

AS and A level **Chemistry**

Your guide to our qualifications



Hello and welcome

Our **AS and A level Chemistry qualifications** will engage and inspire the scientists of the future. We've worked with all parts of the science education community to design courses that encourage students to develop as scientists, and give them the skills to succeed in their chosen pathway.

This guide gives you an **overview** of our new AS and A level Chemistry qualifications. You can also learn more about the comprehensive help and support we have for you.

Take a look through this guide to find out more about:

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We're here to help you to understand our AS and A level Chemistry, so you're ready to teach the new specifications. Whether it's on the phone, by email, or in person at a training event, we'll support you as you plan and teach these qualifications.

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

The new AS and A level Chemistry

- ◆ AS and A level Chemistry are **linear** qualifications; assessments for each qualification will now 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 **20%** of the exam papers.
- ◆ There is **no coursework** elements in AS and A level Chemistry. 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, and knowledge and understanding of some core practicals are 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 chemistry 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.

You can learn more at
<http://quals.pearson.com/edexcelasandalevel/chemistry>.

Our Edexcel AS and A level Chemistry qualifications

Straightforward and balanced specifications

- ◆ AS and A level specifications are **fully co-teachable**, to give you flexibility with your teaching arrangements.
- ◆ 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 not only cover **physical, organic and inorganic chemistry** and fundamental subject elements, but also build on each other to give students a broad knowledge base for assessment, and for progression to further study and the workplace.
- ◆ **New content** has been introduced into the specifications to keep them up to date. We've also removed some topics, such as green chemistry and some aspects of transition element chemistry, to allow for the introduction of more relevant aspects of the subject, such as ^{13}C nmr and organic synthesis.
- ◆ **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.



Inspiring students to *think* as scientists

Practical work is at the heart of the qualifications

- ◆ Core practicals have been designed to meet **assessment requirements** and 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 **works well** in classroom situations and the 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, begins with a more **accessible** question part that all students can engage with.
- ◆ The assessment of students' **scientific investigative skills** in question papers has been based on approaches we know work well already in 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 performance and progress.

Supporting students to *develop* as scientists

Support that's timely and tailored to your needs

- ◆ It's **specialist**: your Subject Advisor, Irine Muhiuddin, 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

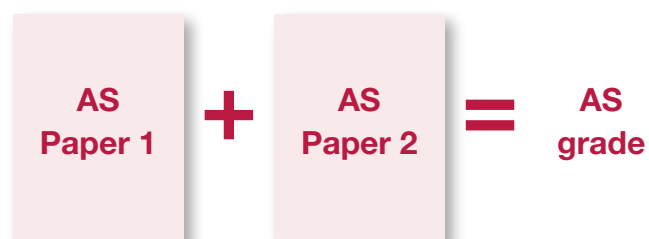
Discover more at
<http://quals.pearson.com/edexcelasandalevel/chemistry>.



How assessment works at AS and A level

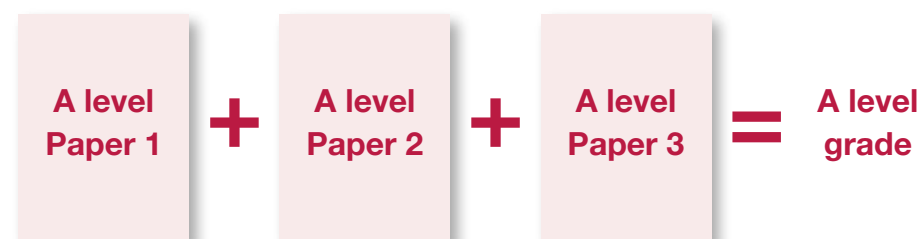
With AS being a stand-alone qualification it does not form part of students' A level grades. As such, students could choose to take AS and A level exams to receive grades for both qualifications, or just A level papers at the end of Year 13 to gain an A level grade. The qualification structure is the same for all AS and A level Sciences, regardless of exam board.

