NEW GCSE Sciences Third Edition

New and updated editions for the (9–1) specifications

AQA

For GCSE 9–1

All Student Books have been approved by AQA, apart from the Foundation: Combined Science Trilogy and Entry Level Certificate Student Book, which has been entered into the AQA approval process.
<table>
<thead>
<tr>
<th>Course</th>
<th>Structure</th>
<th>Student Book*</th>
<th>Teacher Handbook</th>
<th>Revision Guide</th>
<th>Workbook</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>Separate Sciences</td>
<td>978 019 835937 1</td>
<td>978 019 835943 2</td>
<td>978 019 835940 1</td>
<td>978 019 842167 2</td>
</tr>
<tr>
<td></td>
<td>Biology for Combined Science: Trilogy</td>
<td>978 019 835926 5</td>
<td>978 019 835957 4</td>
<td>978 019 835930 2</td>
<td>978 019 835934 0</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Separate Sciences</td>
<td>978 019 835938 8</td>
<td>978 019 835944 9</td>
<td>978 019 835941 8</td>
<td>978 019 842168 9</td>
</tr>
<tr>
<td></td>
<td>Chemistry for Combined Science: Trilogy</td>
<td>978 019 835927 2</td>
<td>978 019 835931 9</td>
<td>978 019 842169 6</td>
<td>978 019 835935 7</td>
</tr>
<tr>
<td>Physics</td>
<td>Separate Sciences</td>
<td>978 019 835939 5</td>
<td>978 019 835945 6</td>
<td>978 019 835942 5</td>
<td>978 019 842169 6</td>
</tr>
<tr>
<td></td>
<td>Physics for Combined Science: Trilogy</td>
<td>978 019 835928 9</td>
<td>978 019 835932 6</td>
<td>978 019 835936 4</td>
<td>978 019 837485 5</td>
</tr>
<tr>
<td>Combined Science:</td>
<td>Synergy</td>
<td>978 019 839590 4</td>
<td>978 019 839591 1</td>
<td>978 019 839592 8</td>
<td>978 019 842883 1</td>
</tr>
</tbody>
</table>

Covers all AQA GCSE 9–1 specifications

- A bank of support for the new practical exam questions, including practical worksheets with differentiated questions, method sheets and full teacher and technician support
- Supports the increased maths demand with maths calculation worksheets, interactive maths activities with step-by-step worked solutions and exclusive links to resources from MyMaths
- Assessment materials based on a five-year assessment model so you can measure progress from KS3 to GCSE
- Includes auto-marked tests, end-of-chapter tests with formative feedback and Checkpoint quizzes with differentiated follow-up activities

*All Student Books have been approved by AQA apart from the Foundation: Combined Science Trilogy and Entry Level Certificate Student Book, which has been entered into the AQA approval process.
These latest editions of *AQA GCSE Sciences* have been tailored for the new AQA GCSE (9–1) specifications. They support your students with the new content and increased maths requirements, as well as the new required practicals. **All Student Books have been approved by AQA apart from the Foundation: Combined Science Trilogy and Entry Level Certificate Student Book, which has been entered into the AQA approval process.**

- **Matched to the new specifications**
  These latest editions have been tailored specifically for the GCSE (9–1) specifications. Student Books are available to cover the separate Biology, Chemistry, and Physics specifications, Combined Science: Trilogy, Combined Science: Synergy, and Entry Level Certificate.

- **Making assessment and progress tracking easy**
  *AQA GCSE Sciences* (9–1) has built-in assessment and progress tracking based on the widely adopted structure used in *Activate* for KS3, to support effective five-year assessment right the way from KS3 to GCSE.

- **Supporting students of all abilities**
  Students of all abilities are supported through the new, more demanding GCSE, with ramped questions for every topic in the Student Books, Foundation and Higher Workbooks, and further support and extension material on Kerboodle. Plus, our new Foundation and Entry Level Certificate Student Book has been specially written to support lower-ability students.

- **Building maths skills**
  Worked examples, interactive activities, and practice questions are incorporated throughout the Student Books and on Kerboodle to support your students with the new increased maths requirement. Kerboodle also has direct links to maths learning platform *MyMaths.co.uk.*

- **Preparing for the new practicals**
  Development of practical skills is embedded throughout the Student Books, with specific exam-style practice questions. Practical resources on Kerboodle cover the new required practicals plus more.

