Bachelor of Science in: Chemistry

Double Degrees:
Chemistry and Chemical Engineering (BSc/BEng)
Chemistry and Extractive Metallurgy (BSc/BSc)
The Creative Science

Chemists began to colour our world in the 19th century when they first developed dyes for clothing through the creation of new synthetic molecules. Countless new molecules have been designed and created by chemists in the last 50 years. This creative aspect of Chemistry has led to its practitioners sometimes being called Molecular Architects.

A few examples of the results of this creative science are:
- synthetic fibres such as those used to produce the latest fabrics for athletic wear, allowing moisture from perspiration to pass out through the fabric but preventing rain from penetrating inward.
- specific lightweight, impact-resistant polymeric materials for use in products ranging from wind surfers to milk crates and from toddlers’ toys to household appliances.
- pharmaceutical products which save thousands of lives around the world.
- biocompatible materials used in medical and pharmaceutical products which save thousands of lives around the world.
- the material for dyvids, scrubbable paints, household cleansers, flea repellent collars for pets and an almost endless list of other applications such as hip replacements, artificial corneas and sutures that dissolve. These are but two aspects of the problem solving nature of Chemistry, which is constantly at work in virtually every segment of our society.

The Investigative Science

Chemists can compare the evidence from a crime scene with traces found on an accused’s clothing. With the power of modern chemical instrumentation, samples can be analysed and a “unique signature” generated. A match in the signature between two samples of glass means chemists can say with a high degree of certainty that the samples have been made from the same materials.

Similar analyses of steel and other manufactured materials can be made. Gold can be “fingerprinted” to determine its source. Chemistry can be used extensively for many other purposes similar to these.

Creating Wealth

Chemistry is fundamental to most of the wealth-generating primary (mining, petroleum, agriculture) and secondary (manufacturing) industries of Australia. Chemists use sophisticated techniques based on advanced technology equipment to provide information essential to the operation of industries ranging from oil exploration and production, through metals production and the manufacture of life-saving pharmaceutical products to cereals production.

Resources industries, both minerals and energy, are dependent on chemists. From the evaluation of geological samples in the early stages of exploration, and that of core samples from beginning to end of the drilling program as well as throughout the production life of a resource development, chemists provide vital information and advice.

In industrial manufacturing, quality control is vital for success in an extremely competitive global economy. In many manufacturing processes chemists ensure the quality of all inputs and outputs of the process.

The agricultural sector of our economy would be far less productive without the regular chemical analysis of soils and the specific fertiliser regimes developed by chemists to treat specific soil deficiencies.

Chemistry leads to career opportunities in many different areas because of its extraordinarily diverse nature. Chemistry is a creative, investigative, problem solving and wealth creating science. Chemistry can provide a career path to senior management positions in a wide range of organisations.

Industries Where Chemistry Graduates Work

- Mining/Oil Industry
- Mineral Processing
- Foods and Beverages
- Forensic & Analytical Services
- High Schools and Colleges
- Government Agencies

Who Employs Chemistry Graduates?

- AICRA
- Anchor Foods
- Analytical Reference Laboratory
- Anchor Foods
- Association of Independent Schools of Western Australia
- Australian assay laboratories
- BP Australia
- Catholic Education Office
- Chemistry Centre WA
- Cockburn Cement
- Coogee Chemicals
- CSIRO
- Crane 
- Damper Salt
- Education Department of Western Australia
- Geotechnical Services
- Hamersley Iron
- Meadow Lea
- Metro Brick
- Midland Brick
- Millennium International Chemicals
- National Measurement Institute
- Pfizer
- Robe River Iron Ore Associates
- Rose Scientific
- SGS Australia
- Swan Brewery
- Swan Cement
- Taubmans
- WAPET
- Water Corporation
- Woodside Petroleum
- Western Australia
- Education Department of Western Australia
- CSIRO
- CSBP
- Coogee Chemicals
- Cockburn Cement
- Coca Cola
- Chemistry Centre WA
- BP Australia
- Association of Independent Schools of Western Australia
- CISWA
- Anchor Foods
- Analytical Reference Laboratory
- Anchor Foods
- Association of Independent Schools of Western Australia
- Australian assay laboratories
- BP Australia
- Catholic Education Office
- Chemistry Centre WA
- Cockburn Cement
- Coogee Chemicals
- CSIRO
- Damper Salt
- Education Department of Western Australia
- Geotechnical Services
- Hamersley Iron
- Meadow Lea
- Metro Brick
- Midland Brick
- Millennium International Chemicals
- National Measurement Institute
- Pfizer
- Robe River Iron Ore Associates
- Rose Scientific
- SGS Australia
- Swan Brewery
- Swan Cement
- Taubmans
- WAPET
- Water Corporation
- Woodside Petroleum
- Western Australia
- Education Department of Western Australia
- CSIRO
- CSBP
- Coogee Chemicals
- Cockburn Cement
- Coca Cola
- Chemistry Centre WA
- BP Australia
- Association of Independent Schools of Western Australia
- CISWA