To achieve an AS qualification, students need to take:



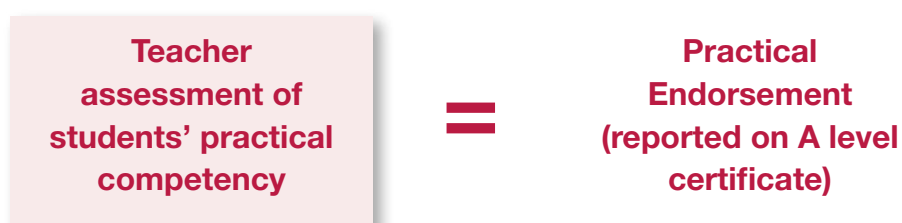
Note: AS exam papers will include questions on some of the **core practicals** in the AS specification.

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



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.

The Practical Endorsement (at A level only)



Note: See page 9 for more details.

AS assessment at a glance

- Exam questions will test students' knowledge and understanding of the relevant specification topics.
- Each paper will also assess students' knowledge and understanding of experimental methods, based on the core practicals in the specification.
- Question types: multiple choice, short and long answer questions (up to 6 marks), and calculations.
- Questions assessing students' use of mathematical skills will make up 20% of the exam papers.

AS Paper 1 – Core Inorganic and Physical Chemistry

✓ 80 marks	⚖️ 50% weighting	🕒 1 hour 30 minutes
• Topic 1: Atomic Structure and the Periodic Table	• Topic 4: Inorganic Chemistry and the Periodic Table	
• Topic 2: Bonding and Structure	• Topic 5: Formulae, Equations and Amounts of Substance	
• Topic 3: Redox I		

AS Paper 2 – Core Organic and Physical Chemistry

✓ 80 marks	⚖️ 50% weighting	🕒 1 hour 30 minutes
• Topic 2: Bonding and Structure	• Topic 7: Modern Analytical Techniques I	
• Topic 5: Formulae, Equations and Amounts of Substance	• Topic 8: Energetics I	
• Topic 6: Organic Chemistry I	• Topic 9: Kinetics I	
	• Topic 10: Equilibrium I	

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

Learn more at <http://quals.pearson.com/edexcelasandalevel/chemistry/exammaterials>.



A level assessment at a glance

- Exam questions will test students' knowledge and understanding of the relevant specification topics and experimental methods based on the core practicals in the specification.
- Paper 3 will also assess students' knowledge and understanding of experimental methods, based on the core practicals in the specification.
- Question types: multiple choice, short and long answer questions (up to 6 marks), and calculations.
- Questions assessing students' use of mathematical skills will make up 20% of the exam papers.

A level Paper 1 – Advanced Inorganic and Physical Chemistry

✓ 90 marks ⚖️ 30% weighting ⌚ 1 hour 45 minutes

- | | |
|---|----------------------------------|
| • Topic 1: Atomic Structure and the Periodic Table | • Topic 8: Energetics I |
| • Topic 2: Bonding and Structure | • Topic 10: Equilibrium I |
| • Topic 3: Redox I | • Topic 11: Equilibrium II |
| • Topic 4: Inorganic Chemistry and the Periodic Table | • Topic 12: Acid-base Equilibria |
| • Topic 5: Formulae, Equations and Amounts of Substance | • Topic 13: Energetics II |
| | • Topic 14: Redox II |
| | • Topic 15: Transition Metals |

A level Paper 2 – Advanced Organic and Physical Chemistry

✓ 90 marks ⚖️ 30% weighting ⌚ 1 hour 45 minutes

- | | |
|---|---|
| • Topic 2: Bonding and Structure | • Topic 9: Kinetics I |
| • Topic 3: Redox I | • Topic 16: Kinetics II |
| • Topic 5: Formulae, Equations and Amounts of Substance | • Topic 17: Organic Chemistry II |
| • Topic 6: Organic Chemistry I | • Topic 18: Organic Chemistry III |
| • Topic 7: Modern Analytical Techniques I | • Topic 19: Modern Analytical Techniques II |

A level Paper 3 – General and Practical Principles in Chemistry

✓ 120 marks ⚖️ 40% weighting ⌚ 2 hours 30 minutes

- All topics across the full A level specification.
- Half of the paper will focus on testing students' knowledge and understanding of practical skills and techniques.

Practical Endorsement

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

Students' skills and technical competency when completing practical work is **assessed by teachers**. This forms 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 <http://quals.pearson.com/edexcelasandalevel/chemistry/exammaterials>.

