

Chemistry

From the earliest times people have been interested in their material surroundings and have tried to modify materials to their own advantage. Half a million years ago humans had mastered fire, but it was less than 8000 years ago that chemists first discovered how to use fire to obtain metals from ores. By 1500 BC a host of other chemical processes had been mastered, from glass-making to the tanning of leather.

Just as in the past, Chemistry today is concerned with the accumulation of knowledge about the behaviour of substances and their conversion into new substances. The past and the present lead into a future where Chemistry has a special place. Many of the evils, which disfigure this present world, cannot be put right by Chemistry alone, but it is equally sure that they cannot be put right without it.

Chemistry is the cornerstone of Science and consists of four main disciplines.

- Physical Chemistry
- Inorganic Chemistry
- Organic Chemistry
- Analytical Chemistry

All four of these disciplines are included in the Chemistry courses from **Year 9** through to **Year 13**.

All four of these disciplines are practically based and students get plenty of opportunity to get involved in the practical aspects of the various topics.

With the different assessment courses that are now available it is important for students to be able to select a pathway that is most suitable for them and their background knowledge of the subject.

However pupil demand will, in the end, determine if a particular course is available. These courses are detailed below.

At any level Chemistry is a challenging, stimulating and rewarding subject.

Yes, it does involve learning a great deal of content, but it also requires the student to explain and apply the material that has been taught.

Chemistry Department Personnel

The Chemistry Department is determined to provide as much help to their students as possible. We are an experienced and conscientious group of people who are always available to answer any queries that arise and help students outside of class time.

- **Mr J W Southern, BSc (Hons)(Southampton)** Head of Department

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- **Mr A S Massey BSc (Massey)**

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- **Dr L Kodikara BSc, Msc (1st Hons) PhD (Waikato)**

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- **Ms L Newton BSc (Hons)(Massey)** - technician

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- **Mrs D Maher - BSc (Auckland)** - technician

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Chemistry in Years 9 and 10

Students are taught Chemistry as a separate subject in Years 9 and 10.

At this level the subject is compulsory. In these years the students are taught Chemistry for one third of the year. The work in these two years covers the foundation ideas and material that the students will need to be able to cope with Chemistry at Year 11.

In **Year 9** after a general introduction students are taught mostly Physical Chemistry with an emphasis on the practical nature of the subject.

In **Year 10** students learn about basic atomic structure, the different types of bond that hold substances together, the language of Chemistry - formulae and equations and some reaction Chemistry.

The work in both years covers theory and practical skills, but it also looks at the history of the development of Chemistry, as well as looking at how Chemistry is important in today's world.



Phosphorus burning in air

Chemistry in Year 11

Chemistry can be taken

as a single subject in the CIE IGCSE course,

or - as part of the Level 1 NCEA Science course.

IGCSE Chemistry

The course initially recaps the material covered in **Years 9 and 10** and then prepares the way for study for the CIE AS course at **Year 12** and the CIE A2 course at **Year 13**.

The topics covered during the year involve all four disciplines of Chemistry mentioned in the earlier.

Topics - Separation techniques, Kinetic theory, Atomic theory, Periodicity, Quantitative Chemistry, Acid/Base Chemistry, Metals, Equilibrium ideas, Organic Chemistry, Electrochemistry, Non-metallic Chemistry.

The CIE IGCSE course is examined at the end of the year where students can choose to sit one of two levels. Extended or Core

At the Extended level the students sit three papers, 1, 3 and 5

Students can achieve a grade from A* to G, [90% +, down to 30% in steps of 10%.]

Paper 1 - Multiple choice 30% Paper 3 - Short answer 50% Paper 5 - Practical 20%

At the Core Level the students also sit three papers, 1, 2 and 5.

With this combination, students can achieve a grade C to G. [60% max down to 30%]

Paper 1 - Multiple choice 30% Paper 2 - Short answer 50% Paper 5 - Practical 20%

NCEA Level 1 Science

As part of this course students take two Chemistry related Achievement Standards.

