



Course Outline

BIOC2101

**Principles of Biochemistry
(Advanced)**

School of Biotechnology and Biomolecular Sciences

Faculty of Science

Term 2, 2021

Welcome Message from the Course Convenor

Welcome to BIOC2101 Principles of Biochemistry in 2021!

I would like to extend a very warm welcome to all BIOC2101 students enrolled in the course in T2 2021. In 2020, all students completed the course in a fully online fashion due to the COVID pandemic. In 2021, most students will experience a combination of online lectures and face-to-face laboratory classes, while a smaller group of overseas students complete the course fully online. As your coordinator, I will be making every attempt to bring both cohorts of students together in an open and shared learning environment where we can all work together as partners in this learning journey.

Now let's talk about course theory and content. BIOC2101 introduces students to a suite of catabolic and anabolic processes and regulatory mechanisms that are essential to life. In this course, we will also study a range of experimental techniques that allow us to investigate these processes.

Unless otherwise specified, most lectures in the course are presented online in a synchronous (live) format via MS Teams according to the lecture schedule on page 11 of this document. All synchronous online lectures are recorded, and recordings are made available to students for continued access after the lecture. It is not compulsory to attend any live lectures, but attendance is highly recommended. If you cannot attend a live lecture, please watch the recording at your earliest convenience to avoid falling behind in your studies.

For all students able to attend compulsory face-to-face laboratory classes, these will be conducted during your scheduled 3-hour lab class in Wallace Wurth Lab 122 or 123, according to the Lab Class schedule on page 11 of this document.

All online laboratory classes (for approved students only) are conducted live via Microsoft Teams, and attendance at these weekly classes is also compulsory. Online laboratory classes will follow the same class schedule as that outlined on page 11 of this document. More information about online laboratory class access and content will be provided in Moodle.

If you have any questions about the course at any time throughout the term, or if you just feel a little lost and would like some advice, please do not hesitate to contact me by email (a.galea@unsw.edu.au) and I will do my very best to help.

Although most of us no longer need to scavenge for toilet paper as we did in the first half of 2020, there are still significant challenges to our daily lives and those of our family members and friends due to fallout from the pandemic. So please be assured that the BIOC2101 teaching team is here to help you, wherever we can, with achieving success in the course and in your broader student experiences here at UNSW.

Thanks for your time in reading this and I very much look forward to seeing you in class.

All the best,

Anne

Dr Anne Galea

a.galea@unsw.edu.au

BIOC2101 Principles of Biochemistry (Advanced) – Course Outline

Contents

1. Course Information	4
2. Staff Contact Details	4
3. Course Details	5
4. Rationale and Strategies Underpinning the Course	10
5. Course Schedule T2 2021	11
6. Assessment Tasks & Feedback	12
7. Additional Resources and Support	13
8. Required Equipment, Training and Enabling Skills	13
9. Course Evaluation and Development	14
10. Administration Matters	14
11. UNSW Academic Honesty and Plagiarism	19
12. Practical Information	20

1. Course Information

Year of Delivery	2021			
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			
Delivery Mode	Blended (fully online for overseas students only)			
Grading Mode	Standard Grading			
Term(s) Offered	T2			
Assumed Knowledge, Prerequisites or Co-requisites	Prerequisites: BABS1201 and CHEM1011 or CHEM1031 or CHEM1051 and CHEM1021 or CHEM1041 or CHEM1061			
Hours per Week	6			
Number of Weeks	9 weeks			
Commencement Date	Monday 31 st May 2021 (Week 1)			
Summary of Course Structure				
Component	Hours/ week	Time	Day	Location
Online Lectures	3 hours total	Most lectures are delivered live online, recorded, and posted for access afterwards at any time.		
Weekday lecture 1	1 hour	12 pm – 1 pm	Monday	Online via MS Teams
Weekday lecture 2	1 hour	5 pm – 6 pm	Thursday	Online via MS Teams
Weekday lecture 3	1 hour	9 am – 10 am	Friday	Online via MS Teams
Laboratory Classes & Quizzes	1 – 3 hours	Laboratory classes are conducted synchronously face-to-face in Wallace Wurth teaching labs or online via MS Teams (approved students only). Attendance at all laboratory classes is compulsory.		
Laboratory – Option 1	3 hours	10 am – 1 pm	Tuesday	Wallace Wurth Lab 122 or 123 / OR Online via MS Teams
Laboratory – Option 2	3 hours	2 pm – 5 pm	Tuesday	Wallace Wurth Lab 122 or 123 / OR Online via MS Teams
Laboratory – Option 3	3 hours	10 am – 1 pm	Wednesday	Wallace Wurth Lab 122 or 123 / OR Online via MS Teams

2. Staff Contact Details

See below for course contact details for course convenor, lecturers and technical staff.

