Chemistry

Chemistry is the scientific discipline that describes, from both an experimental and a theoretical perspective, the properties and reactions of all of the elements and all of their compounds (the material 'stuff' of the Universe). As such, it is of fundamental importance in the physical, biological, and general sciences. Chemistry is responsible for and sustains life on Earth, has played a pivotal role in 'the Ascent of Man', is an absolute requirement of modern technological societies, and is a key science of the future. A sound training in chemistry is essential for employment and advancement in scientific and allied careers in teaching, research, government, the professions, health and environmental regulation, commerce, and industry.

The School of Chemistry offers theory and practical courses in chemistry which are designed to teach:

i a general understanding of the structure and properties of matter;

ii the relationships between structure, properties and chemical reactivity;

iii control of chemical reactions (kinetics, energetics, chemical design and synthesis);

iv the role of chemistry and chemical processes in the natural world;

v the role of chemistry and chemical technology in the industrialised world;

vi an appreciation of the health, safety and environmental issues associated with chemistry.

Students can undertake a three or four-year program in chemistry leading to a degree major in the subject or enrol in a limited selection of subjects to suit their goals and interests. Graduates with a major in chemistry are eligible for membership of the Royal Australian Chemical Institute, the peak professional body for chemists in Australia, as well as chemical societies from around the world.

Overview of subjects

100-level subjects

There are two 100-level chemistry streams for students who have completed VCE or its equivalent. Each consists of two semester length subjects, chemistry 610-121plus 610-122 (Semesters 1 and 2), and 610-141plus 610-142 (which is offered in Semesters 1 and 2 or Semester 2 and Summer Semester).

- 610-121 plus 610-122 Chemistry (Advanced) is an advanced stream suited to students with a very strong background in chemistry. This subject will provide an advanced treatment of chemistry which is appropriate for students who intend to major in chemistry or the physical or biological sciences. Entry to this subject will be by invitation. The course is presented using traditional lecture/tutorial platforms augmented by computer-aided learning (CAL) and laboratory programs. This stream is offered in Semesters 1 and 2.
- 610-141 plus 610-142 chemistry is designed to provide the essential chemistry required to major in chemistry or the physical or biological sciences. VCE Chemistry or its equivalent is normally a prerequisite for this subject. The course is presented using traditional lecture/tutorial platforms augmented by computer-aided learning (CAL) and laboratory programs. This stream is offered twice during the year, once over Semesters 1 and 2, then again over Semester 2 and Summer Semester.

For students who have not completed VCE Chemistry or its equivalent the subject chemistry 610-171 is available

- 610-171 Chemistry (Fundamentals of Chemistry) is designed to cater for students who have not completed VCE Chemistry and is offered in Semester 1. The subject is presented using traditional lecture/tutorial platforms augmented by computer-aided learning (CAL) and laboratory programs. This subject is designed to provide background knowledge in chemistry to allow students to enter chemistry 610-141 in Semester 2. Students who achieve a high level of performance in the examination component of chemistry 610-171 may be permitted to undertake chemistry 142 in Semester 2 or Summer Semester provided they also complete additional computer-aided learning tasks during the winter recess break.

Notes:

- Students with a high level of performance in VCE Physics and Mathematics who have not completed VCE Chemistry may be permitted to enrol in Chemistry 610-141. Contact the the Director of First Year Studies, Dr W D McFadyen, for further information.
- Students with a high level of achievement in chemistry at Year 12 or its equivalent may apply for direct entry into 200-level chemistry subjects (contact the Director of First Year Studies, Dr W D McFadyen, for information regarding exemption examinations).
- Students who have gained credit for 610-051 and 610-052 (available only to B. Biomed. Sc students) are eligible to enrol in 200-level chemistry subjects.
- Credit is available for only one of 610-121 or 610-141 or 610-051, and for one only of 610-122 or 610-142 or 610-052.

200-level subjects

The School of Chemistry offers a selection of subjects at the 200-level. These subjects all reinforce the basic principles introduced in 100-level subjects and extend further to a more sophisticated treatment of the chemical sciences. Theory, practical and combined theory/practical courses in the main areas of chemistry are offered.

300-level subjects

At the 300-level, theory, practical and combined theory/practical courses continue the development of the main areas of chemistry. Students intending to continue to BSc (Hons) in chemistry should note that they are strongly recommended to enrol in at least 62.5 points of 300-level chemistry. The Chemical Research Project is a recommended feature of the 300-level course.

Bachelor of Science (Honours)

The School of Chemistry offers a fourth year honours program to eligible students. The honours year involves course work and the completion of a research project under the supervision of one or more staff members. Honours graduates are eligible for membership of the Royal Australian Chemical Institute and chemical societies from around the world. Please refer to *Bachelor of Science (Honours) and Bachelor of Information Systems (Honours) (p.883)*.

Suggested subjects

The following broad guidelines relate to students majoring in chemistry:

100-level subjects

Along with one of the 100-level chemistry streams, students are recommended to take mathematics and statistics 620-121 plus 620-123 or 620-141 plus 620-143 or 620-160 plus 620-161. Additional 100-level subjects should be selected from physics, biology, earth sciences, mathematics and statistics, or computer science. Students intending to enrol in 610-211 Light, Matter & Chemical Change B *(p.801)* should note that 100-level mathematics and physics are recommended.

200-level subjects

At 200-level, chemistry 610-210, 610-220, 610-240 and 610-260 provide a minimum grounding in the important areas of physical, organic, inorganic and analytical/spectroscopic chemistry, respectively. These subjects combine theory and practical components in a single unit of 12.5 points. More comprehensive training in the areas of physical, organic and inorganic chemistry is provided by the following pairs of theory and practical units, each totalling 18.75 points, viz. (610-211 plus 610-215), (610-221 plus 610-225), and (610-241 plus 610-245). Students with a well-developed interest in particular areas are encouraged to enrol in the larger joint subjects which reflect their goals and interests. Environmental chemistry 610-280 is available to students pursuing environmental science and chemistry students.

