UNSW SYDNEY

COURSE OUTLINE

FACULTY OF SCIENCE

SCHOOL OF BIOTECHNOLOGY AND BIOMOLECULAR SCIENCES

BABS3121

Molecular Biology of Nucleic Acids

Term 1, 2020

Contents

1. Course Information

NB: some of this information is available on the UNSW handbook[1].

Year of Delivery	2020
Course Code	BABS3121
Course Name	Molecular Biology of Nucleic Acids
Academic Unit	School of Biotechnology and Biomolecular Sciences
Level of Course	3rd year undergraduate
Units of Credit	6
Term(s) Offered	T1
Assumed Knowledge, Prerequisites or Co-requisites	Prerequisites: BIOC2201, BIOC2101 or BABS2204 or BABS2264 or BABS2202 or MICR2011
Hours per Week	7
Number of Weeks	10 weeks
Commencement Date	Monday 17th February 2020 (Week 1)

Summary of Course Structure (for details, see 'Course Schedule and Structure')

Component	Hours/week	Time	Day	Location
Lectures (Weeks 1-10)	3			
Lecture 1		3 – 4 pm	Monday	Central Lecture Block 2
Lecture 2		12 – 1 pm	Tuesday	Colombo Theatre B
Lecture 3		10 – 11 am	Wednesday	Central Lecture Block 2
Laboratory (Weeks 2-9)	4			
Laboratory – Option 1		9 am – 1 pm	Thursday	D26 Teaching Lab 10
Laboratory – Option 2		2 – 6 pm	Thursday	D26 Teaching Lab 10
Special details	Any students with special requirements resulting from a disability should consult the course convenor by Week 2 of Term 1 so that the appropriate resources can be provided. Please refer to the detailed Course Schedule of this manual for allocation of wet lab practicals in Weeks 2-9.			

[1] https://www.handbook.unsw.edu.au/undergraduate/courses/2020/BABS3121/

2. Course Details

Course Description[2]	The syllabus comprises a detailed analysis of gene structure and function which includes: structure and properties of polynucleotides such as DNA and RNA; structure of chromatin; mechanisms and regulation of gene replication, transcription and translation, DNA repair and the molecular biology of cancer induction; recombinant DNA technology; nucleic acid sequencing, recombinant DNA technology, application of genomics and proteomics, microarray analyses; protein production using recombinant DNA systems. Practical work provides extensive experience with contemporary molecular techniques; literature surveys and web-based research are also used to enhance the theoretical and practical aspects of the syllabus.
Course Aims[3]	The overall aim of the course is to provide a solid foundation in molecular techniques as well as an introduction to informatics-based methods from which students can pursue future work in industry or academia (including Honours projects). This course complements and supports other BABS courses. Weekly practical sessions provide exposure to procedures used in the routine manipulation and analysis of DNA and associated products (including RNA and proteins). **Aims**: • Create an environment for student engagement and motivation • Student application of their learning to real-life problems • Provide a solid foundation for further nucleic acid work • Promote UNSW graduate attributes including teamwork
Student Learning Outcomes (CLO)[4]	At the successful completion of this course you (the student) should be able to: 1. Perform experimental analysis of gene expression at the mRNA and protein level. This includes planning of laboratory work, recording observations and data, analysis and interpretation of results and the proper and safe use of laboratory equipment. 2. Apply theory and practical methods to the understanding of molecular biology and regulation of expression of genes as well as designing approaches for analysis of gene expression 3. Critically evaluate scientific literature relevant to molecular biology 4. Identify the features of quality writing and apply to their own scientific report and essay style writing

[2] http://timetable.unsw.edu.au/2020/BABS3121.html
[3] https://student.unsw.edu.au/course-outlines
[4] https://teaching.unsw.edu.au/learning-outcomes

2.1 Relationship between Course and Program Learning Outcomes and Assessments

For Program Learning Outcomes (PLO), please refer to:
https://www.handbook.unsw.edu.au/undergraduate/programs/2019/3970

