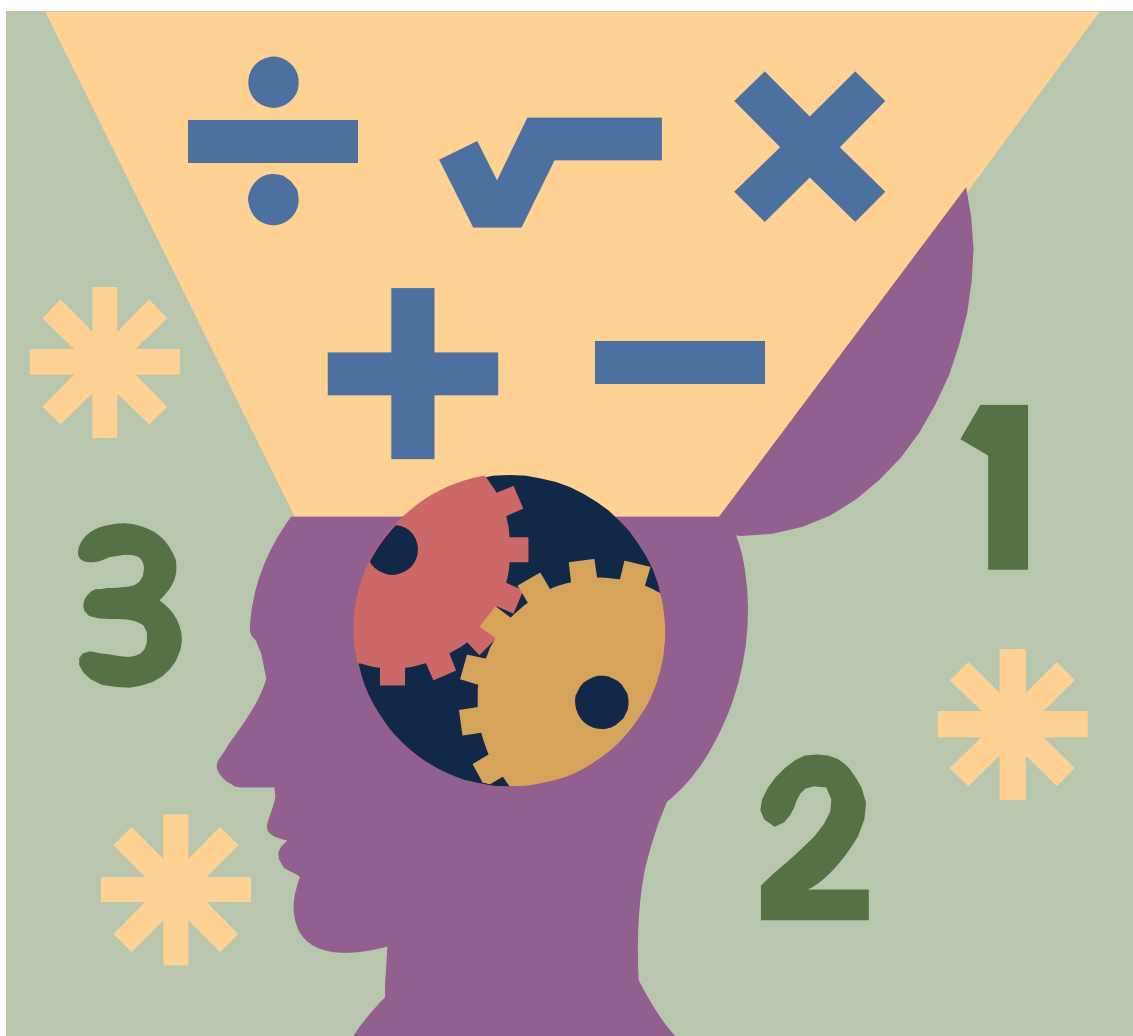


Maths Resource Database

Find the resources your students need



Maths for Scientists: A Good Practice Guide

The mathematical ability of new chemistry undergraduates varies widely and as such it is vital for universities to provide remedial mathematics tuition. This document aims to provide an insight into some of the resources available to institutions to provide this tuition using various methods of delivery, including VLE based materials and CBL/PBL resources.

Drawing on the expertise of both the RSC and the HEA Physical Sciences Centre an extensive survey of the available resources has been undertaken; however this is by no means a definitive list.

To add a resource to this guide please email education@rsc.org

Books

ii) Maths for Chemistry: A chemist's toolkit of calculations by Paul Monk

<http://www.oup.com/uk/catalogue/?ci=9780199277414>

This book uses chemical examples throughout to demonstrate the relevance of mathematical concepts to the study of chemistry, and help motivate the student.

