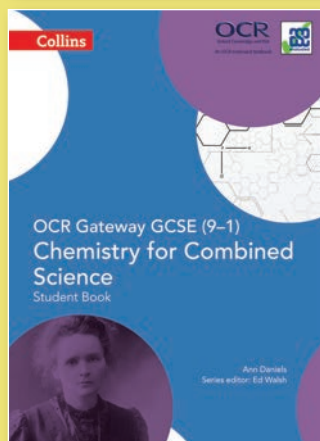
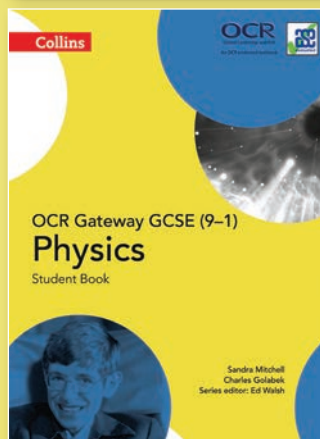
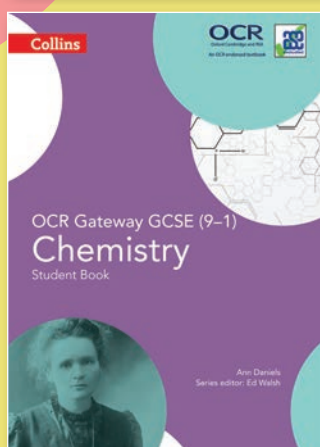
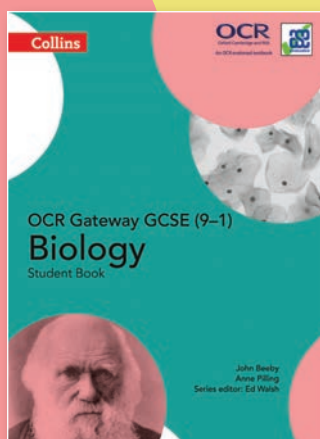


# Collins



Our Student  
Books are  
endorsed by  
OCR.

# GCSE Science

Engaging resources for  
the OCR GCSE (9-1) Gateway  
Science specifications.

Every student will need support in making  
good progress and to succeed in the new  
linear Science GCSEs.

With regular reviews that address performance as well as  
skills and understanding, our resources provide exactly that,  
for students at every level.

**Series Editor:** Ed Walsh

**Authors:** John Beeby  
Ann Daniels  
Sandra Mitchell  
Anne Pilling

[www.collins.co.uk/OCRGatewayGCSEscience](http://www.collins.co.uk/OCRGatewayGCSEscience)

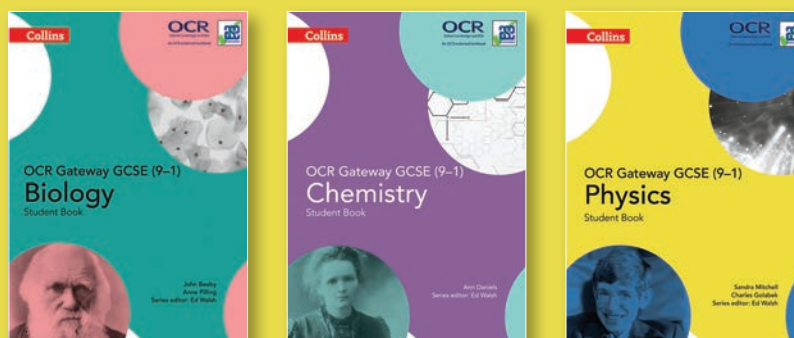


# GCSE Science

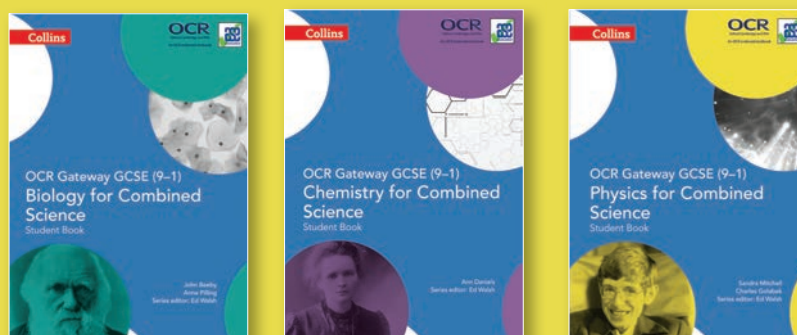
Our resources for the new OCR Gateway specification will develop and embed the skills your students need to succeed in all three assessment objectives, while providing a clear and supportive route through the more challenging GCSE content.