- **Plenty of practice questions**
  Multiple-choice, maths, practical, and synoptic practice questions are included throughout.

*AQA GCSE Sciences* (9–1) Kerboodle provides unrivalled digital support including assessment, differentiation, maths skills resources and a bank of support for the new practical exam questions. See page 10 to find out more.

---

www.oxfordsecondary.co.uk/aqagcsescience
Covering the AQA GCSE 9–1 specifications

The GCSE (9–1) specifications

(9–1) grading

- GCSEs will now be graded 1–9, with 9 being the top grade, to allow greater differentiation between students

How does AQA GCSE Sciences deliver?

- Content matched to 9–1 grades
- Follows on from the widely-adopted assessment model used in Activate and AQA Activate for KS3
- Differentiated content throughout supporting students of all abilities
- Foundation: Combined Science Trilogy and Entry Level Certificate Student Book supports Entry Level Certificate and students aiming for Grades 3–1 or below

New (9–1) topics

- New (9–1) topics include human genome in biology, nanoparticles in chemistry and energy and space in physics

- Content written specifically for the new topic requirements, and approved by AQA
- Full support for teacher and technicians on Kerboodle and in the easy-to-use Teacher Handbooks

Increased maths requirements

- More maths content, at a more challenging level than before
- The maths required is up to the level required for GCSE Maths in the corresponding tier

- Maths links and worked examples throughout
- Maths skills interactives and support sheets on Kerboodle
- Kerboodle is the only digital resource for AQA GCSE Sciences with direct links to MyMaths

Practicals

- Practical skills are now assessed by exam only. The exams will contain questions to draw on students’ understanding and experience of practical experiments
- Each separate science GCSE requires a minimum of eight practical activities. Combined Science requires a minimum of sixteen.
- At least 15% of the total marks available for each GCSE are dedicated to scientific experimentation questions

- Full support for teachers and technicians for all core required practicals
- Practical skills developed throughout the Student Books
- Bank of practicals on Kerboodle to support the specification and link theory and practice

Exam-only assessment

- The new GCSEs will be assessed by exam only, with no controlled assessment components

- Plenty of practice questions and auto-marked quizzes to monitor progress
- Checkpoint assessment system to monitor progress and provide specially-targeted follow-up by ability
- Revision guides, quizzes and podcasts
AQA GCSE Sciences (9–1) provides a five-year progress tracking and assessment solution developed by Dr Andrew Chandler-Grevatt, building on the assessment principles behind Oxford’s Key Stage 3 course, Activate. However, the five-year assessment framework is based on the Programme of Study and the new (9–1) grades for Key Stage 4, so it can also be used to dovetail any Key Stage 3 course you’re currently using. It also builds on the assessment framework used in new AQA Activate for KS3, tailored for the AQA KS3 Science syllabus. AQA Activate for KS3 is also approved by AQA.

**Five-year assessment model**

<table>
<thead>
<tr>
<th>Key stage 3</th>
<th>Band</th>
<th>Know</th>
<th>Apply</th>
<th>Extend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GCSE</th>
<th>Band</th>
<th>Aiming for 4</th>
<th>Aiming for 6</th>
<th>Aiming for 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Demand</td>
<td>Low</td>
<td>Standard</td>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

**Outcomes inform all learning activities**

1. Sort the following characteristics into those affected by genetic variation, environmental variation or both: (3 marks)
   - stem mass
   - number of fruit produced
   - blood group
   - skin colour
   - eye colour
   - leaf size
   - presence of a scar

2. Explain the advantage of using identical twins for the NASA study into the effects of living in space. (2 marks)

3. Using named examples, state and explain the difference between continuous and discontinuous variation. (6 marks)

All learning outcomes are differentiated and linked to lesson activities and questions to help track progress throughout the course.

