Complete Chemistry for Cambridge IGCSE® Third edition
Teacher Resource Pack

Complete Chemistry for Cambridge IGCSE® directly matches the latest Cambridge IGCSE Chemistry syllabus, supporting comprehension of complex ideas and independent learning. A stretching, skills-based approach progressively strengthens student ability, enabling confident exam performance.

This Teacher Resource Pack directly supports teachers in building student understanding.

- Fully prepare for exams – comprehensive coverage of the course
- Develop advanced skills – a rigorous step-by-step approach extends performance
- Progress to the next stage – differentiated extension material eases the transition to 16-18 study

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Complete Chemistry for Cambridge IGCSE® Third edition
Teacher Resource Pack

Empowering every learner to succeed and progress

- Complete Cambridge syllabus match
- Comprehensive exam preparation
- Reviewed by subject specialists
- Embedded critical thinking skills
- Progression to the next educational stage

Complete Chemistry for Cambridge IGCSE® Third edition
Teacher Resource Pack

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Paul Ingram

Oxford excellence for Cambridge IGCSE®
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About this course

*Complete Chemistry for Cambridge IGCSE* has been written for the *Cambridge IGCSE Chemistry* syllabus 0620.

It has four components. These are described below. Together they form a comprehensive course that will help you to deliver the syllabus with success.

### The student book

This provides …

- full coverage of the syllabus, in clear language
- content in two-page units, with the *Extended* material clearly marked
- a wide range of drawings and photos
- a large number of questions
  - short questions at the end of each unit
  - exam-level questions at the end of each chapter
  - questions from past CIE exam papers at the end of the book
- a revision checklist for each chapter
- a full glossary.

### The student website

This provides …

- interactive diagnostic questions for each chapter, with answers
- copies of these, from the student book:
  - the end-of-chapter questions
  - the revision checklists
- help in preparing for the exam, including:
  - advice on revision, and sitting the exam
  - help with the language used in exam papers
  - sample answers for a selection of past exam questions, with comments
- a set of practice exam papers, with exam-style multiple choice questions, and past exam questions.

[www.oxfordsecondary.com/9780198399148](http://www.oxfordsecondary.com/9780198399148)

### The teacher book

This provides …

- a set of lesson plans
- a set of laboratory practicals, and teacher’s notes for these, plus answers to the questions on the practical sheets
- a worksheet for each chapter of the student book, with *Extended* questions clearly marked, and answers for all the worksheet questions
- a complete set of answers to *all* the questions in the student book, provided here, in hard copy, for quick and easy access.
- answers to the test assessments from the CD, for quick access.

### The teacher CD

It accompanies the teacher book, and provides …

- an electronic copy of the material in the teacher book
- activity sheets to accompany the lesson plans
- a selection of key diagrams from the student book
- a set of animations
- a test for each chapter of the student book, with *Extended* questions clearly marked
- a second set of practice exam papers
- a syllabus grid, showing how the student book maps to the syllabus
- answers to every question in every component of the course, including all the exam questions.
Using the course components

The student book
It is the key component of the course. With its clear explanations and full coverage, it aims to help your students master the syllabus with ease.

The student website
www.oxfordsecondary.com/9780198399148
• This can be used in and outside school – wherever your students have computer access.

• Please encourage your students to make the most of it: for example to try the diagnostic questions, use the revision checklists, and work through the sample exam answers. You could set many of the items for homework.

• The end-of-chapter questions from the student book are included, so that students can try these at any time, even if the book is not to hand.

• The practice exam papers will give your students valuable practice, when preparing for the exam.

The teacher book
• It provides these materials from the teacher CD as hard copy, for quick and easy access:
  – the lesson plans
  – the practicals
  – the worksheets
  – the answers for all questions in the student book
  – answers to the test assessments from the teacher CD.

• The lesson plans These give guidance on how you might structure lessons for some of the more challenging topics in the syllabus.

• The practicals These cover key areas of the syllabus, and need only standard apparatus and chemicals. They include questions to get students thinking. (Answers are provided for you.)