Sample Assessment Materials

This question comes from **A level Paper 1 – Advanced Inorganic and Physical Chemistry**.

Even though this question is towards the end of the A level paper, the first question part is designed to be **accessible** to the majority of students.

8 Acids can be classified as weak or strong acids.

(a) A mixture of concentrated sulfuric and nitric acids is used in the nitration of benzene.

The following equilibrium is set up:

$$\text{H}_2\text{SO}_4 + \text{HNO}_3 \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{HSO}_4^-$$

Which statement about this equilibrium is correct? (1)

- ☒ **A** HNO_3 and H_2NO_3^+ are a conjugate acid-base pair
- ☒ **B** the nitric acid acts as an acid
- ☒ **C** the nitric acid acts as an oxidising agent
- ☒ **D** the sulfuric acid acts as a dehydrating agent

(b) Sulfuric acid ionises in two stages.

Stage 1: $\text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{H}^+(\text{aq}) + \text{HSO}_4^-(\text{aq})$

Stage 2: $\text{HSO}_4^-(\text{aq}) \rightleftharpoons \text{H}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq})$

(i) Explain, with reference to the equations, why the HSO_4^- ion is classified as a weak acid. (2)

Our specification gives guidance on the **command words** used in our question papers.

For **'explain'**, the question requires that, 'an explanation requires a justification or exemplification of a point. The answer must contain some element of reasoning or justification.'

Typically, about **10%** of questions on question papers (except A level Paper 3) will be **multiple-choice questions**, with this format.

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This question is a calculation which assesses **mathematical skills** at the required level. Students should remember to show all the relevant steps in any calculation.

(ii) A $0.100 \text{ mol dm}^{-3}$ solution of sulfuric acid has a pH of 0.97.

Calculate the concentration of hydrogen ions in this solution. (1)

(c) Ethanoic acid, CH_3COOH , is a weak acid.

A student prepares 600 cm^3 of a buffer solution by mixing 400 cm^3 of $0.500 \text{ mol dm}^{-3}$ ethanoic acid solution with 200 cm^3 of $0.500 \text{ mol dm}^{-3}$ sodium ethanoate solution, CH_3COONa .

Calculate the pH of the buffer solution produced. (4)

(K_a for ethanoic acid = $1.74 \times 10^{-5} \text{ mol dm}^{-3}$)

The question is **ramped** towards a more demanding final part. Ramping of the whole paper, as well as within each question, encourages students to complete papers whilst still stretching the most able.

(Total for Question 8 = 8 marks)

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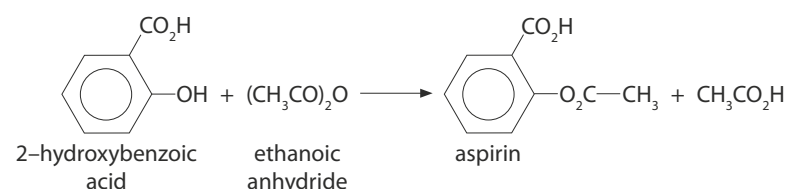
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Learn more at <http://quals.pearson.com/edexcelasandalevel/chemistry/SAMS>.

Sample Assessment Materials

This question comes from **A level Paper 3 – General and Practical Principles in Chemistry**.

- (b) The painkiller aspirin can be synthesised by the reaction between 2-hydroxybenzoic acid, which contains a hydroxyl group, and ethanoic anhydride, using concentrated phosphoric acid as a catalyst. The reagents are heated under reflux, then the excess ethanoic anhydride is removed by reacting it with water.



- (i) The percentage yield for this synthesis is 65%.
Calculate the mass of aspirin you would obtain using 2.0 g of 2-hydroxybenzoic acid.

(3)

Preparing aspirin is a **core practical** activity. As different methods may have been used, a method is outlined and an equation provided.

This calculation meets the requirements for assessing **mathematical skills** at the required level, as some rearrangement of the equation for percentage yield is needed.
A data booklet, with a Periodic Table, is provided for students to look up relative atomic masses.

