Hello and welcome

With our new AS and A level Physics qualifications, we’ve created courses that will engage and inspire the scientists of the future. We’ve worked with all parts of the science education community and used the opportunity of curriculum change to design courses that will encourage students to develop as scientists, and give them the skills to succeed in their chosen pathway. You can teach this qualification using a concept-led approach, or a context-led approach using the Salters Horners (SHAP) materials.

This guide gives you an overview of our AS and A level Physics qualifications. You can also learn more about the comprehensive help and support we are planning for you.

Take a look through our specification guide to find out more about:

- Edexcel AS and A level Physics ................................... 3
- The key features of Edexcel AS and A level Physics ...... 4–5
- How assessments work for AS and A level .................. 6
- AS assessment at-a-glance ........................................... 7
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We’re here to help you understand the AS and A level Physics so you’re ready to teach. Whether it is on the phone, by email, or in person at a training event, we’ll support you as you plan and teach the qualification.

We look forward to meeting you at our New to Edexcel events and answering any questions you might have about our new specifications.

Edexcel AS and A level Physics: what should you expect?

- AS and A level Physics are linear qualifications; assessments for each qualification take place at the end of each course.
- AS is a stand-alone qualification, meaning it will not form part of students’ A level grades. However, the content of the AS is included in the A level content, to allow the two qualifications to be co-taught.
- Questions assessing students’ use of mathematical skills will make up 40% of the exam papers.
- There are no coursework elements in AS and A level Physics. Instead, students are required to complete a number of core practicals which cover specific skills and techniques.

Practical skills are assessed in two ways:

- investigative skills, knowledge and understanding of some core practicals will be assessed in AS and A level exams and contribute to students’ overall grades.
- teacher assessment of students’ competency when completing practical work will count towards the separate Practical Endorsement at A level (see page 9 for more details).

Some of your students will be hoping to study physics or a related subject at university. Wishing to encourage this, we’ve worked with Higher Education institutions to ensure that our qualifications provide the right preparation for further study.
The key features of Edexcel AS and A level Physics

Straightforward and balanced specifications

- The AS and A level specifications are fully co-teachable, to give you flexibility with your teaching arrangements.
- You can teach AS and A level Physics using a concept-led approach, or a context-led approach using the Salters Horners (SHAP) materials, as best suits your students, (see page 5 for more details).
- Specification content is arranged into distinct topics and linked to clear descriptive statements, so you and your students know the depth of understanding that’s expected.
- Topics cover fundamental areas of physics, such as forces, waves and electricity; and later topics build on what has come before to give students a broad knowledge base for assessment, and for progression to further study and the workplace.
- Some aspects, such as mechanical properties of materials, have been removed to allow for the introduction of aspects of the subject more relevant for progression, such as optics.
- Support is available for each key aspect of the specifications, from transition units helping students make the move from GCSE to AS and A level study, to guidance on integrating mathematical and investigative skills into lessons.

Inspiriting students to think as scientists

Practical work is at the heart of the qualifications

- Core practicals have been designed to meet assessment requirements and to link directly to the specifications, so your students can develop their practical skills in a context they’re familiar with.
- Our choices of core practicals are based on what you’ve told us work well in the classroom with experiments you and your students enjoy.
- The range of core practicals enables students to build their confidence by giving them more than one opportunity to master techniques. It also means if your students miss a lesson, they’ll have a chance to try the technique again.
- You know your students best, so we’ve added extra flexibility around practical work, so you can substitute a core practical with one of your own, or do more, if you think they develop the same skills and techniques.
- We’ve created tools and resources to help you and your students with each aspect of practical work – from planning the experiments and selecting apparatus to honing investigative skills.

Enabling students to work as scientists

Assessment you and your students can have confidence in

- Our exam questions include clear command words to ensure students understand the knowledge and skills they’re being asked to demonstrate.
- There are a range of question styles to test students’ breadth of knowledge and depth of understanding, and reward the different strengths students have.
- Our question papers are ramped, with the level of challenge increasing throughout the exam. Every question, where possible, will begin with a more accessible question part that all students can engage with.
- The assessment of students’ scientific investigative skills in question papers are based on approaches we already know work well, from experience of our international exams.
- There are plenty of tools and support available to help you and your students with exam preparation. In addition to student exemplars with examiner commentaries and extra assessment materials, there’s a range of free online services to help you and your students test, track and understand their progress and performance.

