

Section 4: Comparison of Chemistry units of study at the Universities of Sydney and Melbourne

General Overview of units of study - 2003

First year chemistry at both University of Melbourne and the University of Sydney is offered at three different levels:

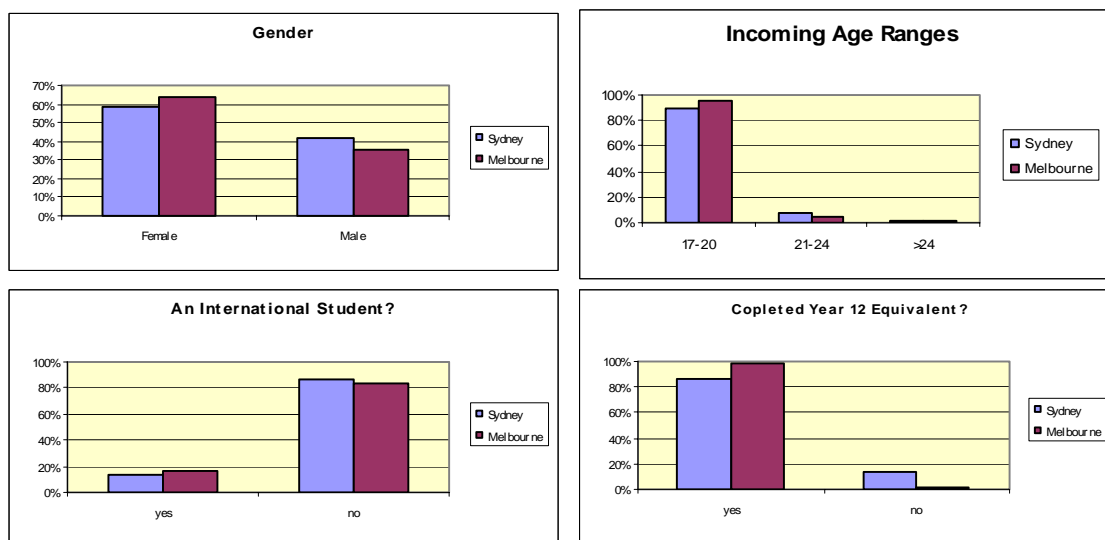
- A basic level of chemistry for students with no year 12 chemistry
- A main stream level in which year 12 chemistry is assumed
- An advanced level for high achievers in chemistry

The main and advanced levels are comprised of two semesters of chemistry, taken sequentially and in order part A before part B. The mainstream level at both universities is also offered to students starting at a mid-year entry point. At the University of Melbourne the basic level of chemistry is a one semester unit offered in first semester only; capable students proceeding to main stream chemistry part B in second semester. At the University of Sydney the basic level chemistry course is available in both semesters (part A and part B).

	University of Melbourne	University of Sydney
Semester 1	<ul style="list-style-type: none"> • Principles of Chemistry • Chemistry A • Chemistry A (Advanced) 	<ul style="list-style-type: none"> • Fundamentals of Chemistry 1A • Chemistry 1A • Chemistry 1B • Chemistry 1A (Advanced) • Chemistry 1A (Special Studies Prog) • Chemistry Life Science A (Adv) • Chemistry A (Pharmacy) • Chemistry (Engineering) • Chemistry (Vet Science)
Semester 2	<ul style="list-style-type: none"> • Chemistry A • Chemistry B • Chemistry B (Advanced) 	<ul style="list-style-type: none"> • Fundamentals of Chemistry 1B • Chemistry 1A • Chemistry 1B • Chemistry 1B (Advanced) • Chemistry 1B (Special Studies Prog) • Chemistry Life Science B (Adv) • Chemistry B (Pharmacy)
Summer School	<ul style="list-style-type: none"> • Chemistry B 	<ul style="list-style-type: none"> • Chemistry 1A • Chemistry 1B • Chemistry Life Science A (Adv) • Chemistry A (Pharmacy) • Chemistry Life Science B (Adv) • Chemistry B (Pharmacy)

Student Demographics - 2003

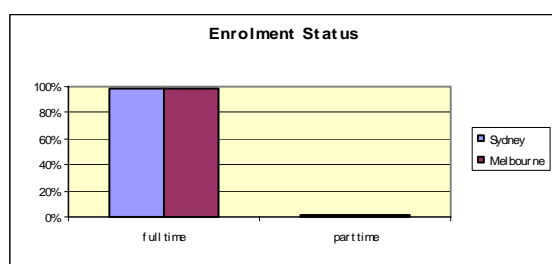
The student demographics are remarkably similar at both institutions. Data were collected from surveys (n = 737 USYD; 460 UMELB) but believed to represent the wider cohort of students. The classes are predominately of school leavers (defined as being within two years of leaving school), most of whom have completed chemistry at year 12 level. There are more females than males studying chemistry 1 units at both universities. Approximately 15% of the students are international students.