Students majoring in chemistry should enrol in at least 50 points of 200-level chemistry; this can be achieved by various subject combinations. Selections must include at least three of the subjects 610-210 (or 610-211 plus 610-215), 610-220 (or 610-221 plus 610-225), 610-240 (or 610-241 plus 610-245), and (610-260 or 610-280). Students with a broad interest in chemistry may elect to enrol in all of 610-210, 610-220, 610-240 and 610-260, whereas students with a well-developed interest in particular areas may elect to enrol in one or more of (610-211 plus 610-215), (610-221 plus 610-225), and (610-241 plus 610-245), and other subjects up to at least 50 points. Students with a particularly strong interest in chemistry may of course enrol in subjects totalling more than 50 points.

300-level subjects

The flexible structure of the 200-level courses is maintained at the 300-level. The subjects 610-310, 610-320 and 610-340 provide a minimum grounding in the important areas of physical, organic and inorganic chemistry, respectively. These subjects combine theory and practical components in a single unit of 12.5 points. A more in-depth treatment of these three areas is provided by the following pairs of theory and practical subjects, each totalling 18.75 points, viz. (610-311 plus 610-315), (610-321 plus 610-325), and (610-341 plus 610-345). Students wishing to specialise in particular areas are encouraged to enrol in the larger joint subjects. Specialist subjects in Bio-organic chemistry, Molecular Technology and Processes, and Analytical and Environmental chemistry are also available (610-332, 610-333 and 610-360, respectively). The Chemistry Research Project, 610-399, is strongly recommended for students intending to enrol in the honours program in chemistry.

Students majoring in chemistry must enrol in at least 50 points of 300-level chemistry; as with 200-level subjects, this can be achieved by various subject combinations. In their selection, students must include at least three of the

four areas of chemistry [three of (610-311 plus 610-315) (or 610-310), (610-321 plus 610-325) (or 610-320), (610-341 plus 610-345) (or 610-340) or 610-360]. It is recommended that students intending to major in chemistry also undertake the Research Project, 610-399. Student with a particularly strong interest in chemistry may of course enrol in units totalling more than 50 points.

Special requirements for laboratory classes

For all laboratory classes in 100 to 400-level chemistry students are required to wear a standard laboratory coat, approved safety glasses or goggles, and approved footwear. Thongs or sandals are not permitted in laboratories.

100-level subjects

Special Requirements: For all chemistry 100-level subjects: an A4 duplicate note-book. Access to a calculator and sets of molecular models is recommended.

610-141 Chemistry

Note: Credit cannot be gained for this subject and 610-121, 610-161 or 610-051.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr W D McFadyen

Prerequisites: VCE Chemistry.

Contact: 36 lectures (three per week), eight 3-hour sessions practical work, 10 hours tutorials, 9 hours problem-solving/computer-aided learning *(Semester 1, repeat 2).*

Description: Upon completion of 610-141 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.

Assessment: A 3-hour written examination at the end of semester which represents 80% of the final assessment. Practical work is continuously assessed and short tests may be given during the semester. These together represent 20% of the final assessment. Practical work must be completed satisfactorily before credit can be granted for the subject.

Prescribed texts: S Zumdahl, *Chemical Principles,* 3rd ed., D C Heath, 1997. • J McMurry, *Organic Chemistry*, 5th ed., Brooks/Cole, 2000.

610-142 Chemistry

Note: Credit cannot be gained for this subject and 610-122, 610-162 or 610-052

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr W D McFadyen

Prerequisites: Chemistry 610-141, 610-161 or 610-121. Students with a high level of achievement in 610-171 or 202-101 may be permitted to enrol in 610-142 upon successful completion of the chemistry 610-141 computer-aided learning modules during the winter recess.

Contact: In Semester 2: 36 lectures (three per week), eight 3-hour sessions practical work, 10 hours tutorials, 9 hours problem-solving/computer-aided learning. In Summer Semester, presented over a six week period: 12 lectures with access to self-paced computer aided learning material developed specifically for the summer course and requiring 2-3 non-timetabled hours per week, six 3-hour sessions practical work; 12 hours of tutorials; 18 hours of problem solving/computer aided learning workshop sessions *(Semester 2).*

Description: On completion of 610-142 the student should have an understanding of the reactivity of organic molecules; the structure and bonding of inorganic molecules; the nature of the solid state; the structure and reactivity of metal compounds.

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 organic acids and bases; nucleophilic substitution reactions; elimination reactions; addition reactions; electrophilic aromatic substitution reactions; nucleophilic addition reactions; organic redox reactions; aspects of main group chemistry: structure and bonding in elements and compounds of groups 14-18; solutions and pH equilibria; intermolecular forces and extended solid state structures; redox reactions and electrochemistry; and transition metal and coordination chemistry.

Assessment: A 3-hour written examination at the end of semester which represents 80% of the final assessment. Practical work is continuously assessed and short tests may be given during the semester. These together represent 20% of the final assessment. Practical work must be completed satisfactorily before credit can be granted for the subject.

Prescribed texts: S Zumdahl, *Chemical Principles,* 3rd ed., D C Heath, 1997. • J McMurry, *Organic Chemistry*, 5th ed., Brooks/Cole, 2000.

610-162 Chemistry

Note: Credit cannot be gained for this subject and 610-122, 610-142 or 610-052

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr W D McFadyen

Prerequisites: Chemistry 610-161 or 610-141 or 610-121.

Contact: Intensive mode. Monday 8 January 2001 to Friday 16 February 2001. See School of Chemistry for further details *(Summer semester).*

Description: On completion of 610-162 the student should have an understanding of: the reactivity of organic molecules; the structure and bonding of inorganic molecules; the nature of the solid state; the structure and reactivity of metal compounds.

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: organic acids and bases; nucleophilic substitution reactions; elimination reactions; addition reactions; electrophilic aromatic substitution reactions; nucleophilic addition reactions; organic redox reactions; aspects of main group chemistry; structure and bonding in elements and compounds of groups 14-18; solutions and pH equilibria; intermolecular forces and extended solid state structures; redox reactions and electrochemistry; transition metal and coordination chemistry.

Assessment: A 3-hour written examination at the end of semester which represents 80% of the final assessment. Practical work and workshops are continuously assessed and together represent 20% of the final assessment. Practical and workshop assignments must be completed satisfactorily before credit can be granted for the subject.

Prescribed texts: Zumdahl S, *Chemical Principles,* (3rd ed D C Heath 1997). • McMurry J, *Organic Chemistry*, (4th ed Brooks/Cole 1997).