Course Learning Outcome (CLO)	LO Statement	Program Learning Outcomes (PLO)	Related Tasks & Assessment
1	Perform experimental analysis of gene expression at the mRNA and protein level	1. Ethical, social and professional understanding 2. Teamwork, collaborative and management skills. 5. Research, enquiry and analytical thinking abilities	**Assessment 2:** Laboratory report & poster presentation **Laboratory Log Books** - planning of laboratory work, recording observations and data, analysis and interpretation of results and the proper and safe use of laboratory equipment
2	Apply theory and practical methods to the understanding of molecular biology and regulation of expression of genes as well as designing approaches for analysis of gene expression	2. Teamwork, collaborative and management skills 5. Research, enquiry and analytical thinking abilities 6. Capability and motivation for intellectual development	**Assessment 1:** Mid-term **Assessment 2:** Laboratory report & poster presentation **Assessment 3:** Final Exam
3	Critically evaluate scientific literature relevant to molecular biology	3. Information literacy including the ability to make appropriate and effective use of information 6. Capability and motivation for intellectual development	**Assessment 3:** Final Exam
4	Identify the features of quality writing and apply to their own scientific report and essay style writing	4. Effective and appropriate communication in both professional and social context 6. Capability and motivation for intellectual development	**Assessment 1:** Mid-term **Assessment 2:** Laboratory report & poster presentation **Assessment 3:** Final Exam

3. Staff

See below for course contact details for course convenors and lecturers.

Position	Name	Email	Consultation times & locations	Contact Details
Course Convenor	Dr Michael Janitz	m.janitz@unsw.edu.au	During laboratory sessions OR by appointment	9385 8608 E26 Room 3106
Lecturers	Prof. Merlin Crossley Prof. Marcel Dinger A/Prof. Vincent Murray A/Prof. Louise Lutze-Mann Dr Richard Edwards	m.crossley@unsw.edu.au m.dinger@unsw.edu.au v.murray@unsw.edu.au l.lutze-mann@unsw.edu.au richard.edwards@unsw.edu.au		
Technical Staff & Demonstrators	Dr Elessa Marendy Lana Ly Manan Shah Sarah Topfer Henry Bell Emily Vohralik Annalise Psaila Ryan Separovich Ashton Curry-Hyde Dr Gabriella Martyn		During laboratory sessions	

4. Strategies and Approaches to Learning

Learning and Teaching Activities	Throughout the course, students are encouraged to develop problem-solving skills and to critically evaluate concepts, ideas and research results by participating in all face-to-face activities such as lectures and practical classes. Also, online learning materials will be made available to further assist students' learning. Lectures serve to emphasize certain principles covered in the text, provide an overview and connect the individual components of the course. They may also cover current ideas and research. The lectures provide a guide to the material need to cover for the course. Most lectures will closely follow the textbook or there will be resource material identified. However, students are encouraged to extend their knowledge by reading from a variety of sources. Lecture notes and recordings are also available online. Laboratory based experimentation is an essential part of modern science. The practicals in this course are designed for students to learn and enhance their lab techniques and are designed to complement the lecture series.

5. Course Schedule and Structure

Relationship to Other Courses within the Program	This course syllabus builds on students' prior knowledge and skills gained in coursework offered by the School of BABS, in particular 'Principles of Molecular Biology (Advanced) (BIOC2201). The course is also highly recommended for students wishing to pursue an Honours project within the School of BABS in genetics, molecular and cell biology and microbiology.

