

AS and A-level Chemistry

Key skills and knowledge booster

Victoria Stutt

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Introduction – from the authors

About the Key Skills and Knowledge Booster series

We have developed this series based on our own teaching, to enable students undertaking science AS and A-levels to experience a smoother transition from GCSE to AS and A-level.

Students often find this transition very difficult and can easily become overwhelmed by the new subject knowledge they meet, which is often abstract, and the level of understanding required. It is not uncommon for students to find themselves in the unenviable position of failing early exams or gaining grades that lead to them to become despondent with the subject or reconsider their subject choices.

The tasks outlined in this series aim to cover areas of common misconceptions in the main science AS and A-levels of biology, chemistry and physics, and to aid teachers in their delivery of underpinning concepts, such as general maths skills or practical skills, needed for each subject. The newly updated AS and A Level Science curricula have placed a far greater emphasis on these underpinning skills, and for this reason each of the books in the Key Skills and Knowledge Booster series has had extra tasks added to ensure that teachers can provide as much support as possible to students with these skills.

Due to the wide number of GCSE specifications covered by students, it is impossible for all students to begin their AS and A-levels with identical background knowledge, and there will always be huge variability in the grades students have achieved in their GCSE exams. Both of these factors can have an impact on the delivery of the AS and A-level specification and, ultimately, on the success of students. At the time of this book being written the new GCSE science specification is in the process of being finalised. This specification also places emphasis on underpinning skills, including maths, and has introduced new topics within each of the three subjects. Extra tasks have been added that teachers can use to check the understanding of these areas in students moving from GCSEs to AS and A-Levels. This will be of particular importance when teaching students who have moved from the old GCSE specifications, as it will help highlight areas that were not covered but are expected to be commonplace as students progress through their science studies.

The Key Skills and Knowledge Booster series has been developed to complement your existing teaching.

It has not been written to meet any particular AS and A-level specification, but rather to cover general areas within each subject that we have found anecdotally give rise to problems for students. These tasks are not intended to replace your existing text books or to act as a stand-alone teaching guide.

What the Key Skills and Knowledge Booster series contains

A separate book has been produced for biology, chemistry and physics. Each title is broken down into the following sections. Ideas on how you may wish to use each type of task, within your own teaching, have been shown in italics.

- **GCSE Checker Tasks:** these tasks can be used to get an overview of GCSE knowledge that students have, or to highlight areas of weakness.

These could be used as an induction exercise to ascertain students' background knowledge and highlight areas that students will need to revise, or they could be combined to form an induction test.

- **Basic Skills for the AS and A-level Student:** these tasks give instructions and guidance to students on skills they will need throughout AS and A-levels, such as essential maths skills. We have found that maths skills, or confidence in particular, is often an area that causes many problems, especially if students are not following AS and A-level courses in maths. These tasks aim to cover some of the gaps in knowledge that students may have.

These could be used at the beginning of the AS course or the A-Level first year to bring students up to a basic level in skills such as graph plotting, using calculators or using scientific notation. They can also be given to students if work they are completing throughout the year shows they have weaknesses in certain areas, for example rearranging equations.

- **Investigation Skills for the AS and A-level Student:** these tasks outline key skills or techniques that students will need in order to access their specific AS and A-level specification; they form an excellent bank of resources that students could refer to in order to remind themselves of practical techniques, or skills that they may need to use time and time again. These will complement the teaching around any investigations or assessed practical activities that students may need to complete.

These could be used when introducing a new practical technique, such as titration, or in the run-up to practical exams, or to aid in-depth investigations.

- **Topic Builders:** these tasks lead students through the topics that, in our experience, students find the most difficult to comprehend. They have been written in as simple a manner as possible to try and support students through topics and to steer them away from forming misconceptions. Where possible, simple analogies have been included to help students overcome the abstract nature of some of the topics. These tasks include a 'taking it further' section that allows students to consolidate what they have covered and to go on and extend their understanding, once they have grasped the essential points and are feeling more confident with the topic.

These can be given to students who are struggling with specific concepts. They could be used as individual self-study exercises, homework, material to work through in tutorials or within small group settings.