- **Teach with confidence** – our Student Books are endorsed by OCR.
- **Fully flexible support** – our course structure allows you to teach your way. With 2 and 3 year schemes of work allowing easy progression from KS3 and a strong basis for A level sciences, plus options for teaching foundation and higher, single sciences and combined
- **Cover the requirements of the (9-1) specifications** – teaching and learning resources combined with regular assessment that enables progression for every student
- **Coverage of suggested practicals** – develop and test skills in analysing, interpreting and evaluating information and ideas so students are fully prepared for the indirect assessment
- **Build maths skills** – a dedicated maths spread in every chapter and skills at the appropriate level embedded throughout, provide a wealth of support and practice

## For OCR Gateway Single Science



## For OCR Gateway Combined Science

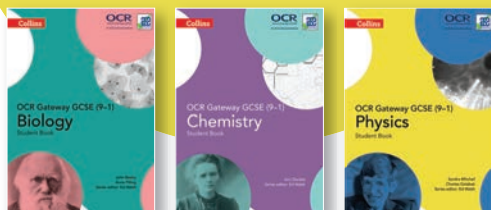


# How is Collins GCSE (9-1) Science structured?

## Learn

### Student Books

Written by a team of expert authors for the new OCR GCSE (9-1) Gateway Science specifications, the student books support students of all abilities with ramped content and questions on every page. Go to [collins.co.uk/OCRGatewayGCSEscience](https://collins.co.uk/OCRGatewayGCSEscience) for full details of how the resources support progress for all of your students.

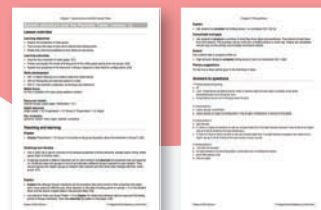


## GCSE (9-1) Science

## Teach

### Teacher Packs

Comprehensive support for delivering the new science GCSEs with detailed introductions to the new specifications, 2 and 3 year schemes of work, and an editable bank of differentiated lesson plans and worksheets.



## Build Skills

Worked examples and practice questions incorporated throughout the Student Books support the new maths and practical requirements.



# Teaching the new Science GCSEs

## Key changes to GCSE Science

### Practical assessment

- Controlled assessment has been discontinued and at least 15% of the total marks available for each GCSE are dedicated to practical skills

### An increased maths element

- Maths accounts for 10-30% of assessment marks for single science (minimum of 10% in Biology, 20% Chemistry, 30% Physics) and 20% for combined (split 1:2:3 Biology, Chemistry, Physics).
- Foundation tier students must demonstrate maths skills at a minimum of KS3 Level and Higher tier students at a minimum of Foundation level GCSE Maths

### A linear course

- There are no modules, all assessment takes place at the end of Year 11

### New assessment objectives

- Assessment objective split:
  - AO1 (knowledge recall) 40%
  - AO2 (application) 40%
  - AO3 (analysis of information and ideas) 20%

### New exams and grading system

- 9-1 grading system for Single Science
- Combined Science will have a 17 point grading scale, from 9-9, 9-8 through to 2-1, 1-1

### More challenging content:

- The level of content has increased, as has the level of challenge

## How our resources support you

- Build and test the skills students need for the new practical assessment
- Full support for practical work, including lesson plans, worksheets and technician notes, in the Teacher Packs

- A Maths Skills spread in every chapter provides support for applying maths to science
- Maths skills are embedded throughout and tested at the appropriate level

- Monitor progress using regular assessment and common review checkpoints

- Questions highlight which assessment objectives they are targeting

- Differentiated content throughout
- Colour coded indicator on each page shows the ramping of demand

- Written for the 2016 specifications
- Written by a team of expert authors, the Student Books have been endorsed by OCR





- it's useful when estimating the numbers of different types of cell on the slide or in a tissue (though here, high power may be needed)

A low power digital image (or drawing) can be used to show the arrangement of cells in a tissue. This includes regions of the tissue but not individual cells.

If required, the cells or tissue can then viewed with high power to produce a detailed image of a part of the slide.

