Students in this unit should read this unit guide carefully at the start of semester. It contains important information about the unit. If anything is unclear, please consult one of the teaching staff in the unit.
ABOUT THIS UNIT

- CBMS223 aims to provide students with insights into the molecular processes of the living cell, and at the same time help students to understand the complex ‘language’ of biochemistry. Topics covered include: protein structure and function, enzymes, vitamins and coenzymes and metabolism.
- The unit carries 3 Credit points (equivalent to at least 9 hours/week of contact and self-study).
- CBMS223 provides an essential background of biochemistry for the modern life scientist, building on fundamentals of organic chemistry and general biology. Lecture topics include the structure of biological macromolecules, enzymatic control of biological reactions, principal pathways of intermediary metabolism, energy flow within cells and the synthesis and breakdown of sugars, lipids, amino acids and nucleotides. The unit emphasizes the interpretation of quantitative data and the experimental basis for our current ideas and developments in biochemistry. Laboratory practical sessions will alternate with tutorials covering lecture and practical topics.
- CBMS223 is an essential unit for the Bachelor of Chiropractic Science. It is also a prerequisite for CBMS332 Protein Discovery and analysis, CBMS337 Biochemistry and Cell Biology, BIOL357 Physiology I and BIOL358 Physiology II.

TEACHING STAFF

- Convenor (SR): Prof. Shoba Ranganathan  
  Building F7B Room 121  
  T: 9850 6262  
  E: shoba.ranganathan@mq.edu.au  
  Consultation hours: to be advised during the first lecture

- Lecturer (RW):  Mr. Gagan Garg  
  Building F7B Room 119  
  T: 9850 8276  
  E: gagan.garg@mq.edu.au

CLASSES

The timetable for classes can be found on the University web site at:

http://www.timetables.mq.edu.au/

Contact hours each week include:
- Two 1 hr lectures
- A 3 hr Practical class, alternating with a 2 hr tutorial/discussion of the practicals, on the same day each week, for each group (listed on iLearn and the lab).
- The 2013 timetable is provided and participation in all sessions is recommended.
- Lectures, Practicals/Tutorials start in Academic Week 1 (week of 25 Feb. 2013) and continue till the end of Academic Week 13 (7 June 2013).
# Lecture Topics

<table>
<thead>
<tr>
<th>Acad. Week</th>
<th>Cal. Week</th>
<th>No.</th>
<th>Date</th>
<th>Topic</th>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>1</td>
<td>25 Feb</td>
<td>Biochemistry: introduction and amino acids</td>
<td>SR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>1 Mar</td>
<td>Properties of Amino acids</td>
<td>SR</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>3</td>
<td>4 Mar</td>
<td>Primary structure and sequencing of Proteins</td>
<td>SR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>8 Mar</td>
<td>Structure of proteins</td>
<td>SR</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>5</td>
<td>11 Mar</td>
<td>Properties, characterization and purification of Proteins &amp; Introduction to Enzymes</td>
<td>SR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>15 Mar</td>
<td>More on Enzymes</td>
<td>SR</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>7</td>
<td>18 Mar</td>
<td>Enzymes, Cell compartments and membranes</td>
<td>SR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>22 Mar</td>
<td>Metabolic strategies and principles</td>
<td>SR</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>9</td>
<td>25 Mar</td>
<td>Glycolysis: from glycogen to pyruvate</td>
<td>SR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>29 Mar</td>
<td>Good Friday (public holiday)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>13</td>
<td></td>
<td>1 Apr</td>
<td>Easter Monday (public holiday)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>5 Apr</td>
<td>Gluconeogenesis: making &quot;new glucose&quot;</td>
<td>GG</td>
</tr>
<tr>
<td>7</td>
<td>14</td>
<td>11</td>
<td>8 Apr</td>
<td>Pentose Phosphate pathway &amp; TCA (Kreb's) cycle</td>
<td>GG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>12 Apr</td>
<td>Glyoxalate cycle</td>
<td>SR</td>
</tr>
<tr>
<td>8</td>
<td>17</td>
<td>13</td>
<td>29 Apr</td>
<td>Electron transport &amp; Oxidative phosphorylation</td>
<td>SR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 May</td>
<td>MID-SEMESTER TEST (during lecture hour)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>18</td>
<td>14</td>
<td>6 May</td>
<td>Electron transport</td>
<td>SR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>10 May</td>
<td>Producing ATP: Oxidative phosphorylation</td>
<td>SR</td>
</tr>
<tr>
<td>10</td>
<td>19</td>
<td>16</td>
<td>13 May</td>
<td>Fats and fatty acid metabolism: Biosynthesis</td>
<td>SR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
<td>17 May</td>
<td>Fats and fatty acid metabolism: Degradation</td>
<td>SR</td>
</tr>
<tr>
<td>11</td>
<td>20</td>
<td>18</td>
<td>20 May</td>
<td>Nitrogen metabolism</td>
<td>SR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19</td>
<td>24 May</td>
<td>Amino acid synthesis</td>
<td>SR</td>
</tr>
<tr>
<td>12</td>
<td>21</td>
<td>20</td>
<td>27 May</td>
<td>Amino acid catabolism</td>
<td>SR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21</td>
<td>31 May</td>
<td>Nucleotide synthesis</td>
<td>SR</td>
</tr>
<tr>
<td>13</td>
<td>22</td>
<td>22</td>
<td>3 Jun</td>
<td>Nucleotide degradation</td>
<td>SR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23</td>
<td>7 Jun</td>
<td>Vitamins and coenzymes</td>
<td>SR</td>
</tr>
</tbody>
</table>