• The worksheets There is one for each student book chapter. You can photocopy them, for use in class or for homework. Extended material starts on a new page, so can be ignored for Core students. Collect the worksheets for marking, or allow self- or peer-marking. (Answers are provided for you.)

• The answers for questions in the student book These are included to save you time and effort. You will even find answers to the short end-of-spread questions here.

The teacher CD
This contains a wealth of material to help you teach the syllabus successfully.

• Everything from the teacher book is duplicated here, in electronic form.

• The activity sheets accompany the lesson plans and provide activities you may want to use in class.

• The tests, one for each chapter of the student book, can be used as end-of-topic tests, or for homework if you prefer.

• The animations, and the key diagrams from the student book, will help you explain concepts to the class.

• The syllabus grid shows clearly how the student book maps to the syllabus.

• The practice exam papers are ideal for holding mock exams, to give your students practice.

• Answers to every question in each component of the course are on the CD, including the answers to all the tests and practice exam papers.
Knowing the 0620 IGCSE Chemistry syllabus

Clearly, it is very important that you should ‘know the syllabus’ you are teaching! ‘Knowing’ the syllabus does not refer only to its knowledge component. You must also understand which skills are to be assessed, and the means of assessing both knowledge and skills. The purpose of this section is to help you focus on the nature and content of the syllabus.

Curriculum content
Try to answer the following questions by reference to the curriculum content section of the syllabus.

1. What extra knowledge is required for the Supplement? How do you know?
2. Which extra levels of skill are required in the Supplement that are not needed for the Core? The grade descriptions in the syllabus will help you. Where do you find these?
3. The order in which topics appear in the syllabus may not always be the order in which you would like to teach them. Can you identify any areas where the scheme of work that you use, or would like to use, differs from the sequence of topics in the syllabus?
4. Can you identify any areas of the syllabus to which you give less emphasis than others? If so, why do you do this?
5. Can you identify any areas that you tend to overlook? If so, how will you rectify this? (You cannot assume that questions will not be asked in particular areas.)
6. Make a list of all the definitions required by the syllabus. See the table on page 7. Would it be useful to photocopy the list for your students?
7. Identify any topics where you consider that your own knowledge, or the teaching material that you have available, is insufficient. What can you do to remedy this?

Assessment
The IGCSE Chemistry examination at the end of the course is the final summative assessment for students following the IGCSE Chemistry syllabus.

1. What method of summative assessment is prescribed by this syllabus? What steps can you take to ensure that your students are prepared for this assessment?
2. The examination papers include some assessment of basic mathematical skills. How do you know which skills are required? How do you check that your students have these skills?
3. The summative assessment also includes an examination of practical skills. How can you find out which laboratory equipment your students should be familiar with?
4. In the practical assessment, the candidates are expected to show that they can deal with data in an effective and meaningful way. This data can be presented in a number of different ways. How are students expected to present data? How do you know this? What steps can you take to make sure that your students have the necessary data-handling skills?
Definitions in IGCSE Chemistry

‘Define’ is a command word used as a direct instruction to candidates in IGCSE examination papers. If this instruction is given, the candidate must offer a word-perfect (or very nearly so) definition, as set out in the syllabus.

In the IGCSE Chemistry syllabus, the terms to be defined so precisely are introduced with the word ‘define’, and written in italics. For example on page 16, in section 3.1:

‘Define isotopes as atoms of the same element which have the same proton number but a different nucleon number.’

The table below lists the terms to be defined. The syllabus will help you complete it.

Definitions required by the syllabus.

<table>
<thead>
<tr>
<th>Term</th>
<th>Core</th>
<th>Extended only</th>
<th>Section of syllabus/context</th>
</tr>
</thead>
<tbody>
<tr>
<td>acids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avogadro constant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>electrolysis</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>isotopes</td>
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<td></td>
</tr>
<tr>
<td>mole</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nucleon number</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>oxidation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>oxidising agent</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>proton number</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>redox</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>reducing agent</td>
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<td></td>
</tr>
<tr>
<td>reduction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>relative atomic mass, $A_i$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>relative molecular mass, $M_i$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You can help students prepare for the exam by devising a scheme for practising these definitions. For example students could match the terms with their correct definitions, chosen out of several incorrect ones, or fill in the blanks in incomplete definitions.
Knowing how to answer exam questions

In the exam papers for IGCSE Chemistry, candidates are told what the examiner expects from them. The instructions are given in the introduction to each question or question part. They are given as command words.