5.1 Course Timetable

Week (Start)	Lecture date and venue Topic and Lecturers	Practical Lab 10 Thu 9am OR 2pm	Assessment & submission dates
1 (17/2)	**Mon 17 Feb, 3-4 pm CLB 2:** Course Introduction (MJ) **Tue 18 Feb, 12-1 pm Colombo Th B:** Basic Techniques 1 (MJ) **Wed 19 Feb, 10-11 am CLB 2:** Basic Techniques 2 (MJ)		Complete BABS Health & Safety Quiz (100%) via Moodle BEFORE your Week 2 lab
2 (24/2)	**Mon 24 Feb, 3-4 pm CLB 2:** Transcription/Control of Gene Expression 1 (MC) **Tue 25 Feb, 12-1 pm Colombo Th B:** Viral Vectors/Critiquing Research Articles/Good writing 1 (MJ/LLM) **Wed 26 Feb, 10-11 am CLB 2:** Viral Vectors/Critiquing Research Articles/Good writing 2 (MJ/LLM)	**Thu 27 Feb: GFP Plasmid Expression Analysis** (day 1)	
3 (2/3)	**Mon 2 Mar, 3-4 pm CLB 2:** Transcription/Control of Gene Expression 2 (MC) **Tue 3 Mar, 12-1 pm Colombo Th B:** Transcription/Control of Gene Expression 3 (MC) **Wed 4 Mar, 10-11 am CLB 2:** Transcription/Control of Gene Expression 4 (MC)	**Thu 5 Mar: GFP Plasmid Expression Analysis** (day 2)	
4 (9/3)	**Mon 9 Mar, 3-4 pm CLB 2:** Basic Techniques 3 (MJ) **Tue 10 Mar:** NO LECTURE (prepare for Mid-term exam) **Wed 11 Mar, 10-11 am CLB 2:** MID-TERM EXAM	**Thu 12 Mar: GFP Plasmid Expression Analysis** (day 3)	**Wed 11 Mar, 10-11am, CLB 2:** **Mid-term exam**
5 (16/3)	**Mon 16 Mar, 3-4 pm CLB 2:** The Transcriptome 1 (RE) **Tue 17 Mar, 12-1 pm Colombo Th B:** The Transcriptome 2 (RE) **Wed 18 Mar, 10-11 am CLB 2:** The Transcriptome 3 (RE)	**Thu 19 Mar:** Synthesis of CRISPR/Cas9 guides (day 1)	
6 (23/3)	**Mon 23 Mar, 3-4 pm CLB 2:** The Transcriptome 4 (RE) **Tue 24 Mar, 12-1 pm Colombo Th B:** RNA Biology (ncRNA) (MJ) **Wed 25 Mar, 10-11 am CLB 2:** Primer design/Microarray background (MJ)	**Thu 26 Mar:** Synthesis of CRISPR/Cas9 guides (day 2)	
7 (30/3)	**Mon 30 Mar, 3-4 pm CLB 2:** Clinical Genomics 1 (MD) **Tue 31 Mar, 12-1 pm Colombo Th B:** Clinical Genomics 2 (MD) **Wed 1 Apr, 10-11 am CLB 2:** Replication, Repair & Cancer 1 (LLM)	**Thu 2 Apr: Microarray** (day 1)	
8 (6/4)	**Mon 6 Apr, 3-4 pm, CLB 2:** Replication, Repair & Cancer 2 (LLM) **Tue 7 Apr, 12-1 pm Colombo Th B:** Replication, Repair & Cancer 3 (LLM) **Wed 8 Apr, 10-11 am CLB 2:** Replication, Repair & Cancer 4 (LLM)	**Thu 9 Apr: Microarray** (day 2)	
9 (13/4)	**Mon 13 Apr:** NO LECTURE (Easter Monday public holiday) **Tue 14 Apr, 12-1 pm Colombo Th B:** DNA Structure/damage 1 (VM) **Wed 15 Apr, 10-11 am CLB 2:** DNA Structure/damage 2 (VM)	**Thu 16 Apr: Microarray** (day 3)	
10 (20/4)	**Mon 13 Apr, 3-4 pm, CLB 2:** Future Applications (MJ) / Wrap up & final exam info **Tue 14 Apr:** NO LECTURE **Wed 15 Apr:** NO LECTURE	**Thu 23 Apr: Microarray** (day 4)	**Thu 23 Apr:** **Poster presentations**

Note: This course consists of 7 contact hours per weeks. You are expected to take an additional 7 hours of non-class contact hours to complete assessments, readings and exam preparation. Practicals in bold type (**GFP plasmid** and the **Microarray** practicals) are assessable. **MJ** – Michael Janitz; **LLM** – Louise Lutze-Mann; **MC** – Merlin Crossley; **RE** – Richard Edwards; **MD** – Marcel Dinger; **VM** – Vincent Murray.