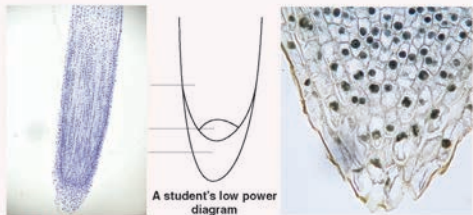


Figure 1.8 Low and high power micrographs, and a student diagram, of a plant root

4 Why is a slide viewed with low power first?

5 On a printout of the low power plan of the root, use the label lines provided to label the root cap, meristem (the region of cell division) and the region of cell elongation.

#### DID YOU KNOW?

These slides are temporary. If a permanent slide of cells is required, the cells or tissue must be dehydrated, embedded in wax and cut into thin slices called sections before staining.

Required practicals spreads in each chapter build and test students' development of the appropriate skills

Maths skills are embedded throughout the book and revisited in dedicated maths pages

## Biology – What happens in cells? (B1.2)

# MATHS SKILLS

## Size and number

### Learning objectives:

- make estimates for simple calculations, without using a calculator
- be able to use ratio and proportion to calibrate a microscope
- recognise and use numbers in standard form.

#### KEY WORDS

standard form

The size of structures is important in biology, from whole organisms to molecules.

### Estimating cell size

Accurate measurements are often essential. But estimating cell size or number is sometimes sufficient and may be quicker.

To estimate cell size, we can count the number of cells that fit across a microscope's field of view.

Size of one cell =  $\frac{\text{diameter of field of view}}{\text{number of cells that cross this diameter}}$

If the field of view of this microscope, at this magnification, is 0.3 mm, or 300  $\mu\text{m}$ , we can do a quick calculation without a calculator.

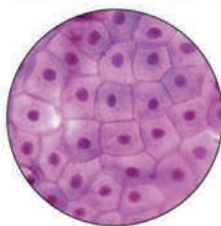


Figure 1.17 In this image, approximately five cells fit across the field of view. We round numbers down to make calculations straightforward.

#### DID YOU KNOW?

Scientists estimate cell or organism numbers when it is impossible or unnecessary to count them all.

#### REMEMBER!

The digital point remains fixed. It is the digits that move as a number is multiplied or divided by powers of 10. So, as a number gets larger, the digits move to the left (and vice versa).

#### DID YOU KNOW?

Pine trees grow in a pyramid shape to expose more needles to the sun, increasing the rate of photosynthesis.

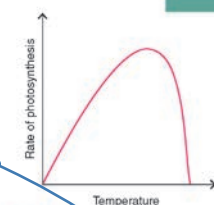


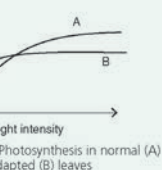
Figure 1.49 Explain what this graph shows

#### HIGHER TIER ONLY

### Limiting factors

Temperature and carbon dioxide levels may be the limiting factor when it's a sunny day. Temperature may be the limiting factor when it's a cold day. Light may be the limiting factor when it's a cloudy day.

Shade-adapted leaves (B) are more adapted to low intensity light than normal leaves (A).



Shade-adapted leaves (B) are more adapted to low intensity light than normal leaves (A).

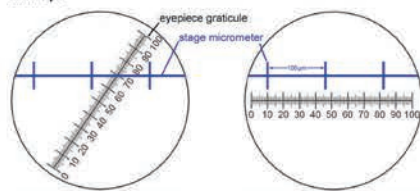
Factors for photosynthesis over one hour's day.

Adaptations for photosynthesis shown in different plants.

Reasons for a tree having needles rather than broad leaves.

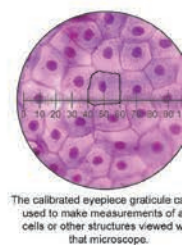
3 What would be the diameter of a cell that was 65 divisions on this graticule?

4 How many graticule divisions would a cell that was 35  $\mu\text{m}$  across take up?



The graticule is enclosed within the eyepiece. A stage micrometer is placed on the stage of the microscope.

The divisions on the eyepiece graticule and stage micrometer are lined up.



The calibrated eyepiece graticule can be used to make measurements of cells or other structures viewed with that microscope.

Figure 1.18: Calibrating, then using an eyepiece graticule.

### Numbers written in standard form

When writing and working with very large or very small numbers, it is convenient to use **standard form**. Standard form shows the magnitude of numbers as powers of ten.