Supporting students to develop as scientists

Support that’s timely and tailored to your needs

- It’s specialist: your Subject Advisor, Irine Mühuddin, will be on-hand to answer any queries you may have; our Science Team also regularly send email updates so you know the latest news.
- It’s local: training events and network events regularly take place near you.
- It’s driven by you: we’ll continue to develop our support based on what you tell us you need.

Guiding you and your students through the AS and A level courses

Teaching approaches to suit you and your students

- The concept-led approach to AS and A level Physics begins with a study of the laws, theories and models of physics, and finishes with an exploration of their practical applications.
- The Salters Horners context-led approach begins with the consideration of situations and applications that draw on one or more areas of physics, and then moves on to the underlying physics laws, theories and models.
- You can mix and match these approaches as you wish to best engage your students. Whilst there are two flexible teaching and learning approaches, the same content is taught to all students and tested through only one set of question papers for each of the AS and A level qualifications.
How assessments work for AS and A level

With AS being a stand-alone qualification, it does not form part of students’ A level grades. As such, students can choose to take AS and A level exams to receive grades for both qualifications, or just the A level papers at the end of Year 13 to gain an A level grade.

To achieve an AS qualification, students need to take:

AS Paper 1 + AS Paper 2 = AS grade

Note: AS exam papers will include questions on some of the core practicals in the AS specification.

To achieve an A level qualification, students need to take:

A level Paper 1 + A level Paper 2 + A level Paper 3 = A level grade

Note: A level exam papers will include questions on some of the core practicals in the specification. All content in the AS specification is included in the A level specification.

Teacher assessment of students’ practical competency = Practical Endorsement (reported on A level certificate)

Note: see page 9 for more details.

AS assessment at a glance

- The papers consist of two sections: A and B. Section A will assess the topics listed for each paper. Section B can include questions involving data analysis, or set within an experimental context, and will draw on topics from the whole specification.
- You can mix and match the concept-led and Salters Horners context-led approaches during teaching because students will all sit the same set of question papers at AS.
- Both exam papers will also test students’ knowledge and understanding of experimental methods, based on the core practicals in the specification.
- Question types: multiple choice, short and long answer questions, and calculations.
- Questions assessing students’ use of mathematical skills will make up 40% of the exam papers.

AS Paper 1 – Core Physics I

<table>
<thead>
<tr>
<th>Concept-led approach</th>
<th>Salters Horners context-led approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working as a Physicist</td>
<td>Working as a Physicist</td>
</tr>
<tr>
<td>Mechanics</td>
<td>Higher, Faster, Stronger (HFS)</td>
</tr>
<tr>
<td>Electric Circuits</td>
<td>Technology in Space (SPC) (except items 92–96)</td>
</tr>
<tr>
<td></td>
<td>Digging up the Past (DIG) (except items 84–86)</td>
</tr>
</tbody>
</table>

80 marks  50% weighting  1 hour 30 minutes

AS Paper 2 – Core Physics II

<table>
<thead>
<tr>
<th>Concept-led approach</th>
<th>Salters Horners context-led approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working as a Physicist</td>
<td>Working as a Physicist</td>
</tr>
<tr>
<td>Materials</td>
<td>The Sound of Music (MUS)</td>
</tr>
<tr>
<td>Waves and the Particle Nature of Light</td>
<td>Good Enough to Eat (EAT)</td>
</tr>
<tr>
<td></td>
<td>Technology in Space (SPC) (only items 92–96)</td>
</tr>
<tr>
<td></td>
<td>Digging up the Past (DIG) (only items 84–86)</td>
</tr>
<tr>
<td></td>
<td>Spare-Part Surgery (SUR)</td>
</tr>
</tbody>
</table>

80 marks  50% weighting  1 hour 30 minutes

Note: All AS exams must be taken in the same examination series. Results from AS examinations will count towards the AS grade but do not form part of the A level grade.

Learn more at quals.pearson.com/edexcelasandalevel/physics/exammaterials
A level assessment at a glance

- Exam questions will test students’ knowledge and understanding of the relevant specification topics.
- You can mix and match the concept-led and Salters Horners context-led approaches during teaching because students will all sit the same set of question papers at A level.
- Paper 3 will also test students’ knowledge and understanding of experimental methods, based on the core practicals in the specification.
- Question types: multiple choice, short and long answer questions, and calculations.
- Questions assessing students’ use of mathematical skills will make up 40% of the exam papers.