**Assessment for Learning with our Checkpoint system**

The Checkpoint assessment system assesses students at the end of every chapter, helping to ensure that all students achieve their full potential. Follow-up lessons are provided, with support and extension tasks designed to allow everyone to perform at their best. Use the Checkpoint system for GCSE or right through from Year 7 to Year 11 to ensure all your students make progress and are ready for the challenges of GCSE assessment.
2 Chemical reactions and energy changes

Introduction

In the early 19th century, people began experimenting with chemical reactions, but they were not able to predict exactly what new substances would be formed and used this knowledge to develop a wider range of different materials and processes. They could extract important resources from the Earth, for example, by using electricity to decompose some substances. This is how reaction methods, such as aluminium and sodium, were discovered.

Energy changes are also an important part of chemical reactions. Transfers of energy take place due to the breaking and formation of bonds. The heating or cooling effects of reactions are used in a range of everyday applications.

Key questions

- How can we extract metals from the Earth?
- How can we make and prepare pure, dry samples of salts?
- Why do chemical reactions always involve transfers of energy?

Making connections

- Reaction profile diagrams will be used in C8 Rates and Equilibria to explain the effect of catalysts on the rate of a chemical reaction.
- The calculations of energy changes using bond energy values can be applied in the 2D structure of the crystal lattice of the compound, which was covered in C3 Structures and bonding.
- Displacement reactions and the use of electrolysis will be applied in CH2 The Earth and its resources.

Progression grid

**I already know...**

- How to define acids and bases in terms of reactions between ions.
- How to calculate the concentration of a solution in moles per litre.
- How to use the pH scale to measure acidity and basicity.
- How to calculate the concentration of a solution from a given volume of a solute.
- How to interpret displacement reactions and the reaction between a metal and a salt solution.

**I will learn...**

- To use bond energy values to calculate the approximate energy change accompanying a reaction.
- To calculate the concentration of an unknown acid or alkali from experimental results.
- To identify and describe oxidation and reduction reactions.
- To use ratios, fractions and percentages from KS3 to GCSE.

Materials science reference chapter supports students with the required maths for the course

### Maths skills reference chapter

#### Maths skills for Physics

**MS1 Arithmetic and numerical computation**

**Learning objectives**

After this topic, you should know how to:

- recognise and use expressions in decimal form
- recognise and use expressions in standard form
- add, subtract, multiply, and divide fractions and percentages
- make estimations of the results of simple calculations

What is the speed of a sound wave? How far away is the Moon? What is the difference between the students and the summit of Mount Everest?

Scientists use maths all the time – when collecting data, looking for patterns, and making conclusions. This chapter includes all the maths you need for your GCSE physics course. The rest of the book gives you many more opportunities to practice using maths in physics.

#### 1a Decimal form

They will always be a whole number of photons, neutrons, or electrons in an atom.

When you make measurements in science the numbers may not be whole numbers, but numbers in between whole numbers. These are decimal numbers. To solve example 3.2 cm or 4.9 g.

The value of each digit in a number is called its place value.

#### 1b Standard form

This will help you to understand the size of a number. However, some numbers in science are so large or so small that it is hard to understand when they are written as ordinary numbers. For example, distance from the Earth to the Sun, 150 000 000 000 km or the diameter of a hydrogen atom, 0.000 000 000 000 75 m.

We use standard form to show very large or very small numbers more easily.

In standard form, a number is written as \( \times 10^n \).

- \( n \) is a decimal number between 1 and 10 (but not including 10).
- \( n \) is a whole number. The power of ten can be positive or negative. For example, 1.5

This gives you a number in standard form, for example, 1.5 \( \times 10^{-2} \).

#### Table 1 How to convert numbers into standard form

<table>
<thead>
<tr>
<th>The number</th>
<th>The number in standard form</th>
<th>The number in standard form to 3 significant figures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.276 596 \times 10^{-2} km</td>
<td>1.28 \times 10^{-2} km</td>
<td></td>
</tr>
<tr>
<td>0.012 766 km</td>
<td>1.276 596 \times 10^{-2} km</td>
<td></td>
</tr>
<tr>
<td>( 1.4 \times 10^2 ) s</td>
<td>140 s</td>
<td>140 s</td>
</tr>
<tr>
<td>( 1.3 \times 10^{-2} ) m</td>
<td>0.013 m</td>
<td>0.013 m</td>
</tr>
<tr>
<td>( 1.4 \times 10^3 ) m</td>
<td>1400 m</td>
<td>1400 m</td>
</tr>
<tr>
<td>( 1.3 \times 10^{-3} ) m</td>
<td>0.0013 m</td>
<td>0.0013 m</td>
</tr>
</tbody>
</table>

#### Study tip

Always remember to add a unit, if appropriate, when quoting a number.