Staff	Role	Name	Contact Details
Course Convenor		Anne Galea	a.galea@unsw.edu.au
Additional Teaching Staff	Lecturers	Prof Andrew Brown A/Prof Kyle Hoehn Dr Rebecca LeBard Dr Vladimir Sytnyk Dr Nirmani Wijenayake Prof Marc Wilkins	aj.brown@unsw.edu.au k.hoehn@unsw.edu.au r.lebard@unsw.edu.au v.sytnyk@unsw.edu.au b.wijenayakeg@unsw.edu.au m.wilkins@unsw.edu.au
	Technical & Laboratory Staff	Tammy Tang (Technical Officer) Zakia Begum Syeda (Technical Officer)	sihui.tang@unsw.edu.au z.begum@unsw.edu.au

3. Course Details

Course Description¹	BIOC2101 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 in the central metabolic pathways under various physiological conditions. Laboratory work complements the lectures and introduces the principles of biochemical analysis.	
Course Aims²	<ul style="list-style-type: none"> • This course aims to introduce students to modern biochemistry with an 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 Outcomes³	<p>By the completion of this course students should be able to:</p> <ol style="list-style-type: none"> 1. Describe and contrast the functions and key features of the major metabolic pathways in humans. 2. Explain the various mechanisms that control and regulate the simultaneous functioning of anabolic and catabolic processes in the cells of living tissues. 3. Describe the integration of major metabolic pathways in the context of common human conditions, such as fasting, starvation, obesity and exercise. 4. Work safely and effectively in a modern biochemical laboratory to perform a range of biochemical assays, analytical techniques and related calculations. 5. Communicate experimental methods, outcomes and their interpretations in the format of a professional scientific report. 	
Graduate Attributes Developed in this Course⁴		
Science Graduate Attributes⁴	Level of FOCUS 1 = MINIMAL 2 = MINOR 3 = MAJOR	Activities / Assessment
Research, inquiry and analytical thinking abilities	3	Lectures, f2f/online laboratory experiments, online discussions, formative quizzes, pre-lab quizzes, examination questions, solving complex problems, practical exam questions and laboratory report.
Capability and motivation for intellectual development	3	Lectures, f2f/online laboratory experiments, online discussions, formative quizzes, pre-lab quizzes, examination questions, solving complex problems, practical exam questions and laboratory report.
Ethical, social and professional understanding	1	F2f/online laboratory experiments, lectures, pre-lab quizzes, laboratory report and online laboratory safety quiz.
Communication	2	F2f/online laboratory experiments and online discussions, examination questions, laboratory report.
Teamwork, collaborative and management skills	2	F2f/online laboratory experiments and online discussions, laboratory report.
Information literacy	2	Lectures, online resources, formative quizzes, laboratory report.

¹ UNSW Handbook: <http://www.handbook.unsw.edu.au>

² [Learning and Teaching Unit: Course Outlines](#)

³ [Learning and Teaching Unit: Learning Outcomes](#)

⁴ [Contextualised Science Graduate Attributes](#)

Major Topics Covered

Introduction to Metabolism

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.e.* highly ordered system. ATP will be used as a typical example to illustrate energy relationships applicable to biochemical reactions in general.

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.

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.

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 defence 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

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

SIGNAL TRANSDUCTION IN METABOLISM (HORMONES)

Hormones/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 metabolism 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.
- 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.

	<ul style="list-style-type: none"> • 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 online laboratory sessions, where students also learn about laboratory techniques and safe workplace skills. Students are provided with avenues for revision, practice, and discussion of the course content through large group revision sessions and online discussion forums. Weekly formative quizzes provide students with more detailed and tailored feedback on their learning.</p>
<p>Rationale for learning and teaching in this course</p>	<p>Lectures are used in the course to 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. Online synchronous revision sessions are used to reinforce concepts presented in the lectures through problem solving, and to encourage further enquiry. Both laboratories and revision sessions 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 Teaching. 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. BIOC2101 Course Schedule T2 2021

Some of this information is available on the [Online Handbook⁵](#) and the [UNSW Timetable⁶](#).