*As on 9 Jan 2013. Rooms may change: pl. check for updates at http://timetables.mq.edu.au

**SR: Shoba Ranganathan; GG: Gagan Garg**
Practicals - E8A-130: Wed: 2-5 pm; Thu: 10 am-1 pm & 2-5 pm; Fri 10 am-1 pm

<table>
<thead>
<tr>
<th>Groups</th>
<th>Wed 2-4 pm</th>
<th>Thu 10 am-12 pm</th>
<th>Thu 2-4 pm</th>
<th>Fri 10 am-12 pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 9</td>
<td>5 &amp; 13</td>
<td>2 &amp; 10</td>
<td>6 &amp; 14</td>
<td>3 &amp; 11</td>
</tr>
<tr>
<td>7 &amp; 15</td>
<td>4 &amp; 12</td>
<td>8 &amp; 16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Room* | C5A 404 | C5A 401 | C5A 401 | C5A 404 | E8A 188 | E8A 386 |

<table>
<thead>
<tr>
<th>Days</th>
<th>Dates</th>
<th>Practical (P) or Tutorial (T)</th>
<th>Groups (=Prac/Tute Class)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wed pm</td>
</tr>
<tr>
<td>1</td>
<td>Wed 27 Feb</td>
<td>T1: Properties of amino acids</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 28 Feb</td>
<td></td>
<td>9, 13</td>
</tr>
<tr>
<td>2</td>
<td>Wed 06 Mar</td>
<td>P1: Amino acid titrations</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 08 Mar</td>
<td></td>
<td>9, 13</td>
</tr>
<tr>
<td>3</td>
<td>Wed 13 Mar</td>
<td>T1: Properties of amino acids</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 14 Mar</td>
<td></td>
<td>9, 13</td>
</tr>
<tr>
<td>4</td>
<td>Wed 20 Mar</td>
<td>P2: Standard curves and protein determination</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 21 Mar</td>
<td></td>
<td>9, 13</td>
</tr>
<tr>
<td>5</td>
<td>Wed 27 Mar</td>
<td>No prac or tutorial classes on Wed &amp; Thu;</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 28 Mar</td>
<td>Good Friday public holiday</td>
<td>9, 13</td>
</tr>
<tr>
<td>6</td>
<td>Wed 03 Apr</td>
<td>T3: Enzymes and sugars</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 04 Apr</td>
<td></td>
<td>9, 13</td>
</tr>
<tr>
<td>7</td>
<td>Wed 10 Apr</td>
<td>P3: Enzyme activity</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 11 Apr</td>
<td></td>
<td>9, 13</td>
</tr>
<tr>
<td>8</td>
<td>Mon 15 Apr - Fri 26 Apr</td>
<td>Mid-semester break</td>
<td>1, 5</td>
</tr>
<tr>
<td>9</td>
<td>Wed 01 May</td>
<td>T4: TCA cycle &amp; making ATP</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 02 May</td>
<td></td>
<td>9, 13</td>
</tr>
<tr>
<td>10</td>
<td>Wed 15 May</td>
<td>T5: Lipid and nitrogen metabolism</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 16 May</td>
<td></td>
<td>9, 13</td>
</tr>
<tr>
<td>11</td>
<td>Wed 22 May</td>
<td>T4: TCA cycle &amp; making ATP</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 23 May</td>
<td></td>
<td>9, 13</td>
</tr>
<tr>
<td>12</td>
<td>Wed 29 May</td>
<td>T5: Lipid and nitrogen metabolism</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 30 May</td>
<td></td>
<td>9, 13</td>
</tr>
<tr>
<td>13</td>
<td>Wed 05 Jun</td>
<td>P6: Transamination &amp; deamination</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 06 Jun</td>
<td></td>
<td>9, 13</td>
</tr>
<tr>
<td>14</td>
<td>Wed 12 Jun</td>
<td>T6: Amino and nucleic acid metabolism</td>
<td>1, 5</td>
</tr>
<tr>
<td></td>
<td>Thu 13 Jun</td>
<td></td>
<td>9, 13</td>
</tr>
</tbody>
</table>