#### Study tip

Maths skills reference chapter supports students with the required maths for the course

### Table 1 How to convert numbers into standard form

<table>
<thead>
<tr>
<th>The number</th>
<th>The number in standard form</th>
<th>The number in standard form to 3 significant figures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.276 596 \times 10^{-2} km</td>
<td>1.28 \times 10^{-2} km</td>
<td></td>
</tr>
<tr>
<td>0.012 766 km</td>
<td>1.276 596 \times 10^{-2} km</td>
<td></td>
</tr>
<tr>
<td>( 1.4 \times 10^2 ) s</td>
<td>140 s</td>
<td>140 s</td>
</tr>
<tr>
<td>( 1.3 \times 10^{-2} ) m</td>
<td>0.013 m</td>
<td>0.013 m</td>
</tr>
<tr>
<td>( 1.4 \times 10^3 ) m</td>
<td>1400 m</td>
<td>1400 m</td>
</tr>
<tr>
<td>( 1.3 \times 10^{-3} ) m</td>
<td>0.0013 m</td>
<td>0.0013 m</td>
</tr>
</tbody>
</table>

#### Study tip

Check that you understand the power of ten, and the sign of the power.

### Study tip

Worked examples on standard form

1. A fast train travels a distance of 100 km at a constant speed in a time of 25 minutes.
2. Calculate the average speed in seconds and write your answer in standard form.
3. Calculate the distance travelled by the train each second. Write your answer in standard form to 3 significant figures.

**Solution**

1. **Step 1:** Because the train travels at 100 km in 25 minutes, the time in seconds is 25 \( \times 60 \). The distance is 100 km.
2. **Step 2:** The train travels an average speed of 100 km per 25 minutes. The average speed is 4 km per minute.
3. **Step 3:** The train travels an average speed of 4 \( \times 60 \) km per minute.

#### Study tip

Always remember to add a unit, if appropriate, when quoting a number.

### Study tip

Maths skills reference chapter supports students with the required maths for the course

### Study tip

Worked examples incorporated throughout to support students with the required maths.

### Study tip

Study tips to reinforce students’ learning.
C5.8 Strong and weak acids

Learning objectives
After this topic, you should know:
• What are strong and weak acids?
• How do strong and weak acids differ?
• Why are some acids called dilute solutions, and others concentrated solutions?

Why are some acids called dilute solutions, and others concentrated solutions?
Some acids are used in experiments in this chapter and are called dilute solutions. This name is only used to describe how strong the acids are, not their concentration. Dilute solutions are used in experiments because they are safer and easier to work with.

Concentrated solutions are used in experiments because they are more reactive.

Why are some acids called strong acids, and others weak acids?
Certain acids, such as the weak acid of ethanoic acid, are not harmful when in dilute or even concentrated solutions. However, other acids, such as concentrated hydrochloric acid, are highly corrosive.

Comparing ethanoic acid and hydrochloric acid
Write down your observations in these blocks to compare solutions of ethanoic acid and hydrochloric acid.

<table>
<thead>
<tr>
<th>pH</th>
<th>Ethanoic acid (weak)</th>
<th>Hydrochloric acid (strong)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>Weak acid</td>
<td>Strong acid</td>
</tr>
<tr>
<td>3.0</td>
<td>Weaker acid</td>
<td>Stronger acid</td>
</tr>
<tr>
<td>2.0</td>
<td>Very weak acid</td>
<td>Strong acid</td>
</tr>
</tbody>
</table>

How are pH values related to the concentration of H+ ions?
The pH of a solution is related to the concentration of H+ ions in the solution. The pH of a solution is inversely proportional to the concentration of H+ ions.

pH = -log[H+]

The pH of a solution is related to the concentration of H+ ions. The more H+ ions there are in a solution, the lower the pH.

Key points
• pH values are related to the concentration of H+ ions in solution.
• The lower the pH, the higher the concentration of H+ ions.