Week	Begins	<u>Monday 12-1 pm Lecture</u> Online Synchronous (Live) via MS Teams	<u>Practicals & Quizzes</u> <u>Tue 10-1pm, Tue 2-5pm or</u> <u>Wed 10-1pm</u> Pracs: Synchronous F2F (WW Lab 122/123) or Online via MS Teams Quizzes: Synchronous via Moodle	<u>Thursday 5-6 pm Lecture</u> Online Synchronous (Live) via MS Teams	<u>Friday 9-10am Lecture</u> Online Synchronous (Live) via MS Teams
Week 1	31 May	Lecture 1: Course Introduction - AMG	Lab 1: Biochemical Calculations and Skills	Lecture 2: Proteins - MW	Lecture 3: Enzymes - MW
Week 2	07 June	Lecture 4: Carbohydrates - VS	Lab 2: Spectrophotometry	Lecture 5: Enzyme Kinetics - MW	Lecture 6: Enzyme Regulation - MW
Week 3	14 June	QUEEN'S BIRTHDAY PUBLIC HOLIDAY	Lab 3: Enzymes	Lecture 7: Glycolysis - VS	Lecture 8: Regulation of glycolysis - VS
Week 4	21 June	Lecture 9: TCA Cycle - RLB	Term Quiz 20%	Lecture 10: Oxidative phosphorylation 1 - AMG	Lecture 11: Oxidative phosphorylation 2 - AMG
Week 5	28 June	Lecture 12: Oxidative phosphorylation 3 - AMG	Lab 4: Glycolysis	Lecture 13: Gluconeogenesis - NW	Lecture 14: Glycogen - NW
Week 6	05 July	FLEXIBILITY WEEK			
Week 7	12 July	Lecture 15: Protein Catabolism - RLB	Lab 5: Separation Techniques	Lecture 16: Urea cycle - RLB	Lecture 17: Fats 1 - AB
Week 8	19 July	Lecture 18: Fats 2 - AB	Lab 6: Glucose Tolerance Test	Lecture 19: Fats 3 - AB	Lecture 20: Fats 4 - AB
Week 9	26 July	Lecture 21: Hormones - AMG	Lab 7: Practical Revision	Lecture 22: Metabolic Specialisation of Tissues - KH	Lecture 23: Exercise - RLB
Week 10	02 August	Lecture 24: Fasting - KH	Practical Quiz 20%	Lecture 25: Integration of Metabolism - AMG	Lecture 26: Concluding Lecture - AMG

Lecturers: AMG = Dr Anne Galea, MW = Prof Marc Wilkins, VS = Vladimir Sytnyk, RLB = Dr Rebecca LeBard, NW = Dr Nirmani Wijenayake, AB = Prof Andrew Brown, KH = A/Prof Kyle Hoehn.

Delivery: All lectures are delivered live via MS Teams unless otherwise stated in Moodle. All live lectures will be recorded and can be accessed asynchronously online in Moodle.

Term & Practical Quizzes: Term Quiz examines Lectures 2-8; Practical Quiz examines laboratory work in Labs 1-6; Final Exam examines Lectures 9-25.

