



UNSW
THE UNIVERSITY OF NEW SOUTH WALES

FACULTY OF SCIENCE

SCHOOL OF BIOTECHNOLOGY AND BIOMOLECULAR SCIENCES

BIOC2101

PRINCIPLES OF BIOCHEMISTRY
(ADVANCED)

SESSION 1, 2018

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BIOC2101 - Advanced Biochemistry Course Outline

1. Course Information

NB: Some of this information is available on the [UNSW Handbook](#)¹

Year of Delivery	2018
Course Code	BIOC2101
Course Name	Principles of Biochemistry (Advanced)
Academic Unit	School of Biotechnology and Biomolecular Sciences
Level of Course	2 nd year undergraduate
Units of Credit	6
Session(s) Offered	S1
Assumed Knowledge, Prerequisites or Co-requisites	Prerequisite: BABS1201 and CHEM1011 or CHEM1031 or CHEM1051 and CHEM1021 or CHEM1041 or CHEM1061
Hours per Week	6
Number of Weeks	12 weeks
Commencement Date	Monday 26 February (Week 1)

Summary of Course Structure

Component	Hours/week	Time	Day	Location
Lectures, tutorials, and exams	3			
Weekday lecture 1		5 – 6 pm	Tuesday	Law Theatre G04
Weekday lecture 2		1 – 2 pm	Thursday	Ainsworth G03
Weekday lecture 3		3 – 4 pm	Friday	Law Theatre G04
Laboratory	3			
Lab – Option 1		10 am – 1 pm	Tuesday	Wallace Wurth 122/123
Lab – Option 2		2 – 5 pm	Tuesday	Wallace Wurth 122/123
Lab – Option 3		10 am – 1 pm	Wednesday	Wallace Wurth 123

2. Staff Involved in the Course

Staff	Name	Contact Details
Course Convenors	Dr Anne Galea	a.galea@unsw.edu.au
	Dr Nirmani Wijenayake	b.wijenayakeg@unsw.edu.au
Teaching Staff	Prof Andrew Brown	aj.brown@unsw.edu.au
	A/Prof Kyle Hoehn	k.hoehn@unsw.edu.au
	Dr Rebecca LeBard	r.lebard@unsw.edu.au
	Dr Vladimir Sytnyk	v.sytnyk@unsw.edu.au
	Prof Marc Wilkins	m.wilkins@unsw.edu.au

3. Course Details

Course Description ² (Handbook Entry)	Introduces modern biochemistry, covers fundamental aspects of the structure-function relationships of proteins and an overall coverage of intermediary metabolism. Major topics covered include: the nature and function of proteins and enzymes; the metabolic working of cells, tissues and organs; the interrelationships between the pathways of carbohydrate, lipid and amino acid metabolism; the vital role of hormones in metabolic regulation; the energy-trapping mechanisms of animals; and interesting variations on the central metabolic pathways in various life forms. Practical work complements the lectures and introduces the principles of biochemical analysis.
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¹ UNSW Online Handbook: <http://www.handbook.unsw.edu.au>

² UNSW Handbook: <http://www.handbook.unsw.edu.au>

Course Aims³	<ul style="list-style-type: none"> • This course aims to introduce students to modern biochemistry with a particular emphasis on how we, as humans, convert foods to useful energy. • This course also aims to provide a solid context for new learning material by providing clinical, medical and everyday applications that correspond to the central themes and topics. • Practical classes are designed to reinforce the core biochemical concepts covered in lectures and introduce students to current laboratory techniques and biochemical assays. 	
Student Learning Outcomes⁴	By the completion of this course students should be able to: <ul style="list-style-type: none"> - describe the fundamental aspects of the structure-function relationships of proteins; - outline intermediary metabolism in humans and its regulation; - perform standard biochemical laboratory techniques, and safe and efficient work practices, and; - communicate effectively and work constructively within a team. 	
Graduate Attributes Developed in this Course⁵		
Science Graduate Attributes⁵	Level of FOCUS 1 = MINIMAL 2 = MINOR 3 = MAJOR	Activities / Assessment
Research, inquiry and analytical thinking abilities	3	Lectures, tutorials, laboratory experiments, online discussions, computer exercises / instruction and formative self-assessment Multiple choice, short answer / essay, solving complex problems, assessed laboratory experiment
Capability and motivation for intellectual development	3	Lectures, tutorials, laboratory experiments, online discussions, computer exercises / instruction and formative self-assessment Multiple choice, short answer / essay, solving complex problems, assessed laboratory experiment
Ethical, social and professional understanding	1	Laboratory experiments, lectures and tutorials Assessed laboratory experiment, HS online quiz
Communication	2	Laboratory experiments and online discussions Short answer / essay
Teamwork, collaborative and management skills	2	Laboratory experiments and online discussions
Information literacy	2	Lecture tutorials and computer tutorials
Major Topics	<p>Introduction to Metabolism</p> <p>Living organisms create and maintain their essential orderliness at the expense of their environment, which they cause to become more disordered in consequence. They are essentially an 'open' chemical system existing in a steady-state condition and must therefore extract energy, generally as chemical fuel, from their surroundings. Viewed as a machine, they must obey the same thermodynamic laws applicable to purely physical phenomena. The study of bioenergetics considers these energy relationships, without which the system of complex chemical reactions unique to life processes cannot be appreciated. All life processes on this planet have utilized a single specific molecule, adenosine triphosphate (ATP), as a concentrated form of chemical energy to which outside energy sources (as food) are converted and which is then used for biosynthetic purposes to maintain low entropy, <i>i.e.</i> highly ordered system. ATP will be used as a typical example to illustrate energy relationships applicable to biochemical reactions in general.</p> <p>The term 'metabolism' encompasses all the chemical processes which occur within living organisms. 'Anabolism' is the sum of those processes by which structural and functional components of a cell are synthesized from simpler units. 'Catabolism' covers the processes whereby complex compounds are degraded to release energy and to provide the smaller units for the cell's synthetic processes. All living organisms break down food materials and synthesize cell components by ordered sequences of chemical reactions called metabolic pathways. These pathways are frequently common to all cells, thus both man and bacteria break down glucose to CO₂ and H₂O by essentially the same pathway. Each chemical reaction in the cell is catalysed by an enzyme. The operation of a metabolic pathway therefore depends on the properties of the individual enzymes catalysing the sequence of chemical reactions.</p>	