Professional Accreditation:

Royal Australian Chemical Institute

Engineers Australia

The Australian Computer Society

The Australian Institute for Mining & Metallurgy

*Only for graduates of relevant double major or double degree programs.

Accreditation: Royal Australian Chemical Institute

Engineers Australia

The Australian Computer Society

The Australian Institute for Mining & Metallurgy

*Only for graduates of relevant double major or double degree programs.
Surprising, really, at least for Lisa, who spends a lot more. “They weren’t sick of it.”

In America, they have special ‘body farms’ where people can go in and take the initiative and talking to as many people as possible before deciding to become a forensic scientist. As for postgraduate advice, they recommend taking at least a second major or by selecting a range of extension topics.

Curtin’s Department of Chemistry boasts leading academic staff as well as state of the art facilities. The Precinct is a powerful and unique collaboration between, government agencies, universities and industry bodies that aims to educate and research to the highest level by attracting world-class expertise for industry-focused research and top quality students to science and resources education. Industry partners include the Chemistry Centre (WA), the main chemistry centre for Western Australia and also the oldest NATA (National Association of Testing Authorities) accredited laboratory in Australia, and BHP Billiton, the world’s largest diversified resources company, which is providing $5 million in support. Through the BHP Billiton Curtin alliance, the Precinct is committed to the development of strong regional links in chemistry and resources education. Industry partners have included the Chemistry Centre (WA), the main chemistry centre for Western Australia, Curtin University’s Forensic Science Precinct.

A feature of the course is the final semester Research Methods unit in which students will work within a research team on their own project and to produce a report prepared to professional standards suitable for presentation to potential employers. Curtin’s Department of Chemistry boasts considerable research expertise in a wide range of areas and projects will be available in:

- Analytical Chemistry (Including Forensic Chemistry, Organic, Geochemistry and Water Chemistry)
- Chemical Sensors
- Chemical Synthesis
- Chemistry Education
- Computational Chemistry
- Corrosion Science
- Medical and Biological Chemistry
- Minerals and Materials Chemistry
- Spectroscopy and Laser Chemistry

There is also the possibility of carrying out research with partners such as the Chemistry Centre (WA), CSIRO Minerals and other local industries.

While the course is designed towards the goal of educating potential professional chemists, the broad education in chemistry and science that it provides ensures that graduates will have wider employment prospects in a range of scientific careers. The course meets the requirements of the Royal Australian Chemical Institute (RACI) for graduate membership.

BSc (Chemistry) (Honours)

On completion of the three-year BSc (Chemistry) degree, students who have performed at an acceptable academic level will be invited to complete an extra year of study to obtain the BSc (Chemistry) (Hons). The research focus of an Honours degree in Chemistry provides a pathway for career advancement at higher level than the base degree.

Course Structure - Chemistry

YEAR 1
Semester 1
- Chemistry 101
- Scientific Computing
- Statistical Data Analysis 101

Elective units
Semester 2
- Chemistry 102
- Maths 103 (or Maths 101)
- Communication skills

YEAR 2
Semester 1
- Chemical Structure and Spectroscopy 201
- Chemical Engagements & Safety 211

Elective units
Semester 2
- Analytical Chemistry 202
- Chemical Reactions & Mechanisms 212
- Medicinal and Biological Chemistry 222

YEAR 3
Semester 1
- Analytical Chemistry and Spectroscopy 301
- Synthetic Methods 311
- Medicinal and Biological Chemistry 321
- Nanotechnology 341

Semester 2
- Chemistry Research Methods 362
- Materials Chemistry 332
- Environmental Chemistry 352

BSc HONS
Semester 1
- Chem 401
- Science Res Methods
- Offer Honours Dissert 497

Semester 2
- Chem 402
- Chem Honors Dissert 498

CRICOS Course Code 01660C

Double Degree Programs with Chemistry

Chemistry and Extractive Metallurgy

This double degree program is a joint undertaking between Curtin Chemistry and the WA School of Mines. It is designed to equip students to work in the mining processes and industries. Three of the eight semesters of study are conducted at Kalgoorlie.

