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# AS AND A LEVEL
# CHEMISTRY A
# CHEMISTRY B (Salters)

Helping you make the most of the new approach –
a brief guide to our exciting new specifications
for first teaching in September 2015

ocr.org.uk/alevelchemistry

OCR
Oxford Cambridge and RSA

# WHAT THE REFORM MEANS FOR YOU

In February 2013 the former Secretary of State for Education, Michael Gove, asked Ofqual to implement changes leading to new A Levels. The Government has stated that the purpose of taking A Levels is primarily for entry to university and that some changes are needed so students are better prepared to start their university course.

We now know that, for first teaching in September 2015, we'll have reformed A Levels in named subjects including Chemistry, followed by more subjects for first teaching a year later.

We've been busy developing specifications to engage and enthuse you and your students, and we're working hard to create high-quality resources. This summary brochure introduces you to the new AS and A Level Chemistry qualifications and shows you how we can help make the transition easier.

# A LEVEL TIMELINE

**Sept 2015**

First **teaching** of new A Levels in Art and Design, Business, Computer Science, Economics, English Literature, English Language, English Language and Literature, History, Psychology, Science (Biology, Chemistry, Physics) and Sociology

**June 2016**

First **exams** for new AS qualifications in Art and Design, Business, Computer Science, Economics, English Literature, English Language, English Language and Literature, History, Psychology, Science (Biology, Chemistry, Physics) and Sociology

**Sept 2016**

First **teaching** of new A Levels in Ancient Languages, Dance, Drama, Geography, Maths, Modern Foreign Languages, Music, Physical Education and Religious Studies

**June 2017**

First **exams** for new A Levels in Art and Design, Business, Computer Science, Economics, English Literature, English Language, English Language and Literature, History, Psychology, Science (Biology, Chemistry, Physics) and Sociology

First **exams** for new AS qualifications in Ancient Languages, Dance, Drama, Geography, Modern Foreign Languages, Music, Physical Education and Religious Studies

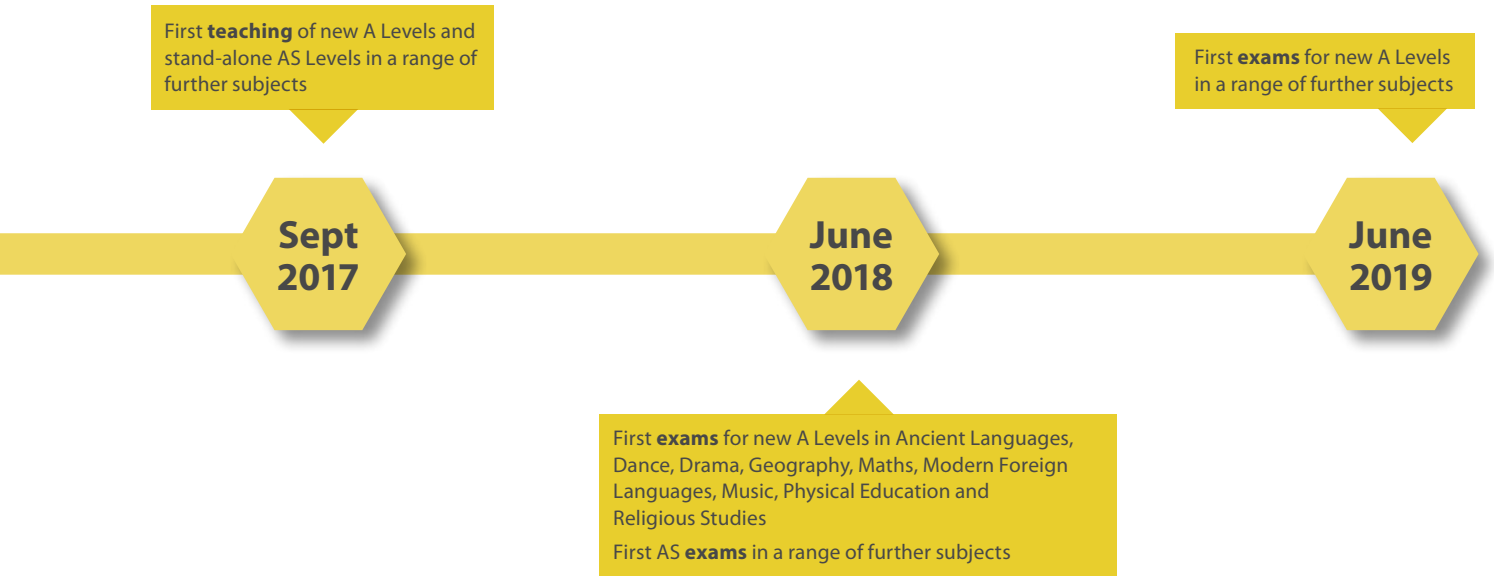
## Changes to assessment

**A Levels from 2015 – linear assessment**

New A Levels will be fully linear so assessment of a student's knowledge and understanding of the whole course takes place at the end of two years of study. (There'll be no exams in January.) The first assessment of two-year courses that start in September 2015 will be in June 2017. It's proposed that the first assessment of the new AS qualification will take place in June 2016.

**Proposed changes for AS Levels**

The new AS Level qualifications, for first teaching in September 2015, won't count towards the final grade of an A Level, but will be separate, stand-alone qualifications in their own right. The new AS qualifications will remain broadly at their current standard. In some subjects, it may be appropriate for the AS to be designed to be co-taught with the first year of the A Level. The first assessment of the new AS Levels is planned for June 2016.



# WHY CHOOSE OCR?

Choose OCR and you've got the reassurance that you're working with one of the UK's leading awarding bodies. Our new AS and A Level qualifications have been developed in consultation with teachers, employers and higher education to provide students with qualifications that are relevant to them and meet their needs.

We're part of the Cambridge Assessment Group, Europe's largest assessment agency and a department of the University of Cambridge. Cambridge Assessment plays a leading role in developing and delivering assessments throughout the world, operating in over 150 countries.

We work with a range of education providers, including schools, colleges, workplaces and other institutions in both the public and private sectors. Over 13,000 centres choose our A Levels, GCSEs, and vocational qualifications including Cambridge Nationals, Cambridge Technicals and Cambridge Progression.

We believe in developing specifications that help you bring the subject to life and inspire your students to achieve more. They're designed to be straightforward and accessible, so you can tailor the delivery of the course to suit your students' needs.

# MEET THE TEAM

We have a dedicated team of people working on our new AS and A Level Chemistry qualifications:

## Steve Evans

Assistant Head of General Qualifications Reform and Head of Science Development

## Danièle Gibney

Subject Specialist, A Level Chemistry

## Ruth Roca-Terry

Subject Specialist, A Level Chemistry

## Rachael Tomkins

Subject Specialist, A Level Chemistry

Find out more about our Science team at ocr.org.uk/scienceteam

**Have any questions and want to talk to us? Want to find out more?**

Our aim is to assist you however we can. As well as giving you a toolkit of support services and resources to choose from, we're also here to help you with specialist advice, guidance and support for those times when you simply need a more individual service. Here's how to reach our Customer Contact Centre:

By phone: **01223 553998**

By email: ScienceGCE@ocr.org.uk

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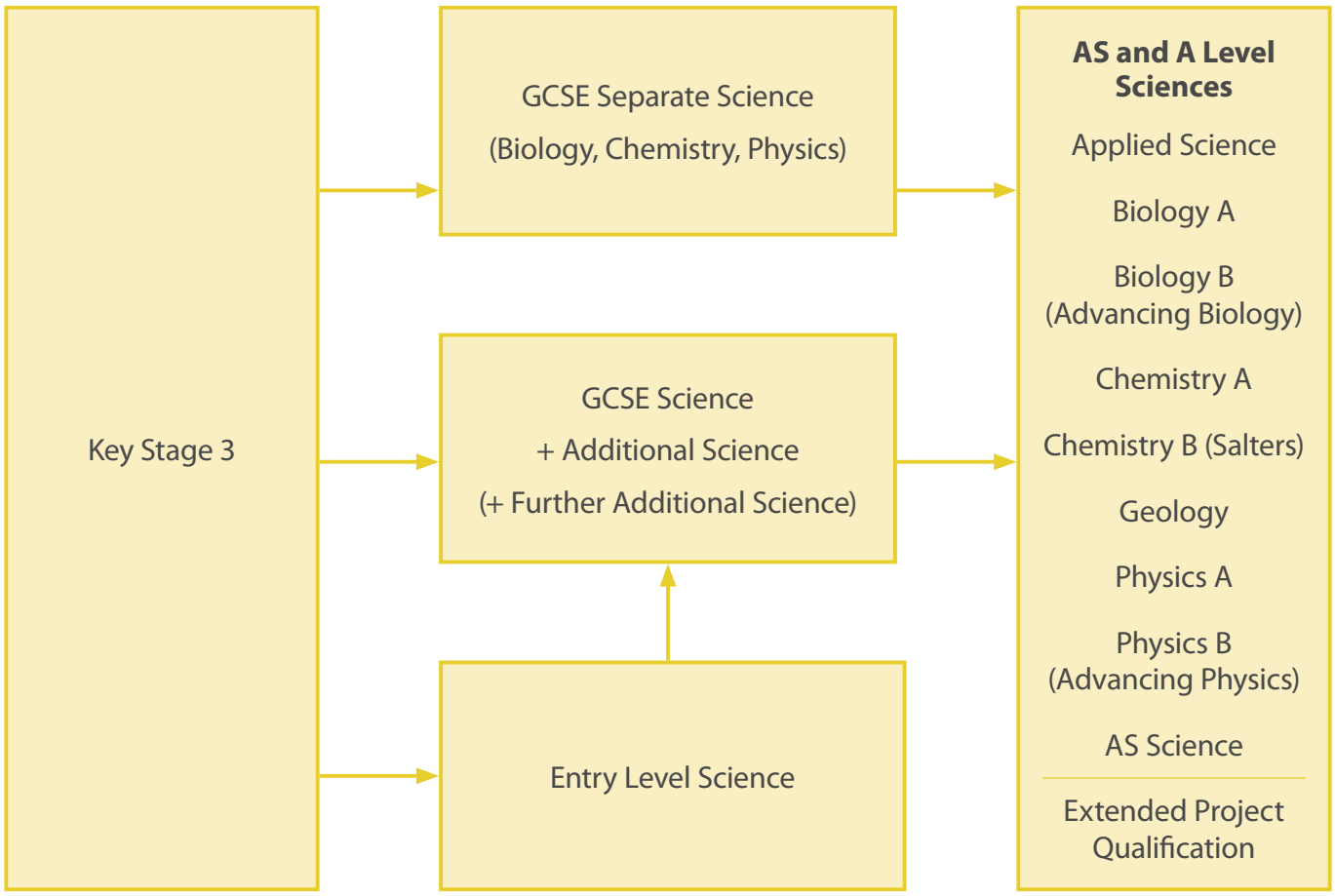
# PROGRESSION PATHWAYS

We offer a range of qualifications across Key Stages 4 and 5: from Entry Level Science to AS and A Levels in a range of sciences. There are clear progression routes from one end of the ability range to the other. At each stage, the qualifications provide students with the foundations to progress to the next with confidence.




For more information about these qualifications, see ocr.org.uk/science

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# INTRODUCING…
# AS AND A LEVEL CHEMISTRY A
# AS AND A LEVEL CHEMISTRY B (SALTERS)
# (FROM SEPTEMBER 2015)

## OUR VISION

Our vision for Science is to create specifications with content that will be up to date, scientifically accurate, developed by subject experts, and allow clear progression pathways (from GCSE to AS and A Level through to higher education, or to other post-16 courses and employment). Courses will provide a rewarding experience across the ability range, genuinely challenging the most able students. We'll reduce the assessment burden as much as possible through:

- Carefully designed assessments (straightforward to use for all centre types, large to small)
- Well laid-out specifications and question papers
- Friendly and prompt support from our team of Subject Specialists
- Quality resource materials that help support a variety of good teaching approaches, drawing on expertise from across the subject community.

We're striving for good science that's straightforward and engaging to teach with fair, challenging and relevant assessment that works well in centres and promotes practical activity.

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# WHY CHOOSE OCR AS AND A LEVEL CHEMISTRY

These new AS and A Level courses build on our existing popular Chemistry qualifications. More students take A Level Biology, Chemistry and Physics with OCR than with any other awarding organisation in England (2013 entry data). This has given us a good understanding of the challenges involved with offering practical science subjects across the full range of centres (from very large to very small).

We've based our redevelopment of our A Level Sciences on our understanding of what works well in centres and we've updated areas of content and assessment where improvements could be made. We've undertaken a significant amount of consultation through our Science forums (which include representatives from learned societies, higher education (HE), teaching and industry) and through focus groups with teachers. Our papers and specifications have been trialled in centres during development to make sure that they work well for all centres and students.

The content changes are an evolution of our current offering and will be familiar to centres already following our courses, but are also clear and logically laid out for centres new to OCR, with assessment models that are straightforward to administer. We're working closely with teachers and HE representatives to provide high-quality support materials to guide you through the new qualifications.

We appreciate that one size doesn't fit all so we'll continue to offer two suites of qualifications in each science. Here's a brief look at the two Chemistry specifications:

**A specification – a content-led approach.** A flexible approach where the specification is divided into topics, each covering different key concepts of chemistry. Teaching of practical skills is integrated with the theoretical topics and they're assessed both through written papers and, for A Level only, the Practical Endorsement.

**B specification – a context-led approach.** Students study chemistry in a range of different contexts, conveying the excitement of contemporary chemistry. Ideas are introduced in a spiral way with topics introduced in an early part of the course reinforced later. This specification continues to place a particular emphasis on an investigational and problem-solving approach to practical work and is supported by extensive new materials developed by the University of York Science Education Group.

**Key features of both specifications:**

- Clear layout of the specification to help you see what's required
- Co-teachable AS
- Teaching of practical skills integrated with the theoretical topics and assessed both through written papers and, for A Level only, the Practical Endorsement
- Terminal assessments, available in June only (from June 2016 for AS, from June 2017 for A Level).

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# CHEMISTRY A AT A GLANCE
# COURSE OVERVIEW

Chemistry A is split into six modules: Modules 1 to 4 constitute the stand-alone AS Level qualification; Modules 1 to 6, combined with the Practical Endorsement, constitute the full A Level. The modules can be summarised as:

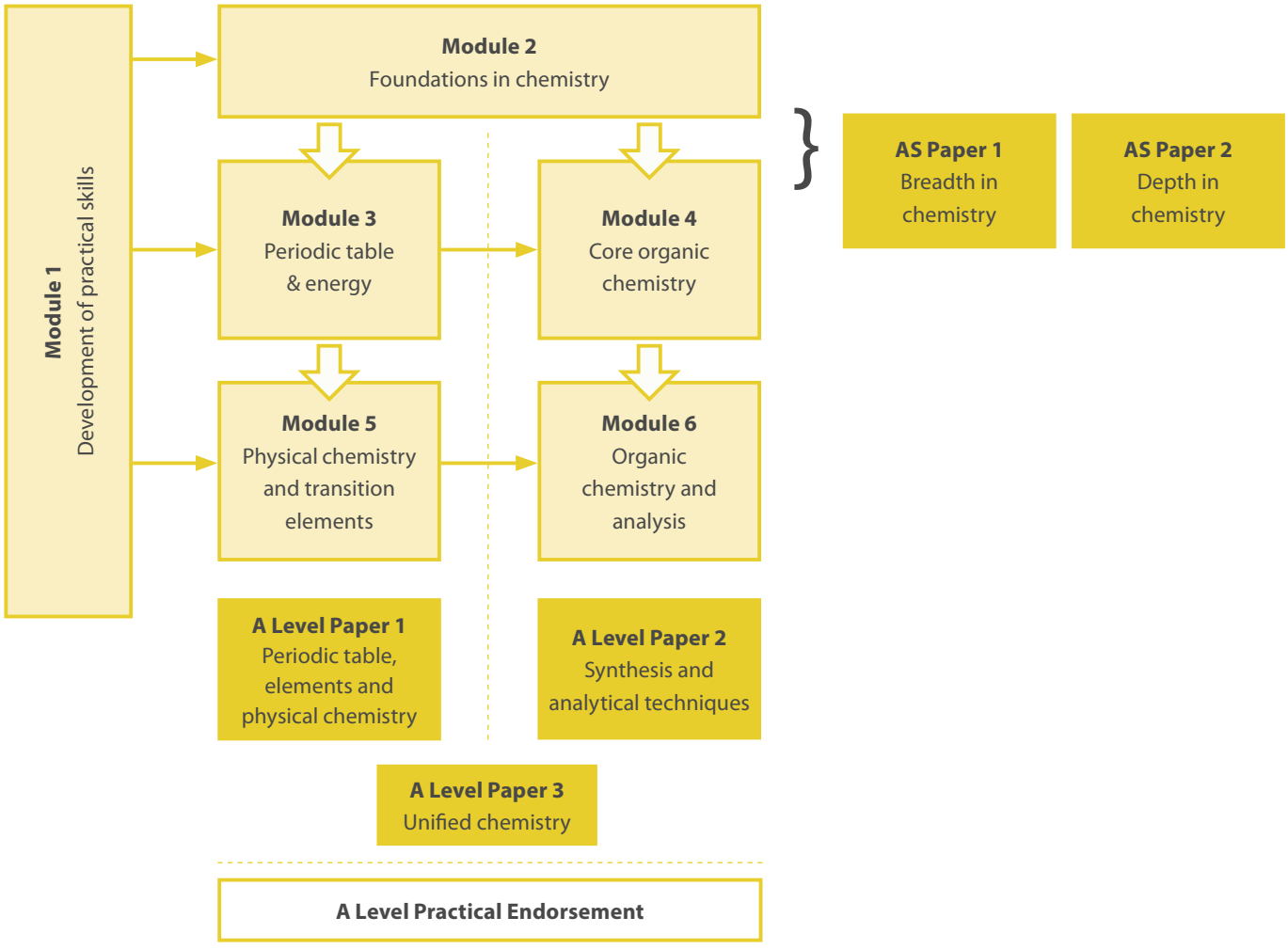
- **Module 1:** Development of practical skills – this module underpins the whole of the specification, and covers the practical skills that students should develop throughout the course. The practical skills in this module can be assessed within written examinations and (for A Level only) within the Practical Endorsement.
- **Module 2:** Foundations in chemistry covering concepts required throughout the remaining modules.
- **Modules 3 and 4:** AS topics.
- **Modules 5 and 6:** A Level topics.

**At AS Level:**

- Papers 1 and 2 can assess any content from Modules 1 to 4.

**At A Level:**

- Paper 1 assesses the content from Modules 1, 2, 3 and 5
- Paper 2 assesses the content from Modules 1, 2, 4 and 6
- Paper 3 assesses the content from Modules 1 to 6.



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# CONTENT OVERVIEW

## CHEMISTRY A – AS (H032) / A LEVEL (H432)

**Module 1 – Development of practical skills**

Skills of planning, implementing, analysis and evaluation

**Module 2 – Foundations in chemistry**

Includes:

- Atoms, compounds, molecules and equations
- Amount of substance
- Acid–base and redox reactions
- Electrons, bonding and structure.

**Module 3 – Periodic table and energy**

Includes:

- The periodic table and periodicity
- Group 2 and the halogens
- Qualitative analysis
- Enthalpy changes
- Reaction rates and equilibrium (qualitative).

**Module 4 – Core organic chemistry**

Includes:

- Basic concepts
- Hydrocarbons
- Alcohols and haloalkanes
- Organic synthesis
- Analytical techniques (IR, MS).

**Module 5 – Physical chemistry and transition elements**

Includes:

- Reaction rates and equilibrium (quantitative)
- pH and buffers
- Enthalpy, entropy and free energy
- Redox and electrode potentials
- Transition elements.

**Module 6 – Organic chemistry and analysis**

Includes:

- Aromatic compounds
- Carbonyl compounds
- Carboxylic acids and esters
- Nitrogen compounds
- Polymers
- Organic synthesis
- Chromatography and spectroscopy (NMR).

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# CHEMISTRY A: ASSESSMENT OVERVIEW

| AS Chemistry A (H032) - First Exam June 2016 | | | | | |
|---|---|---|---|---|---|
| **ASSESSMENT OVERVIEW** | | | | | |
| **Paper** | | | **Marks** | **Duration** | **Weighting** |
| **Paper 1** | **Breadth in chemistry** | | **70** | 1 hr 30 mins | 50% |
| | Section A | Multiple choice | 20 | | |
| | Section B | Structured questions and extended response questions covering theory and practical skills | 50 | | |
| **Paper 2** | **Depth in chemistry** | | **70** | 1 hr 30 mins | 50% |
| | Structured questions and extended response questions, covering theory and practical skills | | 70 | | |

| A Level Chemistry A (H432) - First Exam June 2017 | | | | | |
|---|---|---|---|---|---|
| **ASSESSMENT OVERVIEW** | | | | | |
| **Paper** | | | **Marks** | **Duration** | **Weighting** |
| **Paper 1** | **Periodic table, elements and physical chemistry** | | **100** | 2 hr 15 mins | 37% |
| | Section A | Multiple choice | 15 | | |
| | Section B | Structured questions and extended response questions covering theory and practical skills | 85 | | |
| **Paper 2** | **Synthesis and analytical techniques** | | **100** | 2 hr 15 mins | 37% |
| | Section A | Multiple choice | 15 | | |
| | Section B | Structured questions and extended response questions covering theory and practical skills | 85 | | |
| **Paper 3** | **Unified chemistry** | | **70** | 1 hr 30 mins | 26% |
| | Structured questions and extended response questions covering theory and practical skills | | 70 | | |
| **Non-exam assessment** | **Practical Endorsement for chemistry** | | **Pass/Fail** | Non-exam assessment | Reported separately |
| | See pages 27 and 28. Teacher-assessed component common to Chemistry A and Chemistry B (Salters). Candidates complete a minimum of 12 practical activities to demonstrate practical competence. Performance reported separately to the A Level grade. Moderation details still to be confirmed by Ofqual at the time of going to press | | 0 | | |

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# WHAT STAYS THE SAME, WHAT CHANGES?

## AS LEVEL

| CHANGES OVERVIEW | | | |
|---|---|---|---|
| | **What stays the same?** | **What changes?** | **Why is it changing?** |
| **Structure and assessment** | The standard of the papers is the same as for the current AS | Two mandatory papers rather than two mandatory papers plus coursework | New regulatory requirements allow a maximum of only two papers for AS |
| | | 3 hours of AS examination time versus 2 hours 45 minutes currently | New regulatory requirement for a minimum AS assessment time of 3 hours |
| | | Equal weighting of both AS papers | To allow for assessed grades in cases where scripts go missing for whatever reason or where candidates are eligible for special consideration |
| | | At least 15% of the question paper assessment covers knowledge and understanding of practical | New regulatory requirement, no current required weighting |
| | | 20% of the question paper assessment covers mathematical skills | New regulatory requirement in response to stakeholder concerns about the level of mathematical demand in current Science A Levels |
| | | AS no longer counts towards the A Level (stand-alone) | New regulatory requirements don't allow AS to count towards A Level. We have designed our AS to be fully co-teachable with the first year of our A Level course |
| | | No coursework | New regulatory requirements don't allow coursework at AS. Practical skills will be tested within the question papers (NB: the Practical Endorsement is part of A Level only) |
| **Content** | The actual content remains broadly similar to the current specifications | Content has been revised where necessary to update it | To meet new requirements, or in response to stakeholder feedback |

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# WHAT STAYS THE SAME, WHAT CHANGES?