³ [Learning and Teaching Unit: Course Outlines](#)

⁴ [Learning and Teaching Unit: Learning Outcomes](#)

⁵ [Contextualised Science Graduate Attributes](#)

PROTEINS AND ENZYMES

Protein Structure: Topics

- Proteins and the central dogma of molecular biology
- There are 20 amino acids encoded in DNA and used in protein synthesis
- Amino acids are joined to form peptides and proteins
- Proteins can form secondary structures
- Protein amino acid sequence determines its 3-D structure

Enzymes and Catalysis: Topics

- What is an enzyme?
- What is a substrate?
- What is catalysis?
- Free energy and activation energy
- Transition states in catalysis
- Induced fit model of catalysis

Enzyme Kinetics: Topics

- What is kinetics? Why study kinetics?
- Enzyme reaction velocity
- Test case: human foldase enzyme
- The Michaelis-Menten value, K_M
- Implications of K_M
- The Michaelis-Menten equation
- Lineweaver-Burk plots
- The kinetically perfect enzyme
- Enzyme engineering

Enzyme Inhibition and Regulation: Topics

- Competitive and non-competitive inhibition
- Kinetics of (non)competitive inhibition
- Allosteric inhibition
- Zymogens
- Enzyme phosphorylation

CARBOHYDRATE CATABOLISM AND STORAGE

Carbohydrate catabolism I: Learning Outcomes

- Explain what carbohydrates are
- Explain how monosaccharides are classed (number of carbons, aldose/ketose etc).
- Explain the terms stereoisomer / epimer / diastereomer
- Give an example of a disaccharide and explain the role of the glycosidic bond
- Explain what polysaccharides are and give some examples

Carbohydrate catabolism II: Overview

- Carbohydrate digestion and transport
- Glycolysis: an energy conversion pathway for glucose
- Regulation of glycolysis
- The fate of the products of glycolysis

Glycogen: Learning Outcomes

- Describe the general structure and function of glycogen.
- List the three key enzymes involved in glycogen breakdown and provide a brief description of their functions.
- Understand that glycogen is synthesised and degraded by different pathways.
- List the three key enzymes involved in glycogen synthesis and provide a brief description of their functions.
- Understand that the regulation of glycogen metabolism involves both allosteric control and hormonal control by covalent modification of regulatory enzymes.
- Describe the way in which glycogen breakdown and synthesis are reciprocally regulated.

Gluconeogenesis: Learning Outcomes

- Provide a broad definition of the process of gluconeogenesis.
- Appreciate that glucose can be synthesised from lactate, pyruvate, glycerol and amino acids.
- Explain the Cori Cycle.
- Describe the three enzymatic steps of glycolysis that are bypassed in gluconeogenesis.
- Name the enzymes that are NOT common to glycolysis and gluconeogenesis.
- Explain the energy requirements of gluconeogenesis.
- Explain how glycolysis and gluconeogenesis are reciprocally regulated.

PROTEIN CATABOLISM

Amino Acid Catabolism: Learning Outcomes

- Explain the process whereby an amino group is removed from an amino acid.
- Discuss the degradation of AA in muscle during prolonged exercise and fasting.
- Describe how amino acid degradation is linked to the TCA cycle.
- Discuss the Urea cycle e.g. ATP used, where performed, where the two N in urea are from.
- Explain what is meant by the terms keto- and glucogenic amino acids and provide examples.
- Give examples of conditions where there are errors in the degradation of amino acids.

Protein digestion and turnover: Learning Outcomes

- List the sources of amino acids for building proteins.
- Describe what is meant by the term essential amino acids.
- Describe the breakdown of dietary proteins
- Discuss the process of protein turnover
- Explain the function of ubiquitin and the proteasome

BIOENERGETICS

TCA Cycle: Learning Outcomes

- State the primary function of the TCA cycle
- Provide the net reaction of the TCA cycle
- Explain the role of NADH and FADH₂
- Explain why the cycle functions only in aerobic conditions
- Describe how the TCA cycle is regulated at three levels
- Discuss how cytoplasmic NADH are transported across the mitochondrial membrane and any impact this has on ATP yields

Respiratory chain: Learning Outcomes

- Outline to function of the respiratory chain
- Describe the importance of the mitochondrial structure in reference to the respiratory chain
- Explain the pathway of electrons through the respiratory chain, from their entry points to the reduction of oxygen to water
- Describe the movements of protons across the membrane in the context of the respiratory chain and the creation of a proton gradient

Redox biochemistry: Learning Outcomes

- Understand where reactive species are produced
- What are the major types of reactive species in the cell
- Describe the major antioxidant defense systems in place

