your own bespoke assessments.
- Termly Science Teacher Networks, giving you the opportunity to meet with other teachers and our Subject Advisors.
- CPD courses, including courses for teachers new to teaching our qualifications and courses on outcomes from previous examination series to help inform your teaching.
- You can also follow and interact with our Subject Advisors on Twitter (@ocr_science).

Content

The content within the OCR Physics B (Advancing physics) specification is a context based course continuing the tradition of the course originally developed with the Institute of Physics and Institution of Engineering and Technology. We've laid it out to support the co-teaching of the AS and A level and provide a logical linear progression through the A level.

The OCR Physics B course does not include any optional components which maintains comparability across the whole cohort of candidates. The course content does include two items from the Eduqas medical physics optional unit.

Items which are in one specification but not the other are indicated by square brackets.

OCR Physics B	*Eduqas Physics*
Module 1: Practical skills Planning, implementing, analysis and evaluation, plus all the skills to be covered in the Practical Endorsement, with flexibility to select activities to fulfil the skills, apparatus and techniques.	The same practical skills, as mandated by the DfE, are listed in Chapters 7 and 8 of the AQA specification. The Eduqas model of the Practical Endorsement contains 26 specified practical activities
Module 2: Fundamental data analysis • Physical quantities • S.I. units • Measurements and uncertainties • Graphical representation of data	**1.1 Basic physics** • S.I. units and their prefixes • Homogeneity using units • Estimation of physical quantities Density • Moments and equilibrium
Module 3: Physics in action • *[Communication]* • [Images] • [Lenses] • [Diagrams of wave-fronts and rays] • [Digital signals] • [Sampling techniques] • [Data transmission] • Polarisation of e-m waves • *Sensors* • Resistance [and conductance] • Potential dividers • Ohmic and non-ohmic devices • Resistivity [and conductivity] • Conservation of charge and energy • Electrical circuits • Mechanical properties of materials • Particle size and spacing • Behaviour of materials • Young modulus	**1.4 Energy concepts** • Conservation of energy **2.1 Conduction of electricity** • Charge and current • Conduction **2.2 Resistance** • Potential difference • I-V graphs • Ohm's law • Power • Resistivity • [Superconductivity] **2.3 DC circuits** • Application of Kirchhoff's laws • Potential dividers • Series and parallel circuits • E.m.f. and internal resistance

OCR Physics B	*Eduqas Physics*
• Force and extension • Hooke's law	**2.5 Solids under stress** • Hooke's law • The Young modulus • Classification of solids • Features of force-extension graphs **3.1 The nature of waves** • Polarisation
Module 4: Understanding processes • *Waves and quantum behaviour* • Standing waves • Interference, refraction and diffraction • Photons and quantum behaviour • Electron diffraction • *Space, time and motion* • Vectors • Trajectories • Independent effect of perpendicular forces • Work done • Displacement, velocity and acceleration • Momentum • Gravitational potential energy • Force, energy and power • Modelling changes	**1.1 Basic physics** • Vectors • [Density] • [Moments and equilibrium] **1.2 Kinematics** • Displacement, speed, velocity and acceleration • Derive equations of motion for uniform acceleration in a straight line • Bodies falling in a gravitational field with and without air resistance • Projectile motion **1.3 Dynamics** • Newton's 3rd law of motion • [Free body diagrams] • Momentum **1.4 Energy concepts** • Work done • Conservation of energy • Work – energy relationship • Power as rate of energy transfer • Efficiency **3.1 The nature of waves** • Progressive waves • [Transverse and longitudinal waves] **3.2 Wave properties** • Diffraction with slits or objects • Interference and superposition • Diffraction grating • Stationary and progressive waves

OCR Physics B	*Eduqas Physics*
	3.3 Refraction of light • Refractive index and Snell's law • [Total internal reflection] **3.4 Photons** • Photons • Photoelectric effect and Einstein's equation • Atomic energy level diagrams • $p=h/\lambda$ for particles of matter and photons • [Calculation of radiation pressure on a surface absorbing or reflecting photons] • [Line emission and absorption spectra] **[3.5 Lasers]**
Module 5: Rise and fall of the clockwork universe • *Creating models* • Capacitance • Time constant • Exponential decay • Radioactive decay • Activity and half-life • Simple harmonic motion • Free and forced oscillations • Damping • Out into space • Gravitational and kinetic energy • Motion in a uniform gravitational field • Gravitational field and potential of a point mass • Angular velocity • Circular motion, horizontal and in an orbit • Newton's law of gravitation • *Our place in the universe* • Radar type measurements • The relativistic principle • Evidence for the hot big bang • Logarithmic scales	**1.5 Circular motion** • Period and frequency • Angular velocity, radian • Centripetal force • Equations of motion **1.6 Vibrations** • Simple harmonic motion • Simple harmonic systems • Graphical representations of S.H.M. • Free and damped oscillations • Forced oscillations and resonance **1.7 Kinetic theory** • $pV=nRT$ • pressure exerted by a gas • Boltzmann constant **1.8 Thermal physics** • Internal energy • Absolute temperature • Heat transfer • Work done by a gas • Specific heat capacity