- **Chemistry and its Applications:** these tasks are open ended and research based. They encourage students to consider how the subject they are studying impacts on everyday life, industry or perhaps the world of academic research. Students can become so focused on what they need to know for exams that they lose sight of what the subject they are studying is all about; these tasks allow students to become enthused on topics and may (hopefully) lead to interest in studying the subject further.

These could be used throughout the year, perhaps as homework, research tasks or extension work.

- **Accompanying CD:** this contains a copy of the entire book plus answers to the tasks. The CD files can be used either to project the tasks onto a whiteboard, or to print off relevant pages for individual students.

The tasks in the first four sections all contain questions or tasks for students to attempt to check their understanding. Answers contained on the CD have been provided for self-marking. Where necessary, 'workings out' have been shown to help students check through, and learn from, their answers. Key words and terms have been shown in bold throughout the tasks contained in the books to help students identify words or phrases they should know and be able to define or interpret.

Who is the Key Skills and Knowledge Booster series aimed at?

The tasks have been written predominantly for AS students and students in the first year of their A-Level course, although some of the tasks may be suitable for students in their second year of A-Levels. The tasks would be particularly suitable for students who are finding the transition from GCSE-level science into AS and A-level difficult. They have been written with students in mind who are achieving grades lower than a C in homework or exams; they are designed to assist these students to fill gaps in their background knowledge or subject specific knowledge.

Not all students will find all topics difficult, so the tasks can be used as and when required for any student; to help 'top-up' understanding when they meet an area of study they find more difficult.

The series would also be an excellent resource to use with students who miss lessons due to illness or university visits, for example, along with an excellent resource to give to students as preparation to be completed prior to, or during, personal tutorials or group seminars.

When do I use the Chemistry tasks?

The tasks do not need to be used in a sequential order; they can be used as and when they are suitable within your own specification. Nor does each of the tasks need to be used – the book forms a resource bank that can be dipped in and out of.

About the author

Victoria Stutt is an experienced KS3, KS4 and A-level classroom teacher. Victoria is the co-author of the KS3 Level Assessed Homework Tasks and co-author of the GCSE Triple Science Chemistry Tasks.

Vocabulary

Each of the definitions below is for a common word or term used in chemistry. Identify the correct word or term to go with each definition and write it in the space provided.

