



# Tackling the Mathematics Problem for Chemistry

## Introduction

### Making Mathematics Count

The report of Professor Adrian Smith's Inquiry into Post-14 Mathematics Education (February 2004).

This Inquiry was commissioned by the UK Government and the Terms of Reference of the Inquiry were:

*'To make recommendations on changes to the curriculum, qualifications and pedagogy for those aged 14 and over in schools, colleges and higher education institutions to enable those students to acquire the mathematical knowledge and skills necessary to meet the requirements of employers and of further and higher education.'*

This Inquiry identified three key issues of major concern:

- the shortage of specialist mathematics teachers, particularly in England and Wales;
- the failure of the current curriculum, assessment and qualifications framework in England, Wales and Northern Ireland to meet the needs of many learners and to satisfy the requirements and expectations of employers and higher education institutions;
- the lack of resources, infrastructure and a sustained continuing professional development culture to support and nurture all teachers of mathematics.

The report makes a number of recommendations to provide a series of practical measures designed to reverse the problems identified. These include further CPD activity (possibly linked to a remuneration package), infrastructure changes (including the creation of a national centre), greater use of the expertise and resources of the Open University and the Higher Education Academy, and investigation of the use of C&IT in maths education.

The full report is at:

<http://publications.teachernet.gov.uk/eOrderingDownload/MMC.pdf>

## Resources

### MathsTEAM

A joint initiative by LTSN Engineering, LTSN Maths, Stats & OR Network, UK Centre for Materials Education and LTSN Physical Sciences aimed at utilising the knowledge of methods current in the science and engineering communities. (*LTSN Centres are now part of the Higher Education Academy.*)

<http://mathstore.ac.uk/mathsteam/index.htm>

### What is a TOOLKIT?

A resource which brings together and provides links to:

- reports
  - information
  - resources
  - downloads
- for a particular topic.



The MathsTEAM has published three booklets (which can be downloaded as pdf files):

**Maths Support for Students**

[http://mathstore.ac.uk/mathsteam/packs/student\\_support.pdf](http://mathstore.ac.uk/mathsteam/packs/student_support.pdf)

**Maths for Engineering and Science**

[http://mathstore.ac.uk/mathsteam/packs/engineering\\_science.pdf](http://mathstore.ac.uk/mathsteam/packs/engineering_science.pdf)

**Diagnostic Testing for Mathematics**

[http://mathstore.ac.uk/mathsteam/packs/diagnostic\\_test.pdf](http://mathstore.ac.uk/mathsteam/packs/diagnostic_test.pdf)

These booklets provide a comprehensive collection of 65 case studies, intended to help academics cope with the challenge of enhancing engineering or science students' basic mathematical skills.

**mathcentre**

'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.' This centre comprises a group of people who run university maths support centres, who teach maths, and who design new media products for learning. The people involved come from the Universities of Loughborough, Leeds and Coventry, from the Educational Broadcasting Services Trust, and from UK Learning and Teaching Support Networks.

The resources for staff include quick reference leaflets, teach-yourself booklets, revision booklets, guides and case studies, on-line exercises, video tutorials and resource packs.

<http://mathcentre.ac.uk>

**MathTutor**

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 ordered on DVD -Rom disks.

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

**Quantitative Chemistry Pilot**

This pilot features a 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.

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

**Promoting Physics Learning And Teaching Opportunities (PPLATO)**

PPLATO (an FDTL Phase 4 Project) is producing resources to support the teaching of physics and maths at university first year and foundation year levels. The materials will be designed for teaching, assessment and diagnostics and may be studied within a university course or in self study.

<http://www.rdg.ac.uk/AcaDepts/sp/PPLATO/publish/>

Whilst the resources are primarily aimed at maths support for physics, some parts are appropriate for chemistry, particularly:

The University of Plymouth's set of interactive packages designed to support maths learning

The Open University's Maths for Science resource (which is an electronic version of an OU course book designed for independent study).



