

# AS/A Level Chemistry 9701

## Recommended Prior Knowledge

Students should have completed an IGCSE Chemistry course or its equivalent.

## GENERAL RESOURCES

(a) **General Internet Sites with index pages to more specific topics.** These sites are a selection of the more reliable of the many available, and many of them include useful external links to other sites. Teachers are strongly recommended to consult the index pages of these sites for useful resources for each section of the Scheme of Work given here – room only allows a small selection to be specifically indexed here.

**site 1** <http://www.usetute.com.au/index.html> (An Australian site containing a multitude of free chemistry tutorials, which, for a small annual fee, provides access to an enormous selection of questions and tests, all with the advantage of worked answers)

**site 2** <http://www.wpbschoolhouse.btinternet.co.uk/TopicList.htm> (Doc Brown's "Chemistry Topic List"),

**site 3** [http://www.rod.beavon.clara.net/chemistry\\_contents.htm](http://www.rod.beavon.clara.net/chemistry_contents.htm) (Rod Beavon's "Chemistry Pages", from Westminster School, UK)

**site 4** <http://www.carlton.paschools.pa.sk.ca/chemical/> (David Dice's "Chemical Stuff")

**site 5** <http://www.rjclarkson.demon.co.uk/> (Richard Clarkson's "Chemistry Rules" site, from Winchester College, UK) The following sub-sites are useful index pages:

**site 5a** <http://www.rjclarkson.demon.co.uk/found/found.htm>

**site 5b** <http://www.rjclarkson.demon.co.uk/hfhf/hfhf.htm>

**site 5c** <http://www.rjclarkson.demon.co.uk/candr/candr.htm>

**site 5d** <http://www.rjclarkson.demon.co.uk/candrands/organic.htm>

**site 5e** <http://www.rjclarkson.demon.co.uk/tandp/trendsandpatterns.htm>

**site 6** <http://www.creative-chemistry.org.uk/alevel/index.htm> (A site from Harrogate Grammar School, UK, that is filled with tutorials, worksheets, practical guides and questions)

**site 7** <http://www.chemistry.co.nz/chem.htm> (A New Zealand site with an eclectic mixture of topics, including help with equations, moles, redox, periodic tables, Avogadro, acids and bases)

**site 8** <http://www.dbhs.wvusd.k12.ca.us/webdocs/ChemTeamIndex.html> (John Park's "High School Chemistry Tutorial". The site is somewhat old-fashioned in its presentation, but is packed with useful tutorials and questions)

**site 9** <http://www.chem.vt.edu/chem-ed/index.html> (The *Chemistry Hypermedia Project* from Virginia Tech., USA: An accessible collection of articles for university students and lecturers, mostly on physical chemistry topics, with a few inorganic ones, but no organic)

- site 9a** <http://www.chem.vt.edu/chem-ed/genchem.html> (The most generally useful of several sub-sites)
- site 10** <http://www.mp-docker.demon.co.uk/home.html> (Mike Docker's site from Farnborough Sixth Form College, UK, filled with an enormous quantity of quizzes on all aspects of the AS and A level syllabus)
- site 11** <http://www.s-cool.co.uk/contents.asp> (An A level revision site with many short tutorials on specific topics)
- site 12** <http://www.wiley.com//college/webercises/> (An enormous and highly useful compendium of links to many other chemical internet sites – worth an exploration!)
- site 13** <http://www.chem.ox.ac.uk/vrchemistry/> (The virtual chemistry site from the University of Oxford, UK, with several interesting animations and links. In particular the following sub-sites are worth a look):
- site 13a** <http://www.chem.ox.ac.uk/vrchemistry/foundation.html> (A complete pre-university textbook with animated illustrations)
- site 13b** [http://www.chem.ox.ac.uk/vrchemistry/LiveChem/transitionmetals\\_content.html](http://www.chem.ox.ac.uk/vrchemistry/LiveChem/transitionmetals_content.html) (This allows you to select pairs of reagents and see a short video clip of the reaction that occurs when they are mixed in a test tube)

(b) **Periodic Tables on the Web:** An exhaustive compilation is to be found at: <http://www.liv.ac.uk/Chemistry/Links/refperiodic.html>

Some specific ones are: <http://www.webelements.com/> (the **definitive** Table from Sheffield, UK – includes lots of compounds too)

<http://pearl1.lanl.gov/periodic/default.htm> (lots on the history of the elements)

<http://www.chemicool.com/> (succinct and fact-filled)

<http://www.chemsoc.org/viselements/>

<http://www.colorado.edu/physics/2000/applets/a2.html> (good animations of electrons)

(c) **Resources for Experiments and Practical Work**

**P(AS)** The practical skills support booklet "Teaching AS Practical Skills" published by CIE and available from the Teachers Support website.

