AS and A Level

Physics B (Advancing Physics)

Switching to OCR from Edexcel

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. These can be found in Teach Cambridge.
- 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 teacher 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.

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

OCR Physics B	*Edexcel Salters Horners 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, apparatus and techniques as mandated by the DfE, are listed in appendices5b and 5c of the Edexcel specification. The Edexcel model of the Practical Endorsement contains 16 core practical activities.
Module 2: Fundamental data analysis • Physical quantities • S.I. units • Measurements and uncertainties • Graphical representation of data	1. know and understand the distinction between base and derived quantities and their SI units 3. be able to estimate values for physical quantities and use their estimate to solve problems
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 • Force and extension • Hooke's law	31. current as flow of charged particles 32. $V = W/Q$ 33. $R = V/I$ and Ohm's law 34. conservation of charge 35. conservation of energy 36. resistors in series and parallel 37. electrical power calculations 38. current – p.d. graphs 39 & 41. Resistivity 42, 43 & 44. potential divider 45. e.m.f. and internal resistance 47. resistance and temperature 48. LDR 49. [density] 50. [upthrust] 51. [Stokes' law, viscosity and flow]

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	53. Hooke's law 54. Young modulus 55. force-extension graphs 56. stress-strain graphs 58. elastic strain energy 75. focal length 76. ray diagrams 77. power of a lens 78. lenses in combination 79, 80 & 81. Lens terminology and formulae 82. polarisation 88. [waves can be transmitted or reflected at an interface]
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	9. be able to use the equations for uniformly accelerated motion in one dimension 10. be able to draw and interpret displacement-time, velocity-time and acceleration-time graphs and 11. Physical quantities derived from these. 12. understand scalar and vector quantities, 13. be able to resolve a vector 14. be able to find the resultant of two coplanar vectors 15. projectiles 16. [free body diagrams] 17 & 20. Newton's laws of motion 18. gravitational field strength and weight 21 & 22. Momentum 23. [moment] 24. [centre of gravity] 25. work 26. kinetic energy 28. conservation of energy

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	29. power 30. [efficiency] 59. wave terminology 60. wave equation 61. [longitudinal wave] 62. transverse wave 63 & 67 stationary wave 65. wavefront, coherence, superposition, interference, phase 66. phase difference/path difference 68. [speed of wave on a string] 70. [intensity of radiation 71 & 74. refractive index 72. [critical angle] 73. [total internal reflection] 83. diffraction 84. diffraction grating 86 & 87 de Broglie and the wave nature of the electron 90. e/m radiation in terms of wave and photon model 91. E = hf 92. photo-electric effect 93. threshold frequency and work function 95. photoelectric effect as evidence of quantisation 96. [atomic line spectra] 97. Impulse 99. conservation of linear momentum 101. elastic and inelastic collisions 102. [kinetic energy of non-relativistic particle]

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Module 5: Rise and fall of the clockwork universe • *Creating models* • Capacitance • 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 • 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] • 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	89. pulse-echo techniques 103. angular displacement and the radian 104. angular velocity 105. centripetal acceleration 106 & 107. centripetal force 116. capacitance 117. energy stored on a capacitor 118 & 120. charging and discharging 144. specific heat capacity and latent heat 147. internal energy 148. absolute zero 149 & 150. kinetic theory model 152 $1/2mc^2=3/2\ kT$ 153. [black body radiation] 154. [Stefan-Boltzmann law] 155 [Wien's law] 156. [luminosity equation] 157 & 158. astronomical distances 159 & 160. [Hertzsprung-Russell diagrams] 161. Doppler effect 162. redshift 163. Hubble constant and dark matter 173. half-life and activity of radioactive materials 175. gravitational field strength 176. Newton's law of universal gravitation 177. [gravitational field for a point mass] 178. comparison of field types 180. orbital motion 181. conditions for simple harmonic motion 182. equations for S.H.M. 183. [equations for simple harmonic oscillator]