The companion web site has certain password protected features for lecturers:

- Figures from the book available to download, to facilitate lecture preparation
- Solutions to end of chapter problems, to aid assessment

This book was reviewed by the RSC publication, Education in Chemistry. The review can be accessed here

<http://rsc.org/Education/EiC/issues/2007Jan/EssentialCalculations.asp>

iii) Essential Maths for Chemistry students by David Ball

http://academic.cengage.com/cengage/instructor.do?codeid=6F22&sortBy=copy&type=all_radio&courseid=CH04&product_isbn=9780495013273&discipline_number=12&codeFlag=true

This textbook is ideal for chemical science students who lack confidence of competence in basic essential algebra skills. It focuses on the algebra skills required for general chemistry with worked examples to show how these skills translate into successful chemical problem solving.

iii) Chemical Calculations at a Glance

by **Paul Yates (Staff Development and Training Centre, Keele University)**

<http://eu.wiley.com/WileyCDA/WileyTitle/productCd-1405118717.html>

This book puts maths into a chemistry context, using detailed chemical examples, to aid the students' appreciation of maths within a chemistry course. Problems and answers have been included for each presentation, so encouraging the student to practice both the mathematical manipulations and

the application to problems in chemistry. More detailed chemical problems at the end of each topic illustrate the range of chemistry to which the maths is relevant and help the student acquire sufficient confidence to apply it when necessary.

iv) Maths for Chemists (Tutorial Chemistry Texts)

by M Cockett and G. Doggett

Vol 1 Numbers, Functions and Calculus Vol 1

<http://www.rsc.org/shop/books/2003/9780854046775.asp>

Vol 2 Power Series, Complex Numbers and Linear Algebra

<http://www.rsc.org/shop/books/2003/9780854044955.asp>

“Maths for Chemists” comes in two volumes and provides an introduction to the Maths undergraduate chemistry students will need through out their studies. Support is provided for those students who may not have studied maths beyond GCSE level as well as giving scope for those students with a more in depth maths background to expand their knowledge.

Whilst early chapters explain the basic maths skills the students need, later chapters build on this knowledge and allow them to progress to more complex mathematical principles.

v) Catch Up Maths and Stats: For the Life and Medical Sciences

by M. Harris, G. Taylor and J. Taylor

http://www.scionpublishing.com/shop/product_display.asp?mscssid=9KFMD6J5PVCB9GH0L6NS4X8JQC500439&CurrencyID=1&ProductID=9781904842118

These books are aimed at students both prior to starting university and within introductory courses. The focus is on the major principles required within life and medical science degrees with context provided by a series of relevant worked examples and problems. Whilst the book initially covers very basic concepts it quickly moves on to the more complex theory required by undergraduates studying these subjects,

vi) Math Review toolkit for chemistry

By Gary Long and Sharon Long

<http://www.pearsonhighered.com/educator/academic/product/1,3110,0131493833,00.html>

Ideal for students who find the mathematics behind chemistry difficult, this book gives a step-by-step guide to a range of problems covering the essentials required for an undergraduate chemical science degree.

vii) Guide to Essential Math: A Review for Physics, Chemistry and Engineering Students (Complementary Science)

by Sy M. Blinder

http://www.elsevier.com/wps/find/bookdescription.cws_home/713988/description#description

Focussing on the maths required for chemical science, physics and engineering undergraduate degree studies this book begins with 12 context-based worked problems designed to introduce mathematical terms and methods. Development of these skills should enable students to transfer their knowledge of quantitative methods to scientific problems within their studies

viii) Basic Concepts of Chemistry, with Math Skills Supplement and Free Access for Math Skills Website

by Leo J. Malone

<http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0471215228.html>

This general chemistry book offers extensive appendices to help students provide a quick and effective review of the mathematical concepts used in introductory chemistry

ix) Basic Laboratory Calculations for Biotechnology

by Lisa Seidman

<http://www.pearsonhighered.com/educator/academic/product/0,3110,0132238101,00.html>

This book gives a succinct introduction to common the calculations encountered throughout laboratory work. Students are given the opportunity to practice maths calculations within the context of laboratory examples enabling them to become more confident and competent within a practical situation.

x) The Chemistry Maths Book

by Erich Steiner ISBN13: 978-0-19-920535-6

<http://www.oup.com/us/catalog/general/subject/Chemistry/?view=usa&ci=9780199205356>

This resource is aimed at students of all levels and covers the topics required through out a chemical science degree course. Applications to chemistry and the physical sciences are included allowing students to work through the subject and gain a contextualised understanding. Topics are divided into the broad areas of algebra, mechanics and statistics with exercises at the end of each chapter bringing together the use of key concepts.

xi) Essential Mathematics and Statistics for Science

by Dr. Graham Currell and Dr. Antony Dowman

ISBN: 978-0-470-02228-3

<http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0470022280.html>

A low-level introduction to the fundamental concepts students need, little prior knowledge is assumed making this an ideal introduction to the subject. Examples are given in both the book and on the companion website allowing students the chance to work through problems using the concepts they've learned.