<table>
<thead>
<tr>
<th>A level Paper 1 – Advanced Physics I</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ 90 marks</td>
</tr>
<tr>
<td>□ 30% weighting</td>
</tr>
<tr>
<td>1 hour 45 minutes</td>
</tr>
<tr>
<td><strong>Concept-led approach</strong></td>
</tr>
<tr>
<td>• Working as a Physicist</td>
</tr>
<tr>
<td>• Mechanics</td>
</tr>
<tr>
<td>• Electric Circuits</td>
</tr>
<tr>
<td>• Further Mechanics</td>
</tr>
<tr>
<td>• Electric and Magnetic Fields</td>
</tr>
<tr>
<td>• Nuclear and Particle Physics</td>
</tr>
<tr>
<td><strong>Salters Horners context-led approach</strong></td>
</tr>
<tr>
<td>• Working as a Physicist</td>
</tr>
<tr>
<td>• Higher, Faster, Stronger (HFS)</td>
</tr>
<tr>
<td>• Technology in Space (SPC)</td>
</tr>
<tr>
<td>• Digging up the Past (DIG)</td>
</tr>
<tr>
<td>• Transport on Track (TRA)</td>
</tr>
<tr>
<td>• The Medium is the Message (MDM)</td>
</tr>
<tr>
<td>• Probing the Heart of Matter (POR)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A level Paper 2 – Advanced Physics II</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ 90 marks</td>
</tr>
<tr>
<td>□ 30% weighting</td>
</tr>
<tr>
<td>1 hour 45 minutes</td>
</tr>
<tr>
<td><strong>Concept-led approach</strong></td>
</tr>
<tr>
<td>• Working as a Physicist</td>
</tr>
<tr>
<td>• Materials</td>
</tr>
<tr>
<td>• Waves and the Particle Nature of Light</td>
</tr>
<tr>
<td>• Thermodynamics</td>
</tr>
<tr>
<td>• Space</td>
</tr>
<tr>
<td>• Nuclear Radiation</td>
</tr>
<tr>
<td>• Gravitational Fields</td>
</tr>
<tr>
<td>• Oscillations</td>
</tr>
<tr>
<td><strong>Salters Horners context-led approach</strong></td>
</tr>
<tr>
<td>• Working as a Physicist</td>
</tr>
<tr>
<td>• The Sound of Music (MUS)</td>
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<tr>
<td>• Good Enough to Eat (EAT)</td>
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<tr>
<td>• Technology in Space (SPC)</td>
</tr>
<tr>
<td>• Digging up the Past (DIG)</td>
</tr>
<tr>
<td>• Spare-Part Surgery (SUR)</td>
</tr>
<tr>
<td>• Build or Bust? (BLD)</td>
</tr>
<tr>
<td>• Reach for the Stars (STA)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A level Paper 3 – General and Practical Principles in Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ 120 marks</td>
</tr>
<tr>
<td>□ 40% weighting</td>
</tr>
<tr>
<td>2 hours 30 minutes</td>
</tr>
<tr>
<td>• All topics across the full A level specification.</td>
</tr>
<tr>
<td>• Half of the paper will also focus on testing students’ knowledge and understanding of practical skills and techniques.</td>
</tr>
</tbody>
</table>

Practical Endorsement

As you’ll see from the assessment models, exam papers will feature questions allowing students to demonstrate investigative skills in the context of the core practicals.

Students’ skills and technical competency when completing practical work will be assessed by teachers. This will form the basis for the award of a Practical Endorsement at A level. This is separate to the A level grade and, if awarded, will be reported as a ‘Pass’ on A level certificates for students who achieve it.

Looking for more information about AS and A level exams?
Visit qualis.pearson.com/edexcelasandalevel/physics/exammaterials
16 The diagram shows the inside of an electric toothbrush and a charger.

The charger contains a coil wrapped around an iron core. The coil is plugged into the mains a.c. supply.

The toothbrush also contains a coil that sits around the iron core when the toothbrush is placed on the charger to recharge the battery of the toothbrush.

(a) Describe how the charger is able to charge the low-voltage battery.