Chemistry and Chemical Engineering

Combining Chemistry and Chemical Engineering offers graduates the qualification in highly compatible areas. Not only do they have the option of employment in either field, they also have skills in research and development of new processes and specialisations.
Associate Professor Simon Lewis leads a research group within Curtin’s Nanochemistry Research Institute which has broad interests in chemical measurement with research activities focussed on applications to forensic analysis. Specific areas of current interest include the chemistry of decomposition, analysis of trace evidence and chemical methods for the enhancement and visualisation of marks and impressions (latent fingerprints). The latter project combines analytical chemistry, spectrosocpy and synthetic chemistry to develop new reagents that are safer than current fingerprint detection technologies. This research has recently involved significant time at the Australian Synchrotron using the Infrared Beamline to probe the chemistry of latent fingerprints and developed fingermarks in situ.

The group’s research has been undertaken with various forensic science industry partners including the Australian Federal Police, Western Australia Police, Forensic Science South Australia and the Victoria Police Forensic Services Department. There is also international collaboration with forensic researchers in USA, Canada, Europe and Israel. Associate Professor Lewis teaches undergraduate analytical chemistry and forensic science at all levels from 1st year to Honours. He currently coordinates a specialisation degree program for Western Australian Police forensic investigators. His activities in forensic science and chemistry education have been recognised by a number of university awards and in 2005 he was a finalist for the Australian Awards for University Teaching in the Physical Sciences Category. In addition to his teaching and research, Associate Professor Lewis is actively involved in educational outreach programs to primary schools, high schools and the general public utilising his knowledge and experience to stimulate interest in science.

Forensic Science

BSc (Forensic Science) (Honours)

Students who complete the Bachelor of Science with suitably high academic performance will be invited to undertake a fourth year of study. The Honours degree includes a program of advanced study units in Forensic and Analytical Chemistry, more specifically, forensic legal and case studies, a field placement with the Western Australian Police Service, along with studies in modern analytical instrumentation. Students also engage in a program of rigorous supervised research in Forensic Chemistry, instilling in them a strong sense of investigative research skills, which are critical to crime solving in Forensic Science.

Course Structure - Forensic Science

BSc Hons

Semester 1

Cham 401
Science Res Methods
Chem Hons Dissertation 497
Semester 2

Forensic Units
Chem Hons Dissertation 498
FS Hons Dissert 497
Chem Hons Dissert 498
CRICOS Course Code 061600D

The creative side of chemistry:

From Yorkshire to the antipodes - reconstructing diverse environments of the past and present

A fourth year project on geochemistry started Kliti on her current research; using special techniques to measure stable carbon and hydrogen isotopes of biomarkers in sediments and petroleum that are hundreds of millions of years old. "These biomarkers are derived from biochemicals of algae, bacteria, and plants which originally existed and the isotopes represent the original climate in which the organisms lived," she said. This is where she brings her artistic background to her research. "Reconstructing environments is quite creative in a lot of ways; you have to have an imaginative mind to do that." Her PhD at Bristol Uni was exactly this - Reconstructing Ancient Climates and Environments. Currently, this is where two of her main areas of focus interact: petroleum exploration and mass extinction theories. The largest extinction event in the last 600 million years was huge - 90% of life on Earth was destroyed, much more than when the dinosaurs became extinct. It just so happens that a lot of the oil in the North Basin is of a similar age, so in doing research in petroleum exploration here, she is also finding data related to enormous amounts toxic hydrogen sulfide in the oceans (the smell of bad eggs) to help her reconstruct a picture of the environment in which this extinction event took place.

This brings us to the boars. She recently returned from 11 days of collecting rock samples in Spitzbergen. "It's the northernmost point you can fly to on Earth, just 1000 km south of the North Pole. She, one of her doctoral students and a colleague had Greenland dogs, a guide with a gun in case of polar bear attacks and 24/7 sunlight. She spoke about the amazing quality and quantity of fossils there. ‘They were just all over the place - beautiful, complete fossils.’ These rock samples will also be used to help create this reconstruction of the extinction event 600 million years ago. ‘It’s very important to learn about the past so that we can help to predict future trends in climate change.’

