

BIOL2010: Biochemistry

Callaghan

Semester 1 - 2024



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

Course Description	Living systems are made up of molecules and this course introduces the diversity of important biological molecules and shows how their structures relate to their function. The smaller biomolecules such as amino acids, nucleotides and sugars have important biological functions of their own, and are also utilised as building blocks for biopolymers such as proteins, nucleic acids and polysaccharides. The metabolic processes that occur in cells to synthesise and degrade these biomolecules and to provide energy for the cell will be presented with a view to showing how biochemical reactions and pathways are connected and controlled.
Academic Progress Requirements	Nil
Requisites	This course has similarities to BIOL2011. If you have successfully completed BIOL2011 you cannot enrol in this course.
Assumed Knowledge	CHEM1010, CHEM1020, BIOL1001 and BIOL1002 or equivalent
Contact Hours	Callaghan Lecture Face to Face On Campus 2 hour(s) per week(s) for 13 week(s) starting Week 1 Tutorial Face to Face On Campus 2 hour(s) per week(s) for 13 week(s) starting Week 1
Unit Weighting Workload	10 Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

COURSE OUTLINE

CONTACTS

Course Coordinator **Callaghan**
Prof Brett Nixon
Brett.Nixon@newcastle.edu.au
(02) 4921 6977
Consultation: By email.
If urgent by phone or office (Life Sciences Building LS437)

Teaching Staff Other teaching staff will be advised on the course Canvas site.

School Office **School of Environmental and Life Sciences**
Room C228 Chemistry Building
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9am-5pm (Mon-Fri)

SYLLABUS

Course Content Biomolecules: the building blocks

- Sugars and polysaccharides
- Fatty acids and complex lipids
- Amino acids and proteins
- Nucleotides and DNA/RNA

Biological Catalysts

- Thermodynamics
- Enzymes and kinetics
- Vitamins and coenzymes

Energy metabolism: pathways for ATP production

- Glycolysis
- The pentose phosphate pathway
- The Krebs Citric Acid Cycle or TCA Cycle
- Electron transport and oxidative phosphorylation

Cellular metabolism: using biopolymers

- Utilisation of polysaccharides
- Glycogenesis and biosynthesis of disaccharides and polysaccharides
- Lipid metabolism

Course Learning Outcomes **On successful completion of this course, students will be able to:**

1. Apply scientific philosophy of research in biochemistry;
2. Outline the diversity of biomolecules, and distinguish their metabolic and structural roles in cellular function;
3. Identify the sources of energy for cells, and explain how cells utilise this chemical energy for growth and maintenance;
4. Describe how chemical reactions are mediated, integrated and regulated in the cell.

Course Materials

Recommended Text:

- J.L. Tymoczko, J.M. Berg, G. Gatto, L. Stryer. Biochemistry: A Short Course, 4th Ed. (2010) W.H. Freeman and Co. *Note: Any previous editions of this textbook will be good for this course. Take care that the chapter numbers may differ a little with each version.*

Recommended Reference Books (available in the library):

- J.L. Tymoczko, J.M. Berg, G. Gatto, L. Stryer. Biochemistry: A Short Course, 4th Ed. (2010) W.H. Freeman and Co.
- R.H. Garrett and C.M. Grisham, Biochemistry, 6th Ed. (2016) Saunders College Publishing
- R. Boyer (2000) Modern Experimental Biochemistry 3rd Ed. Addison-Wesley Publishing Company

Other Resources:

- Students enrolled in the course can login <http://uonline.newcastle.edu.au/> to access the UoNline site used to support this course. You need to visit the UoNline site on a regular basis.
- C.K. Mathews, K.E. Van Holde, D.R. Appling, Biochemistry, 4th Ed. (2013) Pearson Education, Inc
- R. Boyer (2012) Biochemistry Laboratory: Modern Theory and Techniques 2nd Ed. Pearson Education, Inc