Standard form numbers are written as:  $A \times 10^n$

where: A is an integer (or decimal number) between 1 and 10; and n is the index or power, which represents how many places to move the decimal point.

Worked example: You have been asked to write 375 000 in standard form.

$$375\,000 = 3.75 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 3.75 \times 10^5$$

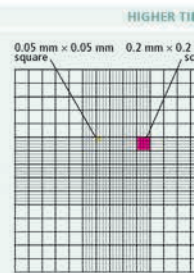
We use standard form when dividing or multiplying large numbers (see example in Figure 1.19).

Blood cell type	Width of an average cell (m)
Lymphocyte (small)	$7.5 \times 10^{-6}$
Macrophage	$5.0 \times 10^{-5}$
Megakaryocyte	$1.5 \times 10^{-4}$
Neutrophil	$1.2 \times 10^{-5}$

The sizes of different types of blood cell, written in standard form.

5 Look at the table of cell sizes. Arrange the cell types in descending order of size.

6 How many times larger is a megakaryocyte than a lymphocyte?



depth of counting chamber = 0.1 mm

For a 0.2 x 0.2 mm counting chamber:

Dimensions: top length: 0.2 mm =  $2.0 \times 10^{-1}$  m

side length: 0.2 mm =  $2.0 \times 10^{-1}$  m

depth: 0.1 mm =  $1.0 \times 10^{-1}$  m

$\therefore$  volume of counting chamber =

$(2.0 \times 10^{-1}) \times (2.0 \times 10^{-1}) \times (1.0 \times 10^{-1})$

multiply =  $4.0 \times 10^{-3} \text{ m}^3$

Figure 1.19 Calculating the volume of a counting chamber. The counting chamber is a hollow on a microscope slide which holds a set volume of fluid. It has a grid ruled onto it, a depth of 0.1 mm. The number of cells in a given volume can be calculated.

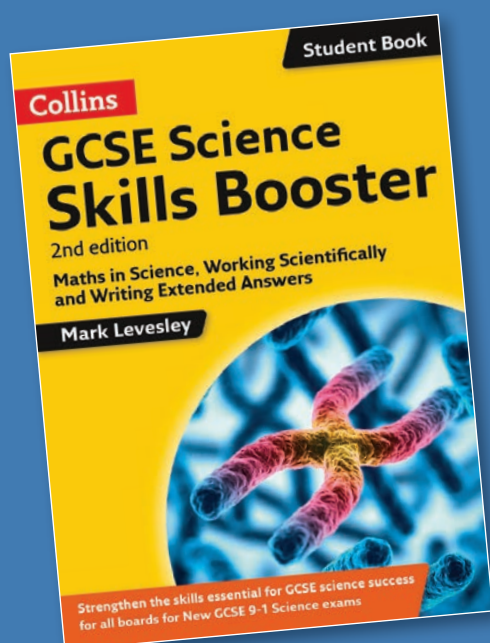
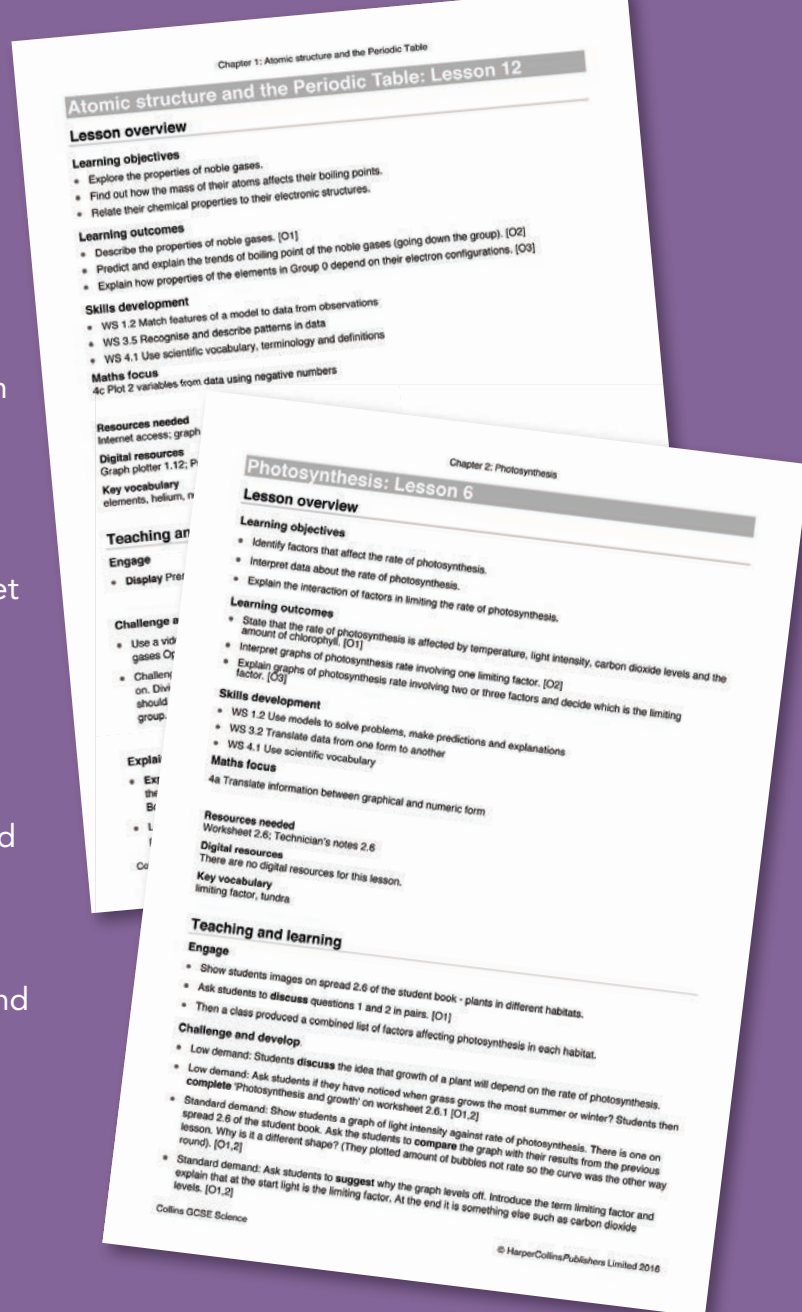
Google search: 'calibrating a microscope, haemocytometer, standard form'

