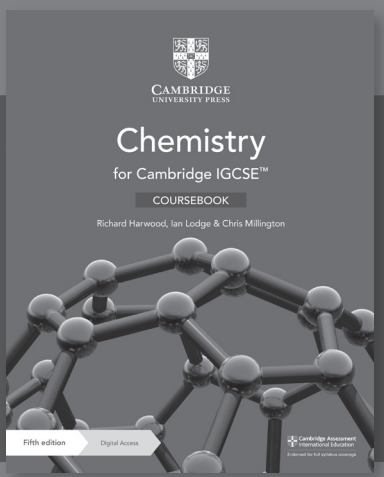
How to use this series

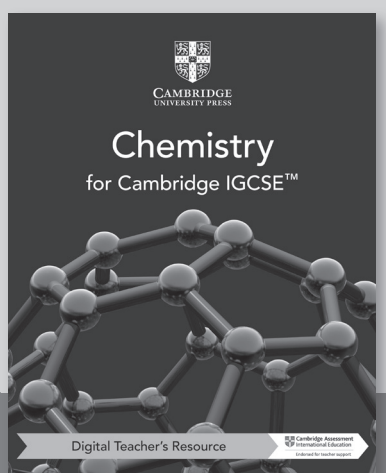
We offer a comprehensive, flexible array of resources for the Cambridge IGCSE™ Chemistry syllabus. We provide targeted support and practice for the specific challenges we've heard that students face: learning science with English as a second language; learners who find the mathematical content within science difficult; and developing practical skills.

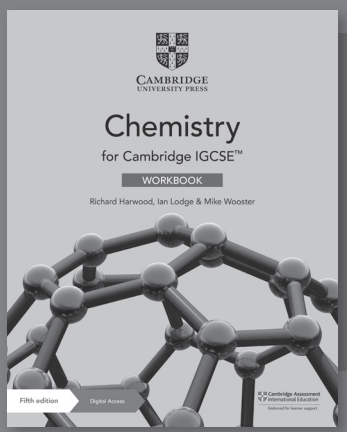


The coursebook provides coverage of the full Cambridge IGCSE Chemistry syllabus. Each chapter explains facts and concepts, and uses relevant real-world examples of scientific principles to bring the subject to life. Together with a focus on practical work and plenty of active learning opportunities, the coursebook prepares learners for all aspects of their scientific study. At the end of each chapter, examination-style questions offer practice opportunities for learners to apply their learning.

The digital teacher's resource contains detailed guidance for all topics of the syllabus, including common misconceptions identifying areas where learners might need extra support, as well as an engaging bank of lesson ideas for each syllabus topic. Differentiation is emphasised with advice for identification of different learner needs and suggestions of appropriate interventions to support and stretch learners. The teacher's resource also contains support for preparing and carrying out all the investigations in the practical workbook, including a set of sample results for when practicals aren't possible.

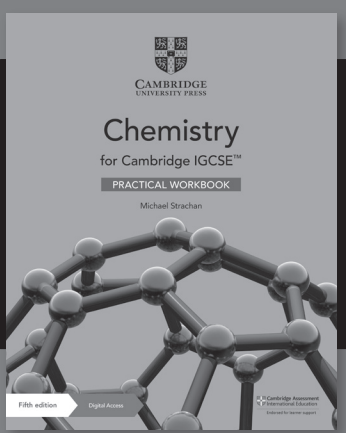
The teacher's resource also contains scaffolded worksheets and unit tests for each chapter. Answers for all components are accessible to teachers for free on the Cambridge GO platform.

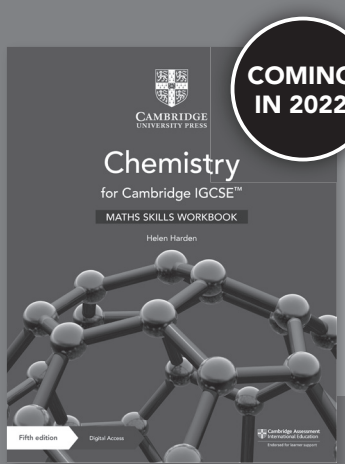




The skills-focused workbook has been carefully constructed to help learners develop the skills that they need as they progress through their Cambridge IGCSE Chemistry course, providing further practice of all the topics in the coursebook. A three-tier, scaffolded approach to skills development enables students to gradually progress through 'focus', 'practice' and 'challenge' exercises, ensuring that every learner is supported. The workbook enables independent learning and is ideal for use in class or as homework.