For example, a candidate might be asked to define a term, to describe a process, or to calculate a numerical value. Define, describe and calculate are command words.

For success in the exam, it is essential that the candidate understands what each command word means, and what kind of answer is expected. This will help candidates to avoid wasting time by writing answers that are longer and more detailed than needed.

What answer is expected?

- Command words may require either concise or extended answers.
- Some require only single-word or single-number answers.
- Command words may require either recall, or for the student to make logical connections between pieces of information.

The command words are listed in Appendix A of the syllabus, as Glossary of terms used in science papers.

Know the command words

The following exercise will help you to become more familiar with the command words, so that you can prepare your students. Use the glossary of terms in the syllabus to answer questions 1–6. Then consider question 7.
1. Which command words require only single-word and single-number answers?
2. Which command words require only brief answers?
3. Which command words may have more than one meaning?
4. What is the difference between the command words explain and describe?
5. What is the difference between the phrase what do you understand by...? and the command word explain?
6. What is the difference between the command word suggest and the command word explain?
7. How can you ensure that your students understand all of the command words?

It is useful to analyse past papers, both Core and Extended, for command words. Which are the most commonly used?

You can access 0620 past papers on the CIE Teacher Support web page: http://teachers.cie.org.uk/

You will need a username and password to access this site.
Assessing your students

Assessment is an important part of the teaching and learning process. You need to carry out two types of assessment: formative and summative.

**Formative assessment is the ongoing assessment you carry out while teaching a topic.** You gather evidence of the students’ learning and use it to assess, with them, where they are in their learning, where they need to go, and how to get there.

**Summative assessment is the assessment you carry out at the end of a topic, or term, or course, to measure and compare students’ performance at that point.** It may be the basis of decision-making, for example about whether to enter a student for the Extended papers in the IGCSE Chemistry exam.

You will probably use formative assessment frequently, and summative assessment less so.

**Successful assessment**

Successful assessment is likely to follow certain key principles.

- Students understand clearly what they are supposed to be doing. This requires clear shared criteria and learning goals.
- Peer assessment and self-assessment are included.
- There is a clear marking system, so that students know how well they have done against the criteria.
- Students receive feedback (a balance of written and oral feedback) with achievement celebrated, and targets set for further action.
- Students are helped to identify actions to take to improve their work.

And …

- Students are actively involved in their own learning.
- Self-assessment techniques enable students to identify what needs improvement, for themselves.
- Both students and teachers understand projected outcomes.
- Both students and teachers are aware of progress towards set targets, and appropriate advice and support is offered.

And, most importantly …

- Teaching is adjusted to take account of the results of the assessment.
- The teacher and students review and reflect on students’ performance and progress.
- There is increased motivation and self-esteem (crucial for effective learning and progress).

**Factors** which work against effective assessment for learning include:

- assessment of the quantity of work and its presentation, rather than the quality of learning.
- greater attention paid to marking and grading (which may lower students’ self-esteem) than to providing advice for improvement.
- strong emphasis on comparing students with each other. (This may demoralise less-successful learners.)
How much assessment do you carry out?
Read through each question. Give yourself a score for each question. Circle the number.
0 = never do this
1 = rarely do this (once or twice a year)
2 = do this occasionally (once or twice a term)
3 = do this regularly (at least once every two weeks)

Marking
Collect in students’ books and look at them  0  1  2  3
Write comments on them (apart from good/bad, etc.)  0  1  2  3
Give a grade for achievement  0  1  2  3

Tests
Set tests and give a grade to each student  0  1  2  3
Write comments on test papers  0  1  2  3
Go over tests as a class exercise  0  1  2  3
Give some students individual feedback on tests  0  1  2  3

Asking questions in class
Ask questions to the whole class  0  1  2  3
Ask questions to specific students  0  1  2  3
Discuss work in progress, with individuals  0  1  2  3
Give practical work to check understanding  0  1  2  3
Give written work or group work in class  0  1  2  3