Oxidative Phosphorylation: Learning Outcomes

- Outline the chemiosmotic theory
- Describe the structure and function of ATP synthase
- Explain what the P/O ratio is
- Explain what an uncoupler does and provide an example
- Describe the ways in which an agent may inhibit oxidative phosphorylation
- Discuss the role reactive oxygen species play in oxidative phosphorylation
- Describe the process of oxidative phosphorylation giving reference to the mitochondrial membrane
- Calculate the number of ATP equivalents generated from a glucose molecule

SIGNAL TRANSDUCTION IN METABOLISM

Signal Transduction: Learning Outcomes

- Briefly describe the function of cell / organelle membranes and how proteins may be associated with them.
- Briefly explain the structures of integral membrane proteins.
- Describe the role of a receptor in signal transduction
- Describe the structure of 7TM receptors and provide an example.
- Outline the process of signal transduction.
- Describe the features and action of 7TM and protein kinase receptors, giving examples.
- Discuss the role of secondary messengers and give examples.
- Explain what can occur if there is a defect in a signal transduction pathway.

FAT METABOLISM AND STORAGE

Fat catabolism I, II, III and IV | Learning Outcomes

- List roles of fats in the diet.
- List roles of fats in the body.
- Briefly describe the structure and function of some of the major fats in the body.

	<ul style="list-style-type: none"> • Provide examples of fats that contain one or more fatty acids. • Describe the general structure of a fatty acid. • Explain the difference between saturated and unsaturated fatty acids. • List examples of lipid-soluble vitamins and their roles/functions. • Describe the steps involved in the digestion and absorption of fats. • Outline the major steps that take place during the digestion of dietary lipids. • Describe the process of lipid absorption and chylomicron formation in intestinal cells. • Describe the general structure of a lipoprotein. • Describe the main features of each of the different classes of lipoproteins. • Explain the difference between exogenous and endogenous transport of lipoproteins. • Briefly explain the difference between 'good' versus 'bad' types of cholesterol. • Briefly explain the role of the liver in lipoprotein metabolism. • Briefly describe the three main stages of fatty acid breakdown. • Outline the overall stoichiometry & energy yield of fatty acid breakdown. • Explain where, when and how ketone bodies are produced. • Briefly describe the three main stages of fatty acid synthesis. • Describe the first committed step in fatty acid synthesis. • Describe the structure and function of the fatty acid synthase complex. • Outline the overall stoichiometry of palmitate synthesis. • Briefly explain why and how fatty acids can be modified. • Compare and contrast the main features of β-oxidation and fatty acid synthesis. • Briefly describe the main mechanisms of control of fatty acid metabolism. <p><u>INTEGRATION OF METABOLISM</u></p> <p>Hormonal control of Fuel Metabolism: Learning Outcomes</p> <ul style="list-style-type: none"> • Discuss the role of glucose transporters and comment on the differences between the various isoforms. • Describe the structure of receptor tyrosine kinases, using the insulin receptor as an example. • Outline the role of insulin on the liver, skeletal muscle and adipose tissues in the fed state. • Outline the role of glucagon on the liver in the fasted state. • Outline the role of adrenaline on the liver, skeletal muscle and adipose tissues. <p>Metabolic Specialisation of Tissues: Learning Outcomes</p> <ul style="list-style-type: none"> • Describe how different glucose transporters confer tissue-specificity • Explain how different hormones (e.g. insulin, glucagon) act on different tissues <p>Fuel Supply in Fasting: Learning Outcomes</p> <ul style="list-style-type: none"> • Explain the three steps of the starved-fed cycle. • Describe the effects of glucagon, cyclic-AMP and F-2,6-bisP during fasting. • Explain the strategies employed for maintaining blood glucose levels during fasting/starvation. • Explain what happens after liver glycogen is depleted. • Describe the various effects of prolonged starvation. • Describe the overall changes in fuel metabolism during starvation - particularly with respect to requirements of the brain. <p>Fuel Supply in Exercise: Learning Outcomes</p> <ul style="list-style-type: none"> • Outline the structure of muscle fibres and their requirement for energy. • Explain the difference between Type I and II muscle fibres in appearance, functional properties and metabolic profiles. • Explain the role of adenylate kinase and link this to the role of ATP/AMP as regulators of glycolysis and glycogen metabolism. • Explain the role of creatine phosphate, creatine kinase, and the fate of creatine. • Discuss how the energy sources for a sprinter, middle distance runner and marathon runner differ.
<p>Relationship to Other Courses within the Program</p>	<p>BIOC2101 is a requirement for Medical Science programs.</p> <p>The course builds on many concepts introduced in first level courses, particularly BABS1201 Molecules, Cells and Genes. It provides the knowledge and skills required for the third level courses including BIOC3261 Human Biochemistry and BIOC3111 Molecular Biology of Proteins.</p>