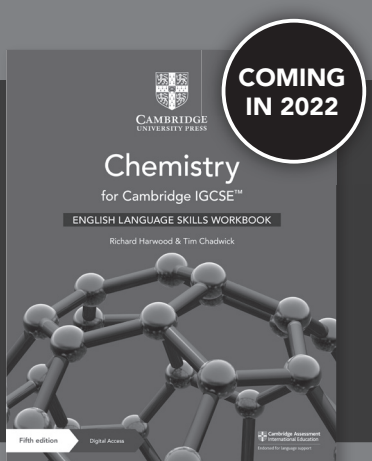
The practical workbook provides learners with additional opportunities for hands-on practical work, giving them full guidance and support that will help them to develop their investigative skills. These skills include planning investigations, selecting and handling apparatus, creating hypotheses, recording and displaying results, and analysing and evaluating data.





Mathematics is an integral part of scientific study, and one that learners often find a barrier to progression in science. The Maths Skills for Cambridge IGCSE Chemistry write-in workbook has been written in collaboration with the Association for Science Education, with each chapter focusing on several maths skills that students need to succeed in their Chemistry course.

Our research shows that English language skills are the single biggest barrier to students accessing international science. This write-in English language skills workbook contains exercises set within the context of Cambridge IGCSE Chemistry topics to consolidate understanding and embed practice in aspects of language central to the subject. Activities range from practising using the passive form of verbs in the context of electrolysis to the naming of chemical substances using common prefixes.



How to use this book

Throughout this book, you will notice lots of different features that will help your learning. These are explained below.

INTRODUCTION

These set the scene for each chapter and indicate the important concepts. These start with the sentence 'The investigations in this chapter will:'.

KEY WORDS

Key vocabulary and definitions are given at the start of each investigation. You will also find definitions of these words in the Glossary at the back of this book.

Supplement content: In the key word boxes, Supplement content is indicated with a large arrow, as in this example.

COMMAND WORDS

Command words that appear in the syllabus and might be used in exams are highlighted in the exam-style questions. In the margin, you will find the Cambridge International definition. You will also find these definitions in the Glossary at the back of the book.

LEARNING INTENTIONS

These set out the learning intentions for each investigation.

In the learning intentions table, Supplement content is indicated with a large arrow and a darker background, as in the example here.

The investigations include information on **equipment**, **safety considerations** and **method**. They also include **questions** to test your understanding on recording data, handling data, analysis and evaluation.

Remember that there is a **safety section** at the start of this book – you should refer to this often, as it contains general advice that is applicable to many of the investigations.

REFLECTION

These encourage you to reflect on your learning approaches.

TIPS

The information in these boxes will help you complete the questions, and give you support in areas that you might find difficult.

Supplement content

Where content is intended for students who are studying the Supplement content of the syllabus as well as the Core, this is indicated using the arrow and bar, as on the left here. Some practical investigations that include both Core and Supplement content use this arrow and bar where the main focus of the investigation is on Supplement content.

EXAM-STYLE QUESTIONS

Questions at the end of each chapter provide more demanding exam-style questions, some of which may require use of knowledge from previous chapters. The answers to these questions are accessible to teachers for free on the Cambridge GO site.

Note for teachers:

The teacher's resource in this series includes sample data and support notes for each of the practical investigations in this practical workbook. You can find information about planning and setting up each investigation, further safety guidance, common errors to be aware of, differentiation ideas and additional areas for discussion.

Answers to all questions in this practical workbook are also accessible to teachers at www.cambridge.org/go

Introduction

None of the pioneering work done in the scientific field of chemistry would ever have occurred without the laboratory and the art of experimentation. Nearly all of the great discoveries that form the foundations of our knowledge came from people completing practical investigations in laboratories not too different from the ones you will be using to complete your studies. Great chemists such as Lavoisier and Priestley, would recognise some of the principles contained in this book, though they would note the modern approaches used to investigate them.