Go further boxes
Go further boxes provide further context to build on your learning.

Key points are summarised at the end of each topic.

Ramped summary questions on every spread to embed students’ understanding, plus end-of-chapter practice questions
Ramped summary questions on every spread to embed students’ understanding, plus end-of-chapter practice questions.

Practical skills boxes provide further context to develop understanding
Practical skills boxes provide further context to develop understanding.

Synoptic links are highlighted throughout to give a rounded understanding and help students make links between topics.

Make science accessible by focusing on key ideas, with step-by-step explanations
Make science accessible by focusing on key ideas, with step-by-step explanations.

High-level content is laid out at the start of each topic
High-level content is laid out at the start of each topic.

All students have been approved by AQA apart from the Foundation: Combined Science Trilogy and Entry Level Certificate Student Book, which has been entered into the AQA approval process.
The Teacher Handbooks provide a page-by-page match to the Student Books, with support for your teaching including lesson plans, differentiation suggestions, and assessment guidance. Use the Teacher Handbooks alongside the Student Books for Biology, Chemistry, Physics, Combined Science: Trilogy, and Combined Science: Synergy.

### P 1 Conservation and dissipation of energy

#### 1.1 Changes in energy stores

**Applink Topic:** AQA GCSE Chemistry

<table>
<thead>
<tr>
<th>Diagram</th>
<th>Question</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td>1. Explain the process of chemical energy transfer from food to the body.</td>
<td>Within 15 min</td>
</tr>
<tr>
<td><img src="image2" alt="Diagram" /></td>
<td>2. Explain how the process of chemical energy transfer in the body is reversed in the excretion of waste materials.</td>
<td>Within 15 min</td>
</tr>
</tbody>
</table>

**Key terms:***
- **exothermic**
- **endothermic**
- **enthalpy change**

**Example:**

In an exothermic reaction, the energy needed to break bonds is released to the surroundings. In an endothermic reaction, energy is taken from the surroundings to break bonds.

**Safety considerations:**
- Take care with the balanced formula of a flammable or toxic substance, avoid dust and fumes.

### C7.4 Bond energy calculations

**Applink Topic:** AQA GCSE Chemistry

<table>
<thead>
<tr>
<th>Diagram</th>
<th>Question</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Diagram" /></td>
<td>1. Explain the process of chemical energy transfer from food to the body.</td>
<td>Within 15 min</td>
</tr>
<tr>
<td><img src="image4" alt="Diagram" /></td>
<td>2. Explain how the process of chemical energy transfer in the body is reversed in the excretion of waste materials.</td>
<td>Within 15 min</td>
</tr>
</tbody>
</table>

**Key terms:***
- **exothermic**
- **endothermic**
- **enthalpy change**

**Example:**

In an exothermic reaction, the energy needed to break bonds is released to the surroundings. In an endothermic reaction, energy is taken from the surroundings to break bonds.

**Safety considerations:**
- Take care with the balanced formula of a flammable or toxic substance, avoid dust and fumes.

### Higher tier

**C7.4 Bond energy calculations**

**Diagram:**

- **Exothermic reaction:** Energy released to the surroundings when bonds are broken.
- **Endothermic reaction:** Energy taken from the surroundings when bonds are formed.

**Formula:**

\[
\text{enthalpy change} = \text{energy required to break product bonds} - \text{energy released when bonds are made}
\]

**Example:**

\[
\text{enthalpy change} = \text{energy required to break product bonds} - \text{energy released when bonds are made}
\]

**Safety considerations:**
- Take care with the balanced formula of a flammable or toxic substance, avoid dust and fumes.

### Differentiated lesson outcomes are built into the five-year assessment model for progress tracking

**Full lesson plans with starters, plenaries, and homework suggestions are provided**
The Workbooks are the perfect companion for the series and support your Higher and Foundation students on their journey from KS3 to success in the new AQA GCSE. Use the Workbooks alongside the Student Books for Biology, Chemistry, Physics, and Combined Science: Trilogy.
The online learning, resources and assessment package

AQA GCSE Sciences 9–1 Kerboodle provides excellent digital support for the new AQA GCSE Science (9–1) specifications, with a bank of resources, activities and a complete online assessment package.