5.2 Lecture Summaries

Background on Molecular Biology **(3 lectures – MJ)**	**References**: ▪ Course textbook ▪ BIOC2201 lectures ▪ BABS3121 Lab Manual notes (Appendices) in OneNote i) **Theoretical background to laboratory techniques used in practical work** - DNA cloning, PCR and its variations, vectors ii) **Primary, secondary and tertiary structure of DNA** - The interaction of proteins with DNA, the basis for the sequence-specific recognition of DNA by proteins, hybridisation iii) **Chromatin structure** - The structure of the nucleosome, the effect of chromatin structure on the control of gene expression iv) **The organisation of genes in humans** - Repetitive sequences, important elements in chromosomes
Viral Vectors / Critiquing Research Articles / Good Writing **(2 lectures – LLM/MJ)**	• Inverted lecture in which groups discuss recent examples of gene therapy and the viral vectors used. The groups will then report to the whole class (with peer review).
Transcription and the Control of Gene Expression **(4 lectures – MC)**	**References**: ▪ Alberts *et al., Molecular Biology of the Cell*, 5th ed. Portions of Chapters: 4, 5 & 7 i) **How genes are turned on and off at the transcriptional level** a. How DNA-binding proteins controls RNA polymerase binding b. How DNA-binding proteins were discovered c. How they find their target genes d. How they turn genes on or off e. How is this regulation maintained for long periods ii) **Regulatory proteins** a. How were DNA-binding proteins and their genes identified b. What can be done with these genes c. How have things changed in the post-genomic era iii) **Mechanism of action of regulatory proteins** a. What we have learned about DNA-binding from studying transcription factors b. What have we discovered about activation and repression domains c. What functional domains actually do and how this leads to epigenetics iv) **Transcription factors in development** a. Loss of function experiments b. Gain of function experiments c. Analysis using genomic techniques
The Transcriptome **(4 lectures – RE)**	**References** ▪ Alberts *et al., Molecular Biology of the Cell*, 5th ed. Portions of Chapters 7 i) **Transcriptomics** a. What is transcriptomics? b. Differential expression c. DNA microarrays d. Single cell arrays e. Sequence-based transcriptomics f. Gene Expression qPCR g. RNA-Seq **ii) Differential gene expression** a. Clustering samples by gene expression b. Identifying differentially expressed genes c. Normalising gene expression

RNA Biology **(1 lecture – MJ)**	i) **Translation** a. Ribosomal RNA (rRNA) and snoRNAs b. Transfer RNA (tRNA) ii) **nRNA processing and splicing** a. Heterogenous nuclear RNAs (hnRNAs) b. Intron splicing iii) **Post-translational gene silencing** a. Catalytic ncRNAs (Ribozymes) b. RNA interference (RNAi) iv) **RNA directed transcriptional gene silencing** v) **lncRNA, sncRNAs and piRNA**
Primer Design / Microarray background **(1 lecture – MJ)**	• Principles of primer design for PCR applications • Principles of microarray technology • Application of microarray technology for genome-wide gene expression profiling
Clinical Genomics **(2 lectures – MD)**	TBA
Replication, Repair and Cancer **(4 lectures – LLM)**	**References** ▪ Watson *et al., Molecular Biology of the Gene*, 5th ed., Chapters 8 and 9 ▪ Alberts *et al., Molecular Biology of the Cell*, 5th ed., Chapter 5, pages 263-316; Chapter 20, pages 1205-18 and 1230-40 i) **DNA replication mechanisms, including initiation and completion of replication** - The proteins and enzymes involved in replication - Comparison of prokaryotic and eukaryotic DNA replication systems - The replicon model of replication initiation - Initiation of replication and its control in the cell cycle, replication of telomeres. ii) **DNA repair** - Replication errors and their repair - DNA damage and its repair - Excision repair - Recombinational repair - Repair deficiencies iii) **Cancer** - The role that DNA damage, carcinogens, somatic mutations, epigenetic changes and genetic instability play in the induction and progression of cancer - The techniques employed to identify cancer-causing genes, including cancer genomics
DNA Structure / Damage **(2 lectures – VM)**	i) DNA-structure and properties of DNA ii) Anti-tumour drugs that affect cell division iii) Methods to assess drug-DNA damage iv) DNA sequencing techniques to analyse drug-DNA damage v) Next-generation DNA sequencing techniques to analyse drug-DNA damage
Future Direction in Nucleic Acids and Molecular Techniques / Course Debrief and the Final Exam **(1 lecture – MJ)**	• BABS3281 Molecular Frontiers • BABS3301 Biomolecular Science Laboratory Project (Advanced) • BABS3291 Genes, Genomes and Evolution • BIOC3271 Molecular Cell Biology 2 • BIOC3271 Molecular Cell Biology 2 (Advanced)