610-121 Chemistry (Advanced Studies Program)

Note: Credit cannot be gained for this subject and 610-141, 610-051 or 610-161

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr W D McFadyen

Prerequisites: A study score of at least 44 in VCE Chemistry or its equivalent. Entry to this subject will be by invitation

Contact: 36 lectures (three per week), six 3-hour sessions practical work, 20 hours workshops/tutorials, 9 hours self-paced computer-aided learning *(Semester 1).*

Description: Upon completion of 610-121 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; spectroscopic identification of organic compounds; 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 importance of instrumental methods in chemistry; and an appreciation of the health and safety issues associated with the safe handling and disposal of laboratory chemicals.

The subject provides an introduction to gases, real and ideal; thermodynamics; energy, enthalpy, entropy; chemical kinetics; chemical equilibrium; homogeneous, heterogeneous, equilibrium calculations; acid-base chemistry; atomic spectra and atomic structure; wave nature of matter; Schrodinger equation; molecular structure and bonding in alkanes, alkenes, alkynes and aromatics; organic nomenclature; stereochemistry; functional groups; and methods in spectroscopic identification of organic compounds.

Assessment: A 3-hour written examination at the end of semester plus short tests and assignments which represent 80% of the final assessment. Practical work is continously assessed and represents 20% of the final assessment.

Practical work must be completed satisfactorily before credit can be granted for this subject.

Prescribed texts: S Zumdahl, *Chemical Principles*, 3rd ed., Houghton Mifflin,, 1997. • J McMurry, *Organic Chemistry*, 5th ed., Brooks/Cole, 2000.

610-122 Chemistry (Advanced Studies Program)

Note: Credit cannot be gained for this subject and 610-142, 610-162 or 610-052

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr W D McFadyen

Prerequisites: Chemistry 610-121, 610-141, 610-161 or 610-051. Entry to this subject will be by invitation

Contact: 36 lecturers, six 3-hour practical sessions, 20 hours workshop/tutorials, 9 hours self-paced computer assisted learning *(Semester 2).*

Description: On completion of 610-122 the student should have an understanding of reaction mechanisms; chemical transformation of organic compounds; organic chemical synthesis; intermolecular forces and the energetics and structures of solid state materials; and the structure and bonding of main group and transition elements and their important compounds.

In the practical component students should develop basic laboratory skills (observation, analytical techniques; report writing); oral communication skills; independent learning skills; appreciation of the importance of instrumental methods in chemistry; and an appreciation of the health and safety issues associated with the safe handling and disposal of laboratory chemicals.

The subject provides an introduction to: physical properties and chemical reactions of organic compounds; reaction mechanisms and chemical equilibria; organic acids and bases; nucleophilic substitution (SN1 and SN2); elimination reactions (E1 and E2); electrophilic addition to alkenes; electrophilic aromatic substitution; nucleophilic addition and substitution to carbonyls; oxidation and reduction; radical addition, substitution and polymerisation reactions; structure and bonding of main group and transition elements and their important compounds; reactions involving solubility; pH equilibria and redox (reduction/oxidation); chemical, technology and analytical applications of electrochemistry; and the structure, applications and biological roles of transition metal coordination compounds.

Assessment: A 3-hour written examination at the end of semester plus short tests and assignments (80%); practical work is continously assessed and represents 20% of the final assessment. Practical work must be completed satisfactorily before credit can be granted for the subject.

Prescribed texts: S Zumdahl, *Chemical Principles*, 3rd ed., Houghton Mifflin,, 1997. • J McMurry, *Organic Chemistry*, 5th ed., Brooks/Cole, 2000.

610-171 Fundamentals of Chemistry

Note: Students intending to undertake chemistry 610-142 in order to meet prerequisites for later year chemistry or biochemistry subjects must achieve at a high level in the examination component of chemistry 610-171. Chemistry 610-141/610-142 is available for students who have completed VCE Chemistry.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr W D McFadyen

Prerequisites: Some knowledge of chemistry and basic principles will be assumed

Contact: 36 lectures (three per week), six 3-hour sessions of practical work, 12 hours of tutorials, 6 hours of computer-aided learning *(Semester 1).*

Description: On completion of 610-171 the student should have an understanding of the nature of matter; the nature of solutions and gases; the nature of chemical change related to equilibrium, energy and kinetics; the nature of redox processes; structures and functional groups in organic molecules.

In the practical component students should develop basic laboratory skills (observation, analytical techniques, report writing) and an appreciation of the health and safety issues associated with the safe handling and disposal of laboratory chemicals.

The subject provides an introduction to the nature of matter, elements, atoms, ions and molecules; electronic structure of atoms and ions; bond formation, including covalent, ionic, metallic, hydrogen bonding, van der Waals; solubility and the solution state; ions and hydration; the behaviour of gases; the mole concept; concentrations; stoichiometry; acids, bases, neutralization reactions and salt formation; acid/base strength and the pH scale; energy and chemical systems; rates of reaction and reaction order; catalysis and enzymes; chemical equilibrium; the equilibrium constant, Ka, Kb, stability constants and solubility products; redox reactions and redox potentials; organic molecules; structure, nomenclature and functional groups; hydrophobicity and hydrophilicity; and biologically significant macromolecules.

Assessment: One 3-hour examination at the end of semester (65%); three tests during semester (15%); practical work (20%).

Prescribed texts: S Zumdahl,, *Chemistry*, 5th ed., Houghton Mifflin, 2000.

200-level subjects

610-210 Light, Matter & Chemical Change A

Note: Credit cannot be gained for this subject and 610-211 or 610-215.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr M L Gee

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052. 100-level mathematics and 100-level physics are recommended.

Contact: 24 lectures (three per week for eight weeks), 8 tutorials, 30 hours practical work *(Semester 2).*

Description: Upon completion of 610-210 students should have an appreciation for the rates and mechanisms of enzyme catalysed reactions and environmentally significant atmospheric processes; understand the concepts of entropy and free energy and their application to chemical and biological systems; understand the interactions between molecules and light and the use of light in the determination of molecular structure; have developed experimental skills in the operation of instrumentation for the acquisition of physical data, as well as observational and critical analysis skills for the interpretation and presentation of data.

The subject covers the topics: the dynamics of molecular processes, energy transformation and storage in chemical and biological systems, and the interaction between molecules and light, and its relationship to molecular structure. The practical course will consist of experiments involving physical and instrumental investigations of important chemical systems and phenomena.