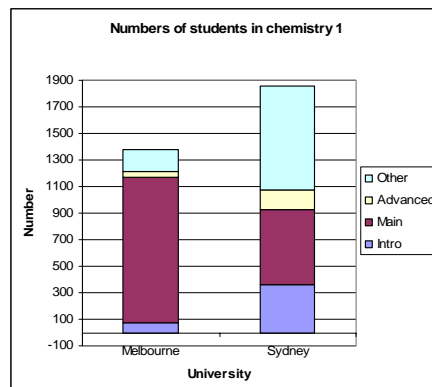
Student enrollment

The enrollment is overwhelmingly that of full-time students at both universities.

	Melbourne	Sydney
Intro/Fundamental	72	357
Main	1100	572
Advanced	40	148
Other	167	780
Total	1379	1857



An example of the units in which students are enrolled is summarized in the graph opposite. Semester 2 enrollments tend to be less than those in semester 1. Note that at the University of Melbourne the Advanced class will expand to ~180 in 2004. Both Universities have experienced an expansion in the numbers of students studying chemistry 1 in recent years.



Objectives of the chemistry units

There are similar objectives to the units at each university both in terms of the chemistry concepts that are covered and the generic skills that are targeted. At the University of Sydney there are some additional service chemistry units offered to the faculties of Pharmacy and Veterinary Science and Engineering as well as a unit for Bachelor of Medical Science students. At the University of Melbourne most of these students participate in one of the three levels of chemistry course.

The objectives are tailored to each unit of study but there are broad parallels to be drawn between the units of study. These are indicated in the following table.

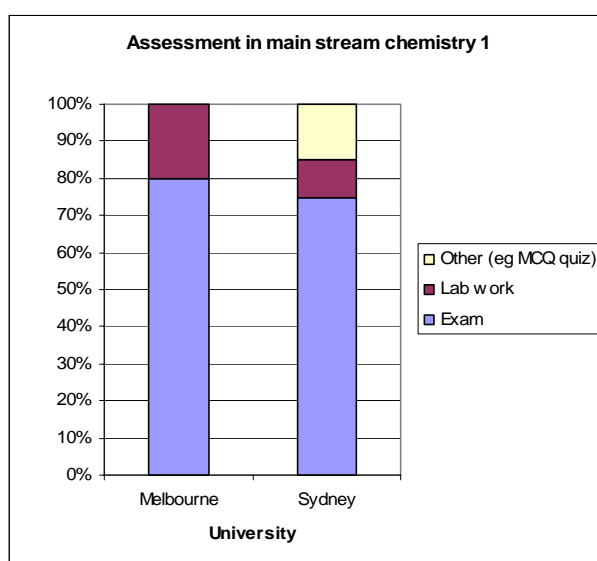
	University of Melbourne	University of Sydney
Chemistry skills	<p>Upon completion of Chemistry 1 students should have an understanding of the place of chemistry in society and the physical environment; the nature of gases; basic energy concepts; the nature of chemical change; the nature of chemical equilibria; the structures of hydrocarbon and main group molecules; the important functional groups; and the nature of techniques of measurement, the evolution of current theories, the terminology used (nomenclature). In the practical component students should develop basic laboratory skills (observation, analytical techniques, report writing); oral communication skills; independent learning skills; an appreciation of the health and safety issues associated with the safe handling and disposal of laboratory chemicals. The subject provides an introduction to stoichiometry; gases; energy (enthalpy and thermochemistry); chemical kinetics; chemical equilibrium; acid-base chemistry; atomic spectra and atomic structure; structure and bonding of alkanes, alkenes and alkynes; benzene and its derivatives; functional groups; and spectroscopy and determination of structure.</p>	<p>By the end of Chemistry 1, students will:</p> <ul style="list-style-type: none"> *possess a general knowledge of atomic theory, chemical energetics, equilibrium and the processes occurring in solution. *be able to demonstrate an understanding of fundamental processes occurring in General and Physical Chemistry. *possess a general knowledge of atomic theory, structure and bonding. *be able to demonstrate an understanding of fundamental processes occurring in Organic Chemistry, particularly relating to biological systems. *be able to progress to Intermediate Chemistry
Generic skills	<p>This subject will provide the student with the opportunity to establish/develop the following generic skills:</p> <ul style="list-style-type: none"> * the ability to use conceptual models, to gather and rationalize data, as well as problem solving and critical thinking skills. 	<p>By the end of this unit of study, students will:</p> <ul style="list-style-type: none"> *have developed laboratory manipulative and glassware handling skills. *have been introduced to the techniques used in research laboratories. *be able to apply chemical principles to problem solving situations.

Load/course components

All units of study comprised 25 per cent of a full-time student load at both universities. The teaching situations are similar in all units, that is 12 or 13 weeks of face-to-face teaching at a rate of three lectures each week, one tutorial each week and 30 hours of the laboratory work across the course of the semester.

Assessment

The assessment at the University of Melbourne varies slightly across the units. The exam represents 65 per cent to 80 per cent of the semester's assessment. In all units the laboratory component represents 15 to 20 per cent of the overall assessment and this is a hurdle requirement. In some units there is a small percentage of the assessment associated with take-home tests or site visits. At the University of Sydney assessment in all chemistry 1 units is the same and comprised of 75 per cent the end of semester exam, 15 per cent associated with ongoing tutorial quizzes and 10 per cent associated with the laboratory work. Once again there are minimum attendance requirements associated with the laboratory work.