*In each fortnight, of tutorials and prac's, we will follow the group schedule provided here, whatever the order in the official timetable. Prac/tute classes will be offered, depending on the group information.

*Rooms may change: pl. check for updates at [http://www.timetables.mq.edu.au](http://www.timetables.mq.edu.au)

Group information will be posted on iLearn as well as outside the lab (E8A 130). Separate timetables for each lab/tute group will be available on iLearn.
IF YOU NEED A WAIVER TO ENROL IN CBMS223

To enrol into CBMS223, you need to have successfully completed both pre-requisites, if you are an UG student.

An UG student who has not completed either pre-requisite is not eligible to apply for a waiver.

An UG student who has not completed one of the pre-requisites, or is enrolling for the third time, can apply for a waiver at:

http://ask.mq.edu.au

More information is available at:

http://web.science.mq.edu.au/new_and_current_students/undergrad/admin_central/

Re-enrolling students may be eligible for exemption from practical and tutorial classes - please contact the unit coordinator after you enrol, if you wish to be exempted and do not enrol in the practical and tutorial sessions on eStudent.

REGISTERING YOUR PRAC AND TUTORIAL SESSIONS

Tutorials (2 hours) and Practicals (3 hours) are held on the same day, starting at the same time, on alternate weeks. The lab/tutorial cycle is Wed, Thu, Fri.

Labs and tutorials start in week 1 on: Wed 27 Feb., Thu 28 Feb and Fri 1 Mar and end in week 13 on: Wed 5 Jun., Thu 6 Jun and Fri 7 Jun. No practicals or tutorials are scheduled in week 5 (Wed. 27 Mar, Thu 28 Mar and Fri 29 Mar - Good Friday).

You will need to register for ONE of the following sessions:

1. Wed: 2-5 pm lab and 2-4 pm tutorial or
2. Thursday: 10 am-1 pm lab and 10 am -12 pm tutorial or
3. Thursday: 2-5 pm lab and 2-4 pm tutorial or
4. Friday: 10 am-1 pm lab and 10 am -12 pm.

Please choose the best day for you when you can block out 3 hours for the lab: the tutorial will occupy only the first two of these on alternate weeks. So, half of you will go to tutorials first followed by practicals, while the other half goes for practicals first and then tutorials.

- If you have registered for lab and tutorial on different days, you will be allocated a lab/tutorial group depending on your preferred lab day.
- If there are no places available on your preferred lab day, please put yourself on the waitlist - we will request student exchange to assist you.
- If the lab class is already 32, no more places can be added - so please choose another day, as we cannot exceed 32 students for safety reasons.
- Not all prac/tute classes will be offered - the classes offered will depend on the enrolment and the university reserves the right to move students to other concurrent classes, if places are available.
REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

- Any earlier edition of “BIOCHEMISTRY” by Garret and Grisham can also be used.
- **Prescribed unit materials**: “CBMS223 Biochemistry Practical Notes” & “CBMS223 Biochemistry Tutorials” to be downloaded and printed from iLearn. Please bring the printed sheets to the scheduled practical/tutorial.
- Copies of the prescribed text are available in the library in the main and reserve sections.