4. Rationale and Strategies Underpinning the Course

<p>Teaching Strategies</p>	<p>Course content is initially presented in lectures. Key concepts from the lectures are incorporated into practical sessions, where students also learn laboratory techniques and safe workplace skills. Students are provided with venues for revision, practice and discussion of the course content through large and independent group tutorials on each major content area.</p>
<p>Rationale for learning and teaching in this course⁶,</p>	<p>Lectures are used in the course to introduce and introduce new concepts and elaborate on intermediary metabolism and its regulation. Laboratory sessions are designed to complement the lecture material in addition to teaching professional technical skills and safe and efficient work practices. Tutorials are used to reinforce concepts presented in the lectures through problem solving, and to encourage further enquiry. Both laboratories and tutorials aim to promote effective communication, discussion and teamwork.</p> <p>The integration of these main teaching areas of the course are in accordance with the UNSW Guidelines on Learning that inform Teaching⁷. Specifically:</p> <ul style="list-style-type: none"> • Effective learning is supported when students are actively engaged in the learning process. • Effective learning is supported by a climate of inquiry where students feel appropriately challenged and activities are linked to research and scholarship. • Activities that are interesting and challenging, but which also create opportunities for students to have fun, can enhance the learning experience. • Learning is more effective when students' prior experience and knowledge are recognised and built on. • Students become more engaged in the learning process if they can see the relevance of their studies to professional, disciplinary and/or personal contexts. • If dialogue is encouraged between students and teachers and among students (in and out of class), thus creating a community of learners, student motivation and engagement can be increased. • Students learn in different ways and their learning can be better supported by the use of multiple teaching methods and modes of instruction (visual, auditory, kinaesthetic, and read/write). • Clearly articulated expectations, goals, learning outcomes, and course requirements increase student motivation and improve learning. • When students are encouraged to take responsibility for their own learning, they are more likely to develop higher-order thinking skills such as analysis, synthesis, and evaluation. • Graduate attributes – the qualities and skills the university hopes its students will develop as a result of their university studies – are most effectively acquired in a disciplinary context. • Learning cooperatively with peers - rather than in an individualistic or competitive way - may help students to develop interpersonal, professional, and cognitive skills to a higher level. • Effective learning is facilitated by assessment practices and other student learning activities that are designed to support the achievement of desired learning outcomes. • Meaningful and timely feedback to students improves learning.

5. Course Schedule

Some of this information is available on the [Online Handbook](#)⁸ and the [UNSW Timetable](#)⁹.

Week	Begins	Practical Wallace Wurth 122/123 Tue 10-1pm, Tue 2-5pm or Wed 10-1pm	Tuesday 5PM Lecture Law Theatre G04	Thursday 1 PM Lecture Ainsworth G03	Friday 3 PM Lecture Law Theatre G04
Week 1	26 Feb	Health & Safety (online activity)	Lecture 1: Introduction - AMG	Lecture 2: Proteins - MW	Lecture 3: Enzymes - MW
Week 2	5 March	Biochemistry skills and calculations	Lecture 4: Enzyme Kinetics - MW	Lecture 5: Enzyme Regulation - MW	Revision Activity
Week 3	12 March	Spectrophotometry	Lecture 6: Carbohydrates - VS	Lecture 7: Glycolysis - VS	Lecture 8: Regulation of glycolysis - VS
Week 4	19 March	Enzymes	Lecture 9: Gluconeogenesis - NW	Lecture 10: Glycogen - NW	Quiz 1 (Lectures 1-9)
Week 5	26 March	Enzyme Inhibition	Tutorial: Assignment Details - AMG	Tutorial: Exam Techniques - AMG	Public Holiday – Good Friday
	2 April	Mid-semester break			
Week 6	9 April	Glycolysis	Lecture 11: TCA Cycle - RLB	Lecture 12: Ox. Phos. 1 - RLB	Lecture 13: Ox. Phos. 2 - AMG
Week 7	16 April	Oxygen Electrode Simulation (online activity)	Lecture 14: Ox. Phos 3 - AMG	Lecture 15: Ox. Phos. 4 - AMG	Revision Activity
Week 8	23 April	Prac quiz (including calculations)	Lecture 16: Fats 1 - AB	Lecture 17: Fats 2 - AB	Lecture 18: Fats 3 - AB
Week 9	30 April	Separation Techniques 1	Lecture 19: Fats 4 - AB	Lecture 20: Protein Catabolism - RLB	Revision Activity
Week 10	7 May	Glucose Tolerance Test	Lecture 21: Urea cycle - RLB	Lecture 22: Hormones - AMG	Quiz 2 (Lectures 10-19)
Week 11	14 May	Separation Techniques 2 (online activity)	Lecture 23: Exercise - RLB	Lecture 24: Fasting - KH	Lecture 25: Integration of Metabolism - KH
Week 12	21 May	No Lab	Lecture 26: Metabolic Specialisation of Tissues - KH	Revision Activity	Lecture 27: Concluding Lecture - AMG

⁸ UNSW Virtual Handbook: <http://www.handbook.unsw.edu.au>

⁹ UNSW Timetable: <http://www.timetable.unsw.edu.au/>

6. Assessment Tasks and Feedback

Task	Knowledge & abilities assessed	Assessment format and/or criteria	%	Date	Feedback		
					WHO	WHEN	HOW
Quiz 1	Covers all content from lectures 1-9 (inclusive).	Multiple choice and short answer	15	Friday 23 rd March (Week 4)	Convenor	Within 1 week	Online (Moodle)
Quiz 2	Covers all content from lectures 10-19 (inclusive).	Multiple choice and short answer	15	Friday 11 th May (Week 10)	Convenor	Within 2 weeks	Online (Moodle)
Pre-lab Quizzes	Cover practical theory, calculations and safety matters relevant to each practical class.	Online (Moodle)	-	<u>Pre-lab quizzes MUST be completed by midnight on Monday of each week</u>	Convenor	Immediately	Online (Moodle)
Prac Quiz	Covers all practical theory, calculations and safety from Weeks 1 to 7 (inclusive).	Multiple choice and short answer	15	During practical times in Week 8	Convenor	Within 2 weeks	Online (Moodle)
Assignment	Prepare a written laboratory report on practical activities in the course. Full details/instructions will be provided in Week 5.	Report should include and will be assessed on the following components: Aims, Introduction, Methods, Results, Discussion and References	15	Submit an electronic copy to Turnitin (Moodle) by 5:00 pm Friday 4 th May (Week 9)	Convenor	Within 3 weeks	Online (Moodle)
FINAL THEORY EXAM	Covers all lecture content from Weeks 1 to 12 (inclusive), and all practical theory/calculations from Weeks 9 to 11 (inclusive).	Multiple choice questions, essay, and short response questions	40	See final examination timetable			