Assessment: One 2-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment. Practical work will be assessed continously in the form of short reports. Practical work must be completed satisfactorily before credit can be granted for the subject.

Prescribed texts: Atkins P W, *Physical Chemistry*, 6th Ed, OUP 1998.

610-211 Light, Matter & Chemical Change B

Note: Credit cannot be gained for this subject and 610-210.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr M L Gee

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052. 100-level mathematics and 100-level physics are recommended. Concurrent enrolment in 610-215 is strongly recommended.

Contact: 36 lectures, 12 tutorials *(Semester 2).*

Description: Upon completion of 610-211 students should have an appreciation for the rates and mechanisms of enzyme catalysed reactions and environmentally significant atmospheric processes; understand the concepts of entropy and free energy and their application to chemical and biological systems; understand the interactions between molecules and light and its use in the determination of molecular structure; and understand modern views of molecular structure and the interaction of light with matter and its chemical consequences.

The subject covers the topics the dynamics of molecular processes; energy transformation and storage in chemical and biological systems; the interaction between molecules and light and its relationship to molecular structure; and molecular structure and the harnessing of energy by absorption of light.

Assessment: One 3-hour written examination at the end of semester and assignments not exceeding six pages. Assignments and tests may constitute up to 10% of the final assessment.

Prescribed texts: P W Atkins, *Physical Chemistry*, 5th ed., OUP, 1994.

610-215 Physical Chemistry Practical II

Note: Credit cannot be gained for this subject and 610-210

Credit points: 6.25 **HECS-band:** 2

Coordinator: Dr M L Gee

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052. Concurrent enrolment in 610-211 is strongly recommended.

Contact: 36 hours practical work *(Semester 2).*

Description: Upon completion of 610-215 students should have developed experimental skills in the operation of instrumentation for the acquisition of physical data, as well as observational and critical analysis skills for the interpretation and presentation of data.

The subject will consist of a number of experiments involving physical and instrumental investigations of important chemical systems and phenomena.

Assessment: Practical work will be continuously assessed in the form of short reports.

610-220 Organic Chemistry

Note: Credit cannot be gained for this subject and 610-221 or 610-225.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr M Gill

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052

Contact: 24 lectures (three per week for 8 weeks), 8 tutorials, 30 hours practical work *(Semester 1).*

Description: Upon completion of 610-220 students should have an understanding of the stereochemistry of carbon compounds; the synthesis and some reactions of simple polyfunctional organic compounds; the concept of aromaticity; and the basic types of heterocyclic compounds.

Students should also develop skills to synthesise simple organic molecules; qualitative laboratory manipulative skills; and skills to record and interpret chemical observations.

Students should also appreciate the importance of rational, critical and independent thought in chemical science and in the understanding of organic chemistry.

The subject covers the topics molecular architecture and its relationship to chemical and biological change (nine lectures); principles of organic synthesis: C-C bond formation (nin lectures); fundamentals of aromatic and heterocyclic chemistry (six lectures)

The laboratory work will consist of a number of experiments involving techniques for the synthesis of important classes of organic compounds.

Assessment: One 2-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment. Practical work will be assessed in the form of short reports. Practical work must be completed satisfactorily before credit can be granted for the subject.

610-221 Organic & Bio-organic Chemistry

Note: Credit cannot be gained for this subject and 610-220.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr M Gill

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052. Concurrent enrolment in 610-225 is strongly recommended.

Contact: 36 lectures, 12 tutorials *(Semester 1).*

Description: Upon completion of 610-221 students should have an understanding of the stereochemistry of carbon compounds; the synthesis and some reactions of simple polyfunctional compounds; the concept of aromaticity; the basic types of heterocyclic compounds; the main classes of biologically significant organic compounds; and some of the important aspects of pharmaceutical organic chemistry.

Students should also appreciate the importance of rational, critical and independent thought in chemical science and in the understanding of organic chemistry.

The subject covers the topics molecular architecture and its relationship to chemical and biological change (nine lectures); principles of organic synthesis; C-C bond formation (nine lectures); fundamentals of aromatics and heterocyclic chemistry (six lectures); alkaloids, ß-lactams and nucleic acid bases (three lectures); amino acid, peptides, proteins and carbohydrates (nine lectures)

Assessment: One 3-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment.

Prescribed texts: J McMurry, *Organic Chemistry*, 5th ed., Brooks/Cole, 2000.

610-225 Organic Chemistry Practical

Note: Credit cannot be gained for this subject and 610-220

Credit points: 6.25 **HECS-band:** 2

Coordinator: Dr M Gill

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052. Concurrent enrolment in 610-221 is strongly recommended.

Contact: 36 hours practical work *(Semester 1).*

Description: Upon completion of 610-225, the student should develop skills to synthesize simple organic molecules; qualitative laboratory manipulative skills; and skills to record and interpret chemical observations.

The course will consist of a number of experiments involving techniques for the synthesis of important classes of organic compounds.

Assessment: Practical work will be continuously assessed in the form of short reports.

610-240 Inorganic and Bio-inorganic Chemistry A

Note: Credit cannot be gained for this subject and 610-241 or 610-245.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr C G Young

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052

Contact: 24 lectures (three per week for 8 weeks), 8 tutorials, 30 hours practical work *(Semester 2).*

Description: Upon completion of 610-240 students should have an understanding of the central role of inorganic and bio-inorganic chemistry in biological systems and emerging industry processes. This subject is developed via carefully chosen examples which include the role of nature's metal-scavanging ligands; the facilitation of life by the trace metals; organometallic chemistry; and the design of catalysts in industry and nature (enzymes).

Students should also have developed skills to synthesize simple inorganic molecules, an understanding of basic analytical and spectroscopic methods and skills to interpret and record observed chemistry.

The subject covers the topics the occurrence, uptake and transport of the essential trace elements; metal binding in complexes; iron nutrition in humans; transport of dioxygen by hemoglobin; the action of poisons; carbon monoxide and cyanide; organometallic chemistry; hydrogen, carbon monoxide and alkenes as ligands; activation of ligands for reaction and the design of catalysts; and structural and spectroscopic techniques.

The practical component of the subject will consist of a number of experiments involving the synthesis, chemistry and instrumental investigations of important inorganic and organometallic compounds.

Assessment: One 2-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment. Practical work will be continuously assessed in the form of short reports. Practical work must be completed satisfactorily before credit can be granted for the subject.