Ready-prepared material for lectures, tutorials and computer practicals are also available for tutors.

xii) Mathematical Problems for Chemistry Students

by Gyorgy Pota

http://www.elsevier.com/wps/find/bookdescription.cws_home/708839/description#description

This resource provides context based examples of maths within a chemical science setting giving students the opportunity to apply their maths skills. Examples from standard chemistry text books as well from theoretical chemistry journals are included to cover all the major areas of chemical science. It is intended for beginner to intermediate level users.

xiii) Beginning Mathematics for Chemistry

by Stephen K Scott

<http://www.oup.com/uk/catalogue/?ci=9780198559306>

This workbook provides worked examples as well as practice exercises making it suitable for use in class or for independent study. Aiming to build confidence with mathematical techniques through practice this resource is aimed at first year chemical science undergraduates.

xiv) Basic Mathematics for Chemists, Second Edition

by Peter Tebbutt

ISBN: 978-0-471-97284-6

<http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0471972843.html>

Using applications, data, examples and problems drawn from chemistry this book aims to introduce students to all the concepts they need to know in order to study chemical science at degree level. Little prior knowledge is assumed and students are taken through basic mathematical principles and their usage within chemistry.

xv) Engineering Mathematics

by K. A. Stroud and Dexter J. Booth

<http://www.palgrave.com/stroud/stroud6e/index.html>

In this book students are taken through the subject step-by-step using worked examples and exercises. Full comprehensive, the sixth edition includes a Personal Tutor CD-ROM. The companion website provides access to questions and applications.

xvi) Basic Mathematics for Biochemists

by Athel Cornish-Bowden

This book covers the maths required by biochemistry undergraduates throughout their studies but may also be a useful reminder to postgraduate students and above. Minimal prior knowledge of maths is assumed and students are guided through a series of worked examples and exercises. The basic concepts needed by biochemists are introduced and built on throughout the subsequent chapters and examples specific to biochemistry are given.

xvii) Foundations of science mathematics**by D. S. Sivia and S. G. Rawlings**<http://www.oup.com/uk/catalogue/?ci=9780198504283>

This concise resource gives an informal approach to maths and starts from GCSE level progressing through the basic concepts and on to more in depth knowledge. A large range of topics are covered giving students the breadth of knowledge they need for their undergraduate chemical science studies. The informal, readable style makes this resource accessible to all students and their tutors.

xviii) Foundations of science mathematics: worked problems**by D. S. Sivia and S. G. Rawlings**<http://www.oup.com/uk/catalogue/?ci=9780198504290>

A concise resource aimed at developing the maths skills needed by students throughout their studies. This book provides solutions to most of the problems set in the companion book "Foundations of Science Mathematics", model answers are given alongside additional comments to assist the reader.

xix) Beginning Calculations in Physical Chemistry**by B. R. Johnson and S. K. Scott**<http://www.oup.com/uk/catalogue/?ci=9780198559658>

Aimed at first year undergraduate chemical science students this workbook provides students with a range of exercises to practice their maths skills and develop their confidence in using them in a chemical science situation.

xx) Chemistry: Chemistry Calculations Explained**By A. Ninan and G. Lawler**<http://www.amazon.co.uk/Chemistry-Calculations-Explained-Studymates-Focus/dp/1842850725>

Chemical science students need to be able to apply their maths skills in both theoretical and practical situations. This book takes students through the key concepts step-by-step demonstrating how to tackle different problems, from percentage yield to Avogadro's constant. Tutorials at the end of each chapter summarise the key points and introduce sample problems, discussion points, practical tasks and revision tips. A list of useful websites is also included.

xxi) Mathematical Methods for Science Students**By G. Stephenson**<http://vig.pearsoned.co.uk/catalog/academic/product/0,1144,0582444160,00.html>

Aimed at all science students this book doesn't assume any prior knowledge but works through key concepts in detail allowing students to develop a good grounding in the subject. Worked examples and exercises are included to enable students to practice their skills.