OCR Physics B	*Eduqas Physics*
• Distances, ages and relative velocities of astronomical objects • *Matter very simple* • Specific thermal capacity • Ideal gases • Impulse • Kinetic theory of gases • Relationships between *p, V, N* and *T* • *Matter: hot or cold* • Ratios of numbers of particles in quantum states • Qualitative effects of temperature in processes with activation energy • [Boltzmann factor]	**2.2 Capacitance** • [Parallel plate capacitor] • Capacitance • Energy stored by a capacitor • [Capacitors in series and parallel] • Charging and discharging **2.6 (Electrostatic and) gravitational fields of force** • Features of fields • Newton's law of gravitation • Field strength and resultant field strength • Potential and potential energy **2.7 Using radiation to investigate the stars** • [Emission and absorption spectra] • [Black body radiation] • [Stefan & Wien's laws] **2.8 Orbits and the wider universe** • Kepler's three laws of planetary motion • Derivation of Kepler's third law • Evidence for dark matter • [Centre of mass for two spherically symmetric objects] • Doppler relationship • Hubble constant and approximate age of the universe • [Critical density of a "flat" universe] **3.6 Nuclear decay** • Nuclear decay • Half-life, activity and decay constant • Exponential decay • Derivation of $\lambda=\ln 2/T_{1/2}$
Module 6: Field and particle physics • Electromagnetism • Transformer action • Action of a dynamo • Electromagnetic forces • Magnetic circuits • Magnetic field strength • Flux • Charge and field	**2.3 Capacitance** • Electric field **2.6 (Electrostatic and) gravitational fields of force** • Features of fields • Coulomb's law

OCR Physics B	*Eduqas Physics*
• Uniform electric field • Inverse square law • Electric potential energy • Motion of charged particles in a magnetic field • Comparison of field types • The electronvolt • Coulomb's law • Fundamental particles • Particle accelerators • Evidence from scattering • Energy levels within the atom • A simple atomic model • Quark structures • Conservation of mass/energy, charge and lepton number • Balanced nuclear equations • [Relativistic calculations] • [Ionising radiation and risk] • Effects of ionising radiations on tissue • Penetrating power • Stability and decay in terms of binding energy • Nuclear fission and power generation • Absorbed and effective doses • Energy changes from nuclear transformations	• Field strength and resultant field strength • Potential and potential energy **3.6 Nuclear decay** • Nuclear decay • Types of radiation **3.7 Particles and nuclear structure** • Rutherford scattering experiment • Coulomb repulsive forces **3.8 Nuclear energy** • $E=mc^2$ • Binding energy • Conservation of mass, fission and fusion **3.9 Magnetic fields** • Force on a current carrying conductor in a magnetic field • Force on a moving charge in a magnetic field • [Hall voltage] • [Field strength for a long straight wire and solenoid] • Deflection of ion beams by electric and magnetic fields • Motion of charged particles in linear accelerators, cyclotrons and synchrotrons **3.10 Electromagnetic induction** • Magnetic flux and flux linkage • Electromagnetic induction • Rotating coil in a perpendicular field **Option B Medical physics** • Effects of radiation on living matter • Absorbed, equivalent and effective doses

OCR Physics B	*Eduqas Physics*
Appendix 5f: Mathematical requirements • Arithmetic and numerical computation • Handling data • Algebra • Graphs • Geometry and trigonometry	**Chapter 6: Mathematical requirements and exemplifications** • Arithmetic and numerical computation • Handling data • Algebra • Graphs • Geometry and trigonometry