The changing flux linkage in the coil of the toothbrush induces an emf according to Faraday’s law:

\[ E = -N \frac{d\phi}{dt} \]

The supply creates a changing magnetic field in the iron core:

- Rate of change of flux in toothbrush coil is equal to rate of change of flux in charger coil (for an ideal transformer)
- The changing flux linkage in the coil of the toothbrush induces an emf according to Faraday’s law
- \( E = -N \frac{d\phi}{dt} \), so to step down the emf there must be fewer turns in the toothbrush coil
- The emf in the toothbrush coil must be larger than in the toothbrush battery
- A diode is included, so the battery is not discharged by the alternating emf

(b) This question assesses a student’s ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning. Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning.

Indicative content

- The changing flux linkage in the coil of the toothbrush induces an emf according to Faraday’s law
- \( E = -N \frac{d\phi}{dt} \), so to step down the emf there must be fewer turns in the toothbrush coil
- The emf in the toothbrush coil must be larger than in the toothbrush battery
- A diode is included, so the battery is not discharged by the alternating emf

The following table shows how the marks should be awarded for indicative content:

<table>
<thead>
<tr>
<th>Number of indicative marking points seen in answer</th>
<th>Number of marks awarded for indicative marking points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>5 + 1</td>
<td>3</td>
</tr>
<tr>
<td>3 + 2</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The following table shows how the marks should be awarded for structure and lines of reasoning:

<table>
<thead>
<tr>
<th>Number of marks awarded for structure of answer and sustained line of reasoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answer shows a coherent and logical structure with linkages and fully-sustained lines of reasoning</td>
</tr>
<tr>
<td>Answer is partially structured with some linkages and lines of reasoning</td>
</tr>
<tr>
<td>Answer has no linkages between points and is unstructured</td>
</tr>
</tbody>
</table>

Guidance on how mark scheme should be applied

An answer with five indicative marking points which is partially structured with some linkages and lines of reasoning scores 4 marks (3 marks for indicative content and 1 mark for partial structure and some linkages and lines of reasoning).

The remaining two marks are awarded depending on how well the answer is structured and forms a logical whole.

Learn more at qualities.pearson.com/edexelasandalevel/physics/SAMS
14 (a) One type of optical fibre is made from a glass core surrounded by a glass cladding of lower refractive index. The light ray passes along the fibre by total internal reflection. The diagram shows a light ray incident on one end of the fibre.

A light ray enters the core with an angle of incidence \( \theta \) and the angle of refraction is 20°. Show that the light ray will be totally internally reflected when it meets the boundary between the core and the cladding.

\[
\sin \theta = \frac{1}{n}
\]

\[
\sin 20° = \frac{1}{1.44}
\]

(4)

(b) Magnifying ‘bug boxes’ are used to observe small insects. One type consists of a clear plastic pot with a snap-on lid.

The lid acts as a converging lens of focal length 8.5 cm. An insect inside the box appears to be 3.5 times bigger when viewed through the lid.

(i) Draw a ray diagram to show the formation of the image by the lens when used in this way.

(ii) Calculate the distance of the insect from the lid.

(3)

Data needed in a question is provided for students.

‘Show that’ questions require students to prove that a statement or calculated value is correct.

‘Calculate’ questions are common in exam papers. Students will need to provide units for their answer.

Although this is an A level question, this part of the question tests knowledge gained by students in the first (AS) year of the course.

Learn more at quals.pearson.com/edexcelasandalevel/physics/SAMS
This question is, essentially, a planning exercise: but also tests the ability of candidates to design an electrical circuit.

This question assesses aspects of practical skills.

This question again tests practical skills: the ability of students to show how experimental results can be used to come to a conclusion.

‘Analyse’ helps students to see that they must use information from the graph.

This instruction makes it clear to students that they cannot score full marks with a written explanation only.

Learn more at quals.pearson.com/edexcelasandalevel/physics/SAMS
How we’re supporting you

Based on what you’ve told us, we’ve looked in depth at how we can give you the support you need to plan and implement Edexcel AS and A level Physics specifications successfully. We’ve thought about how we can help you and your students overcome those critical barriers to progress in science. Whether it’s getting started with the qualifications, helping students to master fundamental mathematical and practical skills, or getting an answer to a query, we’ll be there to help with a wide range of free support.