Higher-only content is clearly flagged for easy co-teaching



# Teacher Packs

- Deliver the new GCSE Science curriculum with confidence, using the detailed support for introducing and teaching the new specifications
- Make planning easy with 2 and 3 year schemes of work and a comprehensive set of editable lesson plans and worksheets
- Detailed lesson plans include embedded opportunities to review students' performance
- Equip students with the skills they need for working scientifically, using maths, and carrying out practicals
- Prepare students for the challenges of the new specifications with differentiated questions and activities in every lesson and targeted supporting worksheets
- Co-teach both Foundation and Higher tier with a single book (the Higher-only content is clearly flagged)
- All resources are also provided on CD-ROM



## GCSE Science Skills Booster

Help students practise and perfect the core skills for the new GCSE Science (9-1) specifications; Applying Maths in Science, Working Scientifically and Writing Extended Answers. Suitable for all exam boards. Just £5.99 a copy.

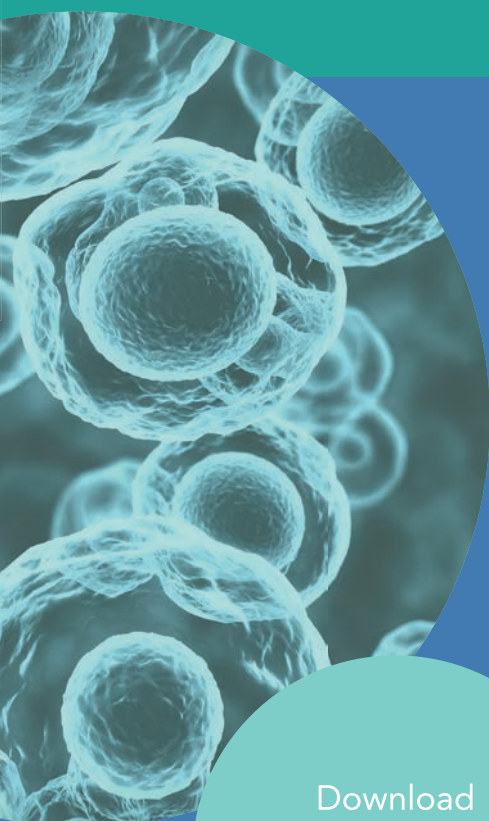
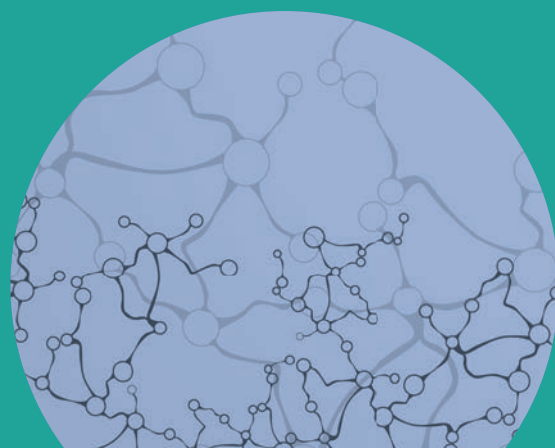