5.3 Practicals

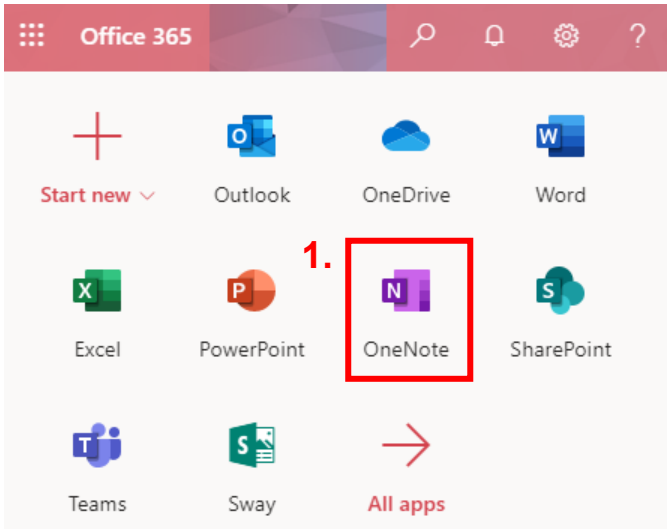
Details of the practicals are outlined in the Electronic Notebook for practical work which is supported in OneNote.

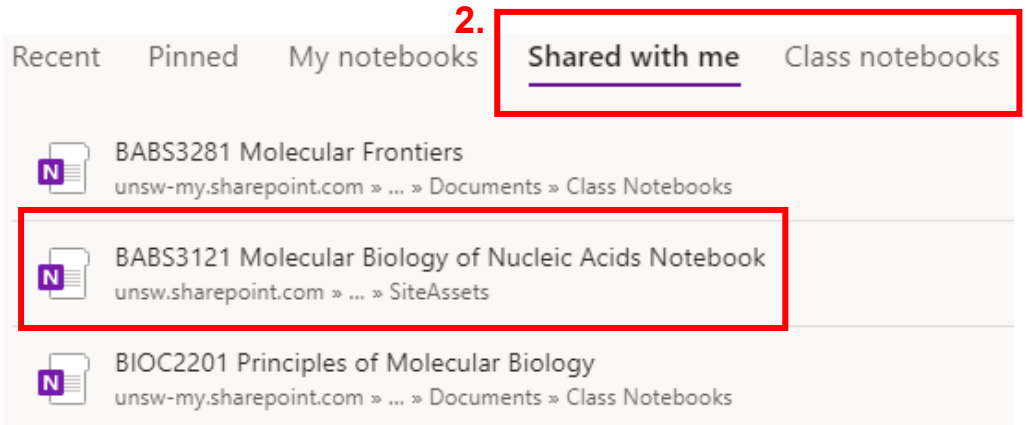
For this course, we require students to record their results and observations in an Electronic Notebook. Using an electronic/online lab notebook allows you to record your results, upload results/images etc without having to bring paper notebooks into the lab and take out of the lab at the end of the session. One critical feature of OneNote is that any edits are tracked (with date/time/identity). OneNote is part of Office365 (all UNSW staff and students have access) and therefore uses/integrates the MS Office suite (Word, Excel, PowerPoint). We assume that students have installed and are familiar with using the MS Office365.