TOTAL: 100

7. Additional Resources and Support

Text Book	Biochemistry 8th edition , WH Freeman and Company, 2015. JM Berg, JL Tymoczko, GJ Gatto, and L Stryer Availability: UNSW bookshop, UNSW library: Open Reserve/High use collection
Course Manual	Course manual containing tutorials and practicals is available for purchase through the UNSW Bookshop or through download via Moodle.
Recommended Internet Sites	All students enrolled in BIOC2101 automatically have access to the course Moodle site http://telt.unsw.edu.au/ . This site will be used to distribute course notes and information, and should be checked at regular intervals. In particular, the site will be used to provide: <ul style="list-style-type: none"> • Assessment marks • Practical notes • Lecture handouts • Information about examination arrangements • Wet practical exercise papers • Further assessment information resulting from special consideration • Self-management resources <p>There are also a number of computer exercises and teaching aids available to students enrolled in BIOC2101 Principles of Biochemistry (Advanced). Links to the textbook companion websites and additional online animations and revision tutorial can be found on the course Moodle site.</p>
Study Spaces	There are student common areas for study or relaxation on the ground floor of the Biological Sciences Building E26.

8. Required Equipment, Training and Enabling Skills

Equipment Required	Personal protection equipment (PPE): safety glasses, lab coat and closed shoes. Calculator Timer
Enabling Skills Training Required to Complete this Course	Students need to complete the Health and Safety training quiz (online) prior to the start of practical classes in Week 2; students are also required to complete individual pre-laboratory quizzes prior to each practical class.

9. Course Evaluation and Development

MyExperience	Students have the opportunity to provide feedback online, as instructed in the final week of term.
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10. Administration Matters

<p>Expectations of Students</p>	<p>Students are expected to be regular and punctual in attendance at all classes (lectures, practicals and tutorials). If students miss more than 1 practical, they may be refused final assessment or may receive a UF grade.</p> <p>Students are required to do a pre-lab quiz prior to each lab. The pre-lab quiz will be released a week before the lab and will close at 9am on Wednesday irrespective of your lab time. If you do not complete the pre-lab quiz and achieve a grade of 100% prior to the lab, you will not be allowed to participate in the lab and will be marked absent.</p> <p>Students must bring their own copy of the relevant laboratory experiment to each practical class. Failure to do so will result in exclusion from the class and an absence recorded.</p> <p>In some practical classes, raw data results will need to be confirmed by the Demonstrator. Failure to obtain confirmation may result in an absence being recorded.</p> <p>Illness and Misadventure In addition to the university's centralised procedure BIOC2101 Principles of Biochemistry (Advanced) has a local procedure that you will also need to follow.</p> <ul style="list-style-type: none"> – If you are absent from a small group tutorial or practical due to a medical condition, it is sufficient to submit a copy of your medical certificate to your tutor/demonstrator at the next small group tutorial/practical. If you believe that the medical condition is confidential, then see the Course Coordinator. – Considerations for absences due to other reasons should be submitted to and discussed with a Course Coordinator within seven (7) days of the absence. Such matters will be treated in confidence. <p>These procedures are designed to ensure that you are not penalised for absences for which there was an appropriate reason.</p> <p>A pass in BIOC2101 is conditional upon a satisfactory performance in the practical program. This consists of:</p> <ul style="list-style-type: none"> (i) attendance at all of the practical classes (unless illness & misadventure documented); (ii) satisfactory performance in the marked practical assessment task, and; (iii) maintenance of an accurate and up-to-date laboratory manual, including the recording of all data and completion of calculations and questions.
<p>Assignment Submissions</p>	<p>Assignments in this course will require a submission cover sheet for submission to the BSB Office. Cover sheets available on Moodle or at the BSB office. Late submissions lose 25% per day late.</p>
<p>Occupational Health and Safety¹⁰</p>	<p>Prior to commencing the practical component of the course you will need to complete and pass an HS Awareness quiz that covers information presented to you in week 1.</p> <p>Part of your laboratory practical manual comprises an Undergraduate Risk Assessment Guide for the School of Biotechnology and Biological Sciences. This addresses the hazards and risks you may encounter. To work with these correctly and safely, you will need to follow the safe work practices provided in the manual or by academic or technical staff involved in the course. Additional information on Health and Safety at UNSW can be found at: http://www.HS.unsw.edu.au/</p>
<p>Assessment Procedures</p> <p>UNSW Assessment Policy¹¹</p>	<p style="text-align: center;"><u>SPECIAL CONSIDERATION AND FURTHER ASSESSMENT SEMESTER 1 2018</u></p> <p>Students who believe that their performance, either during the session or in the end of session exams, may have been affected by illness or other circumstances may apply for special consideration. Applications can be made for compulsory class absences such as (laboratories and tutorials), in-session assessments tasks, and final examinations. Students must make a formal application for Special Consideration for the course/s affected as soon as practicable after the problem occurs and within three working days of the assessment to which it refers.</p> <p>Students should consult the "Special Consideration" section of Moodle for specific instructions related to each BABS course they are studying. Further general information on special consideration can also be found at https://student.unsw.edu.au/special-consideration.</p>

¹⁰ [UNSW HS Home page](#)

¹¹ [UNSW Assessment Policy](#)