# Getting Started support for the new curriculum

Download for  
free from  
[www.collins.co.uk/  
OCRGateway  
GCSEscience](http://www.collins.co.uk/OCRGatewayGCSEscience)

## Schemes of Work

Support your planning with 2 and 3 year schemes of work, available to download from our website for free. These editable schemes of work provide a flexible approach for teaching Single and Combined Science GCSEs and are designed to help you get the most from our resources.



## Transition Units

Help your Year 9 students get to grips with key ideas and prepare them to work at a GCSE level of challenge with our ready-to-go units, specifically written to address the transition from KS3 to the new GCSE science.

- Flexible units that can be used in any order, so you can pick up and teach in a way that suits your timetable
- Cover five key ideas from the new curriculum: Seedlings and coloured light, sound reflectors, barometric pressure, rhododendrons and milk glue
- Each unit includes three lesson plans, resource sheets, worksheets, technician notes and front of class PowerPoints

Download  
for free from  
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## About the Series Editor



### Ed Walsh

Ed Walsh is a curriculum developer, CPD provider and school improvement officer. A teacher for twenty years and a team leader for twelve of those, he now writes and edits curriculum materials, designs and delivers CPD and works with science departments to improve the quality of their provision. He regularly presents sessions at ASE regional and national conferences and is a Regional Development Leader for the Science Learning Network in the south west. Ed's current projects include developing the Science Mark programme for the National Science Learning Centre, piloting the use of iPads in science teaching and writing STEM teaching materials for Siemens. He lives in Cornwall, where he works with local schools as Science Adviser.

### John Beeby

After completing a PhD in insect biochemistry, John Beeby was a teacher of Biology and Chemistry. He has extensive examining experience. John has a passion for making science interesting and relevant and the latest scientific research and developments accessible to learners.

### Ann Daniels

Ann is a former headteacher, curriculum developer, teacher trainer and teacher in the UK. She now works as an Educational Consultant, international adviser and assessment specialist.

### Sandra Mitchell

Sandra Mitchell spent over twenty years working in schools, as a Head of Physics and a Head of Science. She has extensive examining experience and is a writer, having contributed to several successful textbooks.

### Anne Pilling

Anne began her career undertaking research into slow release nutrient tablets and copper based fungicides before becoming a secondary school Science teacher based in the North West. She went on to work as a Consultant Adviser for a local authority, initially as part of the National Strategies initiative, with responsibility for primary and secondary science before taking up her current role as an independent consultant. Anne also has extensive examining experience.

## About the Authors



# Collins GCSE Science: Component chart

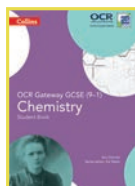
## Student Books



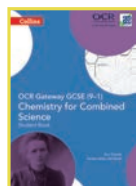
**Biology**  
978-0-00-815094-5  
£18.99



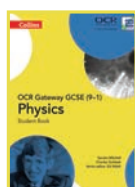
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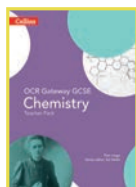


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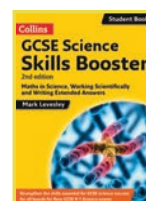


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**Physics**  
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£125

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**GCSE Science (9-1) Skills Booster, second edition**  
978-0-00-818982-2  
£5.99

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A circular inset in the top left corner shows a microscopic view of several cells, likely animal cells, with visible nuclei and textured surfaces. The cells are rendered in shades of blue and white against a dark background.

**Collins**

A large, solid pink circle is positioned in the bottom right area of the page, partially overlapping the yellow background.

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