When you are given access to the Notebook "BABS3121 (Molecular Biology of Nucleic Acids)" you will receive an email on your UNSW email. Students can find all new class notebooks on their OneDrive for Business inside the **Shared with me** folder.

After logging into your UNSW zmail, you will be taken to the Microsoft Office Home:

1. Click on OneNote
2. Click on "Shared with me" or "Class notebooks
3. Click on "BABS3121 Molecular Biology of Nucleic Acids Notebook"





6. Assessment

6.1 Assessment Tasks

Assessment Task		Format & Submission Methods	%	Due date
BABS Health & Safety Quiz COMPULSORY: Assess knowledge of safe working practices and procedures in BABS teaching laboratories		Online formats accessed via Moodle. Students only need to complete this quiz once for all BABS courses. Must be completed with 100% correct answers BEFORE your week 2 laboratory class.	-	Thu 27 February (Week 2 practical)
Assessment 1: Mid-term exam (45 minutes)		45-minute written exam held during lecture time (10-11am, 11th March, CLB 2). The exam will cover lectures 1-10, inclusive.	30	10-11am, Wed 11 March, CLB 2 (Week 4 lecture)
Assessment 2: Practical work	**GFP Plasmid Scientific Report**	Written laboratory report based on the Weeks 2-4 practicals	20	Fri 20 March (Week 5)
	Microarray Poster Presentation	Students work together in pairs to prepare and present a poster during the Week 10 laboratory time.	20	Thu 23 April (during Week 10 practical)
Assessment 3: Final Written Exam		The exam will cover lectures 11-25 inclusive.	30	Exam period (TBA)
		TOTAL	100	

6.1.1 Assessment 2: Practical Work

GFP Plasmid Report	The **GFP plasmid sequence and expression analysis experiment** requires a written assessment to be submitted. Written reports should follow the usual format of Introduction, Methods, Results and Discussion. In most cases 'Methods' can be covered simply by saying 'as described in the practical notes', and then listing any significant variations. Marks will mainly be awarded for clear presentation of results, with the inclusion of sample calculations where appropriate. The discussion should include an interpretation of the results, and your assessment of whether the results are reliable. If the experiment failed to yield the expected result the possible reasons for this should be discussed along with assumptions that have been made in interpreting the results etc. In general, the reports that score the highest marks will be those that are clear, complete and concise. (You shouldn't take the time to write too many pages and we don't have the time to read them!).
Microarray Poster Presentation	The **Microarray** laboratory practical results will be presented as a poster during the practical session in Week 10 (Thursday practical time). See details in OneNote.
Recording of Experimental Results	In addition to the written reports, all students should equip themselves with a laptop or borrow one of the SurfacePros to access OneNote in which to record details of experiments as they are carried out and to record results as they are obtained. This Electronic Notebook should also be used to record information provided by the demonstrators in talks introducing experiments or as experiments progress, to write answers to questions asked in the practical notes and to keep a record of experiments run as demonstrations.
Occupational Health and Safety – Online Quiz	OH&S issues are covered later in separate sections however, all students doing a BABS course are required to complete (and score 100% in) the BABS Health and Safety Quiz which is embedded in the Practicals Section of Moodle course for each of the BABS courses. This only needs to be completed once per year for all BABS courses. You will need to bring a copy of the final screen (showing the score) to get into the lab for each course for the first time each session.
Further Information	UNSW grading system: https://student.unsw.edu.au/grades UNSW assessment policy: https://student.unsw.edu.au/assessment