	<p>HOW TO APPLY FOR SPECIAL CONSIDERATION</p> <p>Applications must be made via Online Services in myUNSW. You must obtain and attach Third Party documentation before submitting the application. Failure to do so will result in the application being rejected. Log into myUNSW and go to My Student Profile tab > My Student Services channel > Online Services > Special Consideration. After applying online, students must also verify supporting their documentation by submitting to UNSW Student Central:</p> <ul style="list-style-type: none"> • Originals or certified copies of your supporting documentation (Student Central can certify your original documents), and • A completed Professional Authority form (pdf - download here). <p>The supporting documentation must be submitted to Student Central for verification within three working days of the assessment or the period covered by the supporting documentation. Applications which are not verified will be rejected.</p> <p>Students will be contacted via the online special consideration system as to the outcome of their application. Students will be notified via their official university email once an outcome has been recorded.</p> <p>SUPPLEMENTARY EXAMINATIONS: The University does not give deferred examinations. However, further assessment exams may be given to those students who were absent from the final exams through illness or misadventure. Special Consideration applications for final examinations and in-session tests will only be considered after the final examination period when lists of students sitting supplementary exams/tests for each course are determined at School Assessment Review Group Meetings. Students will be notified via the online special consideration system as to the outcome of their application. It is the responsibility of all students to regularly consult their official student email accounts and myUNSW in order to ascertain whether or not they have been granted further assessment.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>The BABS supplementary exam period for S1, 2018 is: Saturday 14 July – Saturday 21 July 2018</p> </div> <p>Further assessment exams will be offered during this period ONLY and failure to sit for the appropriate exam that you have been offered may result in an overall failure for the course. Further assessment will NOT be offered on any alternative dates.</p>		
<p>Equity and Diversity</p>	<p>Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course Convenor prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit 93854734, http://www.studentequity.unsw.edu.au/ or http://www.equity.unsw.edu.au/disabil.html</p> <p>Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.</p>		
<p>Student Complaint Procedure¹²</p>	<p>School Contact</p> <p>A/Prof Louise Lutze-Mann, Room 241C Biological Sciences Bldg. l.lutze-mann@unsw.edu.au</p>	<p>Faculty Contact</p> <p>Dr Gavin Edwards Associate Dean (Undergraduate Programs) g.edwards@unsw.edu.au Tel: 9385 4652</p>	<p>University Contact</p> <p>Student Conduct and Appeals Officer Telephone: 02 9385 8515, email: studentcomplaints@unsw.edu.au.</p> <p>University Counselling and Psychological Services¹³ Tel: 9385 5418</p>

¹² [UNSW Student Complaint Procedure](#)

¹³ [University Counselling and Psychological Services](#)

11. UNSW Academic Honesty and Plagiarism

Academic misconduct may apply to any work or document related to assessment that is submitted to the School of Biotechnology and Biomolecular Sciences; this includes quizzes, the marked practical, laboratory workbooks, and examinations. All work must represent a student's own individual efforts. Copying or paraphrasing another person's work and using another student's experimental results are all examples of academic misconduct.

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.

*Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle

† Adapted with kind permission from the University of Melbourne

12. Practical Information

Students are required to assemble in Laboratory WW122 or WW123, 1st Floor, Wallace Wurth Building, at the **beginning** of their enrolled class.

GENERAL INFORMATION

- (i) **BEFORE** you can start your practical classes, you **MUST** complete an online **Laboratory Occupational Health and Safety Quiz** that is accessed through the BIOC2101 Moodle site. Your final quiz mark will be checked prior to your lab in Week 2. If you have not scored 100%, then you will **NOT** be permitted to attend that lab class or any subsequent lab class until you have satisfied this requirement.
- (ii) You **MUST** also complete a **Pre-lab quiz** for each of the wet labs **PRIOR** to each lab class. You **MUST** achieve a mark of 100% for each quiz in order to participate in the lab class. Students who have not completed the quiz prior to lab class will not be allowed to participate in the lab and will be marked absent. Each Pre-lab quiz **MUST** be completed by **MIDNIGHT on Monday** of the week of the lab class in question.
- (iii) *At ALL laboratory classes, students must wear a laboratory coat and fully-closed shoes made from non-absorbent materials to serve as proper foot protection. **Students without footwear or wearing thongs, sandals or other open shoes will not be permitted in the laboratory.*** Students are also required to wear eye protection during ALL experimental procedures and so are asked to provide their own safety goggles.
- (iv) **Attendance at ALL BIOC2101 laboratory classes is COMPULSORY and an 80% attendance rule is enforced throughout the session** (i.e. students are required to attend at least 80% of laboratory classes in order to satisfy the requirements for passing the course). A medical certificate is required from students who are absent from the practical class due to illness. Medical certificates are to be submitted to the course coordinator within three days of the absence.

PREPARATION

To derive the full benefit from the practical work, it is necessary to study the notes and relevant material **before** the class and not just blindly follow a “recipe”. Students who adopt a “recipe approach” generally fail to understand the practical and obtain inferior results. This, in turn, usually means that they are unable to provide satisfactory answers for the related practical questions and thus obtain a low mark for their laboratory assessment.

We have found that a good way to prepare for the next laboratory exercise is to make a short summary of the actual techniques and manipulations that you will be using in the laboratory. This summary can take the form of some brief, written comments, or it can take the form of a flow diagram that maps out the steps that you will have to take in order to complete the experiment. Within this manual, a page has been provided at the beginning of each practical for the purpose of writing up a summary and notes of the experiment(s) to be performed.