## A LEVEL

| CHANGES OVERVIEW | | | |
|---|---|---|---|
| | **What stays the same?** | **What changes?** | **Why is it changing?** |
| **Structure and assessment** | Standard of A Level is as now | Three mandatory papers plus a Practical Endorsement rather than four mandatory papers plus coursework | New regulatory requirements allow a maximum of only three papers for A Level |
| | | 6 hours of A Level examination time versus 5 hours 45 minutes currently | New regulatory requirement for a minimum A Level assessment time of 6 hours |
| | | At least 15% of the question paper assessment covers knowledge and understanding of practical | New regulatory requirement, no current required weighting |
| | | 20% of the question paper assessment covers mathematical skills | New regulatory requirement in response to stakeholder concerns about the level of mathematical demand in current Science A Levels |
| | | AS papers don't count towards the A Level; students sitting the AS and the A Level will sit five papers not four as currently | New regulatory requirements don't allow AS to count towards A Level. We have designed our AS to be fully co-teachable with our A Level |
| | | Practical Endorsement (replacement for current coursework) doesn't count towards the A Level but is reported alongside it | New regulatory requirement. See pages 27 and 28 |
| **Content** | The actual content remains broadly similar to the current specification | Content has been revised where necessary to update it | To meet new requirements or in response to stakeholder feedback |

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# CHEMISTRY A SAMPLE ASSESSMENT MATERIALS

(answer lines omitted)

## NEW AS SAMPLE QUESTIONS

Selected from across both AS sample papers

**1.** How many electrons are there in a $^{24}_{12}Mg^{2+}$ ion?

**A** 10

**B** 12

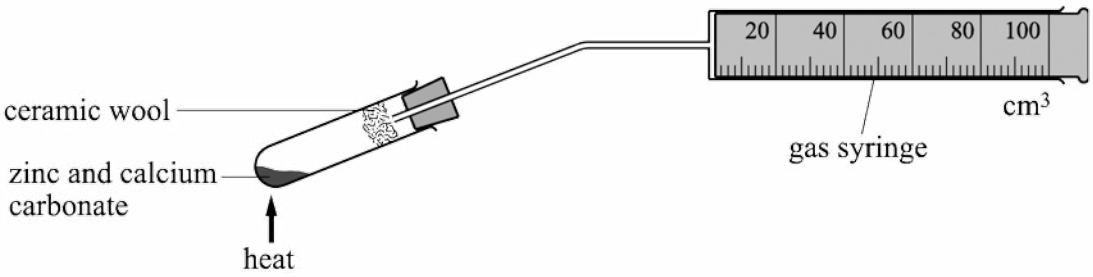
**C** 14

**D** 22

**2.** Carbon monoxide can be made in the laboratory by heating a mixture of zinc metal and calcium carbonate. An equation for this reaction is shown below.

$Zn(s) + CaCO_3(s) \rightarrow ZnO(s) + CaO(s) + CO(g)$

**(a)** A student carried out the reaction of Zn and $CaCO_3$ in a fume cupboard. The student measured the volume of gas produced.




A mixture containing 0.38 g of powdered $CaCO_3$ was mixed with 0.27 g of powdered zinc and heated strongly for two minutes. The volume of gas collected in the 100 $cm^3$ syringe was then measured. The experiment was then repeated.

**(i)** Calculate the maximum volume of carbon monoxide, measured at room temperature and pressure, that could be produced by heating this mixture of Zn and $CaCO_3$.

Show **all** your working.

volume of carbon monoxide = …….$cm^3$

**(ii)** The student did not obtain the volume of gas predicted in **(i)** using this procedure.

Apart from further repeats, suggest **two** improvements to the practical procedure that would allow the student to obtain a more accurate result.

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**3.** Students work together in groups to identify four different solutions.

Each solution contains one of the following compounds:

- Ammonium sulfate, $(NH_4)_2SO_4$
- Sodium sulfate, $Na_2SO_4$
- Sodium chloride, NaCl
- Potassium bromide, KBr

Your group has been provided with a universal indicator paper and the following test reagents:

- Barium chloride solution
- Silver nitrate solution
- Dilute ammonia solution
- Sodium hydroxide solution

**(a)** A student in your group suggests the following plan:

- Add about 1 cm depth of each solution into separate test-tubes
- Add a few drops of barium chloride solution to each test-tube
- A white precipitate will show which solutions contain sulfate ions
- Two of the solutions will form a white precipitate.

Describe how you would expand this plan so that all four solutions could be identified using a positive test result.

You should provide all the observations and conclusions that would enable your group to identify all four solutions.

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# NEW A LEVEL SAMPLE QUESTIONS

Selected from across all three A Level sample papers

**1.** The functional group in an organic compound, **W**, was identified by carrying out two chemical tests. The results of the tests are shown below.

| Heating with acidified sodium dichromate(VI) (aq) | Addition of 2,4-dinitrophenylhydrazine (aq) |
|---|---|
| orange solution turns green | yellow/orange precipitate formed |

Which compound could be **W**?

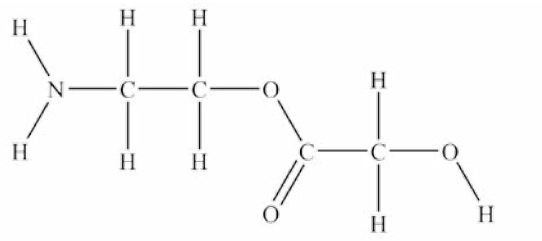
**A** $CH_3CH_2CH_2OH$

**B** $CH_3COCH_3$

**C** $CH_3CH(OH)CH_3$

**D** $CH_3CH_2CHO$

**2.** The structure of molecule **Z** is shown.



Which of the following statements is/are true?

**Statement 1:** The carbon-13 NMR spectrum of **Z** shows four peaks.

**Statement 2:** The proton NMR spectrum of **Z** shows five peaks.

**Statement 3:** The proton NMR spectrum of **Z** run in $D_2O$ shows three peaks.

**A** 1, 2 and 3

**B** Only 1 and 2

**C** Only 2 and 3

**D** Only 1

**3.** Methanoic acid and bromine react as in the equation below.

$Br_2(aq) + HCOOH(aq) \rightarrow 2H^+(aq) + 2Br^-(aq) + CO_2(g)$

A student investigates the rate of this reaction by monitoring the concentration of bromine over time. The student uses a large excess of HCOOH to ensure that the order with respect to HCOOH will be effectively zero.

Why would use of excess HCOOH ensure that the order with respect to HCOOH is effectively zero?

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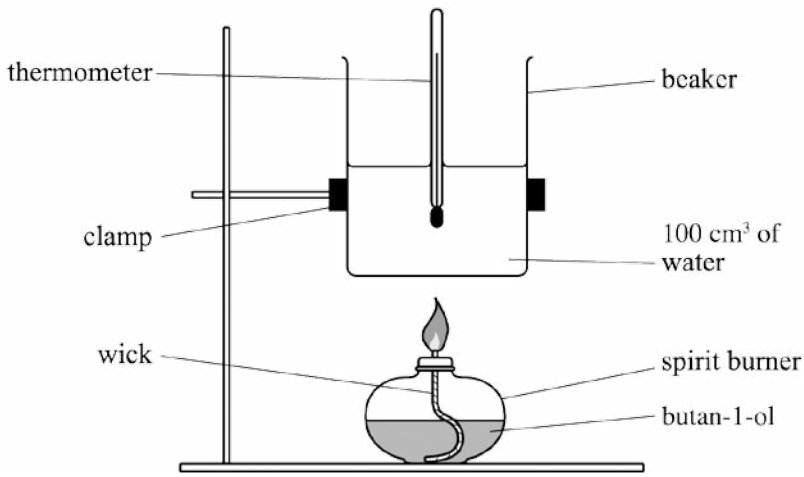
**4.** A student is asked to calculate $\Delta G$ at 25 °C for the combustion of butan-1-ol. The teacher provides two pieces of information.