Class size

At the University of Melbourne the lecture group size varies from around 100 to almost 500. Tutorial groups contain about 50 students and the laboratory classes are run for about 90 students with each demonstrator group having between 15 and 18 students. At the University of Sydney the lecture group size varies from around 100 to 300. Tutorial groups contain approximately 60 students and laboratory classes have up to 290 students in groups of 18 students per demonstrator. In this respect the two universities treat their students in chemistry 1 in a similar manner.

Number of students attending in one class	University of Melbourne	University of Sydney
Lectures	< 500	< 300
Practical	90	290
Prac group sizes	15-18	18
Tutorial group sizes	50	60

Facilities and Staffing

At the University of Sydney all chemistry 1 lectures are carried out in the lecture theatres within the Chemistry School. This enables demonstrations to be performed. In contrast the majority of chemistry 1 lectures at the University of Melbourne are carried out at university lecture theatres remote from the School of chemistry and consequently no demonstrations are performed.

At both universities lectures and tutorials are given by all members of teaching staff (approximately 25 in each case) and honours and postgraduate students demonstrate in the laboratory classes. At the University of Melbourne a post-doctoral research worker is the senior person in charge of laboratory sessions. In contrast, at the University of Sydney, a member of lecturing staff has overall responsibility for supervising each laboratory session. At both universities there is a dedicated service room for the first year laboratory staffed by two (Melbourne) or three (Sydney) technical staff. Administrative support for chemistry 1 appears to differ between the two universities. At Melbourne there is 0.5 position associated with the first year admin, while at Sydney there are 1.5 staff members associated with the first year admin. Some of this difference is accounted for by the administrative duties associated with preparation and collation of exam scripts and processing of assessment marks which are performed by a professional officer at the University of Sydney and which is distributed between staff that are first year unit coordinators at Melbourne. At Melbourne there is technical support for ICT maintenance and development and print design corresponding to approximately 50% of a full time position. Both universities have a director of first-year studies who is the coordinator of all chemistry 1 units. The University of Sydney has recently appointed a deputy director of first-year

studies in chemistry and the University of Melbourne has appointed a ‘Transition Lecturer’ with duties focused in the first year area.

Both Universities have in-house resources to support student learning (eg computer room and part-time duty tutor).

Print resources

	University of Melbourne	University of Sydney
Textbook	S Zumdahl, Chemical Principles J McMurry, Organic Chemistry	M Silberberg, Chemistry J McMurry, Organic Chemistry
Other		Laboratory manual - \$12

CAL and ICT learning resources

Both Universities offer a very similar range of activities to support student learning in chemistry 1. These include recommendation of a ‘standard’ chemistry text book, provision of on-line material and availability of a duty tutor to answer student enquiries.

There are compulsory and voluntary components to the online material at both universities. The compulsory component is associated with on line pre-laboratory work and it is a requirement that the students complete the appropriate module before starting the laboratory work. The voluntary component is composed of a series of self-help modules covering different concepts in chemistry and also supported by a question bank of examples and test problems.

	University of Melbourne	University of Sydney
Management systems	WebRaft	<i>WebCT</i> and in-house on-line learning materials
E-mail	All students have a free university account	All students have a free university account
Web site materials	Lecture notes, administration information, list of practical class assessment, subject descriptions, information for new students	Lecture notes, administration information, list of practical class assessment, subject descriptions, information for new students
CAL + multimedia	Pre-laboratory work ChemCAL learning modules Bank of practice questions	Pre-laboratory work ChemCAL learning modules Bank of practice questions

Access to orientation and support services

	University of Melbourne	University of Sydney
Welcome days	Staff run an orientation day	Administrative assistant in first year enquiry office to deal with enquiries
Ongoing support	Consultation with academic staff	Consultation with academic staff

Evaluation and student feedback

There is a staff-student liaison committee that meets twice a semester in chemistry at each university. Each unit and class has a representative there. At both universities there are also quality of teaching surveys and unit evaluation surveys. These provide the main forms of formal feedback about the chemistry 1 units.

	University of Melbourne	University of Sydney
Questionnaires	University Quality of Teaching Questionnaire	University Unit of Study Evaluation Questionnaire
		Chemistry questionnaire on <ul style="list-style-type: none"> • Student evaluation of teaching • Unit of study evaluation • Laboratory evaluation (Examples given in appendix 4A)
Committee	Student-Staff Liaison Committee (meets once a semester)	Student-Staff Liaison Committee (meets twice a semester)

Student Directions

Some data are available for the University of Sydney (Appendix 4B) on where students go within the Sciences after successfully completing first year.

Summary

In summary, there is a striking similarity between the University of Melbourne and the University of Sydney in how they treat their chemistry 1 students. While there are some differences in the staffing arrangements of first-year chemistry at the two universities, a comparison of outcomes of the chemistry 1 units seems valid.