UNIT WEB PAGE

- The web page for this unit is at Macquarie's new learning management system website:

  http://ilearn.mq.edu.au

- Login and follow prompts to CBMS223 Biochemistry.

TECHNOLOGY USED

To view notes on all the lecture topics, quizzes, tutorial answers and past questions, on the unit web site, you will require the free software, Adobe Acrobat Reader to be installed on your computer. Acrobat Reader can be downloaded from the Adobe website http://get.adobe.com/uk/reader/. If you are using the computers in the library, then Acrobat has already been installed.

General use computers are provided by the University, but it would be advantageous to have your own computer and internet access.

You will need to install the free protein structure viewer software, Chime, on your computer, as a plug-in for your internet browser, for completing the assignment. Instructions on downloading and installing the software are available from the unit web pages on Blackboard. Alternatively, you can use the Computer Lab. at E8C 134, where the plug-in is already installed.

You are also expected to access your Macquarie University student email account regularly to get the latest information on the unit.

Hand-held calculators will be occasionally used in tutorials and practicals, for tests and in the final examination. Note that text-retrieval or programmable calculators are not permitted during the tests or the mid-year examination.
LEARNING OUTCOMES

CBMS223 starts with an overview of the structure and function of the most important macromolecules in the living cell. The aim of the unit is to integrate key molecules into biochemical pathways, representing essential sets of regulated reactions, involved in cell growth and survival.

CBMS223 is designed to provide:

- a basic understanding of key biochemical processes and their control;
- a basis for the mechanisms involved in the synthesis and breakdown of important biomolecules, for growth and energy;
- basic laboratory skills necessary for research in biochemistry;
- an appreciation of biochemistry and the chemical aspects of biological systems, and
- a biochemical foundation for advanced units of study as well as post-graduate research in biochemistry and professional studies in the health and biomolecular sciences.

By the end of the unit, you should be able to:

- define biochemistry and what biochemists know;
- define the thermodynamic principles of enzyme catalysis;
- define the major biological systems involved in metabolism;
- define energy production pathways in the living cell;
- describe qualitatively and quantitatively the relationship between structure and function of proteins;
- describe qualitatively and quantitatively the factors affecting sugar metabolism in energy production;
- describe qualitatively how essential biomolecules are made and turned over;
- understand the reasons for protein mutations leading to malfunction and diseases;
- have a detailed knowledge of the interactions between different metabolic pathways;
- design experiments to characterise, quantify and separate biomolecules and
- apply analytical techniques to determine the molecular composition of reaction products and determine the thermodynamic parameters of enzyme reactions.

In addition to the discipline-based learning outcomes above, this unit will also help develop graduate capabilities. These are the building blocks for developing the attributes valued in a university graduate. Some of the attributes and skills that CBMS223 can help you develop are:

1. Discipline Specific Knowledge and Skills: The topics explored in CBMS223 are fundamental to the discipline of biochemistry. You will be applying problem-solving skills in a biochemical context, applying biochemistry theory to practice in
order to design and carry out laboratory experiments, using biochemistry specific apparatus and techniques, and will apply safe laboratory practices.

2. **Critical, Analytical and Integrative Thinking; Problem Solving and Research Capability:** Within this unit you will be developing and practicing your ability to apply problem-solving strategically both in situations where there are clear solutions and in situations demanding critical, analytical and integrative thinking. This is especially true in the laboratory component, where you will be conducting experiments requiring problem solving and research instrumentation in the biochemistry context. You will be solving problems by analysing the information given or discovered, looking for other sources of information to apply, and looking for the scope and limitation of the context in which the problem and solution lie. In many cases you will be using standard and specialised IT technology for the discovery of information, the analysis of data and the presentation of results.

3. **Effective Communication:** CBMS223 will help equip you with written and oral communication skills, through your practical book and your written assignment, and through the communications you will be engaged in with your lecturers, your demonstrators and your class-mates, especially in the group laboratory work. Tutorial sessions will provide an opportunity to develop your ability to communicate in clear, concise and appropriate, context-dependent terms.

4. **Engaged and Ethical Local and Global citizens:** Engaged and ethical behaviour will be addressed in the professional biochemist context, *i.e.* you will be concerned with collecting data and information with appropriate acknowledgement of sources, you will learn ways of performing experiments and recording outcomes in a manner that conforms to the expectations of the profession and community at large. You will be working with people from a variety of cultural and economic backgrounds and you will be expected to be able to form cohesive and effective teams and share the workload with other students in your class. In the theory section of the course we will touch upon ethical issues of interest to contemporary society in relation to the effect of steroidal hormones on biochemical pathways.