Practical skills form the backbone of any chemistry course and it is hoped that, by using this book, you will gain confidence in this exciting and essential area of study. This book has been written to prepare Cambridge IGCSE™ Chemistry learners for their practical and alternative to practical examinations for Cambridge IGCSE Chemistry (0620/0971). It covers many of the topics from the syllabus. The various investigations and accompanying questions will help you to build and refine your abilities. You will gain enthusiasm in tackling laboratory work and will learn to demonstrate a wide range of practical skills. It is hoped that these interesting and enjoyable investigations will develop in you, a great enthusiasm for practical chemistry. Great care has been taken to ensure that this book contains work that is safe and accessible for you to complete. Before attempting any of these activities, make sure that you have read the safety section and are following the safety regulations of the place where you study. Answers to the exercises in this practical workbook can be found in the teacher's resource. Ask your teacher to provide access to the answers.

Safety

Despite using Bunsen burners and chemicals on a regular basis, the science laboratory is one of the safest classrooms in a school. This is due to the emphasis on safety and the following of precautions set out by regular risk assessment and procedures.

It is important that you follow the safety rules set out by your teacher. Your teacher will know the names of materials and the hazards associated with them as part of their risk assessment for performing the investigations. They will share this information with you as part of their safety briefing or demonstration of the investigation.

The safety precautions in each of the investigations of this book are guidance that you should follow to ensure your safety and that of other students around you. You should aim to use the safety rules as further direction to help to prepare for examination when planning your own investigations in the practical and alternative to practical papers.

The following precautions will help to ensure your safety when carrying out most investigations in this practical workbook.

- Be careful with chemicals. Never ingest them and always wash your hands after handling them.
- Wear safety goggles to protect your eyes.
- Tie back hair and any loose items of clothing.
- Tidy away personal belongings to avoid tripping over them.
- Wear gloves and protective clothing as described by the book or your teacher.
- Turn the Bunsen burner to the yellow flame when not in use.
- Observe hazard symbols and chemical information provided with all substances and solutions.

Many of the investigations require some sort of teamwork or group work. It is the responsibility of your group to make sure that you plan how to be safe as diligently as you plan the rest of the investigation.

In Chemistry particular attention should be paid to the types of Bunsen burner flame needed as well as the concentrations and volumes of chemicals used.

Cambridge International uses the following hazard codes:
C corrosive, **MH** moderate hazard, **HH** health hazard, **T** acutely toxic, **F** flammable, **O** oxidising, **N** hazardous to the aquatic environment.

You should try to become familiar with these codes.

The information in this section is based on the Cambridge IGCSE and IGCSE (9-1) Chemistry syllabuses (0620/0971) for examination from 2023. You should always refer to the appropriate syllabus document for the year of your students' examination to confirm the details and for more information. The syllabus document is available on the Cambridge International website at www.cambridgeinternational.org.

Note to teachers: Guidance on safety has been included for each of the practical investigations in this practical workbook. You should make sure that they do not contravene any school, education authority or government regulations. You and your school are responsible for safety matters.

Practical skills and support

The 'Experimental skills and investigations' outlined in the Cambridge IGCSE Chemistry syllabus focus on skills and abilities you need to develop to work as a scientist. Each of these aspects has been broken down for you below with a reference to the chapters in this book that cover it. This will enable you to identify where you have practised each skill and also allow you to revise each one before the exam.