xxii) Essential Mathematics for Chemists

By J. Gormally

<http://vig.pearsoned.co.uk/catalog/academic/product/0,1144,0130863459,00.html>

This book addresses many of the common difficulties encountered by undergraduates when learning maths by introducing basic skills in handling numbers before tackling key chemistry-related topics. Little knowledge of maths is assumed and the order of chapters is designed to reflect the structure of many chemistry courses relating to both lecture and laboratory studies. Worked examples and graded problems are included allowing students the opportunity to practice their skills and gain confidence in working through chemical science problems.

xxiii) Maths: A student's survival guide

By J. Olive

<http://www.cambridge.org/catalogue/catalogue.asp?isbn=0521017076>

This resource is aimed at first year undergraduate science and engineering students. It covers the core maths needed by most students starting these courses and contains almost 800 exercises as well as worked solutions.

xxiv) Foundation Maths

By A. Croft and R. Davison

<http://www.pearsoned.co.uk/Bookshop/detail.asp?item=10000000116064>

Aimed at students who have not studied maths at post-16 level but are now taking further or higher education courses this book is ideal for students studying a range of courses including the chemical sciences. Guidance is given in mathematical methods and worked examples are given to help improve students confidence in answering questions. Useful as a revision or reference guide.

x) Maths, Stats and OR Network resources

The HEA Maths, Stats and OR Subject Centre produce a wide range of maths resources which are available on the website or a paper copy can be requested. <http://mathstore.gla.ac.uk/>

These include facts and formulae leaflets available at <http://mathstore.gla.ac.uk/index.php?pid=41>

They also produce the following resources that can be requested from the HEA Physical Sciences Centre (psc@hull.ac.uk):

Diagnostic testing for mathematics

An in-depth review of current diagnostic testing including the results of a focused project and national survey. There are detailed case studies as well as brief outlines of the actual testing procedures within various institutions.

Maths support for students

As Engineering and Science departments face the problems of inadequate mathematical preparation by students; many are setting in place networks of

support-based activities, e.g. maths learning centres. This booklet presents examples of these initiatives through a series of case studies.

Maths for engineering and science

This booklet looks at teaching mathematics to engineering and science students. Case studies from contributing authors describe the execution of the learning activities, the support needed, the implementation difficulties, evidence of success and suggestion of how other academics could reproduce the activity.

Software

i) MathTutor

<http://www.mathtutor.ac.uk/>

Mathtutor aims to bridge the gap between school and university. It contains diagnostic tests, video tutorials, summary text and exercises for topics from algebra to integration. It can be viewed on-line (<http://www.mathtutor.ac.uk/viewdisks.php>) or on DVD-Rom disks.

ii) Mathletics

<http://people.brunel.ac.uk/~mastmmg/>

The Mathletics program comprises a suite of mathematics tests for diagnostic, formative and summative assessment in commonly taught areas of number, algebra and calculus from GCSE to year 2 undergraduate level. The aim is to provide an assessment environment where topic question libraries can be combined in various ways (pentathlon, decathlon etc.) and immediate feedback given. Each test starts with information and revision screens. Much of Mathletics was written by final-year project students using Question Designer.

It has been used extensively at Brunel University, where it has been developed, and can be supplied to any academic or teacher, free of charge.

Online resources

General maths

i) Quantitative Chemistry

<http://www.symplekta.co.uk/QC/>

This series of interactive online resources aims to help students with the maths they need throughout their chemical science degree courses. Featuring video clips, worked problems and sample questions, this resource gives context-based examples of key mathematical principles within a chemical science setting. Feedback on this resource is welcomed, please email the Chemistry for our Future team at education@rsc.org with your comments.

ii) The University of Hull, Study Advice Centre

<http://www.hull.ac.uk/studyadvice/MathsResources/index.html>

The University of Hull's Study Advice Centre produces a wide range of leaflets covering basic maths skills from algebra to vectors. These leaflets can be found as .pdf files at this link. Some sections have online quizzes available.

iii) Mathcentre

<http://www.mathcentre.ac.uk/>

Mathcentre is an on-line mathematics support centre which provides resources to help students make the transition from school-level to university-level mathematics. There are also resources and useful links for those who teach or support students.

Mathcentre offers students quick reference guides, practice and revision materials, video tutorials, workbooks and online practice exercises on many branches of mathematics, including: Algebra, Arithmetic, Complex Numbers, Differentiation, Drug dose calculations, Finance, Functions and Graphs, Geometry, Graphs for health sciences, Guides & Case Studies, Integration, Matrices, Mechanics, Numeracy Skills, Sequences & Series, Statistics, Trigonometry and Vectors.

iv) Tackling the Mathematics Problem for Chemists toolkit

This document is intended to help teachers of chemistry deal with the mathematics problem. It brings together relevant reports and information about useful resources with hyperlinks to allow further investigation or downloading of materials.