5. **Socially and Environmentally Active and Responsible:** You will be working in small teams for much of CBMS223, especially in the laboratory component of the course, giving you the opportunity to develop your ability to work with others as a leader and a team player and to have a sense of connectedness and mutual obligation with others.

6. **Capable of Professional and Personal Judgement and Initiative:** Especially during your laboratory work, you will be expected to develop discernment and common sense in your professional and personal judgement. You will also be given assignment and test questions that will give you the opportunity to exhibit these capabilities, especially in the context of the application of “models” in biochemical knowledge and theory.

7. **Commitment to Continuous Learning:** Some of the coursework in this unit is open ended and without a predefined structure or direction. The topic is far too big to cover in one semester so we have designed the content to stimulate curiosity and lead you to continue to pursue knowledge for its own sake. You will be have opportunities to extend the topics covered and reflect on your experiences, learn from them, and grow personally, professionally and socially.
CBMS223 is a 3 credit point, half year unit and will require an average of 9 hours of work per week (contact hours plus self-study time), to perform satisfactorily in this unit.

CBMS223 has two hours of lectures each week, along with either a two-hour tutorial or a three-hour block of laboratory practicals. Students are required to attend all lectures, tutorials and laboratory classes and participate actively.

- Lectures will be presented as a combination of formal lectures and interactive tutorial sessions. Live lecture recordings will be available through the ilecture link from Blackboard. Learning is an active process, and as such, you must engage with the material. This means reading the textbook (and beyond) before and after lectures, attempting the assignment questions and the quiz questions and discussing the concepts with your classmates and lecturers. Tutorials provide an opportunity to apply theoretical knowledge to problem solving.

- The assignment questions are issued so that you will have the opportunity to use the information provided in the lectures and textbook and to test your degree of understanding of the assignment topic.

- A mid-semester test will be run in the lecture session. The mid-semester test is designed to allow you to continuously learn and to identify what you understand and the areas that you need to strengthen.

- All laboratory experiments will be conducted in groups. These have a highly investigative approach, where you will be conducting experiments to apply theoretical knowledge to understand biochemical reactions. This laboratory work is designed to give real life experiences in research by training students to effectively carry out experiments, collate and analyse data and follow the best practises in an experimental situation. It will emphasise the importance of being prepared for all experiments and being fully aware of all safety procedures, proper recording and reporting of all data and interpreting of all results, and having an analytical and inquisitive approach.

- Tutorials complement lecture and practical materials and provide a forum for problem-based learning and participation in small groups.

The unit is structured to cover three basic areas of biochemistry:

1. *Proteins and Enzymes (weeks 1-4):*

The first series of lectures deal with protein structure and enzyme function and includes basic Michaelis-Menton type enzyme kinetics. Key points covered include:

- Structure and properties of amino acids found in proteins including some “non standard” amino acids, and chirality of amino acids.
- Definition and properties of a peptide bond
- Definition of primary, secondary, tertiary and quaternary structure of proteins, including protein structural domains
- Protein analysis
  - Stability
  - Protein folding and denaturation
  - Protein purification
Sequencing methods such as Edman degradation, MS-MS
Chromatography
Salting out
UV-Vis spectroscopy
Overview of protein structure determination methods
Gel electrophoresis

- Enzyme activity and models of enzyme activity
  - Catalytic site and enzyme mechanisms
  - The six primary classes of enzymes
  - Enzyme inhibition
- Review of basic thermodynamics and chemical equilibria

2. Intermediary metabolism (weeks 4-8):
Principles of metabolism and how cell structure may influence metabolism within cells is covered as an overview before examining specific pathways found in most bacteria, plants and animals.