⁵ UNSW Virtual Handbook: <http://www.handbook.unsw.edu.au>

⁶ UNSW Timetable: <http://www.timetable.unsw.edu.au/>

6. Assessment Tasks & Feedback

Task	Knowledge & abilities assessed	Assessment format and/or criteria	%	Date	Feedback		
					WHO	WHEN	HOW
BABS Health and Safety Quiz	COMPULSORY: Assesses knowledge of safe working practices and procedures in BABS teaching laboratories.	Online formats (e.g. multiple choice, true or false, drag-and-drop, correct order). Accessed via Moodle. Students only need to complete this quiz once for all BABS courses.	-	Must be completed with 100% correct answers BEFORE Week 1 laboratory class	Convenor	Immediately	Online (Moodle)
Term Quiz	Covers all content from lectures 2-8, inclusive.	1-hour duration. Multiple choice & short answer formats. Conducted via Moodle Quiz in first hour of Week 4 lab time.	20	Week 4 Lab Time (10am Tue, 2pm Tue or 10am Wed) Lab attendance NOT required.	Convenor	Within 10 working days	Online (Moodle)
Laboratory Report Assignment	Students prepare a written laboratory report based on experimental results from the Enzymes Lab class in Week 3. Students will be assessed on their ability to communicate clearly in a scientific format and style. Students will also be assessed on their ability to present scientific data clearly and professionally, and on their ability to process and interpret scientific data accurately with references to appropriate supporting information from the scientific literature.	This assignment is worth 20% in total. The report itself is worth 15% while the remaining 5% of the assignment weighting is devoted to 3 different supporting activities: 1) Calibration Activity (1%) 2) Peer Review of Draft Report (2%) 3) Smarthinking* Feedback (2%) Full details on report format and criteria are provided online in Moodle. All parts are conducted online in Moodle. Draft and Final reports are submitted digitally in Moodle. *More information on Smarthinking services will be provided in class and via Moodle course announcements	1	1) Calibration Activity Can be completed any time before Final Report submission deadline (Week 9)	Convenor	Immediately upon submission	Online (Moodle)
			2	2) Draft Report DUE: 11:59pm Mon 12 th July (Week 7) Peer Reviews DUE: 11:59pm Wed 21 st July (Week 8)	Peers	Within 10 working days	
			2	3) Smarthinking Feedback Smarthinking feedback on your report can be requested at any time before Final Report submission (Week 9) but must be incorporated in your Final Report to gain marks	Smarthinking and Convenor/Demonstrator	Within 10 working days	
			15	Final Report DUE: 11:59pm Friday 30 th July (Week 9)	Convenor/Demonstrator	Within 10 working days	
Practical Quiz	Covers all practical theory, calculations, and safety from Labs 1 to 6 (inclusive).	1.5-hour duration. Multiple choice & short answer formats. Conducted via Moodle Quiz in first 1.5 hours of Week 10 lab time.	20	Week 10 Lab Time (10am Tue, 2pm Tue or 10am Wed) Lab attendance NOT required.	Convenor	Within 10 working days	Online (Moodle)
Final Theory Exam	Covers all content from lectures 9-25, inclusive.	Multiple choice questions, essay, and short response questions.	40	See final examination timetable			

TOTAL:

100

7. Additional Resources and Support

Text Book	<p>Biochemistry 9th edition, WH Freeman and Company, 2019. JM Berg, JL Tymoczko, GJ Gatto, and L Stryer</p> <p>Availability: UNSW bookshop, UNSW library: Open Reserve/High use collection</p>
Course Manual	<p>All BIOC2101 course information including course outline, assessment schedule and practical information is available via Moodle.</p>
Recommended Internet Sites	<p>All students enrolled in BIOC2101 automatically have access to the course Moodle site https://moodle.telf.unsw.edu.au/. This site will be used to distribute course notes and information and should be checked at regular intervals. Specifically, the Moodle site will be used to provide:</p> <ul style="list-style-type: none"> • Important course announcements • Assessment marks • Practical notes • Lecture handouts and recordings • Information about examination arrangements • Further assessment information resulting from special consideration • Self-directed learning resources <p>There are also many computer exercises and teaching aids available to students enrolled in BIOC2101 Principles of Biochemistry (Advanced). Links to the textbook companion websites (if available) and additional online animations and revision tutorial can be found on the course Moodle site.</p>
Study Spaces	<p>There are student common areas for study or relaxation on the ground floor of the Biological Sciences Building E26 and in the UNSW Library.</p>

8. Required Equipment, Training and Enabling Skills

Equipment Required	<p>To access live online BIOC2101 lectures and online lab classes (if enrolled), students will need:</p> <ul style="list-style-type: none"> • A computer equipped with Microsoft Teams and an internet browser • For assistance with online learning, please see the UNSW 'Transitioning to Online Learning' website: https://www.covid19studyonline.unsw.edu.au/ <p>To all face-to-face lab classes (if enrolled), please bring:</p> <ul style="list-style-type: none"> • Disposable face mask • Personal protection equipment (PPE): safety glasses, lab coat & closed shoes • Calculator • Timer (e.g. watch)
Enabling Skills Training Required to Complete this Course	<p>Students should aim to complete the BABS Health and Safety Quiz (online) BEFORE their first lab class in Week 1. It is also recommended that students complete individual pre-laboratory quizzes (where appropriate) prior to each practical class (accessed via Moodle).</p>