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	184 & 185 graphs of S.H.M. 186. resonance 188. conservation of energy in S.H.M 189. free and forced oscillations 190. resonance 191. damping
Module 6: Field and particle physics • Electromagnetism • Transformer action • Action of a dynamo • Electromagnetic forces • Magnetic circuits • Magnetic field strength • Flux • Charge and field • 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	94 the electronvolt 108. field theory 109 $E=F/Q$ 110. distinguish between field and potential 110. Coulomb's law 111. electric field 113. $E=V/d$ 114. electric potential 115. field diagrams 121. magnetic flux density and linkage 122. $F=Bqv$ 123. $F = BIl\sin\theta$ 124 & 125. induced e.m.f. 126. Lenz's law 127. Faraday's law 128 & 129. [a.c. terminology and values] 130. nucleon and proton number 131. large angle scattering 132. [thermionic emission] 133. particle accelerators [linac and cyclotron] 134 charged particles in a magnetic field 135. conservation of charge, energy and momentum 136. understand why high energies are required to investigate the structure of nucleons

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	137. $\Delta E = c^2 \Delta m$ 138. eV, MeV, GeV, MeV/c^2, GeV/c^2 139. situations where relativistic increase is significant 140. quark-lepton model 141. anti-particles 142. laws of conservation of charge, baryon number and lepton number 143. particle equations 164. nuclear binding energy and mass deficit 165. [atomic mass unit] 166 & 167. nuclear fission and fusion 168. background radiation 169. penetrating and ionising by nuclear radiations 170. nuclear equations 172. random nature of radioactive decay
Appendix 5f: Mathematical requirements • Arithmetic and numerical computation • Handling data • Algebra • Graphs • Geometry and trigonometry	**Appendix 6: Mathematical skills and exemplifications** • C.0 Arithmetic and numerical computation • C.1 Handling data • C.2 Algebra • C.3 Graphs • C.4 Geometry and trigonometry

Assessment

OCR Physics B	*Edexcel Salters Horners 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: Core Physics I** 50% of qualification Written paper 1hr 30 minutes 80 marks • The paper may include multiple-choice, short open, open-response, calculation and extended writing questions. • Content defined as: ● Working as a Physicist ● Higher, Faster, Stronger ● Technology in Space (except items 70 and 92–95) ● Digging up the Past (except items 83–87)
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: Core Physics II** 50% of qualification Written paper 1 hr 30 minutes 80 marks • The paper may include multiple-choice, short open, open-response, calculation and extended writing questions. • Content defined as: ● Working as a Physicist ● The Sound of Music ● Good Enough to Eat ● Technology in Space (only items 70 and 92–95) ● Digging up the Past (only items 83–87) ● Spare-part Surgery (SUR)
A Level Paper 1: Fundamentals of physics 41% of A level Written paper 2 hours 15 minutes 110 marks	**A Level Paper 1: Advanced Physics I** 30% of qualification Written paper 1 hours 45 minutes 90 marks • Questions are broken down into a number of parts. • The paper may include multiple-choice, short open, open-response, calculations and

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Section A multiple choice questions, 30 marks. Section B Structured questions covering theory and practical skills.	extended writing questions. • Content defined as: • Working as a Physicist ● Higher, Faster, Stronger ● Technology in Space(except items 70 and 92–95) ● Digging up the Past (except items 83–87) ● Transport on Track ● The Medium is the Message ● Probing the Heart of Matter (PRO)
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: Advanced Physics II** 30% of qualification Written paper 1 hour 45 minutes hours 90 marks • Questions are broken down into a number of parts. • The paper may include multiple-choice, short open, open-response, calculations and extended writing questions. • Content defined as: • Working as a Physicist ● The Sound of Music ● Good Enough to Eat ● Technology in Space (only items 70 and 92–95) ● Digging up the Past (only items 83–87) ● Spare-Part Surgery ● Build or Bust? ● Reach for the Stars

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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: General and practical principles in physics** 40% of qualification Written paper 2 hours 30 minutes 120 marks ● Questions in this paper may draw on any of the topics in this specification. ● The paper will include synoptic questions that may draw on two or more different topics. ● The paper will include questions that assess conceptual and theoretical understanding of experimental methods (indirect practical skills) that will draw on students' experiences of the core practicals.

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 expression of interest 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 Edexcel 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.