- Types of metabolic strategies that organisms utilize.
  - Chemolithotroph
  - Photoautotroph
  - Photoheterotroph
  - Heterotroph
- The link between catabolism and biosynthesis
  - Reducing equivalents. (NADPH)
  - Coupling reactions to make them favourable. (ATP)
  - Carbon and nitrogen source and other nutrients
- Compartmentalization of enzymes and pathways
- Membrane structure
- Regulation of metabolic pathways: Intra- and inter-cellular signals i.e. hormones such as glucagon and epinephrine. NB. Regulation of quantities of enzymes within cells by regulating gene transcription is covered later.
- Clustering of enzyme activities
- Glycolysis and gluconeogenesis
  - Emphasis is on the key regulatory steps, mechanism of these enzymes and compartmentalization of parts of the gluconeogenesis pathway in mammals
- The TCA cycle in mitochondria: catalytic and synthetic roles
- Glyoxalate cycle
- Pentose phosphate pathway
- Electron transport chain and oxidative phosphorylation

3. Biosynthesis and utilization of macromolecules (weeks 9-13):
We examine the details of how biomolecules are made and recycled within the cell.

- Fatty acid synthesis and degradation
- Nitrogen metabolism
- Amino acid synthesis and breakdown
- Nucleotide synthesis and catabolism
- The role of vitamins and coenzymes in the functioning of the cell.
  - Diseases caused by deficiencies in these essential molecules.
RELATIONSHIP BETWEEN ASSESSMENT AND LEARNING OUTCOMES

Assessment tasks, weightage and key dates

The assessment tasks are designed to give you feedback as well as to assess your progress within the unit. More specifically:

- **The assignment** will provide early feedback on the understanding of protein structure and provide you an opportunity to use computer-based tools to understand the 3D nature of functional proteins (graduate capabilities 1, 2, 3, 6 and 7 on pp.6-7).
- **The mid-semester test** (multi-choice format) will cover lecture material and give you an idea of the types of questions that will be asked in the mid-year examination (graduate capabilities 1, 2, 3, 6 and 7 on pp. 6-7).
- **The practical exercises** will provide you the opportunity to apply experimental techniques, collate relevant experimental results and analyse them. This assessment will address all graduate capabilities, with special emphasis on 4 and 5 (pp.6-7). The pre-lab quizzes are designed to prepare for the practicals.
- **Tutorials** provide an opportunity to work out problems and questions complementing lecture and practical materials (graduate capabilities 1, 2, 3, 6 and 7 on pp.6-7). The tutorial quiz questions will cover also the associated practicals.
- **The mid-year examination** will comprise a combination of multiple-choice questions, short answers and an essay question, to assess your overall understanding of the subject (graduate capabilities 1, 2, 3, 6 and 7 on pp.6-7).
- **Satisfactory performance independently in the theoretical and practical assessments tasks and the exam is mandatory for passing the unit.**

<table>
<thead>
<tr>
<th>Assessment task</th>
<th>(%)</th>
<th>When</th>
<th>Where</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment (Protein Structure)</td>
<td>5</td>
<td>Mon 25 March, midnight</td>
<td>iLearn website (online quiz)</td>
</tr>
<tr>
<td>Mid-semester test (multiple-choice format)</td>
<td>15</td>
<td>Fri 3 May</td>
<td>W5A Price* (instead of lecture)</td>
</tr>
<tr>
<td>Practicals (2.5% for each prac)</td>
<td>15</td>
<td>P1-P5: next scheduled lab session.</td>
<td>Pre lab quiz: online at iLearn website</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P6: at the end of the lab session.</td>
<td>Prac sheets: E8A 130</td>
</tr>
<tr>
<td>Tutorials (1% for each tute)</td>
<td>5</td>
<td>T1-T5: upto next tutorial session.</td>
<td>iLearn website (online quiz)</td>
</tr>
<tr>
<td>Mid-year exam</td>
<td>60</td>
<td>10 June onwards</td>
<td>See exam timetable</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* additional room(s) will be confirmed on iLearn.

- Marked work will be returned to students within 2 weeks of submission.
- Students are to submit their completed Assignment on or before the due date.
  - Late assignments will receive a 10% per day penalty and will not be marked if more than 1 week late. Extensions will only be given in extenuating circumstances, by the unit coordinator BEFORE the due date.
• The **completed Practical Notes** for P1-P5 are to be submitted to the next lab session and for P6 at the end for the lab. for grading.

**Attendance**

Students are expected to attend all tests, tutorials and practical classes and the final examination. A zero mark (0) will be allotted to a missed assessment unless a Special Consideration form is approved (see below). Else, contact the unit coordinator to reschedule, if possible.