Skills grid

Chapter	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Experimental skills and investigations																						
1.1 demonstrate knowledge of how to select and safely use techniques	■				■	■	■				■			■		■		■		■	■	■
1.2 demonstrate knowledge of how to select and safely use apparatus and materials	■		■		■	■	■		■	■	■	■				■	■	■	■		■	■
1.3 demonstrate knowledge of how to follow a sequence of instructions where appropriate	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2 plan experiments and investigations						■					■			■		■			■	■	■	
3.1 make and record observations	■	■	■	■			■		■	■	■	■	■	■	■	■	■	■	■			■
3.2 make and record measurements	■				■	■	■	■	■	■					■		■		■	■	■	■
3.3 make and record estimates																	■	■				
4.1 interpret experimental observations and data	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
4.2 evaluate experimental observations and data					■		■	■								■			■	■	■	■
5.1 evaluate methods		■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■
5.2 suggest possible improvements to methods	■	■			■	■	■	■	■	■	■	■	■	■	■		■			■	■	
Additional skills for Chemistry																						
Constructing own table	■				■	■	■	■		■	■			■	■	■	■	■	■	■		
Drawing/analysing a graph	■					■	■	■		■	■			■	■		■			■		
Planning an investigation to improve accuracy/reliability/ precision									■											■		
Mathematical calculations		■			■	■	■										■				■	

Apparatus

You will need to be able to identify, use and draw a variety of scientific apparatus.
Complete the table below by adding a diagram and uses for each piece of apparatus.
The first two pieces of apparatus have been completed for you.

Apparatus	Diagram	Uses	Apparatus	Diagram	Uses
timer		Measure time taken for something to happen. Usually measured in seconds.	balance		Measure mass of a substance. Usually measured in grams.
thermometer			measuring cylinder		
beaker			volumetric pipette		
burette			conical flask		

Apparatus	Diagram	Uses	Apparatus	Diagram	Uses
Bunsen burner			tripod		
gas syringe			test-tube / boiling tube		
filter paper			filter funnel		

Measuring values

Being able to take accurate measurements using a variety of different apparatus is an essential skill in chemistry. It is important that you are familiar with the appropriate apparatus and units for the measurement of volume (liquids and gases), time, temperature, mass and length.

Traditional measuring equipment (e.g. a ruler, measuring cylinder or thermometer) uses a scale made up of equally spaced divisions with numbers marked at regular intervals. These numbers usually increase in values of 1, 2, 5 or 10. You read the measurement from the scale. Not all of the points of the scale will be marked, so you will need to work out the value of each graduation. Data values should be read to an accuracy of one half of one of the smallest divisions on the scale. Digital measuring equipment (e.g. an electronic balance, pH meter, digital timer or temperature probe) display the measurement directly on a small screen.

When using measuring cylinders and burettes for measuring the volume of a liquid you will need to look for the meniscus, which is the bottom of the curved surface formed by the liquid. Always read the measurement from the bottom of the meniscus at eye level. For example, the volume of liquid in the measuring cylinder in Figure P1 is 36.5 cm^3.

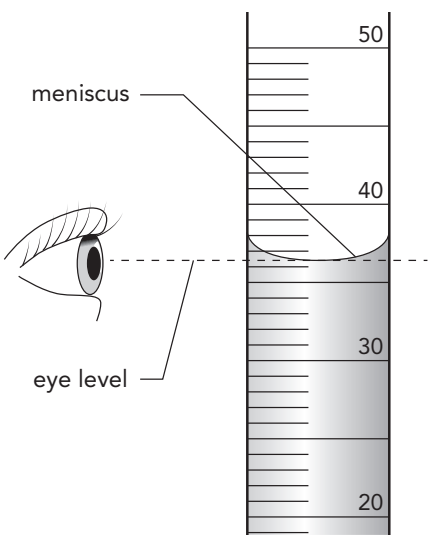


Figure P1: Reading the volume of a liquid.

Recording data

The ability to record data accurately is very important when performing an investigation. Sometimes a table will be supplied for the results; however, you will often need to be able to draw your own table with the correct headings and units.

The first task is to identify the independent and dependent variables for the investigation you are performing. The independent variable is the variable that you are changing to see if this affects the dependent variable. The dependent variable is the variable that you will measure and record the results of in the table. The names of these two variables and their appropriate units need to go into the top two boxes in the columns in your results table. The independent variable goes in the left-hand box and the dependent variable goes in the right-hand box. Separate the name of the variables and units using a forward slash, e.g. volume of gas produced / cm^3. Remember that the column headings need to be physical quantities (time, mass, temperature, etc.).