Prescribed texts: D F Shriver and P W Atkins, *Inorganic Chemistry*, 3rd ed., OUP, 1999.

610-241 Inorganic and Bio-inorganic Chemistry B

Note: Credit cannot be gained for this subject and 610-240.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr C G Young

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052. Concurrent enrolment in 610-245 is recommended.

Contact: 36 lectures, 12 tutorials *(Semester 2).*

Description: Upon completion of 610-241 students should have an understanding of the central role of inorganic and bio-inorganic chemistry in biological systems, emerging industry processes and the action of metallo-drugs. This subject is developed via carefully chosen examples which include the role of nature's metal-scavanging ligands; the facilitation of life by the trace metals; organometallic chemistry; the design of catalysts in industry and nature (enzymes); and design and action of metal drugs.

The subject covers the topics the occurrence, uptake and transport of the essential trace elements; metal binding in complexes; iron nutrition in humans; transport of dioxygen by hemoglobin; the action of poisons; carbon monoxide and cyanide; organometallic chemistry; hydrogen, carbon monoxide and alkenes as ligands; activation of ligands for reaction and the design of catalysts; structural and stereoscopic techniques; metal compounds as therapeutic agents including treatments for bipolar disorder (lithium) and cancer (cis-platin); toxic overload (chelation therapy); directed sythesis; control of stereochemistry; structural inorganic chemistry; and the structural basis of advanced materials.

Assessment: One 3-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment.

Prescribed texts: D F Shriver and P W Atkins, *Inorganic Chemistry*, 3rd ed., OUP, 1999.

610-245 Inorganic Chemistry Practical

Note: Credit cannot be gained for this subject and 610-240

Credit points: 6.25 **HECS-band:** 2

Coordinator: Dr C G Young

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052.

Contact: 36 hours practical work *(Semester 2).*

Description: Inorganic chemistry emcompasses an enormous and diverse area of chemistry of great practical importance. This subject develops synthetic, analytical and instrumental skills in inorganic, bio-inorganic and orga-

nometallic chemistry. A wide variety of synthetic methods, handling procedures and analytical techniques are introduced.

The subject consists of the synthesis and characterisation of classes of main group, transition metal and organometallic compounds of technological and medical application. They include peroxy species, phosphates, metal-DNA complexes and metal catalysts. The metals include V, Cr, Fe, Co and Ni as well as Mo and Ru, from the second row transition metals. These systems are investigated by infrared, NMR and UV-visible spectroscopies, by Xray powder diffraction and by magneto-chemistry. They are analysed by quantitative titrimetric and gravimetric techniques.

Assessment: Practical work will be continuously assessed in the form of short reports.

610-260 Analysis in Chemical and Life Sciences

Note: Credit cannot be gained for this subject and 610-285.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr J N Lambert

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052.

Contact: 20 lectures (two per week for 10 weeks), 9 tutorials, 42 hours practical work *(Semester 1).*

Description: The subject covers the separation and analysis of biologically important molecules. An emphasis will be placed on the principles of drug analysis and the isolation and structural elucidation of bioactive compounds. Course topics include the principles and application of various methods of compound purification, discussion of various forms of chromatography and their applications, spectroscopy, including atomic absorption, infrared, nuclear magnetic resonance, ultraviolet/visible and mass spectrometry. Web-deliverable material will be used to both reiterate and augment aspects of the course presented in lectures and tutorials.

Through the practical component of this course students will develop quantitative and qualitative laboratory manipulative skills aimed at the accurate and reproducible analysis of chemical materials, both as single entities and mixtures. This will be achieved through hands-on experience with a variety of spectroscopic and analytical instruments (NMR, HPLC, GC, AA).

Upon completion of 610-260, students will acquire critical skills applicable across the chemical and life sciences. In particular, emphasis will be placed upon the choice and application of techniques for the separation and analysis of chemical and biological materials and the development of problem-solving skills in the spectroscopic determination of molecular structure.

Assessment: A 2-hour written examination at the end of semester. Practical work will be continuously assessed in the form of short reports. Assignments and tests may constitute up to 10% of the final assessment. Satisfactory performance in both theory and practical work is required before credit can be granted for this subject.

610-280 Environmental Chemistry

Note: Credit cannot be gained for both 610-280 and 610-246.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr P J Thistlethwaite

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052

Contact: 36 lectures, 6 tutorials *(Semester 2).*

Description: On completion of 610-280 students should comprehend the relationship between chemistry and the environment; the sources, reactions, transport, effects and fates of chemical species in the water, soil and atmospheric environments; the consequences of changes in the chemical composition of the environment for humankind and other species; the consequences of energy utilisation; and the integration of a chemically-centred study of the environment with other approaches to the treatment of environmental data.

Students should have developed skills in recognising chemical-based environmental problems; an awareness of the possible effects of chemicals on the environment; and a capacity to interpret environmental data and to apply diverse chemical principles in the explanation of environmental phenomena. Students should appreciate the need for high quality environmental analysis; and the links between the misuse of chemicals and pollution events.

The subject covers the topics emissions to troposphere; behaviour of pollutants in troposphere and stratosphere; ozone and SMOG chemistry; air pollution potential (chemistry and meteorology); airborne particulates; acid rain, the greenhouse effect; the ozone layer; the struture and chemistry of freshwater bodies; the chemistry of nutrients; dissolved oxygen, Henry's Law, oxygen demand; the environmental impact of selected examples of metals, organic priority pollutants, pesticides, herbicides; water quality and health; the chemistry of soils (formation, constituents and properties); sources and characteristics of soil contaminants; absorption and persistence of contaminants in soils; soil degradation, salinity, acid-sulphate soils; chemical assessment of contaminated soils; introduction to soil and water remediation; and energy utilisation and conservation.

Assessment: One 3-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment.

610-285 Practical Environmental Analysis

Note: Credit cannot be granted for this subject and 610-260

Credit points: 6.25 **HECS-band:** 2

Coordinator: Dr J Lambert

Prerequisites: One of chemistry 610-141, 610-161 or 610-051 AND one of 610-142, 610-162 or 610-052

Contact: 42 hours practical work *(Semester 2).*

Description: Upon completion of 610-285, the student should develop skills enabling them to detect various chemical species of environmental significance as well as gaining a general understanding of the techniques used in environmental analysis. The course will consist of a number of experiments involving the use of various analytical methods.