**Mid-year examination**

The University Examination period in First Half Year 2013 is from 11 June onwards.

You are expected to present yourself for examination at the time and place designated in the University Examination Timetable. The timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of the examinations.


The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for Special Consideration. Information about unavoidable disruption and the special consideration process is available at http://web.science.mq.edu.au/new_and_current_students/undergrad/admin_central/

If a Supplementary Examination is granted as a result of the Special Consideration process the examination will be scheduled after the conclusion of the official examination period. (Individual Divisions may wish to signal when the Division's Supplementary Examinations are normally scheduled.)

You are advised that it is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, i.e. the final day of the official examination period.

**EXTENSION AND SPECIAL CONSIDERATION REQUESTS**

Extension requests for assessable materials must be made to the unit coordinator with appropriate supporting evidence. Each request will be treated on its merits.

The University is committed to equity and fairness in all aspects of its learning and teaching. In stating this commitment, the University recognises that there may be circumstances where a student is prevented by unavoidable disruption from performing in accordance with their ability. The University has a policy on special consideration requests that may be found at:

http://mq.edu.au/policy/docs/special_consideration/policy.html
The University recognises that an event or set of circumstances may occur that:
- could not have reasonably been anticipated, avoided or guarded against by the student AND
- was beyond the student’s control AND
- caused substantial disruption to the student’s capacity for effective study and/or completion of required work AND
- substantially interfered with the otherwise satisfactory fulfilment of unit or program requirements AND
- was of at least three (3) consecutive days duration within a study period and/or prevented completion of a formal examination.

This policy is instituted to support students who experience serious and unavoidable disruption such that they do not reach their usual demonstrated performance level. The form required to submit for a request for special consideration can be found at http://mq.edu.au/policy/docs/special_consideration/policy.html

The Faculty of Science form for Special Consideration is explained on: http://web.science.mq.edu.au/new_and_current_students/undergrad/admin_central/ and the form itself (to be submitted within 5 working days of the absence) is accessed from this website.

**ACADEMIC HONESTY**

The University declares that it is a ‘fundamental principle” that “all staff and students act with integrity in the creation, development, application and use of ideas and information. This means that:
- all academic work claimed as original is the work of the author making the claim
- all academic collaborations are acknowledged
- academic work is not falsified in any way
- when the ideas of others are used, these ideas are acknowledged appropriately.”

You should be familiar with the University’s Policy on Academic Honesty practices and its Statement on Ethics. These can be found in the Handbook of Undergraduate Studies or on the web at:

The policies and procedures explain what academic dishonesty is, how to avoid it, the procedures that will be taken in cases of suspected dishonesty, and the penalties if you are found guilty. Penalties may include a deduction of marks, failure in the unit, and/or referral to the University Discipline Committee.
Examples of dishonest academic behaviours are:

**Plagiarism:** Using the work or ideas of another person and presenting this as your own without clear acknowledgement of the source of the work or ideas. This includes, but is not limited to, any of the following acts:

a. copying out part(s) of any document or audio-visual material or computer code or website content without indicating their origins
b. using or extracting another person's concepts, experimental results, or conclusions
c. summarising another person's work
d. submitting substantially the same final version of any material as another student in an assignment where there was collaborative preparatory work
e. use of others (paid or otherwise) to conceive, research or write material submitted for assessment
f. submitting the same or substantially the same piece of work for two different tasks (self-plagiarism).

**Deception:** includes, but is not limited to, false indication of group contribution, false indication of assignment submission, collusion, submission of a work previously submitted, creating a new article out of an existing article by rewriting/reusing it, using the same data to form the same arguments and conclusion, presenting collaborative work as one's own without acknowledging others' contributions, cheating in an examination or using others to write material for examination.

**Fabrication:** includes, but is not limited to, creating fictitious clinical data, citation(s), or referee reports.

**Sabotagey:** includes, but is not limited to, theft of work, destruction of library materials.

Assignments are to be your own work. Using someone else's words (either another student's or from a book or journal article or a web site) without clear acknowledgement is plagiarism and can incur serious penalties. If it is ever necessary to use someone else's words for a phrase or sentence, they should be placed in quotation marks and acknowledged at the end of the sentence. If you use or modify a diagram or figure from another author, that must be acknowledged underneath (e.g. Figure 3 from Brown et al., 1995; figure modified from Green, 1997). Lecturers want to read your own words and ideas.