9. Course Evaluation and Development

MyExperience	<p>Students can provide feedback on the course via online myExperience surveys, as instructed, in the final week of term.</p> <p>The latest information on how student feedback has been used to update and improve the course can be found on the Moodle site for the course.</p>
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10. Administration Matters

Expectations of Students	<p><u>ATTENDANCE:</u></p> <p>In T2 2021, compulsory attendance is only required for your weekly laboratory classes and all examinations (Term Quiz, Practical Quiz, and Final Exam). If you miss a laboratory class or examination due to illness or misadventure, you must apply for Special Consideration with appropriate supporting documentation within 3 days. If you miss more than one laboratory class without adequate supporting documentation, you may not be eligible for passing the course. Attendance at 'live' lectures (conducted via MS Teams) is highly recommended but not compulsory, as these sessions will also be recorded and available for asynchronous viewing.</p> <p><u>PRE-LAB QUIZZES:</u></p> <p>Students are encouraged to complete a pre-lab quiz prior to each weekly laboratory class (where available). Pre-lab quizzes can be accessed via Moodle. Although the completion of pre-lab quizzes is not compulsory, it is highly recommended because it will help you to prepare for and get the most out of each online laboratory class. Pre-lab quizzes will also help you prepare for the Practical Quiz in Week 9 (worth 20% of final course mark).</p> <p><u>PRACTICAL SKILLS AND DATA RECORDING:</u></p> <p>In some face-to-face practical classes, the demonstration of specific laboratory skills and/or the collection of raw data results will need to be checked and confirmed by your Demonstrator or Course Convenor. These requirements will be made clear at specific stages in your Course Practical Guide/Manual (where appropriate). Failure to obtain such confirmation may result in an absence being recorded in your attendance record for that class. All students are expected to bring BIOC2101 practical notes to each weekly class in printed or digital format using your own device, or students can access the practical notes via the shared laboratory computers. (Please note that the BIOC2101 Practical Notes are not available for purchase in printed format from the UNSW Bookshop).</p> <p><u>ILLNESS AND MISADVENTURE:</u></p> <p>The following procedures are designed to ensure that you are not penalised for absences for which there was an appropriate reason.</p> <p>If you are not fit to attend a BIOC2101 laboratory class (face-to-face or online) throughout the Term, please email the course convenor (a.galea@unsw.edu.au) with supporting documentation within 5 working days of the absence. (Do not apply for Special Consideration for laboratory class absences).</p> <p>If you are not fit to sit the BIOC2101 Term Quiz, Practical Quiz, or Final Exam, you must apply for Special Consideration following the guidelines provided on the following page or in Moodle prior to the start of the quiz/exam or within 24 hours of the quiz/exam.</p>
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	<p>If you are unable to submit any component of the BIOC2101 Laboratory Report by the scheduled deadlines, you must email the Course Convenor AND apply for Special Consideration following the guidelines provided on the following page or in Moodle. PLEASE NOTE that due to the automated online nature of the peer review component of the report assignment, failure to submit a component on time may result in the need for you to complete an alternative assignment.</p> <p><u>SATISFACTORY LABORATORY PERFORMANCE:</u></p> <p>A pass in BIOC2101 is conditional upon a satisfactory performance in the laboratory program. This consists of:</p> <ul style="list-style-type: none"> (i) attendance at all laboratory classes (unless illness/misadventure is documented). (ii) completion of all compulsory scientific report assignment components. (iii) maintenance of accurate and up-to-date laboratory notes (if in face-to-face lab stream), including the recording of all data and completion of calculations and questions. (iv) participation in laboratory class discussions and completion of scheduled weekly online laboratory activities (if in online lab stream).
Assignment Submissions	<p>All components of the BIOC2101 Laboratory Report assignment will be submitted online via Moodle.</p>
Occupational Health and Safety⁷	<p>Prior to commencing the practical component of the course, you will need to complete and pass a BABS Health and Safety Quiz. Your weekly BIOC2101 Practical Notes include 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>Although a small group of students will be completing the BIOC2101 practical component fully online in 2020, in order to achieve all practical learning outcomes in the course, online lab students are still required to complete the Health and Safety Quiz, preferably before their first lab class in Week 1. This will also ensure that students are adequately prepared for future face-to-face laboratory classes.</p>

⁷ [UNSW HS Home page](#)

Assessment Procedures

UNSW Assessment Policy⁸

SPECIAL CONSIDERATION AND FURTHER ASSESSMENT TERM 2 2021

Students who believe that their performance, either during the term or in the end of term exams, may have been affected by illness or other circumstances may apply for special consideration. Applications can be made for mid-term assessment tasks and final examinations.