Assessment: Practical work will be continuously assessed in the form of short reports.

300-level subjects

610-310 Physical Chemistry IIIA

Note: Credit cannot be gained for this subject and 610-311 or 610-315.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr F Grieser

Prerequisites: Chemistry 610-210 or (610-211 and 610-215) (1998: (610-210 or 610-211) and 610-215).

Contact: 24 lectures (three per week for 8 weeks), 32 hours practical work *(Semester 1).*

Description: Upon completion of 610-310 students should relate UV-visible spectroscopy to the fates of electronically excited molecules; understand photochemical kinetics and its application to controlling light induced processes; understand the main concepts of equilibrium electrochemistry and be able to apply electrochemical principles to interpret the behaviour of solutions and galvanic cells; understand the nature of a surface and the phenomena of spreading behaviour of liquids, capillary rise, vapour pressure, superheating, crystal solubility and super-saturation; understand the processes of micelle formation from surfactants and gas adsorption on solids; and have developed skills in experimental techniques and instrumental methods of physical chemistry.

The subject covers the topics surface chemistry, electrochemistry, photochemistry, and reactions of reactive intermediates.

The practical course will consist of a number of experiments involving the physical and instrumental investigations of important chemical systems and phenomena.

Assessment: One 2-hour written examination at the end of semester. Assignments not exceeding 12 pages and tests may constitute up to 10% of the final assessment. Practical work will be continuously assessed in the form of short reports. Practical work must be completed satisfactorily before credit can be granted for the subject.

610-311 Physical Chemistry IIIB

Note: Credit cannot be gained for this subject and 610-310.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr F Grieser

Prerequisites: Chemistry 610-210 or 610-211. Concurrent enrolment in 610-315 is strongly recommended.

Contact: 36 lectures *(Semester 1).*

Description: Upon completion of 610-311 students should understand the principles of statistical mechanics, their relationship to classical thermodynamics and appreciate their application in describing chemical systems; understand the concepts of equilibrium electrochemistry and the principles controlling the rates of electrode processes; be able to quantitatively describe the role of surfaces in a variety of important chemical phenomena and to use models to describe micelle formation from surfactants; understand the range of techniques for the production of atomic and free radical species and the kinetic aspects of abstraction, addition and branched chain reactions; appreciate the principles of molecular spectroscopy, spectral interpretation and laser action; be able to quantitatively characterize excited state properties and understand their significance in processes such as photosynthesis and photodegradation of materials; and understand the solution properties of macromolecules.

The subject covers the topics surface chemistry; electrochemistry; photochemistry; reactions of unstable species; statistical thermodynamics; and macromolecules.

Assessment: One 3-hour written examination at the end of semester. Assignments not exceeding 12 pages and tests may constitute up to 10% of the final assessment.

610-315 Physical Chemistry Practical III

Note: Credit cannot be gained for this subject and 610-310 (Before 1999: 610-311).

Credit points: 6.25 **HECS-band:** 2

Coordinator: Dr F Grieser

Prerequisites: 610-210 or (610-211 and 610-215) (1998: (610-210 or 610-211) and 610-215). Concurrent enrolment in 610-311 is strongly recommended.

Contact: 48 hours practical work *(Semester 1).*

Description: Upon completion of 610-315 students should have developed skills in conducting instrument-based laboratory experiments in kinetics, surface chemistry, electrochemistry, photochemistry, and polymer and surfactant chemistry. The range of practical exercises will also develop observational skills and scientific report-writing skills.

The course will consist of a number of experiments involving the physical and instrumental investigations of important chemical systems and phenomena.

Assessment: Practical work will be continuously assessed in the form of short reports.

610-320 Organic Chemistry IIIA

Note: Credit cannot be gained for this subject and 610-321 or 610-325.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr C Schiesser

Prerequisites: Chemistry 610-220 or (610-221 and 610-225) (1998: (610-220 or 610-221) and 610-225).

Contact: 24 lectures (three per week for 8 weeks), 8 tutorials, 32 hours practical work *(Semester 2).*

Description: Upon completion of 610-320 students should comprehend the main types of chemical transformations involved in the synthesis of organic compounds; the range of agents available to effect these transformations; the different types of stereochemical complexity of organic compounds; factors which influence stereochemical outcome; and the procedures for determination of the structures of organic compounds by spectroscopic and chemical techniques.

Students should have also developed time and resource management skills; skills to synthesise a range of organic molecules; knowledge of the application and interpretation of a range of spectroscopic and physical techniques; and experience in reporting the results of an experimental study.

Students should also appreciate the importance of rational, critical and independent thought in chemical science and in the understanding of organic chemistry.

The subject covers the topics pericyclic reactions; the chemistry of alkenes; organometallic reactions, enolates, aldol and related reactions, and the Wittig reaction; reductions and rearrangements with emphasis on chemo-, regio-, and stereo-selectivity; and applications of nuclear magnetic resonance and mass spectrometry to the determination of structure.

The practical course will consist of a number of experiments involving the synthesis and/or chemical and/or instrumental investigations of important classes of organic compounds.

Assessment: One 2-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment. Practical work will be continuously assessed in the form of short reports. Practical work must be completed satisfactorily before credit can be granted for the subject.

610-321 Organic Chemistry IIIB

Note: Credit cannot be gained for this subject and 610-320.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr C Schiesser

Prerequisites: Chemistry 610-220 or 610-221. Concurrent enrolment in 610-325 is strongly recommended.

Contact: 36 lectures, 12 tutorials *(Semester 2).*

Description: Upon completion of 610-321 students should comprehend the main types of chemical transformations involved in the synthesis of organic compounds; the range of agents available to effect these transformations; the different types of stereochemical complexity of organic compounds; factors which influence stereochemical outcome; the procedures for determination of the structures of organic compounds by spectroscopic and chemical techniques; the theoretical basis of organic chemical reactions; and the concept of reaction mechanisms and the methods used to delineate these mechanisms.

Students should also appreciate the importance of rational, critical and independent thought in chemical science and in the understanding of organic chemistry.

The subject covers the topics pericyclic reactions; the chemistry of alkenes; organometallic reactions, enolates, aldol and related reactions, and the Wittig reaction; free-radical chemistry; reductions and rearrangements with emphasis on chemo-, regio-, and stereo-selectivity; applications of nuclear magnetic resonance and mass spectrometry to the determination of structure; concerted and stepwise processes; detection and identification of intermediates and products; and applications of infrared, nuclear magnetic resonance and mass spectrometry.