### Mathematical Learning Hierarchies in the Physical Sciences

By Paul Yates, Keele University and funded by the Physical Sciences Centre  
<http://www.keele.ac.uk/depts/ch/ltsn/home.html>

This online 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. This resource can also be downloaded:

[http://www.heacademy.ac.uk/physsci/resources/detail/resources/downloads/mathematical\\_learning\\_hierarchies](http://www.heacademy.ac.uk/physsci/resources/detail/resources/downloads/mathematical_learning_hierarchies)

### The Higher Education Academy Maths Stats and OR Network

This network produces a number of publications including:

*Algebra Refresher: Material to help students prepare for a university mathematics course*

*Calculus Refresher: Revision material for students before or in the early stages of a university mathematics course*

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

For paper copies, the current cost is £125 for 100 copies to members of staff in UKHE institutions. Contact [info@mathstore.ac.uk](mailto:info@mathstore.ac.uk) to order, quoting reference A1 for the Algebra booklet and A2 for the Calculus booklet. Alternatively there are pdf versions of both booklets which can be downloaded for in house printing and distribution (<http://mathstore.ac.uk/publications/index.shtml>).

Three six fold formulae leaflets are available free of charge to lecturers in higher education on request from [info@mathstore.ac.uk](mailto:info@mathstore.ac.uk)

*Facts and Formulae*

*Mechanics Facts and Formulae*

*Probability & Statistics Facts and Formulae*

### Resources from the Higher Education Academy Physical Sciences Centre

#### Primer – Maths for scientists resources list

A resources list produced with the RSC covering software, web sites and books plus publications.

[http://www.heacademy.ac.uk/assets/ps/documents/maths\\_resource\\_list\\_RSC.pdf](http://www.heacademy.ac.uk/assets/ps/documents/maths_resource_list_RSC.pdf)

#### Toolkit - Tackling the Mathematics Problem in the Physical Sciences

This document brings together and provides links to reports, information, resources and downloads.

[http://www.heacademy.ac.uk/assets/ps/documents/primers/primers/ps0086\\_maths\\_toolkit\\_for\\_scientists\\_jan\\_2005.pdf](http://www.heacademy.ac.uk/assets/ps/documents/primers/primers/ps0086_maths_toolkit_for_scientists_jan_2005.pdf)

### Useful data for chemistry students

[http://www.heacademy.ac.uk/assets/ps/documents/equation\\_sheets/chemistry\\_equation\\_sheet.pdf](http://www.heacademy.ac.uk/assets/ps/documents/equation_sheets/chemistry_equation_sheet.pdf)

This guide has been produced as a resource for first year undergraduate students in chemistry.

### From the Royal Society of Chemistry Tutorial Chemistry Text Series

**Maths for Chemists Volume I: Numbers, Functions and Calculus** by M Cockett and G Doggett

**Maths for Chemists Volume II: Power Series, Complex Numbers and Linear Algebra** by M Cockett and G Doggett.

<http://www.rsc.org>

### From Oxford University Press

**Beginning Mathematics for Chemistry** by Stephen K Scott

**The Chemistry Maths Book** by Erich Steiner

**Maths for Chemistry - A chemist's toolkit of calculations** by Paul Monk

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

### From Wiley-Blackwell

**Chemical Calculations at a Glance** by Paul Yates

**Basic Concepts of Chemistry, with Math Skills Supplement and Free Access for Math Skills Website** by Leo J. Malone

**Basic Mathematics for Chemists, Second Edition** by Peter Tebbutt

<http://www.blackwellpublishing.com>

### From Elsevier

**Mathematical Problems for Chemistry Students** by Gyorgy Pota

[http://www.elsevier.com/wps/find/homepage.cws\\_home](http://www.elsevier.com/wps/find/homepage.cws_home)



## Publication Details

This document is just one of a series of Toolkits from the Physical Sciences Centre all available to download from the website (see right). The Centre also produces other publications and resources in support of teaching and learning in higher education. This includes a newsletter and journal. To have these sent to you in hard copy format upon publication, visit our website and join the Centre mailing list.

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