One External, 4 credits, dealing with acids and bases.

One Internal, 4 credits, dealing with carbon compounds and fuels.

Students also sit other Science Achievement Standards in Biology and Physics.

Chemistry in Year 12

Chemistry can be taken

as a single subject in the CIE AS course,

or - as a single subject in the NCEA Level 2 Chemistry course.

CIE AS Chemistry

Students who have completed the IGCSE Extended course at C grade, or above, are well prepared for entry into the CIE AS course.

Students who have completed the IGCSE course at below C grade or come from an NCEA Level 1 Science course will find the course difficult. They will need to work very hard to keep up with the topics that are covered.

The course material is extensive and challenging. Some of it recaps or builds on previous work from Years 9, 10 and 11.

Topics - Atomic theory, Stoichiometry, Organic chemistry, Bonding and Structure, Volumetric and Gravimetric analysis, Ions analysis, Kinetic theory and Gases, Thermochemistry, Equilibria, Redox & Electrochemistry, Inorganic chemistry.

The course involves sitting three external assessments.

Papers, 1, 2 and 3, two theory and one practical, at the end of the year.

Paper 1 Multiple choice 31 % - 60 mins

Paper 2 Structured questions 46 % - 75 mins

Paper 3 Practical 23% - 120 mins

From the results of these three papers students will be awarded a grade A - E and have to reach 40% to achieve a grade E. A University entry for this subject requires a grade D. +50% as a minimum.

NCEA Level 2 Chemistry

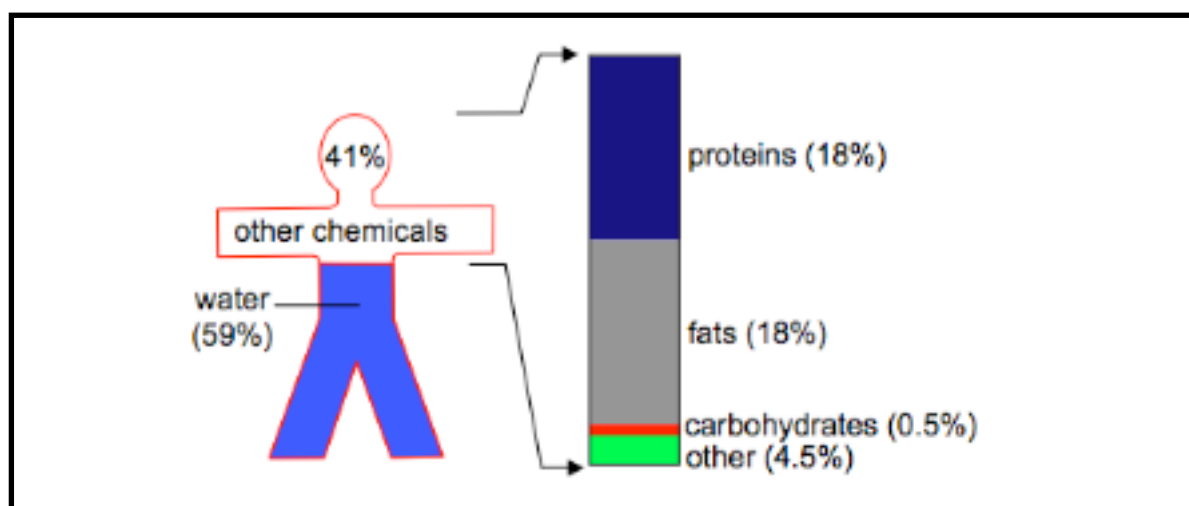
A course of general Chemistry is assessed using

Three External Achievement Standards - 13 credits

Bonding, structure and energy changes	5 credits
Organic chemistry	4 credits
Chemical reactions	4 credits