Assessment: One 3-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment.

610-325 Organic Chemistry Practical III

Note: Credit cannot be gained for this subject and 610-320 (Before 1999: 610-321).

Credit points: 6.25 **HECS-band:** 2

Coordinator: Dr C Schiesser

Prerequisites: 610-220 or (610-221 and 610-225) (1998: (610-220 or 610-221) and 610-225). Concurrent enrolment in 610-321 is strongly recommended.

Contact: 48 hours practical work *(Semester 2).*

Description: Upon completion of 610-325 students should have developed time and resource management skills; skills to synthesise a range of organic molecules; knowledge of the application and interpretation of a range of spectroscopic and physical techniques; and experience in reporting the results of an experimental study.

The course will consist of a number of experiments involving the synthesis and/or chemical and/or instrumental investigations of important classes of organic compounds.

Assessment: Practical work will be continuously assessed in the form of short reports.

610-332 Bio-organic Chemistry

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr M Gill

Prerequisites: At least one of chemistry 610-220, 610-221 OR completion of 25 points of 200-level biochemistry subjects

Contact: 36 lectures *(Semester 1).*

Description: The course will cover the following topics:

- natural products (12 lectures): the conception, establishment and application of biosynthetic theories as they apply to steroids; polyketides; terpenoids; alkaloids;
- metabolism (12 lectures): a mechanistic, chemical and stereochemical treatment of primary metabolism; vitamins (for example, thiamine, pantothenic acid, lipoic acid) and their role as components of co-enzymes in metabolism; bioregulators such as prostaglandins, their structure and synthesis; and
- medicinal chemistry (12 lectures): drug design and structure; peptide, protein and DNA synthesis; drug-protein interactions; drug metabolism; anabolic steroids.

Assessment: One 3-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment.

610-333 Molecular Technology and Processes

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr P Mulvaney

Prerequisites: At least two of chemistry 610-210 (or 610-211), 610-220 (or 610-221), 610-240 (or 610-241), 610-260, 610-280

Contact: 36 lectures (three per week) *(Semester 2).*

Description: Upon completion of 610-333 students should have an understanding of the development and application of molecular technology. Developments in the modern chemistry industry will be examined together with the rise of the 'new' technologies.

The course will be selected from the following topics:

- petrochemicals: synthesis on the industrial scale; non-renewable and renewable carbon sources; lessons from biological processes;
- polymers: fundamental properties; smart polymers; biodegradable systems;
- pharmaceuticals and agricultural derivatives: natural and synthetic agents for animal and human health and crop protection; screening in drug discovery; bioprospecting; combinatorial chemistry; and
- advanced materials: colloids and nano-particles; colloids and new generation paints; emulsions and micro-emulsions in pharmaceuticals.

Assessment: One 3-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment.

610-340 Inorganic Chemistry IIIA

Note: Credit cannot be gained for this subject and 610-341 or 610-345.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr S Best

Prerequisites: Chemistry 610-240 or (610-241 and 610-245) (1998: (610-240 or 610-241) and 610-245).

Contact: 24 lectures (three per week for 8 weeks), 8 tutorials, 32 hours practical work *(Semester 1).*

Description: Upon completion of the subject 610-340 students should comprehend the main types of reactions of coordination compounds; cluster molecules; organometallic species and biomolecules; the reasons for the different types of structures observed for such molecules; the procedures for determination of the structures via spectroscopic and related techniques; and the mechanisms of the more important reactions.

Students should have also developed time and resource management skills; skills to synthesise a range of inorganic molecules; knowledge of the application and interpretation of a range of spectroscopic and physical techniques; and experience in reporting the results of an experimental study.

The lecture course covers the topics symmetry, group theory, and their applications; metal and main group chemistry; coordination, cluster and organometallic species; reactivity, including redox and catalytic processes; applications of nuclear magnetic resonance and related structural techniques.

The practical course will consist of a number of experiments involving the synthesis and/or chemical and/or instrumental investigations of important classes of main group and transition metal coordination and organometallic compounds.

Assessment: One 2-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment. Practical work will be continuously assessed in the form of short reports. Practical work must be completed satisfactorily before credit can be granted.

610-341 Inorganic Chemistry IIIB

Note: Credit cannot be gained for this subject and 610-340.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr S Best

Prerequisites: Chemistry 610-240 or 610-241. Concurrent enrolment in 610-345 is strongly recommended.

Contact: 36 lectures, 12 tutorials *(Semester 1).*

Description: Upon completion of the subject 610-341 students should comprehend the main types of reactions of coordination compounds, cluster molecules, organometallic species and biomolecules; the reasons for the different types of structures observed for such molecules; the procedures for determination of the structures via spectroscopic and related techniques; the mechanisms of the more important reactions; electronic structure and photochemistry of metal complexes; the structure of the solid state; and reactions of coordinated ligands, including aspects of asymmetric synthesis and the mechanism of action of metallo-enzymes.

The lecture course covers the topics symmetry, group theory, and their applications; metal and main group chemistry; coordination, cluster and organometallic species; reactivity, including redox and catalytic processes; applications of nuclear magnetic resonance and related structural techniques.

Assessment: One 3-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment.

610-345 Inorganic Chemistry Practical III

Note: Credit cannot be gained for this subject and 610-340 (Before 1999: 610-341).

Credit points: 6.25 **HECS-band:** 2

Coordinator: Dr S Best

Prerequisites: 610-240 or (610-241 and 610-245) (1998: (610-240 or 610-241) and 610-245). Concurrent enrolment in 610-341 is strongly recommended.

Contact: 48 hours practical work *(Semester 1).*

Description: Upon completion of 610-345 students should have developed time and resource management skills; skills to synthesise a range of inorganic molecules; knowledge of the application and interpretation of a range of spectroscopic and physical techniques; and experience in reporting the results of an experimental study.

The course will consist of a number of experiments involving the synthesis and/or chemical and/or instrumental investigations of important classes of main group and transition metal coordination and organometallic compounds.

Assessment: Practical work will be continuously assessed in the form of short reports.