Designing your curriculum

✦ Getting Started Guide – summarising the changes to AS and A level Physics from 2015, our assessment models and specification content.
✦ Mapping documents showing changes to the AS and A level specifications, so you know the content that’s been removed, added, or changed in emphasis – all at a glance.
✦ Editable schemes of work and course planners for teaching AS and A level courses separately or together, to account for the different teaching approaches your centre may choose.

Preparing for practical work

✦ A handy list of core practicals enabling you to get the information you need from the specifications quickly and easily.
✦ Mapping documents matching the core practicals to the essential skills appendix in our specifications.
✦ Teacher, technician and student worksheets which detail the procedure, apparatus and safety instructions for each core practical.
✦ Teacher materials for developing investigative skills, helping you integrate practical work and the teaching of investigative skills into your lessons.
✦ Student materials for developing investigative skills encouraging a deeper understanding of the underlying science behind practicals, guiding students to think independently as scientists and helping their preparations for AS and A level assessment.

Understanding the new standard

✦ A bank of exemplar student work and examiner commentaries, available before first teaching to help you and your students understand the standard that’s expected.
✦ Additional sample assessment materials to help you familiarise yourself with the new assessment styles and to use with your students to help assess their progress throughout the course.
✦ Enhanced examiner reports and feedback training events* after each exam series.

Teaching and learning

✦ Transition units – written by experienced teachers, these classroom materials are designed for those initial AS lessons, to help your students develop the essential skills they need to transition from GCSE to A level study successfully.
✦ Topic delivery guides to refresh your knowledge on some of the AS and A level content, and offer teaching suggestions.
✦ Teacher and student materials for developing maths skills to help you and your students understand the mathematical requirements of the AS and A level specifications and give opportunities to practise applying these essential skills.

Tracking and progression

✦ ResultsPlus A free online service giving detailed, instant feedback on your students’ exam performance.
✦ Free secure mock papers that will be released when you need them.
✦Mocks Analysis – a specific component of our free ResultsPlus service that allows you to use past papers as mocks and receive the same detailed analysis of students’ exam performance.
✦ examWizard A free, easy-to-use exam preparation tool containing a bank of past questions to help you create your own mock exams and tests.

*There may be a charge for these events.
Our paid-for resources are written specifically to help you teach Edexcel A level Physics and to develop successful independent scientists able to progress from GCSE and to further study at Higher Education and beyond.

Developing a deep subject understanding: help your students understand the bigger picture and recognise connections across topics.

Removing the barriers to learning: understanding core conceptual knowledge and acquiring key scientific skills are essential to removing barriers to learning and developing confident and independent learners.

Synoptic learning and exam preparation: our Edexcel A level Physics course approaches synoptic learning, consolidation and revision.

Endorsed resources for Edexcel AS and A level Physics

We’re committed to helping teachers deliver our new AS and A level Physics and students to achieve their full potential. To do this, we aim for our qualifications to be supported by a wide range of high-quality resources, produced by a range of publishers, including ourselves.

We work with a range of publishers who have their resources endorsed:

- Hodder Education: Edexcel A level Physics Year 1 and Year 2
- Hodder Education: Edexcel A level/AS Physics Student Guide 1 and Guide 2
- Pearson: Edexcel A level Physics 1 and 2
- Pumpkin Interactive

Published resources

It is not necessary to purchase endorsed resources, including those published by Pearson, to deliver our qualifications.

Salters Horners Advanced Physics

Developed in conjunction with leading subject experts from the University of York Science Education Group (UYSEG), in collaboration with schools, educational specialists and scientists from universities and industry, the new 2015 editions of Salters Horners Advanced Physics (SHAP) continue to offer a context-led approach to A level Physics designed to stimulate scientific interest and enquiry set in real-life contexts.

Drawing on years of experience and successful use in centres around the country, these new editions of the tried and trusted 2008 Salters Horners resources offer exciting new features throughout, helping to develop successful independent learners able to progress from GCSE and to further study at Higher Education and beyond.

Find out more at pearsonschoolsandfcolleges.co.uk/secondary/Science/16Physics/edexcel-a-level-science-2015/Edexcel_AS_and_A_level_Science.aspx
Get in touch!

Supporting you for all your science qualification needs

support.pearson.com/uk/s/qualification-contactus