You must submit the application prior to the start of the relevant exam, or before a piece of assessment is due, except where illness or misadventure prevent you from doing so. If you become unwell on the day of the exam or fall sick during an exam, you must provide evidence dated within 24 hours of the exam, with your application. You must obtain and attach Third Party documentation before submitting the application. Failure to do so may result in the application being rejected.

UNSW has a fit to sit/submit rule which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so.

Further information on special consideration can be found at <https://student.unsw.edu.au/specialconsideration>.

HOW TO APPLY FOR SPECIAL CONSIDERATION

The application must be made through Online Services in [myUNSW](#) (My Student Profile tab > My Student Services > Online Services > Special Consideration).

Students will be contacted via *their official university email* as to the outcome of their application. It is the responsibility of all students to regularly consult their official student email accounts and myUNSW to ascertain whether they have been granted further assessment.

SUPPLEMENTARY EXAMINATIONS

Supplementary examinations may be given to those students who were absent from mid-term or final exams due to illness or misadventure. Only students who submit a compliant Special Consideration application (as per the above instructions) may be eligible for a supplementary examination. Students will be notified via the online special consideration system and their official UNSW email account as to the outcome of their application. Supplementary **mid-term examinations** will be managed internally by your course convenor and held during term. Supplementary **final examinations** will be managed externally by UNSW Exams Branch and held during the official BABS Supplementary Final Examination period.

The BABS Supplementary Final Exam period for Term 2, 2021 is:

Monday 6th September to Friday 10th September 2021

Supplementary Final Exams will be offered during this period ONLY. 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.

⁸ [UNSW Assessment Policy](#)

Equity and Diversity

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. Such students may also contact Disability Services <https://student.unsw.edu.au/disability> for more information on the types of support they can provide (Disability Services Ph: 9385 4734, Email: disabilities@unsw.edu.au).

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 on time and in full.

SCHOOL OF BABS DIVERSITY AND INCLUSION VALUES

In an ideal world, science would be objective. However, the reality is much of science is subjective and is historically built on a small subset of voices. In BABS we will make an effort to expose students to literature from a diverse group of scientists, despite limits still existing on this diversity. We acknowledge that it is possible that there may be some biases in the material due to the lens with which it was written, and the School welcomes feedback to improve the diversity of the course materials.

There are challenges inherent in communicating between people from other cultures, but BABS staff will strive to ensure their passion for science is appreciated through different eyes. We have a genuine desire to experience new cultures, expand our own horizons, and transcend any barriers that interacting with diverse groups could impose. The School is acutely aware of the importance of diversity and inclusion in all aspects of life and BABS academics strive to uphold these values as educators.

The School of BABS is dedicated to creating a positive, inclusive educational environment that embraces diversity in all forms and rejects any form of hostile workplace, discrimination, or bullying. We have a clear statement of behavioral expectations (as well as definitions of discrimination, (sexual) harassment and bullying, which can be found here: <https://student.unsw.edu.au/harassment>). On this website, students can also find resources and contacts for reporting issues. In addition, the Science Equity, Diversity and Inclusion Working Group of the Faculty of Science have recently launched a set of Classroom Inclusivity Guidelines that all staff and students are striving to work under. They can be found here:

<https://www.science.unsw.edu.au/our-faculty/classroom-inclusivity-guidelines>

Beyond the University protocols, **it is our goal in BABS to create a learning environment for our students that supports a diversity of thoughts, perspectives and experiences, and Honours student identities** (including race, gender, class, sexuality, religion, ability). To help accomplish this, BABS staff will endeavour to use student's chosen name and pronouns, adapt as we learn about diverse perspectives and identities, and action any concerns raised as a result of any EDI-related student experiences.

In addition those students who have a disability that requires some adjustment in their teaching or learning environment (e.g. access requirements, assessment arrangements) are encouraged to discuss their study needs with the course Convenor and with the Equitable Learning Service <https://student.unsw.edu.au/els>).

Finally, the School recognises the added challenges faced by students during the coronavirus outbreak, in particular those related to teaching and learning remotely while public health is managed. Specific details on how this course will be managed are given throughout this manual and will be highlighted further in the first lecture, but please be assured the School of BABS will strive to minimise stress to students while still endeavouring to deliver a high-quality teaching experience.