Three Internal Achievement Standards - 10 credits

Quantitative analysis	4 credits
Ions analysis	3 credits
Reduction and oxidation Chemistry	3 credits



Chemistry in Year 13

Chemistry can be taken

at A2 level, to follow up the AS course from the previous year.

or - as a single subject in the NCEA Level 3 Chemistry course.

and - Students from both courses can take the Level 4 Scholarship exam [an exam based on the Level 2/3 Chemistry courses but the majority of the material is covered in the AS/A2 course]

CIE A2 [or A level] Chemistry

Students who have gained a C grade or above at CIE AS level in 2011 should be able to complete the CIE course by taking the CIE A2 course.

Topics - Lattice enthalpies and Ionic compounds, Electrochemistry, Reaction Kinetics, Acid/Base and Solubility equilibria, Group IV and Transition metal Chemistry, Organic Chemistry.
Applications of Chemistry - Biochemistry, Analytical Chemistry, Modern materials, Green Chemistry.

The overall assessment involves two further papers, 4 and 5.

Paper 4 Structured questions, 38% - 120 mins

Paper 5 Planning, Analysis and Evaluation, 12% - 75 mins

The final A Level Chemistry grade is a summary of the results of Papers 1 - 5.

Students can achieve a grade A* to E, A* - 90% +, down to E in steps of 10%

NCEA Level 3 Chemistry

An advanced course of Chemistry which follows on from the NCEA Level 2 course is assessed using

Three External Achievement Standards - 15 credits

Particles and Thermochemistry	5 credits
Organic chemistry	5 credits
Aqueous Chemistry	5 credits

Two Internal Achievement Standards - 7 credits

Quantitative analysis	4 credits
Reduction and oxidation Chemistry	3 credits

NCEA Level 4 Scholarship Chemistry

This assessment involves a one off exam which covers the NCEA Level 2 and 3 material at a greater depth.

Only the students who are able to gain,

an A* or A grade in the CIE exams,
or are achieving at Excellence level in the Level 3 assessments,

should contemplate devoting time to preparing for this assessment.

Other Year 13 options

i. The Year 13 students also have the opportunity of resitting the CIE AS papers 1,2 and 3 once more in order to improve their final A Level Grade.

This can be done mid-year in May/June and/or Oct/Nov.

ii. Students who took a one year CIE AS course in 2011 but failed to gain a grade of D or more, could consider retaking the CIE AS once more

iii. Students who did not take Chemistry in 2010, in Year 12, could consider doing a one year CIE AS course, but would find it tough going.

All courses are supported by excellent websites which provide basic material, extension material, past tests and exams and links to other topics. These are valuable resources which are being upgraded on a weekly basis.

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$_{39}\text{Y}$	$_{40}\text{Zr}$	$_{41}\text{Nb}$	$_{42}\text{Mo}$	$_{43}\text{Tc}$	$_{44}\text{Ru}$	$_{45}\text{Rh}$	$_{46}\text{Pd}$	$_{47}\text{Ag}$	$_{48}\text{Cd}$

The first and second rows of the Transition Metals

Chemistry beyond Year 13

So where does Chemistry lead ? Some future pathways are listed below.

Medicine	Dentistry	Biological Engineering
Teaching	Pharmacy	Manufacturing
Food Technology/Science	Veterinary Science	Chemical Engineering
Agriculture and Horticulture	Forensic Science	Environmental Engineering
Technical Marketing/Management	Biochemical and Medical Research	Polymer Science

Four principal options now exist for the continued education and training of students in Chemistry, once they leave school:

- i. Technical training at a Polytechnic can lead, after a period of study, to the National Diploma of Science.
- ii. Polytechnics now offer a three year Bachelor of Applied Science degree (BAppSci).
- iii. Training at all Universities can lead to a BSc degree in Chemistry, Biochemistry or a related discipline after a minimum of three years full time study.
- iv. Students can undertake study at Auckland, Massey or Canterbury Universities for a Chemical Engineering degree.