610-360 Analytical & Environmental Chemistry

Note: Credit cannot be gained for this subject and before 1998: 610-346.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr I Hamilton

Prerequisites: Either chemistry 610-260, or both 610-280 and 610-285

Contact: 18 lectures, 32 hours practical (project) work *(Semester 2).*

Description: Upon completion of the subject 610-360 students should comprehend the principles of quantitative analytical chemistry; the complementary nature of classical and instrumental methods of analysis; the importance of planning and full understanding in the efficient performance of chemical analyses; and the nature of chemical systems in the environment.

In the practical component of the course students should have developed skills in quantitative chemical separations; ability to carry out classical and instrumental determinations of selected components of a variety of sample materials; and competence in planning and execution of experimental procedures; ability to prepare reports of analyses carried out.

The lecture course covers topics selected from principles of the major analytical instruments; chemical methods of sample preparation for classical and instrumental analysis; and aspects of environmental chemistry.

Assessment: One 2-hour written examination at the end of semester. Assignments and tests may constitute up to 10% of the final assessment. Practical work will be continuously assessed. Satisfactory performance in both theory and practical work is required before credit can be granted.

610-399 Chemical Research Project

Note: Enrolment in this subject is strongly recommended for all students enrolled in 75 or more points of 300-level chemistry.

Credit points: 12.5 **HECS-band:** 2

Coordinator: Prof K P Ghiggino

Prerequisites: Students must be enrolled in at least 50 points of 300-level chemistry, including two of the three core subjects 610-311 (or 610-310), 610-321 (or 610-320), 610-341 (or 610-340) AND including two of the units containing practical work [610-310, 610-315, 610-320, 610-325, 610-340, 610-345].

Contact: One lecture and 96 hours laboratory work *(Semester 2).*

Description: The subject is designed to introduce students to independent original research; to further develop practical skills; to train the student to use the chemical literature; to train the student in the art of assessing the results obtained; and to develop communication skills, both written and oral.

At the completion of the subject the student should comprehend the importance of a critical review of work already published in the field; the necessity for careful planning of the research work; and the importance of accurate observation and recording of data.

Students will carry out a short chemical investigation under the direction of a School of Chemistry staff member. Each student will be required to prepare and deliver both a written and an oral report on the investigation.

Assessment: A written report of no more than 10 pages and an oral presentation of no more than 15 minutes will form the basis of the assessment. The oral report will be independently assessed by at least two members of academic staff.

Chemistry subjects available only to Bachelor of Biomedical Science students

610-051 and 052 are only available to Bachelor of Biomedical Science students. Credit towards the Bachelor of Science will not be awarded for the completion of 610-051 or 052.

610-051 Chemistry (Biomedical Science A)

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr W D McFadyen

Prerequisites: VCE Chemistry or its equivalent.

Contact: 36 lectures (three per week), eight 3-hour sessions of practical work, 10 hours tutorials, 9 hours problem-solving/computer-aided learning *(Semester 1).*

Description: Upon completion of 610-051 students should have an understanding of the place of chemistry in a biomedical context; the nature of gases; the nature of chemical equilibria; the structure of matter; and the nature of hydrocarbons.

In the practical component, students should develop basic laboratory skills (observation, analytical technique, report writing); oral communication skills; independent learning skills; and an appreciation of the health and safety issues associated with the safe handling and disposal of laboratory chemicals.

The subject provides an introduction to gases (solubility, diffusion), energy (sources, food), reaction rates and equilibria (catalysis), acid-base chemistry,

atomic spectra and structure (spectroscopy), and bonding and structure in organic molecules.

Assessment: A 3-hour written examination at the end of semester which represents 80% of the final assessment. Practical work is continuously assessed and short tests may be given during the semester. These together represent 20% of the final assessment. Practical work must be completed satisfactorily before credit can be granted for the subject.

Prescribed texts: S Zumdahl, *Chemical Principles*, 3rd ed., D C Heath, 1997. • J McMurry, *Organic Chemistry*, 4th ed., Brooks/Cole, 1992.

610-052 Chemistry (Biomedical Science B)

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr W D McFadyen

Prerequisites: Chemistry 610-051

Contact: 36 lectures (three per week), eight 3-hour sessions of practical work, 10 hours tutorials, 9 hours problem-solving/computer-aided learning *(Semester 2).*

Description: Upon completion of this subject students should have an understanding of the reactivity of organic molecules; the structure and reactivity of biomolecules; the structure and bonding of inorganic molecules; the nature of the solid state; and metal chemistry in biology.

In the practical component, students should develop basic laboratory skills (observation, analytical technique, report writing); oral communication skills; independent learning skills; and an appreciation of the health and safety issues associated with the safe handling and disposal of laboratory chemicals.

The subject provides an introduction to the chemistry of functional groups important to biological processes; the structures of biological molecules; chemistry of the main group elements; intermolecular forces and solids; redox reactions; and metal chemistry in biology.

Assessment: A 3-hour written examination at the end of semester which represents 80% of the final assessment. Practical work is continuously assessed and short tests may be given during the semester. These together represent 20% of the final assessment. Practical work must be completed satisfactorily before credit can be granted for the subject.

Prescribed texts: S Zumdahl, *Chemical Principles*, 3rd ed., D C Heath, 1997.

Chemistry subjects available only to Optometry students

610-006 is only available to optometry students. Credit towards the Bachelor of Science will not be awarded for the completion of 610-006.

610-006 Chemistry (Optometry)

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr W D McFadyen

Prerequisites: A knowledge of VCE Chemistry will be assumed

Contact: 36 lectures, 12 tutorials, eight 3-hour sessions of practical work *(Semester 2).*

Description: The subject provides an introduction to elementary theories of chemical bonding in organic molecules; the stereochemistry of simple organic molecules and application of stereochemical concepts to the understanding of the relation between molecular shape and biological activity; the nature of biologically important molecules and their functions; the nature of chemical equilibrium with particular reference to acid-base chemistry; the chemistry of polymers, metals and inorganic solids; the chemistry of redox processes; and the role of transition metals in life processes.

Assessment: A 3-hour written examination. Practical work is continually assessed. Up to 10% of the total mark may come from continuous assessment tasks given during the course of the semester.

Prescribed texts: J McMurry, *Organic Chemistry*, 4th ed., Brooks/Cole, 1996. • S Zumdahl, *Chemical Principles*, 3rd ed., Houghton Mifflin, 1998.