Student Complaint Procedure ⁹	School Contact	Faculty Contact	University Contact
	<p>Dr Megan Lenardon Student Grievance Officer Office: Room 4103 Biosciences South (E26) m.lenardon@unsw.edu.au Ph: 9385 1780</p>	<p>Dr Shannan Maisey Director, Academic Programs s.maisey@unsw.edu.au Ph: 9385 6142</p>	<p>Student Conduct and Appeals Officer Telephone: 02 9385 8515, email: studentcomplaints@unsw.edu.au University Counselling and Psychological Services¹⁰ Ph: 9385 5418</p>

⁹ [UNSW Student Complaint Procedure](#)

¹⁰ [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

The following information is **ONLY** for students enrolled in the fully online BIOC2101 laboratory program

ONLINE LABORATORY CLASS REQUIREMENTS

In Term 2, 2021, due to the Coronavirus pandemic, some students who cannot attend face-to-face laboratory classes are required to complete an online alternative version of the BIOC2101 practical program. The online sessions have been designed to help students achieve most of the original learning outcomes, and therefore it is still compulsory for students to satisfy all requirements of the laboratory component to pass the course.

To satisfy all requirements of the laboratory component, students must:

- Attend all weekly online laboratory classes
- Participate in all online laboratory class discussions and activities
- Complete all tasks assigned in all online laboratory classes
- Complete all compulsory components of the Laboratory Report assignment
- Attempt the Practical Quiz in Week 9

NEW ONLINE LABORATORY CLASS FORMAT

In T2 2021, online laboratory classes will be conducted in Microsoft Teams as follows:

- 1) Each weekly lab session will typically start with a 10-20-minute Introductory Talk by the course convenor in a designated channel within MS Teams.
- 2) Students will then be instructed to work on a task or series of tasks within a separate MS Teams channel that has been created for their Demonstrator Group. Group discussions with your classmates are encouraged to help you complete the tasks in this part of the class.
- 3) Your Demonstrator will then join you to facilitate a discussion of the completed tasks, with a focus on ensuring you achieve all learning outcomes for that class.
- 4) Online Laboratory sessions are currently scheduled on Wednesdays at 10am-1pm in Weeks 1, 2, 3, 5, 7, 8, and 9 of Term. These online lab classes will follow the same topics as indicated in the common class schedule for all students. Separate laboratory notes for online lab students will be provided in Moodle and in MS Teams, where your online classes are held.
- 5) There are no online or face-to-face laboratory classes in Weeks 4 or 10. In Week 4, all students will attempt an online Term Quiz (20%) and in Week 10 all students will attempt an online Practical Quiz (20%). More details on these quizzes will be provided in Moodle.

ONLINE LABORATORY CLASS INSTRUCTIONS

Detailed instructions for accessing all online laboratory classes and introductory talks in MS Teams are available in the '[BIOC2101 Online Learning Guide](#)' which is available and continually updated in Moodle.

Before each weekly laboratory class, it is highly recommended that you read through the associated laboratory notes that are available in Moodle. You are also encouraged to attempt the Pre-Lab Quizzes (accessed via Moodle) prior to each online lab class and/or afterwards for study purposes. While these Pre-Lab Quizzes were designed to cover key concepts in the original face-to-face lab classes, they still cover many of the important learning outcomes in this year's classes.

Students are also required to complete the **BABS Online Health and Safety Quiz** (accessed via Moodle) before their first lab class in Week 1. This ensures that you achieve course learning outcomes associated with working safely in a laboratory and prepare you for experimental work in future classes and research.

The Laboratory Safety Information provided on pages 21 to 23 below is for ALL BIOC2101 students. This information covers fundamental teaching laboratory safe working practices and procedures and may be used as a reference for completing the BABS Online Health and Safety Quiz in Moodle.

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

- **Disposable face masks must be worn in the lab at all times.**
- **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, disposable face masks, safety 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.

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 be manipulated with great care and if any comes 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 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 Gate 9 in front of the Chancellery Building** (Gate 9 is on High Street near the John Clancy Auditorium). 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.

For all other pipetting, pipetting aids such as Gilson Pipetmans or Eppendorfs will be provided for use during classes. These should be returned to the appropriate stands in class immediately after use.

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 benchtop. 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.