- The equation for the combustion of butan-1-ol.
  $CH_3(CH_2)_3OH(l) + 6O_2(g) \rightarrow 4CO_2(g) + 5H_2O(l)$
- Standard entropies of butan-1-ol, oxygen, carbon dioxide and water.

| | $CH_3(CH_2)_3OH(l)$ | $O_2(g)$ | $CO_2(g)$ | $H_2O(l)$ |
|---|---|---|---|---|
| $S^\theta$/ J $K^{-1}$ $mol^{-1}$ | 228 | 205 | 214 | 70 |

The student carries out an experiment using the apparatus below and obtains the following results.
The specific heat capacity of water is 4.18 J $g^{-1}$ $K^{-1}$.




| | |
|---|---|
| Mass of burner and butan-1-ol before burning / g | 98.997 |
| Mass of burner and butan-1-ol after burning / g | 98.738 |
| Initial temperature / °C | 18.5 |
| Maximum temperature reached / °C | 39.0 |

Use the information above to calculate $\Delta G$, in kJ $mol^{-1}$, for the combustion of butan-1-ol at 25 °C.

Show **all** your working.

$\Delta G$ = ……..kJ $mol^{-1}$

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# CHEMISTRY B (SALTERS) AT A GLANCE
# COURSE OVERVIEW

Chemistry B (Salters) is designed to be taught in context. The course takes students on a journey through ten Storylines, while introducing chemical concepts in a spiral approach. These Storylines engage students through learning in a contemporary context and range from concerns about the ozone layer to the development of new medicines.

Since coursework will no longer contribute towards the A Level, we've replaced the Individual Investigation in its current form by an emphasis on providing students with opportunities to develop and practise their investigational and problem-solving skills. There are many opportunities for practical work signposted throughout the specification, encouraging the development of hands-on practical skills. These skills will be assessed in a specially designed written paper at the end of the A Level course which is built upon features of a popular pilot run for OCR Chemistry between 2006 and 2008.

The A Level specification also emphasises the development of chemical literacy skills, which are assessed at the end of the course using an Advance Notice article.

The course is fully supported by a dedicated support package written and developed by the University of York Science Education Group, in collaboration with OCR.

Development of practical skills (first section of the specification) underpins the whole of the specification, and covers the practical skills that students should gradually develop through hands-on practical work throughout the course. The practical skills in this module can be assessed within written examinations and (for A Level only) within the Practical Endorsement.

The course is split into ten teaching modules: Modules 1 to 5 constitute the stand-alone AS Level qualification; Modules 1 to 10, combined with chemical literacy and the Practical Endorsement, constitute the full A Level. Each module is based on one of the Storylines and contains a variety of chemical ideas, which form the basis of the specification.

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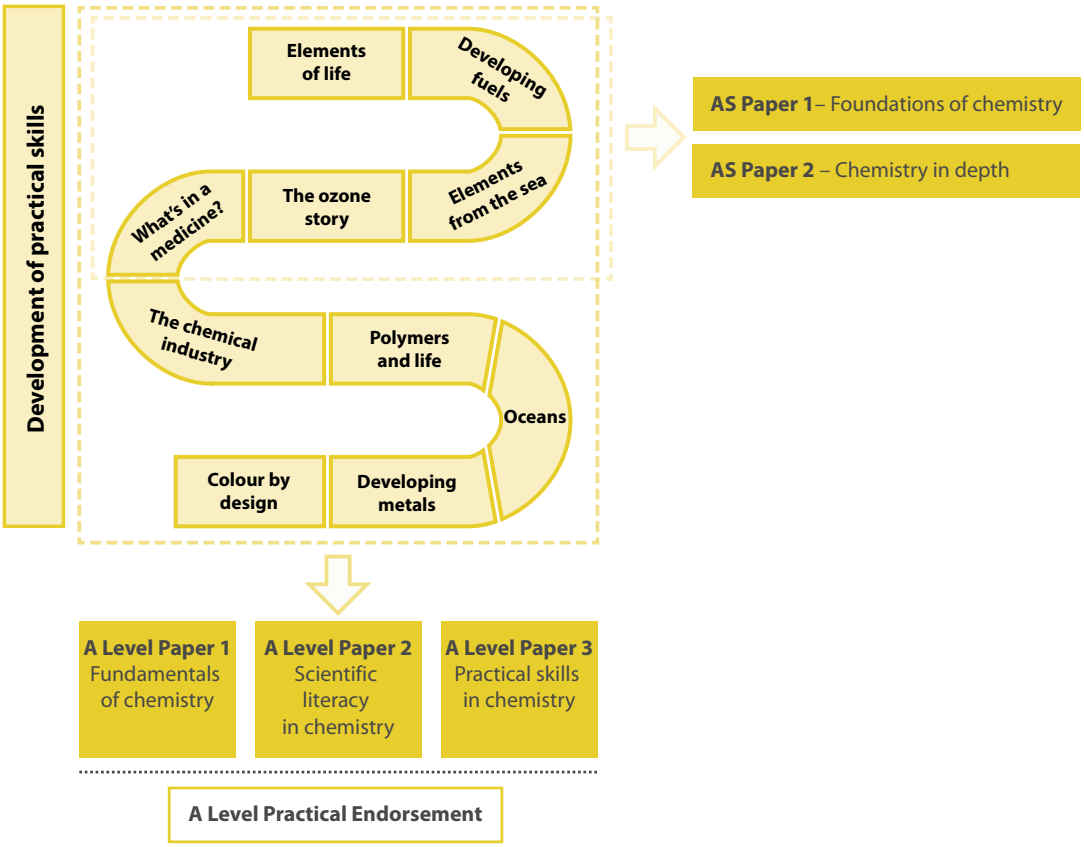


## AT AS LEVEL:

- Papers 1 and 2 can assess any content from Modules 1 to 5 as well as practical skills
- Paper 1 covers breadth of understanding of concepts
- Paper 2 assesses the deeper understanding of concepts learned during the AS course.

## AT A LEVEL:

- Papers 1, 2 and 3 can assess content from Modules 1 to 10 as well as practical skills and chemical literacy
- Paper 1 covers breadth of understanding of concepts assessed by mainly shorter structured questions
- Paper 2 covers deeper understanding of concepts assessed by a mixture of short structured questions, extended response items and more open problem-solving style questions. Carrying on the theme of the current Chemistry B (Salters), this paper includes an Advance Notice article aimed at testing skills of chemical literacy developed during the course
- Paper 3 focuses on the assessment of practical skills with a particular emphasis on investigational and problem-solving skills.

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# CONTENT OVERVIEW

## CHEMISTRY B (SALTERS) – AS (H033) / A LEVEL (H433)

| DEVELOPMENT OF PRACTICAL SKILLS IN CHEMISTRY | |
|---|---|
| Skills of planning, implementing, analysis and evaluation | |
| **STORYLINES** | |
| **1. Elements of life** | **2. Developing fuels** |
| The elements and compounds in the universe, the human body and in salt deposits.<br>Some of the chemical ideas included in this module are: atomic structure, chemical equations and the mole, titrations, the periodic table, Group 2 chemistry, bonding and the shapes of molecules. | Fuels, what they consist of, how energy involved in their combustion is measured and the contributions that chemists make to the development of better fuels.<br>Some of the chemical ideas included in this module are: thermochemistry, catalysis, alkanes, alkenes, addition polymers, isomerism and dealing with polluting gases. |
| **3. Elements from the sea** | **4. The ozone story** |
| The extraction of halogens from minerals in the sea, together with a study of the properties and uses of these elements and their compounds.<br>Some of the chemical ideas included in this module are: halogen chemistry, redox chemistry and equilibrium. | Important processes occurring in the ozone layer of the atmosphere.<br>Some of the chemical ideas included in this module are: rates of reaction, radical reactions, intermolecular bonding, haloalkanes and the ozone layer. |
| **5. What's in a medicine?** | **6. The chemical industry** |
| Medicines such as aspirin, leading to more functional group chemistry and methods of analysis.<br>Some of the chemical ideas included in this module are: chemistry of the –OH group, carboxylic acids and esters, and analytical techniques (TLC, MS and IR). | How chemists use industrial processes to benefit mankind.<br>Some of the chemical ideas included in this module are: equilibrium, kinetics, nitrogen chemistry, consideration of the costs and effects of chemical processes. |
| **7. Polymers and life** | **8. Oceans** |
| Condensation polymers, proteins and enzymes. DNA and its use in synthesising proteins.<br>Some of the chemical ideas included in this module are: enzyme catalysis, amino acid and protein chemistry, proton and carbon-13 NMR and the structure and function of DNA and RNA. | The role of the oceans in dissolving substances and maintaining pH.<br>Some of the chemical ideas included in this module are: enthalpy changes, entropy, acid–base equilibria, pH, and the 'greenhouse effect'. |
| **9. Developing metals** | **10. Colour by design** |
| The reactions and properties of the transition metals.<br>Some of the chemical ideas included in this module are: redox titrations, cells and electrode potentials, rusting, d-block chemistry and colorimetry. | Dyes and the use of chemistry to provide colour to order.<br>Some of the chemical ideas included in this module are: origins of colour in organic compounds, dyes, aromatic compounds, carbonyl compounds, and organic synthesis. |
| **CHEMICAL LITERACY** | |
| Skills of extracting data, interpreting information and written communication. | |