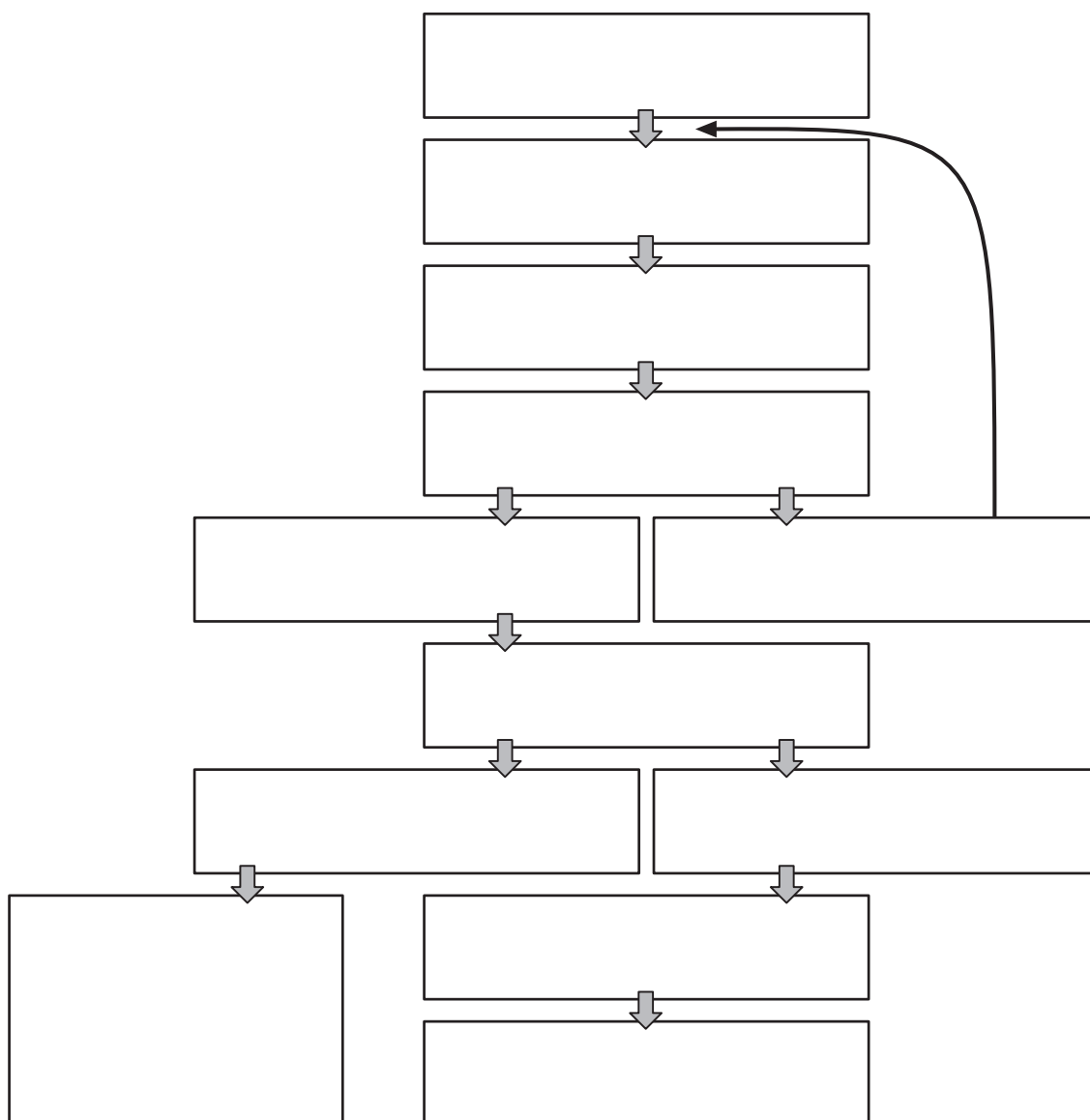
Definition	Word/Term
The smallest particle of an element	
Positive nuclei held together by delocalised electrons	
Different physical structures of atoms of the same element	
The rate of change in concentration of a reactant or product over time	
Chemically combined elements in a fixed ratio	
Able to dissolve in a particular solvent	
Breaking a substance apart using an electrical current	
A reaction in which a substance is burned in oxygen	
A substance able to speed up a chemical reaction but which remains unchanged after the reaction is complete	
A bond formed by the sharing of a pair of electrons	
Negatively charged particle found within atoms	
The loss of electrons	
The reaction between an acid and a base to produce water and a solution of pH 7	
A bond formed by the exchange of electrons and resulting attraction between ions	
Positively charged particle found within atoms	
A type of reaction that gives out heat and causes a rise in temperature	
Centre of an atom, containing protons and neutrons	
Gain of electrons	
Particle with no charge found within atoms	
The amount of a dissolved substance in a given volume of solvent	
A type of reaction that takes in heat and causes a decrease in temperature	
An atom or molecule with an overall charge	
A more reactive element taking the place of a less reactive element	

The Scientific Method

Task

Place the processes below into the flow chart to illustrate the typical order of the 'scientific method'.

- Carry out experiments that test the hypothesis
- Results do not support hypothesis
- Follow advice given by the expert reviewers
- Propose a hypothesis
- Submit results (scientific paper) for review by qualified, expert scientists
- Ask questions/carry out simple tests
- Findings are not accepted by other scientists
- Draw a conclusion from experimental results
- Findings may be continually accepted and become a 'theory' or eventually a 'law'
- Findings are accepted by other scientists
- Results support hypothesis
- Scientific paper is published



Atomic Structure

Every substance around you is made from atoms. But what is an atom and what does an atom contain?

In the space below produce a drawing that shows what makes up an atom. You should label your diagram fully and give explanations where necessary.

Once you are happy that you have included everything, compare it with the completed diagram in the Answers to check you have all the essential points.