Target setting
Set targets for the group as a whole  0  1  2  3
Set targets for individual students  0  1  2  3

Student self-evaluation
Ask students about their progress  0  1  2  3
Obtain feedback from individual students about how they feel they are performing  0  1  2  3

Add up the number of 0s, 1s, etc. (max 16 in any column) ___ ___ ___ ___

A large number of 0s and 1s is not a criticism of your teaching methods. Rather, it will highlight areas which you could consider developing further, to help your students improve their performance.
SMART targets for formative assessment

Setting targets for the student is a key part of formative assessment. SMART stands for:

- Specific: the target should state exactly what needs to be done, e.g. learn a specific section of work/ learn how to balance equations.
- Measurable: it should be easy to measure whether the target has been reached, for example by using a specific test/ piece of work.
- Achievable: the target should be simple enough to meet within a short period of time, e.g. two weeks.
- Realistic: the task should depend on the level / grade at which the student is working. It is counterproductive to set tasks in which students are likely to fail.
- Time-related: the length of time allowed to complete the task is specified. You may need to check how the task is going, from time to time.

Students may also evaluate how they are progressing, through discussion with the teacher. A student's view of his or her progress may differ from the teacher's view. Self-evaluation may also highlight areas where a student could improve.

Summative assessment: formal tests

Summative assessment is often in the form of formal tests, carried out in exam-like conditions, against the clock.

For any assessment to be useful, the student should take something positive from the experience. So formal tests should not be just a blunt tool for obtaining student grades. They should be used for further feedback too.

For example, feedback on tests could include not only the correct answers, but the reasons why the given answers were correct or incorrect.

You can also direct students towards any remedial work they need to do.
You may set formal tests for your students at different points throughout the course. However, the final summative assessment for the 0620 Chemistry syllabus is provided by Cambridge International Examinations. The process is described in the syllabus and on the CIE Teacher Support website. The scheme is outlined below.

All candidates must enter for three papers.

Candidates who have studied the Core syllabus content, or who are expected to achieve a grade D or below, should be entered for Paper 1, Paper 3 and either Paper 5 or Paper 6. These candidates will be eligible for grades C to G.

Candidates who have studied the Extended syllabus content (Core and Supplement), and who are expected to achieve a grade C or above, should be entered for Paper 2, Paper 4 and either Paper 5 or Paper 6. These candidates will be eligible for grades A* to G.

### Core candidates take:
- **Paper 1**: 45 minutes
  - A multiple-choice paper consisting of 40 items of the four-choice type.
  - This paper will test assessment objectives AO1 and AO2.
  - Questions will be based on the Core syllabus content.
  - This paper will be weighted at 30% of the final total mark.

### Extended candidates take:
- **Paper 2**: 45 minutes
  - A multiple-choice paper consisting of 40 items of the four-choice type.
  - This paper will test assessment objectives AO1 and AO2.
  - Questions will be based on the Extended syllabus content (Core and Supplement).
  - This paper will be weighted at 30% of the final total mark.

and:
- **Paper 3**: 1 hour 15 minutes
  - A written paper consisting of short-answer and structured questions.
  - This paper will test assessment objectives AO1 and AO2.
  - Questions will be based on the Core syllabus content.
  - 80 marks
  - This paper will be weighted at 50% of the final total mark.

### All candidates take:
- either:
  - **Paper 5**: 1 hour 15 minutes
    - Practical Test
    - This paper will test assessment objective AO3.
    - Candidates will not require knowledge outside of the Core syllabus content.
    - 40 marks
    - This paper will be weighted at 20% of the final total mark.

or:
- or:
  - **Paper 6**: 1 hour
    - Alternative to Practical
    - This paper will test assessment objective AO3.
    - Candidates will not require knowledge outside of the Core syllabus content.
    - 40 marks
    - This paper will be weighted at 20% of the final total mark.

This process requires that you, and the school, make two important decisions for each candidate:
- Core or Extended? (i.e. Papers 1 and 3, or Papers 2 and 4)
- Practical test, or Alternative to practical test? This decision is likely to reflect the school’s circumstances and facilities.

Then you must make sure that students are clear about which papers they will take.