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# ASSESSMENT OVERVIEW

| AS Chemistry B (Salters) (H033) - First Exam June 2016 | | | | | |
|---|---|---|---|---|---|
| **ASSESSMENT OVERVIEW** | | | | | |
| **Paper** | | | **Marks** | **Duration** | **Weighting** |
| **Paper 1** | **Foundations of chemistry** | | **70** | 1 hr 30 mins | 50% |
| | Section A | Multiple choice | 20 | | |
| | Section B | Structured questions and extended response questions covering theory and practical skills | 50 | | |
| **Paper 2** | **Chemistry in depth** | | **70** | 1 hr 30 mins | 50% |
| | Structured questions and extended response questions, covering theory and practical skills | | 70 | | |

| A Chemistry B (Salters) (H433) - First Exam June 2017 | | | | | |
|---|---|---|---|---|---|
| **ASSESSMENT OVERVIEW** | | | | | |
| **Paper** | | | **Marks** | **Duration** | **Weighting** |
| **Paper 1** | **Fundamentals of chemistry** | | **110** | 2 hr 15 mins | 41% |
| | Section A | Multiple choice | 30 | | |
| | Section B | Structured questions and extended response questions covering theory and practical skills | 80 | | |
| **Paper 2** | **Scientific literacy in chemistry** | | **100** | 2 hr 15 mins | 37% |
| | Structured questions and extended response questions, covering theory, practical skills and chemical literacy | | 100 | | |
| **Paper 3** | **Practical skills in chemistry** | | **60** | 1 hr 30 mins | 22% |
| | Structured questions and extended response questions with a focus on the assessment of practical skills | | 60 | | |
| **Non-exam assessment** | **Practical Endorsement for chemistry** | | **Pass/Fail** | Non-exam assessment | Reported separately |
| | See pages 27 and 28. Teacher-assessed component common to Chemistry A and Chemistry B (Salters). Candidates complete a minimum of 12 practical activities to demonstrate practical competence. Performance reported separately to the A Level grade. Moderation details still to be confirmed by Ofqual at the time of going to press | | 0 | | |

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# WHAT STAYS THE SAME, WHAT CHANGES?

## AS LEVEL

| CHANGES OVERVIEW | | | |
|---|---|---|---|
| | **What stays the same?** | **What changes?** | **Why is it changing?** |
| **Structure and assessment** | The standard of the papers is the same as for the current AS<br>Total AS assessment time unchanged (3 hours) | Two mandatory papers rather than two mandatory papers plus coursework | New regulatory requirements allow a maximum of only two papers for AS |
| | | Equal weighting of both AS papers | To allow for assessed grades in cases where scripts go missing for whatever reason or where candidates are eligible for special consideration |
| | | At least 15% of the question paper assessment covers knowledge and understanding of practical | New regulatory requirement, no current required weighting |
| | | 20% of the question paper assessment covers mathematical skills | New regulatory requirement in response to stakeholder concerns about the level of mathematical demand in current Science A Levels |
| | | AS no longer counts towards the A Level (stand-alone) | New regulatory requirements don't allow AS to count towards A Level. We have designed our AS to be fully co-teachable with the first year of our A Level course |
| | | No Advance Notice article | Moved to A Level to allow more scope for breadth in the chemistry, and to assess chemical literacy in more depth |
| | | No coursework | New regulatory requirements don't allow coursework at AS. Practical skills will be tested within the question papers (NB: the Practical Endorsement is part of A Level only) |
| **Content** | The actual content remains broadly similar to the current specification | Content has been revised where necessary to update it | To meet new requirements or in response to stakeholder feedback |

Accredited

# WHAT STAYS THE SAME, WHAT CHANGES?

## A LEVEL

| CHANGES OVERVIEW | | | |
|---|---|---|---|
| | **What stays the same?** | **What changes?** | **Why is it changing?** |
| **Structure and assessment** | Standard of A Level is as now | Three mandatory papers plus a Practical Endorsement rather than four mandatory papers plus coursework | New regulatory requirements allow a maximum of only three papers for A Level |
| | | 6 hours of A Level examination time versus 6 hours 30 minutes currently | New regulatory requirement for a minimum A Level assessment time of 6 hours |
| | | At least 15% of the question paper assessment covers knowledge and understanding of practical | New regulatory requirement, no current required weighting |
| | | 20% of the question paper assessment covers mathematical skills | New regulatory requirement in response to stakeholder concerns about the level of mathematical demand in current Science A Levels |
| | | AS papers don't count towards the A Level; students sitting the AS and the A Level will sit five papers not four as currently | New regulatory requirements don't allow AS to count towards A Level. We have designed our AS to be fully co-teachable with our A Level |
| | | The Individual Investigation is replaced by an emphasis on investigation and problem-solving skills that are assessed in a specially designed written paper at the end of the course | New regulatory requirements don't allow coursework to contribute to the A Level grade |
| | | Advance Notice article in Paper 2 | Included at A Level to allow more scope for breadth in the chemistry, and to assess chemical literacy in more depth |
| | | Practical Endorsement (replacement for current coursework) doesn't count towards the A Level but is reported alongside it | New regulatory requirement. See pages 27 and 28 |
| **Content** | The actual content remains broadly similar to the current specification<br>Continued emphasis on practical skills | Content has been revised where necessary to update it | To meet new requirements or in response to stakeholder feedback |

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# CHEMISTRY B (SALTERS)
# SAMPLE ASSESSMENT MATERIALS

(answer lines omitted)

## NEW AS SAMPLE QUESTIONS

Selected from across both AS sample papers

**1.** A student carries out a titration. Sodium hydroxide solution is transferred to a conical flask using a pipette. Methyl orange indicator is added to the flask. Hydrochloric acid is added from a burette until the indicator changes colour. Which of the following would lead to the litre being larger than it should be?

**A** Rinsing the conical flask with water before adding the sodium hydroxide solution

**B** Rinsing the burette with water before filling it with hydrochloric acid

**C** Rinsing the pipette with water before filling it with sodium hydroxide solution

**D** Adding extra drops of indicator

**2.** A chemist has four solutions, labelled **A**, **B**, **C** and **D**. Each contain one of salicylic acid ($HOC_6H_4COOH$), ethanoic acid, phenol, ethanol or aspirin ($HOOCC_6H_4OCOCH_3$).

It is not known which solution is which.

Neutral iron(III) chloride solution and sodium carbonate solution are added separately to samples of **A**, **B**, **C** and **D**. The results of the tests are shown below.

| | **Solution A** | **Solution B** | **Solution C** | **Solution D** |
|---|---|---|---|---|
| **Neutral iron(III) chloride solution** | purple colour | yellow colour | purple colour | yellow colour |
| **Sodium carbonate solution** | gas evolved | gas evolved | no change observed | no change observed |

Which solution contains salicylic acid?

**A** Solution **A**

**B** Solution **B**

**C** Solution **C**

**D** Solution **D**

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**3.** Magnesium hydroxide is useful as an antacid in some indigestion tablets.

A typical antacid tablet contains 0.292 g of magnesium hydroxide, $Mg(OH)_2$.