CONTINUOUS ASSESSMENT OF LABORATORY COMPONENT

Within the laboratory section of this manual, each experiment is followed by one or two question pages in which data, associated calculations and answers to specific questions are to be written. Each student must complete these sheets in full, preferably before the next practical class when your Demonstrator will check and assess your work as being either ‘Satisfactory’ or ‘Unsatisfactory’. If an ‘Unsatisfactory’ mark is awarded, it will be your responsibility to find out why and you will be given an opportunity to rectify any problems. By the end of your last practical of this session, ALL question pages are to be completed and marked ‘Satisfactory’ by your Demonstrator. Failure to do so will result in the deduction of marks from your final assessment mark in BIOC2101.

REMEMBER: A pass in BIOC2101 is conditional upon a satisfactory performance in the practical program.

DOCUMENTING YOUR LABORATORY WORK AND ANSWERING RELATED QUESTIONS

The observations from your laboratory work must be recorded neatly at the time the observations are made. For most experiments, there is ample space provided for this recording of data in the practical notes themselves. ALL data, graphs and diagrams must be included in your manual where indicated. These recorded data therefore form the bulk of the information you will need to complete the questions at the end of each practical. These questions are designed to make you think about your experimental results, make observations and hopefully allow you to draw some conclusions from them. They will also help you relate your practical work to the theory presented in BIOC2101 lectures. Since you are being assessed by your Demonstrator on your ability to record and discuss your experimental results in a proper scientific manner, a few things to consider when documenting your lab work include:

- Write your results, observations and answers neatly and legibly in pen (pencil can be used for rough data and graphs).
- Graphs should be drawn properly on graph paper, titled and labelled correctly on both axes (**with appropriate units**) with the axes ruled in clearly.
- The spaces on the question sheets usually indicate the length of answers required.
- Where calculations are required, include the steps in your calculations so that your demonstrator can follow the method by which you attempted them. If the data are provided and your calculations are clearly set out and legible, your demonstrator may be able to trace any mistakes you might make and explain them to you. This may be important in your attempts to rectify the mistakes and thus allow your practical work to be assessed as 'Satisfactory'.

LABORATORY EQUIPMENT

All the necessary laboratory equipment required for each practical exercise will be provided for you on the day of your class.

Instructions concerning the collection, correct use and storage of equipment will be delivered during the introductory talk at the beginning of each lab class. Therefore, it is **ESSENTIAL** that you arrive at your laboratory class on time in order to hear the full equipment and safety discussion.

During each lab class, various items of equipment and apparatus will only be available from the technical staff. Other pieces of equipment will be given to you by your Demonstrator or available at the front of the laboratory. Failure to carry out all laboratory instructions and maintain a tidy and safe work space may result in your removal from the laboratory and disqualification from the prac (in extreme cases, but that will never happen right?).

NOTE: You are liable for any negligent or intentional damage to any equipment whilst it is in your care. Ensure that you follow all instructions closely and carefully so that any such damage is easily avoided. It is also your responsibility to ensure that all equipment is returned or disposed of correctly, as instructed by demonstrators and technical staff.

ACADEMIC MISCONDUCT

Information concerning the University Regulations concerning Academic Misconduct can be found on the UNSW website:

<https://my.unsw.edu.au/student/academiclife/assessment/AcademicMisconduct.html> .

It is essential that all students read this information.

Academic Misconduct may apply to any work or document related to assessment that is submitted to the School; this includes the laboratory work you document/discuss within this manual, the three mid-session tests and the final examinations in June.

All work submitted for assessment must represent a student's own individual efforts. Copying or paraphrasing another person's work and using another student's experimental results are all examples of academic misconduct (see Academic Honesty and Plagiarism).

ATTENDANCE

Students are expected to be regular and punctual. Professional documentation (e.g. medical certificates) explaining **absences from formal assessments and laboratory practicals** should be included with an online application for Special Consideration according to the guidelines provided in this manual (and online via Moodle). All such documentation should be submitted within **three days** of the absence in question. This procedure will ensure that you are not penalised for absences for which there were appropriate medical or compassionate reasons.

IMPORTANT NOTE: IF STUDENTS ATTEND LESS THAN EIGHTY PERCENT OF THEIR POSSIBLE PRACTICALS, THEY WILL BE REFUSED FINAL ASSESSMENT.

GENERAL LABORATORY SAFETY

Biochemical laboratories contain chemicals and equipment that are potentially dangerous when misused or handled carelessly. Consequently, safe experimental procedures and responsible conduct in the laboratory are essential at all times. The regulations governing conduct in the laboratory have been set down by the NSW Environmentally Hazardous Chemical Regulation 2008, NSW WHS Regulation 2011, NSW Work-cover Publications, Work-safe National Codes of Practice and Guidance Notes and Australian Standards AS:2243 series Safety in Laboratories. These policies and standards apply to all university staff and students.

Section 4.11 Students are responsible for:

Complying with the requirements of this policy, legislation and Australian Standards

Following directions given to them by the person supervising their work

Co-operating in the performance of risk assessments

Participating in induction and training programs

Reading MSDS's for substances to be handled prior to doing experiments

Failure to comply will result in expulsion from the laboratory class.

PPE¹ REQUIREMENTS IN THE LABORATORY

- **Students must purchase a laboratory coat and wear it when in the laboratory.** It should be removed when leaving the lab *e.g.* on visits to the computer lab or toilets. Lab coats should not be left on benches or stools but hung on the coat hooks that are provided at the back of the laboratory.
- **Safety glasses** MUST be worn during ALL practical procedures.
- **Disposable plastic gloves will be provided for certain manipulations. These should be discarded after use or if torn.** All gloves should be removed from your hands by first holding the gloves at the wrist and pulling to turn them inside out before they are discarded into one of the 'solids waste' containers on top of bench.
- **Never** throw gloves or any other laboratory material into the domestic bins.
- **Never** use gloved hands to open doors etc. Either ask someone to open the door for you or remove one glove temporarily. **Always** remove gloves before leaving the lab.
- **Suitable foot protection (fully closed shoes made from non-absorbent materials) must be worn.** Students with bare feet, thongs, exposed shoes or strappy sandals will not be allowed into the working area.