SCHEDULE

Week	Week Begins	Topic	Learning Activity	Assessment Due
1	26 Feb	Lecture 1: Introduction Lecture 2: Aqueous solutions (water, pH, buffers)	No Tutorial	
2	4 Mar	Lecture 3 : Thermodynamics Lecture 4 : Carbohydrates (simple sugars)	Tutorial 1	
3	11 Mar	Lecture 5: Carbohydrates (polysaccharides) Lecture 6: Structures of amino acids	Tutorial 2	
4	18 Mar	Lecture 7: Properties of amino acids Lecture 8: Proteins (primary, secondary, tertiary, quaternary structure)	Tutorial 3	
5	25 Mar	Lecture 9: Enzyme (enzyme kinetics) Lecture 10: Enzyme regulation	Tutorial 4	
6	1 Apr	Lecture 11: Lipids Lecture 12: Cell membranes	Tutorial 5	
7	8 Apr	Lecture 13: Nucleotides & nucleic acids Lecture 14: Nucleic acids	Tutorial 6 and Revision Lecture	Tutorial Assignment 1
Mid Term Break				
Mid Term Break				
8	29 Apr	Lecture 15: Vitamins (classification, biological roles) Lecture 16: Vitamins important for metabolism (NADH, FAD)	Tutorial 7	Quiz 1
9	6 May	Lecture 17: Intermediary metabolism and an overview of anaerobic carbohydrate metabolism Lecture 18: Glycolysis	Tutorial 8	
10	13 May	Lecture 19: Anaerobic carbohydrate metabolism (utilisation of sugars) Lecture 20: Biosynthesis of disaccharides & polysaccharides	Tutorial 9	
11	20 May	Lectures 21: Pentose phosphate pathway Lectures 22: Citric acid cycle	Tutorial 10	
12	27 May	Lecture 23: Electron Transport Chain Lecture 24: Integration of carbohydrate & lipid metabolism	Tutorial 11	Tutorial Assignment 2
13	3 Jun	Revision Lecture		Quiz 2
Examination Period				
Examination Period				

ASSESSMENTS

This course has 3 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Exam	Formal Exam Period	Individual	50%	1, 2, 3, 4
2	Quizzes - On-line	Quiz 1: 5pm Friday 3 rd May, 2024 Quiz 2: 5pm Friday 7 th June, 2024	Individual	20%	1, 2, 3, 4
3	Tutorial contribution assignments	Tutorial Assignment 1: 5pm Friday 12th April, 2024 Tutorial Assignment 2: 5pm Friday 31st May, 2024	Individual	30%	1, 2, 3, 4

Late Submissions

The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Exam

Assessment Type	Formal Examination
Description	This assessment is a Compulsory Course Component and will test all topics of the course.
Weighting	50%
Due Date	Formal Exam Period
Submission Method	Formal Exam
Assessment Criteria	The final formal examination is designed to test the individual student's knowledge of the course material and their ability to describe, analyse and hypothesise from this material. Marks are awarded in accordance with Table 1 from the Grading Scales in the 2014 Course Management and Assessment Procedure Manual (Policy 000996) at http://www.newcastle.edu.au/policy/000996.html
Return Method	Not Returned
Feedback Provided	No Feedback
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 2 - Quizzes - On-line

Assessment Type	Quiz
Description	The online quizzes test the content covered in the preceding weeks.
Weighting	20%
Due Date	Quiz 1: 5pm Friday 3 rd May, 2024 Quiz 2: 5pm Friday 7 th June, 2024
Submission Method	Online
Assessment Criteria	The purpose and benefit of the online quizzes is to provide the students with feedback on student learning. These quizzes focus on the key learning objectives and the outcomes will be discussed in tutorials.
Return Method	Not Returned
Feedback Provided	Online - Correct answers will be provided after the quiz is completed.
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 3 - Tutorial contribution assignments

Assessment Type	Report
Description	These assignments test the content covered in the preceding weeks.
Weighting	30%
Due Date	Tutorial Assignment 1: 5pm Friday 12th April, 2024 Tutorial Assignment 2: 5pm Friday 31st May, 2024
Submission Method	Online Assessments to be electronically through Turnitin along with a signed coversheet (scanned or attached)
Assessment Criteria	These written assessments meet the course objectives of knowledge acquisition and demonstrated assimilation of data, upon reflection and analysis, to produce articulate and concise documents which convey evidence-based understanding of the concepts and topics.
Return Method	Online
Feedback Provided	Online - Within 15 working days from submission.
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.

Students are advised to regularly login to Canvas and check their NUmil student email account.

Course Evaluation	Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.
Oral Interviews (Vivas)	As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the Oral Examination (viva) Procedure . In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the Student Conduct Rule .
Academic Misconduct	All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to https://policies.newcastle.edu.au/document/view-current.php?id=35 .
Adverse Circumstances	<p>The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:</p> <ol style="list-style-type: none">1. the assessment item is a major assessment item; or2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;3. you are requesting a change of placement; or4. the course has a compulsory attendance requirement. <p>Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at: https://policies.newcastle.edu.au/document/view-current.php?id=236</p>
Important Policy Information	<p>The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures that support a safe and respectful environment at the University.</p>
Other Information	If you are registered with AccessAbility and have been provided with a Reasonable Adjustment Plan (RAP), please ensure that you provide your Course Coordinator with a copy as soon as you can, or let your Course Coordinator know that you are still waiting for your RAP.

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.

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