A student decides to calculate the volume of stomach acid that the tablet can neutralise.
Assume the stomach contains hydrochloric acid of concentration 0.10 mol $dm^{-3}$.

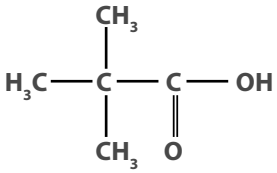
The equation for the neutralisation reaction is:

$$Mg(OH)_2(s) + 2HCl(aq) \longrightarrow MgCl_2(aq) + 2H_2O(l)$$

What volume of stomach acid can the tablet neutralise?

volume = ……$cm^3$

**4.** Pivalic acid, 2,2-dimethylpropanoic acid, is a white solid used in the production of high-quality lacquers.

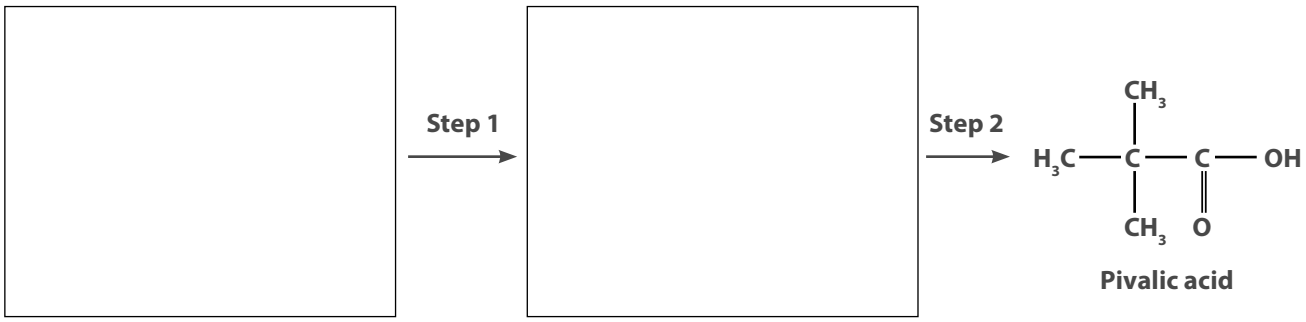


**Pivalic acid**

A student suggests making pivalic acid from 1-bromo-2,2-dimethylpropane in a two-step synthesis.

Write suitable structures in the boxes below to complete the flow diagram.

Give the reagents and conditions for each step.




**1-bromo-2,2-dimethylpropane**

**Step 1:**

reagents and conditions ……

**Step 2:**

reagents and conditions ……

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## NEW A LEVEL SAMPLE QUESTIONS

Selected from across all three A Level sample papers

**1.** Four gases, **W**, **X**, **Y** and **Z**, are known to be $N_2$, NO, $NH_3$ and $O_2$.
It is not known which gas is which.

When gases **X** and **Y** are mixed a brown gas is formed.
Gas **Y** relights a glowing splint.
Gases **W**, **X** and **Z** extinguish a burning splint.
Gas **Z** turns red litmus paper blue.

Which gas is $N_2$?

**A** Gas **W**

**B** Gas **X**

**C** Gas **Y**

**D** Gas **Z**

**2.** Aluminium can be used to clean silver cutlery that has been 'tarnished' by a layer of black silver sulfide. The silver object is placed in a hot solution of sodium carbonate in contact with a piece of aluminium foil. An electrochemical reaction occurs and the tarnished silver becomes shiny again.

| | $E^\ominus$ / V |
|---|---|
| $Al^{3+} + 3e^- \rightleftharpoons Al$ | –1.66 |
| $Ag^+ + e^- \rightleftharpoons Ag$ | +0.80 |

Draw a labelled diagram of the cell you could set up in a laboratory to measure the $E^\ominus_{cell}$ of the reaction involved in cleaning tarnished silver.

**3.** When brass objects are used in the presence of horses, the brass tends to corrode. This is because ammonia from horse urine reacts with copper in the brass to form the soluble compound $[Cu(NH_3)_4]SO_4$.

Draw a diagram to show the square planar shape of the complex ion $[Cu(NH_3)_4]^{2+}$ and give the coordination number.

On your diagram name the type of bond joining atoms to the metal ion.

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**4.** A group of students set out to investigate the heating effect of volcanic lava on any carbonate rocks that it may flow over. They decide to devise an experiment to compare the thermal stability of magnesium carbonate and calcium carbonate.

The students have access to magnesium carbonate powder, lumps of calcium carbonate, calcium hydroxide powder, distilled water and whatever apparatus they need.

Describe how the students could carry out their experiment.

You should include in your answer:

- A labelled diagram of the apparatus used to safely heat the carbonate compounds
- The main steps in the experimental procedure and the names of the key apparatus used (not included in the labelled diagram)
- The observations and measurements that should be recorded
- How to ensure the comparison is fair and the results are as accurate as possible.

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# PRACTICAL ENDORSEMENT

Future assessment of practical work across all awarding organisations will be different from that in current qualifications. The new Practical Endorsement replaces current A Level coursework and has the following common features across awarding organisations. It:

- Only applies to A Level (AS Chemistry has no Practical Endorsement)
- Is reported separately from the A Level (as Pass/Fail)
- Is teacher-assessed with common assessment criteria
- Emphasises development of practical skills over the two-year A Level course to a minimum standard of competency (the 'Pass', as defined by common assessment criteria)
- Requires a minimum of 12 practical activities to be carried out over the two-year A Level course covering a common core list of apparatus and technique usage (see Table 1 below).

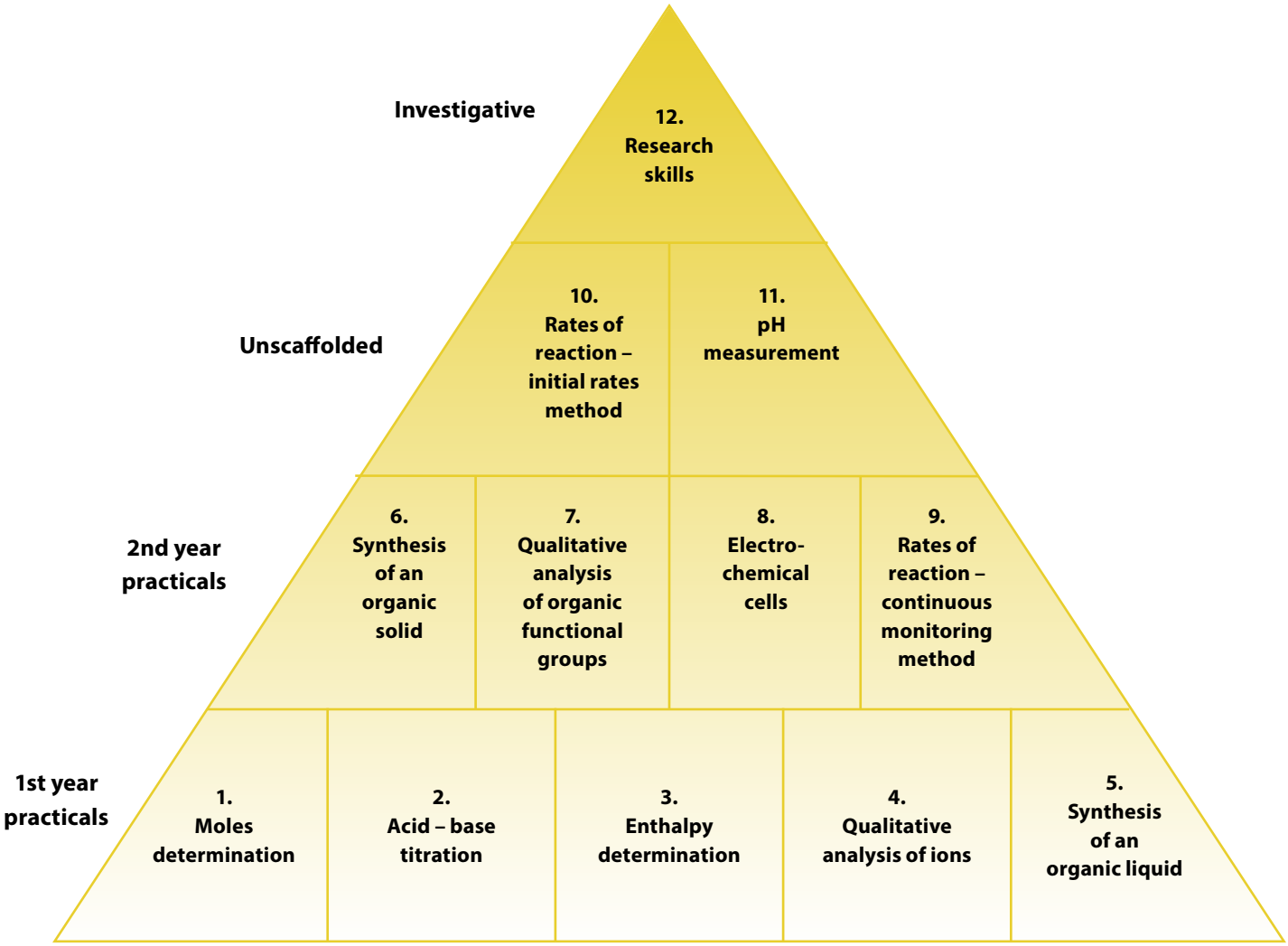
At the time of going to press, the precise details for moderation/authentication of the Practical Endorsement are still being confirmed by the Regulator.