Assessment

OCR Physics B	*Eduqas physics*
AS Paper 1: Foundations of Physics, Modules 1-4 50% of AS Written paper 1hr 30 minutes 70 marks Section A multiple choice questions, 20 marks. Section B Structured questions, covering problem solving, calculations, practical and theory, 50 marks.	**AS Paper 1: Motion, energy & matter** 50% of qualification Written paper 1hr 30 minutes 75 marks A mix of short answer and extended answer structured questions with some set in a practical context.
AS Paper 2: Physics in Depth, Modules 1-4 50% of AS Written paper 1hr 30 minutes 70 marks Short structured questions and extended response questions covering problem solving, calculations, practical and theory.	**AS Paper 2: Electricity and light** 50% of qualification Written paper 1 hr 30 minutes 75 marks A mix of short answer and extended answer structured questions with some set in a practical context.
A Level Paper 1: Fundamentals of physics 41% of A level Written paper 2 hours 15 minutes 110 marks Section A multiple choice questions, 30 marks. Section B Structured questions covering theory and practical skills.	**A Level Paper 1: Newtonian Physics** 31.25% of qualification Written paper 2 hours 15 minutes 100 marks Section A: 80 marks short and extended answer questions with some set in a practical context. Section B: 20 marks one comprehension question

OCR Physics B	*Eduqas physics*
A Level Paper 2: Scientific literacy in physics 37% of A level Written paper 2 hours 15 minutes 100 marks Structured questions and extended response questions covering theory and practical skills. The paper includes questions on an Advance Notice article for candidates to apply their knowledge to new and exciting contexts in Physics	**A Level Paper 2: Electricity and the universe** 31.25% of qualification Written paper 2 hours 100 marks A mix of short and extended answer questions with some set in a practical context.
A Level Paper 3: Practical skills in physics 22% of A level Written paper 1 hour 30 minutes 60 marks Structured questions, problem solving, calculations, and extended response questions with a focus on the assessment of theory and practical skills within practical contexts	**A Level Paper 3: Light, Nuclei and Options** 37.5% of qualification Written paper 2 hours 15 minutes 120 marks Section A: 100 marks A mix of short answer and extended answer questions with some set in a practical context. Section B: 20 marks - choice of 1 out of 4 options: Alternating Currents, Medical Physics, The Physics of Sports, Energy and the Environment.

Want to switch to OCR?

If you're an OCR-approved centre, all you need to do is download the specification and start teaching.

Your exams officer can complete an intention to teach form which enables us to provide appropriate support to them. When you're ready to enter your students, you just need to speak to your exams officer to:

1. Make estimated entries by 10 October so we can send you any early release materials, prepare the question papers and ensure we've got enough examiners.
2. Make final entries by 21 February

If you are not already an OCR-approved centre please refer your exams officer to the centre approval section of our admin guide.

Practical Endorsement Administration (A Level only)

The requirements for the practical endorsement have been set by the Department for Education and Ofqual working with all awarding bodies to ensure a common approach.

Just as when following the Eduqas A Level Physics qualification, your A Level students studying OCR Physics B will need to demonstrate to you, their teacher(s), that they are consistently and routinely competent in each of the skills and techniques defined for A Level Physicists.

You will need to:

- Keep records of carrying out practical activities as well as your assessment of competence of each of your students in each of these skills and techniques. This can be done, if you wish, using our OCR tracker spreadsheet, available in both fixed format and new flexible format, editable version.
- Designate a 'Lead Teacher' who will need to make sure that they have completed the online Lead Teacher training.
- Email us at science@ocr.org.uk to let us know you've started teaching the qualification. This will make sure we have up-to-date information on your centre for planning monitoring visits. When a monitoring visit takes place at your centre for Physics it will be carried out by an OCR-appointed monitor applying the criteria agreed across all awarding organisations. Up-to-date details on the monitoring process are available on the Positive about practical page.

Students need to keep records of their practical work, which can be done in whatever format best suits you and your students, be it a lab book, a loose leaf folder or an electronic record.

Help and guidance are available from our Positive about practical page.

Next steps

1. Familiarise yourself with the specification, sample assessment materials and teaching resources on the OCR Physics B qualification page of the OCR website.

2. Browse the online delivery guides for teaching ideas and our scheme of work to prepare for teaching.

3. Ask your exams officer to provide access to our secure resources on Teach Cambridge, or sign-up for a free trial – allows you to access the latest past/practice papers and use our results analysis service, Active Results.

4. Sign up to receive subject updates by email.

5. Sign up to attend a training event or take part in webinars on specific topics running throughout the year and or our Q&A webinar sessions every half term.

6. Attend one of our free teacher network events that are run online every term. These are hosted at the end of the school day in a school or college near you, with teachers sharing best practice and subject advisors on hand to lead discussion and answer questions.

7. Follow us on Twitter (@ocr_science) where you can have discussions with other teachers and OCR Subject Advisors, and where new resources are developed and posted first.