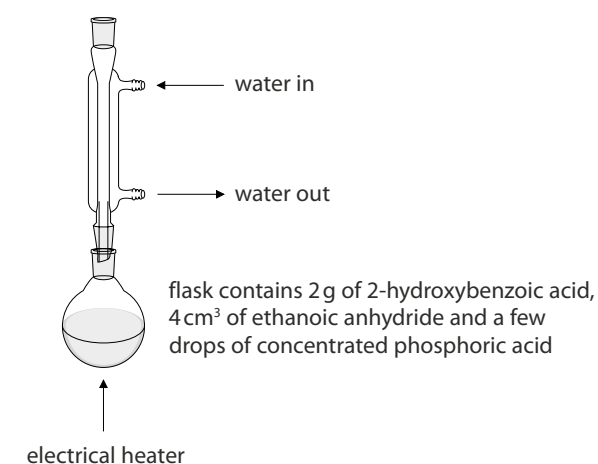
This question tests what students learned from the **core practical** activity. Note that the question does not ask for the recall of a method, which could have been learned from a book. Instead, it tests students' **practical experience** by asking them to identify areas where the setup is not ideal for the procedure.

- (ii) The diagram shows a proposed set-up of apparatus used for the stage of the synthesis that requires heating under reflux.

Identify **three** improvements that should be made to this set-up. Give a reason for each improvement made.

You may assume suitable clamps are used.

(6)



(Total for Question 6 = 15 marks)

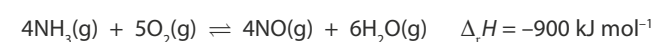
Learn more at <http://quals.pearson.com/edexcelasandalevel/chemistry/SAMS>.

Sample Assessment Materials

This question comes from **AS Paper 2 – Core Organic and Physical Chemistry**.

3 Ammonia is used in the manufacture of nitric acid.

The equation for one step in this manufacturing process is:



*(a) A manufacturer carries out this reaction at a temperature of 1200 K and a pressure of 10 atm. A scientist proposes that a temperature of 1000 K should be used at the same pressure.

Evaluate the effects of making this change on the rate and yield of this reaction.

(6)

The **asterisk** shows students that this question is an **'extended-writing question'**.

The front page of the question paper tells students that 'marks will be awarded for your ability to structure your answer logically showing the points that you make are related or follow on from each other where appropriate'.

For an **'evaluate'** question, students need to 'review information then bring it together to form a conclusion, drawing on relevant data or information'.



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 Chemistry specifications successfully. We've also 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 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 Chemistry 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 approach 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 new 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.

* There may be a charge for these events.

Learn more at <https://qualifications.pearson.com/en/qualifications/edexcel-a-levels/chemistry-2015/teaching-support.html>.



Tracking and progression

◆ ResultsPlus

A free, online service giving detailed instant feedback on your students' exam performance.

◆ **Secure mock papers** that will be released when you need them.

◆ **Mock Analysis** – a specific component of our **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.

Subject and local support when you need it

◆ **New to Edexcel events** to support you as you prepare to teach our courses.

◆ **Local network events** for the latest updates and providing opportunities to network and share best practice with fellow teachers.

◆ **Training events** throughout the academic year to help with delivering the AS and A level courses.*

◆ **Regular email updates** from our Science Team.

◆ **An expert Subject Advisor, Irine Muhiuddin, and specialist Science Team** available to answer your queries.

* There may be a charge for these events.

Learn more at: <http://quals.pearson.com/edexcelasandalevel/chemistry/teachingsupport>.

Published resources

Endorsed resources for Edexcel AS and A level Chemistry

We're committed to helping teachers deliver our AS and A level Chemistry and students to achieve their full potential. To do this, our qualifications 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 Chemistry Year 1 and Year 2
- ◆ Pearson: Edexcel AS/A level Chemistry Books 1 and 2

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

All information correct at time of going to print will be subject to change.

Published resources from Pearson

Our paid-for resources are written specifically to help you teach Edexcel A level Chemistry and to develop successful independent scientists able to progress from GCSE and to further study at HE 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 Chemistry course approaches synoptic learning, consolidation and revision from day one.



View all our resources for this qualification:

https://www.pearsonschoolsandfecolleges.co.uk/secondary/Science/16Chemistry/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