OCR has designed the Practical Endorsement to be common to Chemistry A and Chemistry B (Salters). Regardless of which course students are following, the structure of the Practical Endorsement will be the same.

**Table 1** Overview of Practical Endorsement requirements for A Level Chemistry (see the DfE website for the detailed requirements listed in the A Level Science criteria).

| Use of apparatus and techniques included within the Practical Endorsement.<br>Overview of expectations common across all awarding organisations. **Candidates must:** |
|---|
| • Use appropriate apparatus to record a range of measurements (mass, time, volume, temperature)<br>• Use a water bath/electric heater/sand bath for heating<br>• Measure pH<br>• Use laboratory apparatus for a variety of techniques including: titration, distillation, qualitative tests for ions and organic functional groups, filtration, and recrystallisation<br>• Use melting point apparatus<br>• Use thin layer or paper chromatography<br>• Set up electrochemical cells and measure voltages<br>• Safely and carefully handle solids and liquids<br>• Measure rates of reaction by at least two different methods. |

The items listed within Table 1 have to be covered within the Practical Endorsement through a minimum of 12 practical activities (again this is set as a common rule across all awarding organisations). OCR's model for the Practical Endorsement maps out 12 activities into the categories shown below.




For each group (1–12) above, OCR will create suggested activities for teachers to use. Alternatively, centres can draft their own activities. Coursework consultancy will be available to support centres drafting their own activities and wishing for advice on the suitability of their proposed tasks.

# SUPPORTING YOU ALL THE WAY

We recognise that the introduction of a new specification can bring challenges for implementation and teaching. Our aim is to help you at every stage and we're working hard to provide a practical package of support in close consultation with teachers and other experts so we can help you to make the changes.

For a start, we'll provide a range of high-quality creative resources. Tailored to the needs of each subject, their focus is on supporting creative teaching approaches and progression for all students. We see our resources as a body of knowledge that will grow throughout the lifetime of the specifications. They'll be built on the best practice we've identified from our discussions with the teaching community since the reforms were announced. Please visit our website at **ocr.org.uk/reformresources** to take a look at the types of resources on offer.

Along with subject-specific resources, you'll also have access to a selection of generic resources that focus on skills development and professional guidance for teachers.

These include the following:

## Skills Guides

– we've produced a set of Skills Guides that aren't specific to Chemistry, but each covers a topic that could be relevant to a range of qualifications – for example communication, legislation and research.
Download the guides at **ocr.org.uk/skillsguides**

## Active Results

– a free online A Level results analysis service to help you review the performance of individual students or your whole school. It provides access to detailed results data, enabling more comprehensive analysis of results to give you a more accurate measurement of the achievements of your centre and individual students. For more details, please refer to **ocr.org.uk/activeresults**

## Publisher Partner Resources

We're working with Oxford University Press to publish resources for all the new AS and A Level Science specifications for 2015. We're working together to make sure that our resources embed the fundamental content of each specification, while delivering the breadth and depth needed to succeed at A Level and beyond.

## Free updates and support

Oxford University Press is on hand to support you with information, resources and free CPD, all focused on the new A Level Science specifications.
Email **ocrresources@oup.com** to receive updates and sample material as soon as it's available.

## To keep in touch with Oxford University Press…

Follow: **@OxfordEdScience** on Twitter.

Visit: **www.oxfordsecondary.co.uk/ocrscience**

Email: **ocrresources@oup.com**

# NEW PRACTICE PAPER SERVICE

# EXAMCREATOR

## PAST PAPERS AT YOUR FINGERTIPS

We've launched an exciting new online past papers service, ExamCreator, that enables you to build your own test papers from past OCR exam questions. Test papers can be created either focusing on single topics or made up from the full range of topics to produce a complete mock GCSE or A Level exam.

You can print tests you've created, use them like traditional exam papers or assign them to students to be taken and marked online. Students are sent an email by the system, telling them that a test has been assigned to them and to log in to take the test from any internet-enabled PC. Plus, it could be a great tool for setting homework and tracking the outcomes.

## WITH EXAMCREATOR YOU CAN:

- Build your own tests using real exam questions
- Filter questions by topic, tier, unit, year, etc
- Select individual questions and sort them to the test you want
- Print off tests as PDF documents to be taken in normal exam conditions – you can print off resource booklets, mark schemes and Examiner's comments too
- Assign tests online
- Gather students into teaching groups, year groups or any other combination to make assignment easier
- Mark online tests on-screen and record the results
- Create reports for individual students or whole teaching groups
- Access full telephone and email user support.

Tests created in ExamCreator are supported by the original mark scheme and Examiner reports – broken down by individual question. So a mark scheme is created to specifically support a test that's been built. All the questions are pre-tagged by topic so you don't have to review every question to create focused tests on specific topics.

ExamCreator could help you create end-of-topic tests for Assessment for Learning, make termly tests to assess retention of knowledge, set mock examinations or set homework. And remember, it has a built-in reporting system, so could help you track the progress of individual students or teaching groups.

To find out more about the costs and to register as a user, please see the details at **ocr.org.uk/examcreator**

# CHEMISTRY A LEVEL REFORM EVENTS

## AN INTRODUCTION TO THE NEW SPECIFICATIONS

We're running events throughout the next academic year to help you get to grips with the reformed Chemistry qualifications for first teaching in September 2015.

### PRACTICAL EVENTS, CREATED WITH YOU IN MIND

These carefully planned events are designed to help smooth the path to the reformed qualification and provide you with an understanding of:

- The new Chemistry specification content, structure and assessment
- The differences between the existing and new specifications
- The resources and support available for Chemistry.

They'll give you the opportunity to speak face-to-face with our team, and network and discuss teaching approaches with colleagues.

In 2015, we'll also be running a series of events to help you get ready for first teaching of the reformed qualifications. Watch out for details at **cpdhub.ocr.org.uk**

To receive more information about dates, both of these events, and the wide range of locations as we release them, please register for A Level reform email updates at **ocr.org.uk/updates**

## Download high-quality, exciting and innovative AS and A Level Chemistry resources from ocr.org.uk/alevelchemistry

We also have a team committed to supporting you through this time of change. They would like to hear from you, whether you want to know the bigger picture or what's happening in a specific subject area, or would like to tell us what kind of resources you'd like to see.

To stay up to date with all the relevant news about our A Levels from 2015, register for A Level reform email updates at ocr.org.uk/updates

**Science Community**
The social network is a free platform where teachers can engage with each other – and with us – to share ideas and best practice, offer guidance, and access a range of Science support materials produced by other teachers. To sign up, go to social.ocr.org.uk

In the meantime, if you have any queries, please contact us on **01223 553998** or email us at ScienceGCE@ocr.org.uk

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