Building practical skills

- Student method sheets guide students through each practical step-by-step
- All required practicals are supported by three differentiated worksheets to cater for students of all levels
- Teacher and technician notes provide detailed guidance and example data for each practical

Maths and literacy skills support

- Maths skills interactives include step-by-step worked solutions and practice questions with feedback, as well as exclusive links to resources on MyMaths.co.uk
- Maths calculation worksheets provide worked solutions and ramped practice questions
- Student literacy sheets support and build literacy skills

To request a free in-school Kerboodle demo, contact your local Educational Consultant using www.oxfordsecondary.co.uk/repfinder.
Prepare for the linear exam

- Student checklists to help your students track their own progress
- On Your Marks activities help students to understand how to tackle questions

Support and extension

- Extension worksheets stretch higher-ability students and increase depth of knowledge
- Pragmatics are fully differentiated, with separate resources for students working at different grades
- Go Further worksheets for higher-ability students bridge the gap between GCSE and A Level

Engage your students

- Interactive activities can be used as starters or plenaries
- Resources are built into each lesson presentation, including practical activity sheets, interactive activities, and progress quizzes
- Each lesson is accompanied by teacher notes to support your lesson delivery
- Ready-to-play lesson presentations are provided for whiteboard use, to help you run creative and effective lessons
- Checkpoint quizzes with differentiated follow-up activities track students’ progress and provide formative feedback
- Includes access to digital editions of the Student Books
- Animations clearly linked to learning objectives help consolidate learning

Practice questions and full practice papers for both Higher and Foundation levels provide checkpoints of students’ progress

Webquest research tasks encourage independent learning and study

Animations clearly linked to learning objectives help consolidate learning

Includes access to digital editions of the Student Books
Tick to receive your copy of the AQA GCSE Sciences (9 – 1) Evaluation Pack. Fill in your details below and return this tear-off form to us free of charge.

☐ Yes, please send me a copy of the AQA GCSE Sciences (9 – 1) Evaluation Pack (978 019 837527 2)

Name

Job title

School/College

Address

Postcode

Email address

☐ Please tick this box if you do not want to receive print marketing from Oxford University Press in relation to our other products and services.

☐ Please tick this box if you do not want to receive email marketing from Oxford University Press in relation to our other products and services.

Our Privacy Policy sets out how Oxford University Press handles your personal information, and your rights to object to your personal information being used for marketing to you or being processed as part of our business activities. To view our Privacy Policy go to www.oup.com/privacy.
About the authors

Chemistry

Lawrie Ryan (Series Editor)
Lawrie Ryan is an experienced author and science educator, having worked for over 20 years in schools as Head of Science, LA adviser, and inspector. He has written and edited a number of best-selling courses and titles including Chemistry for You, AQA GCSE Science, Spotlight Science, and Advanced Chemistry for You, as well as many electronic resources.

Biology

Ann Fullick
Ann Fullick was a biology teacher and Head of Science for many years. She is a successful published author of more than 90 titles, including many UK A Level and GCSE biology textbooks, as well as a producer of online resources and apps. She also has examining experience, has been closely involved in UK curriculum development, and is a Fellow of the Royal Society of Biology.

Physics

Jim Breithaupt
Jim Breithaupt has extensive experience of teaching physics in schools and colleges, and was the Physics author for the previous editions of Nelson Thornes’s popular AQA GCSE Science series. He has also written a number of highly regarded A Level textbooks including AQA Physics A and Understanding Physics for A Level.

Dr Andrew Chandler-Grevatt (Assessment Consultant)
Dr Andrew Chandler-Grevatt has a PhD in school assessment, and a real passion for science teaching and learning. Having worked as a science teacher for 10 years, of which five were spent as an AST, Andy has a real understanding of the pressures and joys of teaching in the classroom.

Alongside his national and international research in school assessment, Andy is a teaching fellow on the PGCE course at the University of Sussex, and is a successful published assessment author. He is the Assessment Editor for Activate and AQA Activate, and Assessment Consultant for AQA GCSE Sciences Third Edition and OCR Gateway GCSE Science. Find out more about Andy’s five-year assessment model at www.oxfordsecondary.co.uk/aqagcsescience