Besides the science itself, she loves the interaction with colleagues. She is very proud of her many doctoral students, and said the most exciting part of her job is sharing in the enthusiasm when they get results.
Entry Requirements

Local Students
Standard University admission requirements as well as the prerequisite TEE subjects applicable to the choice of full-time, part-time and external students studying outside Australia, may have some information or phone +61 8 9266 7331 for further

More Information
science.curtin.edu.au

International Students
Standard University entry requirements, as well as high school completion of advanced mathematics and chemistry. Students wishing to enrol in double degree programs including engineering may also require physics.

More Information
international.curtin.edu.au

International Students
International students studying in Australia on a student visa can only study full-time and there are also specific entry requirements that must be met.
Please refer to international.curtin.edu.au or phone +61 8 9266 7331 for further information, as some information contained in this booklet may not be applicable to international students. Australian citizens and permanent residents, and international students studying outside Australia, may have the choice of full-time, part-time and external study. Information about TISC only applies to Australian residents.

Chemistry Research at Curtin
Research in chemistry spans a wide range of areas from fundamental to applied chemistry. Most of the research conducted is of direct relevance to the needs of commerce and industry. In fact, many of the research projects undertaken in chemistry are either through industrial sponsorship, or collaboration with industrial partners. Some areas of current research include:
- Analytical Chemistry (including Forensic Chemistry, Organic Geochemistry and Water Chemistry),
- Chemical Sensors,
- Chemical Synthesis
- Chemistry Education
- Computational Chemistry
- Corrosion Science
- Medicinal and Biological Chemistry
- Minerals and Materials Chemistry
- Spectroscopy and Laser Chemistry

Good Reasons to Study Chemistry
1. You will be working within the new $116 million state of the art Resources and Chemistry Precinct at the latest in chemistry facilities. The Precinct is supported by the Chemistry Centre of WA (one of the largest employers of chemists), which will colocate in the building, and BHP Billiton, the world’s largest diversified resources company. In the neighbourhood there is also the CSIRO Division of Minerals (another large employer of chemists).
2. You will be taught by staff in Chemistry that are internationally recognized researchers and committed educators. As chemistry students you will gain hands-on experience in the use of cutting-edge equipment relevant to industry.
3. Curtin Chemistry graduates are in high demand and their employment rate is excellent.

Further Study Opportunities
For graduates of bachelor programs the following options for further study related to Chemistry are available:
- Chemistry Honours
- Forensic Science Honours
- Postgraduate Diploma in Chemistry
- Master of Science (Chemistry) by Coursework
- MPhil and PhD programs by Research
- DipEd

For more, contact:
Science and Engineering
Curtin University of Technology
GPO Box U11987
Perth Western Australia 6845
Tel: +61 8 9266 1000
E: futurestudents@curtin.edu.au
W: futurestudents.curtin.edu.au

International enquiries
Tel: +61 8 9266 7331
Fax: +61 8 9266 2605
E: international@curtin.edu.au
W: international.curtin.edu.au

Information in this publication is correct at the time of printing and is valid for 2009/2010, but may be subject to change. In particular the University reserves the right to change the content or method of assessment, to change or alter tuition fees of any unit of study, to withdraw any unit of study or program which it offers, to impose limitations on enrolment in any unit or program, and/or to vary arrangements for any program.
Part time and external study is only available to Australian resident students and International students studying outside Australia. Full details of units and course structure can be obtained by contacting the above or electronically from http://handbook.curtin.edu.au

SEBASTIAN BUNNEY
Double Degree Bachelor of Science (Chemistry), Bachelor of Engineering (Chemical Engineering)

“As a direct result of my Curtin degrees, I have worked for one of WA’s biggest nickel companies and have interned, in the USA, at the fourth biggest oil company in the world.”

I’ve studied a great course and have had great opportunities from it. Curtin provides a learning environment that equips me to deal with industry once I’ve graduated.

I’ve taken some elective units in dramatic arts and broadcast journalism and have been writing for the Curtin Guild magazine, Grok, for over four years, so I can put my point across well in any media.

Related Areas of Study
- Nanotechnology
- Chemical Engineering
- Environmental Biology
- Viticulture and Oenology

CurtInnovation
Curtin aims to be a leading edge university of technology. To fulfill this vision, we strive to be innovative and forward-looking in everything we do. It’s in our approach to teaching and learning, it’s in our research, it’s in our staff, it’s in our students, it’s in our graduates. It’s the way we think and act. It’s what we call CurtInnovation.