**P(A2)** The practical skills support booklet "Teaching A2 Practical Skills" published by CIE and available from the Teachers Support website.

(d) **General textbooks for reference**

The following books have been endorsed by CIE for use with this syllabus. They have been through an independent quality assurance process and match the syllabus content closely.

- **Chemistry for Advanced Level** by P. Cann & P. Hughes, (Edition 2002), published by John Murray, [www.johnmurray.co.uk](http://www.johnmurray.co.uk) (ISBN 071958602X)  
This recent text has been developed to cover the new AS-A2 syllabuses of the UK Boards and also the CIE syllabuses. The specification chart for the 9701 syllabus is available [here](#), to help locate relevant sections. Explanations are thorough, the more advanced ones being placed in boxes, to separate them from the main text for ease of location. The style of the AS chapters is suitable for those starting a post-IGCSE course. References in the Scheme of Work

are given the abbreviation **C+H**.

- **AS Level and A Level Chemistry** (Edition 2004) by B. Ratcliff, H. Eccles, J. Raffan, J. Nicholson, D. Johnson, & J. Newman, published by Cambridge University Press, [www.cambridge.org](http://www.cambridge.org) (ISBN 0521544718) . This new text uses as its base the CUP booklets produced for the OCR AS/A2 syllabus, but it has been edited to cover the CIE AS and A level syllabus.

Both texts include questions within each chapter (with answers), and a bank of past examination questions at the end of the book.

In addition the following text will be found useful by teachers.

- **Advanced Chemistry**, by Philip Matthews (CUP Low Price Edition, 1992), This large volume covers all syllabuses, including the 9701 syllabus, and a lot more – up to first or second year University level. Explanations of theories and mechanisms are very thorough, but because of the detail included, finding one's way around the book maybe slow at first, especially for students starting the AS course. References in the Scheme of Work are given the abbreviation **M**.

## UNITS

|    | Unit title  | Outline   | Syllabus reference              |
|----|---|---|---------------------------------|
| 7  | Theoretical Chemistry: (Atoms, Molecules and Chemical Bonding)  | Calculations involving the mole; empirical and molecular formulae; the structure of the atom; electron arrangements; ionic, covalent and metallic bonding; intermolecular forces; gases and the use of the ideal gas equation; the liquid and solid states.   | sections 1, 2, 3 and 4          |
| 8  | Physical Chemistry: (Enthalpy changes, Equilibria and Kinetics) | Enthalpy changes of reactions; bond energies; Hess's law; redox and electrolysis; chemical equilibrium; le Chatelier's principle; the Haber and Contact processes; Bronsted-Lowry theory; strong and weak acids and bases; simple rate equations; orders of reaction; rate constants; effect of temperature on rate constants; Boltzmann distribution; activation energy; catalysis; enzymes. | sections 5, 6, 7 and 8          |
| 9  | Inorganic Chemistry   | Physical and chemical properties of the elements in Period 3 and their compounds; trends in the properties of the elements in Groups II and VII and their compounds; their uses; ammonia; nitric acid; nitrogen oxides; sulphur dioxide and sulphuric acid.   | sections 9.1, 9.2, 9.4 and 9.6  |
| 10 | Organic Chemistry I   | Formulae, names and shapes of organic compounds; isomerism; alkanes; alkenes; addition polymerisation; halogenoalkanes.   | sections 10.1, 10.2, 10.3, 10.8 |
| 11 | Organic Chemistry II  | Preparation and reactions of alcohols, aldehydes, ketones, carboxylic acids and esters.   | sections 10.4, 10.5, 10.6       |

## TEACHING ORDER

Each unit is designed to take about half a term of teaching. Unit 7 should be taught first. After that the units can be taught in any order. The order given above:

8 Physical – 9 Inorganic – 10 Organic I – 11 Organic II,

may be thought excessively to bunch together similar topics and extended periods of little practical activity. Alternating the units thus:

10 Organic I – 8 Physical – 11 Organic II – 9 Inorganic *or*

10 Organic I – 8 Physical – 9 Inorganic – 11 Organic II

would be an alternative approach. Only a few topics from unit 2, e.g. bond energies, need to be covered before unit 4 is started. Much more of unit 2 needs to be covered before unit 3 is started, so it is recommended that unit 2 is taught before units 3 and 5.