<http://www.heacademy.ac.uk/physsci/publications/toolkits>

v) A maths toolkit for scientists primer

The Physical Sciences Centre Primers are designed to provide practical advice and guidance on aspects of teaching and learning in the physical sciences. This toolkit provides information on resources available for the teaching of maths to scientists. Information is included on software, websites, publications and FDTL (Fund for the Development of teaching and Learning) Phase 4 projects.

<http://www.heacademy.ac.uk/physsci/publications/primers>

vi) Mathematics courseware

This is a further list of maths for scientists resources.

<http://www.heacademy.ac.uk/physsci/resources/courseware/mathematics>

vii) Reviews of resources

The Centre commissions reviews of teaching, learning and assessment resources. These reviews are published in our journal, Physical Sciences Educational Reviews and on-line here.

<http://www.heacademy.ac.uk/physsci/publications/journals>

viii) Maths Support

The HEA Physical Sciences Centre produces a wide range of supporting information to help support the teaching of maths to chemical science students, available online here

<http://www.heacademy.ac.uk/physsci/home/pedagogicthemes/mathssupport>

ix) Mathematical Learning Hierarchies in the Physical Sciences

by Paul Yates, Keele University

This downloadable resource is designed to support the teaching of chemical and physical scientists with a weak mathematical background and includes maths problems related to both chemistry and physics.

http://www.heacademy.ac.uk/physsci/resources/detail/resources/downloads/mathematical_learning_hierarchies

x) Mathematics for Economics: Enhancing Teaching and Learning (METAL)

<http://www.metalproject.co.uk/>

These resources are aimed at 1st year undergraduate economics students however the content may be useful to those teaching introductory maths to chemical science students as the fundamental principles remain the same. The website offers video streamed real world examples alongside teaching and learning guides, a question bank and series of case studies.

xi) Helping Engineers Learn Mathematics (HELM)

These resources developed by a consortium of 5 universities (Loughborough, Hull, Reading, Sunderland and Manchester) aim to enhance the teaching and learning of maths to UK engineering undergraduates, however the content may be relevant to those teaching other science subjects.

Available free of charge to UK HEIs and FEIs from Loughborough University's Mathematics Education Centre HELM consists of a series of workbooks, computer-aided learning courseware and computer-aided assessments. More information, access to the online resources and contact details to request the workbooks are available at the following weblink

<http://www.lboro.ac.uk/research/helm/>

xii) MathsTEAM

This project, funded by the Learning and Teaching Support Network, resulted in the publication of three booklets:

- Diagnostic Testing for Mathematics
- Maths Support for Students
- Maths for Engineering and Science.

These booklets are aimed at enhancing the teaching of fundamental mathematical principles to undergraduate engineering and science students through a series of 65 case studies. PDF versions of these booklets are available to download from the following website

<http://itsn.mathstore.ac.uk/mathsteam/>

Statistics

i) DISCUSS: Discovering Important Statistical Concepts Using SpreadSheets
<http://www.mis.coventry.ac.uk/~nhunt/home/>

The DISCUSS project is a modified and supplemented web-based implementation of the widely used DISCUS materials for teaching elementary Statistics. It aims to integrate the powerful interactive capabilities of Microsoft Excel with the convenience of web-based resource materials using Microsoft Internet Explorer.

There are modules covering Charts and Graphs, The Binomial Distribution, The Poisson Distribution, Sampling, Regression and Correlation, Buffon's Needle, Coupon Collecting, Critical Path Analysis, Sampling Methods and Probabilities with Dice.

ii) STARS: Creation of Statistical Resources from Real Data Sets

<http://stars.ac.uk/>

The STARS project has used real datasets and scenarios to help develop teaching and learning resources for staff and students. The statistics packages being used are Excel, MINITAB, SPSS and, to a minor extent, SAS. The datasets cover business, health and psychology, but these may be useful datasets for the general teaching of statistics

University on-line material

i) Queen Mary, University of London

Quantitative methods in chemistry

<http://www.chem.qmul.ac.uk/software/download/qmc/>

This contains support maths material for students use.

ii) University of Plymouth

<http://www.tech.plym.ac.uk/maths/resources/PDFLaTeX/mathaid.html>

Maths support materials. This includes interactive quizzes.

iii) University of Birmingham

AIM - Assessment on Mathematics

<http://mat111.bham.ac.uk/index.html>

This is the University of Birmingham's assessment in mathematics tool for its students. Many of the topics are available to guest users, and include algebra and calculus. Each topic contains online quizzes, with solutions.