¹ PPE – Personal Protection Equipment

SAFETY RULES IN THE LABORATORY

- Eating, drinking and smoking are forbidden in the laboratory.
- Students with long hair must tie it back.
- **Laboratory coats, safety goggles/glasses and appropriate footwear (NO thongs or open-toed shoes) must be worn at ALL times.**
- All work with toxic, corrosive or flammable (etc.) chemicals must be conducted in a fume cupboard where possible.

ALL INJURIES OR ACCIDENTS WITH CHEMICALS MUST BE REPORTED IMMEDIATELY...Either to your demonstrator or to a member of the technical staff.

RISK ASSESSMENTS

For your own protection and that of those with whom you will be working, you should read, before each week's experiment is started, the notes and instructions on the Risk Assessment Sheet preceding each experiment and take note of any hazards in the procedures to be used for that laboratory session.

Risk Assessments have been carried out on all practicals to highlight the potential for possible risks to the users. These cover chemical, biological and physical hazards. This is to ensure that the proper precautions are taken during all laboratory procedures.

The chemical risks have been assessed using **MSDSs (Material Data Safety Sheets)**. These are available on file at the front of the lab. A copy of the Hazardous Substances Policy is also on file in the Prep Room.

As strong acids, alkalis and other toxic substances are used in some procedures, the relevant safety instructions will be included at the appropriate places in the manual. **Such dangerous materials must never be pipetted by mouth**, they should be manipulated with great care and if any come into contact with skin or clothing, wash the affected areas with water **immediately**, seek assistance and any antidote that may be applied.

Poisonous solutions will be provided in automatic dispensers; these should be operated gently and carefully because careless use can cause breakage or a spray of the reagent. Automatic pipettes will be provided where possible.

EMERGENCY PROCEDURES

- In the event of a fire or other serious emergency, the building may be evacuated. When the alarm has been activated, a “get ready to evacuate” siren will sound. You should immediately cease work and secure your workplace (*e.g.* cap solutions, turn off Bunsen burners). The second stage is the “evacuate the building” call. You should immediately make your way to the nearest exit unless another exit is designated by staff. **Follow directions from the staff and evacuation wardens and gather at the Michael Birt Gardens in front of the Chancellery Building** (near Gate 9 on High Street). You should wait there until you have been checked off by your demonstrator.
- Emergency eye wash stations and Safety showers are installed at the back of the lab. Seek staff help immediately. If you get something in your eye, you must wash your eyes for at least 20 minutes.
- For procedures to clean up spills, seek staff help immediately.
- Special antidotes (if using cyanide) are located near the Prep Room windows. Seek staff help immediately.
- **If you are in doubt about any safety matter, please consult a member of staff.**

Internet sites/references:

National Occupational Health & Safety Commission:

<http://www.nohsc.gov.au./hazsubs/index.htm>

NSW Work-cover site:

<http://www.workcover.nsw.gov.au/links.html>

SAFETY IN HANDLING LABORATORY CHEMICALS

PIPETTING

Essentially all hazardous solutions (acids, alkalis, toxic solutions etc.) that are needed in the practical class will be provided in dispensers which will be set to deliver the correct volume. See Appendix for proper handling.

For all other pipetting, pipetting aids such as Gilson Pipetmans or Eppendorfs will be provided for use during classes. See Appendix for proper handling instructions. These should be returned to the prep. room at the end of the class.

BROKEN GLASSWARE AND OTHER SHARP OBJECTS

Should any breakage of glassware occur, the fragments must be swept up immediately and placed in the special bins provided for glass. These bins are located at the front of each laboratory and are clearly marked "**BROKEN GLASS ONLY**". Other sharp objects e.g. needles or razor blades should be placed in the **yellow "Sharps" Bins** located on each bench-top. **Broken glass or other sharp objects MUST NOT be placed in the waste paper bins or in any other bins, UNDER ANY CIRCUMSTANCES.**

DISPOSAL OF "CLINICAL" WASTE

Special labeled enamel or plastic containers are available on each laboratory bench for the disposal of gloves, gels, tips, microcentrifuge tubes, and any other used disposable plastic ware or Glad-wrap. **Never, ever put this material in the normal domestic waste bins.**

DISPOSAL OF CHEMICAL (LIQUID) WASTE

According to the Environmental Policy of the University no chemical waste may be disposed of down the laboratory sinks.

All chemical residues must be placed in the appropriate waste containers which will be provided in the laboratory. Solvent, aqueous, biological wastes and some chemicals may have separate waste containers which are usually located in the fume cupboards. For disposal details, always check your practical manual, the instructions written on the waste disposal containers in the lab or ask your demonstrator.

STUDENT SAFETY DECLARATION

I,.....(Print Full Name Please)

declare that I have completed the safety quiz for BIOC2101, that I have read the Safety in Laboratories and Appendix Instrumentation sections in my BIOC2101 course manual, and attended the Pre-lab safety discussion in the first practical.

I am aware of my responsibilities in the laboratory and I agree to co-operate with these regulations.

Signature:.....

Date:.....

Countersigned by Demonstrator:.....

Date:.....