In the event that a Lecturer identifies a case of academic dishonesty, the student will be advised, either on the submitted work or by separate letter, and a record kept in the Faculty office. Students will always have the opportunity to discuss each case with their Lecturer if they indicate they wish to do so by either contacting the Lecturer or the Head of Department. Proven cases of academic dishonesty may result in the immediate award of an “F” grade.
University Policy on Grading

The Academic Senate has a set of guidelines on the distribution of grades across the range from fail to high distinction. Your final result will include one of these grades plus a standardised numerical grade (SNG). The grades you achieve at Macquarie University are descriptive rather than numeric. The assessments and conditions on your performance (attendance, completion, etc.) help to decide which of these descriptive grades applies to your work for the entire unit. Details of this policy are available from:


Your raw marks from assessments are combined into a weighted sum. The weighted sums for the whole class are ranked, and compared with rankings for the same unit in previous offerings and across other appropriate consistency. This process of comparison allows for the identification any unusual influences on class performance that might warrant the weighted sums of marks being scaled or otherwise altered. The numerical cut-offs for each descriptive grade are then determined. The numerical value that you will be issued with (the Standardised Numerical Grade, SNG) is determined to match your descriptive grade by standardising the weighted sums of raw marks to match standard scores out of 100. The SNG gives you an indication of how you have performed within the band for your descriptive grade.

As the SNG is the result of scaling the weighted sum of your raw marks, you will not be able to:
- work out your exam mark based on the assignment marks you already know and the SNG;
- determine that you were "one mark away" from a different grade.

The Grades, from High Distinction to Fail, are defined in the Handbook as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>SNG</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD High Distinction</td>
<td>85-100</td>
<td>Work of outstanding quality. This may be demonstrated in areas such as criticism, logical argument, interpretation of materials or use of methodology. This grade may also be awarded to recognise a high order of originality or creativity in student performance</td>
</tr>
<tr>
<td>D Distinction</td>
<td>75-84</td>
<td>Work of superior quality in the same areas of performance as above. This grade may also be awarded to recognise particular originality or creativity in student performance</td>
</tr>
<tr>
<td>Cr Credit</td>
<td>65-74</td>
<td>Work of predominantly good quality, demonstrating a sound grasp of content together with efficient organisation, selectivity and use of techniques</td>
</tr>
<tr>
<td>P Pass</td>
<td>50-64</td>
<td>Satisfactory achievement of unit objectives</td>
</tr>
<tr>
<td>F Fail</td>
<td>0-49</td>
<td>Failure to achieve unit objectives</td>
</tr>
</tbody>
</table>
The process of scaling does not change the order of marks among students. A student who receives a higher raw mark than another will also receive a higher final scaled mark.

It is our professional responsibility as your teachers to assign you a descriptive grade that accurately reflects your performance in a unit. Our grading decisions are subject to scrutiny from our academic colleagues at the Department, Faculty and University Senate level.

It is important that you realise that the policy does not require that a minimum number of students are to be failed in any unit. In fact, it requires examiners to explain any circumstances/problems, if more than 20% of students fail in a unit.

**STUDENT SUPPORT SERVICES**

Macquarie University provides a range of Academic Student Support Services. Details of these services can accessed at:

http://www.student.mq.edu.au.

**CHANGES TO THE UNIT SINCE 2010**

The unit was previously labelled “Biochemistry and Molecular Biology I” and covered “Biosynthesis of macromolecules and basic molecular biology” in weeks 9-13, with an associated tutorial and practical. Since 2010, to provide a more comprehensive biochemistry unit, the molecular biology material has been exchanged with the topic, “Biosynthesis and utilization of macromolecules” from the pre-2009 CBMS224 Biochemistry and Molecular Biology II unit, now renamed “Molecular Biology”.

Also, to conform to the University’s 2011 policy on grading, the Conceded Pass (PC) grade has been removed.

Since 2012, we have changed the format of the lab. classes from four hours to three hours. The practical theory test has been replaced by quizzes covering the theoretical calculations associated with the practicals.

**FEEDBACK**

We welcome suggestions for improving the content and delivery of this unit. We are very happy to receive any constructive criticism that you may wish to provide.

We hope you find CBMS223 Biochemistry both interesting and valuable.