6.2 Assessment Criteria and Standards

6.2.1 GFP Plasmid Report Marking Guide

GFP Plasmid report (worth 20% of final course mark)	
Introduction (15%)	○ Background and aims of the experiment (half a page)
Materials and Methods (10%)	○ Materials and Methods can be covered by writing 'as described in the lab manual', and then listing any significant variations ○ Use a diagram to show the experimental procedure (don't copy from the lab manual)
Results (35%)	*Protein Gels:* ○ Correctly label and annotated protein gel photos from days 1 and 2 showing any fluorescence under UV illumination and the Coomassie staining under white light. ○ What was the estimated molecular weight of the GFP protein (heat-treated and non-heat treated)? ○ What was the effect of adding arabinose? ○ What effect did heating have on the GFP protein (apparent size, function)? ○ What was the fold increase in the amount of GFP protein (comparing uninduced (and/or non-transfected), semi-induced and induced)? (you might do this by eye, but it is better to try ImageJ to quantify the densitometry of the band in the image)? ○ Was there GFP protein without arabinose induction? ○ Was the GFP protein in the absence of the pGLO plasmid? *RT-qPCR:* ○ How much RNA was isolated from each clone (i.e. cultures of. *E. coli* transfected with pGLO-GFP)? ○ How much cDNA? ○ Show the working (ΔΔCt) for estimating fold induction of GFP mRNA expression (comparing uninduced (and/or non-transfected), semi-induced and induced) ○ Questions for consideration: • Was there GFP mRNA without arabinose induction? • Was there GFP mRNA in the absence of the pGLO plasmid? • What is the purpose of performing qRT-PCR on samples that have not been reverse transcribed? • Why do we also have the water (no-template) controls?
Discussion (35%)	○ Why was ampicillin and arabinose added to the transfection plates? ○ Did the heat treatment affect the apparent molecular weight of the GFP protein? ○ Does the induction of mRNA expression correlate with the amount of GFP protein? ○ Was there GFP expression in the absence of arabinose induction? What does this say about the inducible promoter?
References (5%)	○ Cite literature and tools used in the report

6.2.2 Microarray Poster Presentations Marking Guide

Poster Section (worth 20% of final course mark)	
Introduction (/3)	○ Is the background to the practical clear? ○ What approach is being taken? ○ Are the aims stated?
Methods (/1)	○ Can you understand the experimental approach? ○ Can you understand how you would do RT-PCR from the methods given?
Results (/5)	○ Are the results clearly presented? ○ Are all the necessary results included? ○ Are any changes in the procedure/problems with the procedure identified? ○ Are the figures labelled? ○ Did the experiment work? Can you tell from the presentation?
Conclusions (/5)	○ Are the conclusions clearly stated? ○ Are they logical and in agreement with the results? ○ Discussion of the changes in gene expression for the MB-175 cells? ○ For the SK-BR-III cells? ○ Are the limitations of the experiment mentioned?
Presentation (/2)	○ Is the poster well-presented? ○ Is it clearly laid out and easy to follow?
Understanding (/4)	○ Can the presenter give clear answers on technique? ○ Do they understand why each step was included? ○ Do they understand the microarray procedure? ○ Can they explain the changes in gene expression observed?
Total (/20)	

6.2.3 Assessments 1, 2 and 3: Expectation of writing quality

Written assessments and presentations will be assessed according to Biggs's SOLO taxonomy. Biggs's SOLO approach to learning has 5 types of response to the assessment and these will be applied to the scientific report and the written exams.

The figure below gives an idea of what is required to achieve different types of grade:

	SOLO Type of Response	Mark region	Grade Type
I	Prestructural	<40	F
II	Unistructural	40-50	F – P
III	Multistructural	51-64	P
IV	Relational	65-80	C – D
V	Extended Abstract	81-100	D – HD

An answer that relies upon information provided during the lectures and simply 'regurgitates' this information will at most be awarded a mark of 40-50, i.e. a '**unistructural'** response. The student has failed to demonstrate adequately a firm understanding of the principles and their application as required in the examination question. An incorrect answer, where it appears the student is unclear of the principles is more likely to be considered as a '**prestructural'** answer and will result in a mark of less than 40.

A correct answer using information provided during the lecture corresponds to a '**multistructural'** response. The answer suggests an understanding of the principles and limited information to support the answer. In contrast, a correct answer using lecture information, but supported by strategic references would demonstrate a firm understanding of the principles and the use of information to explain the concepts and applications. This is considered as a '**relational'** response. The best answer possible will not only demonstrate a firm understanding of the principles and their applications, but also the implications in the wider context of the field, as they relate to the question, i.e. '**extended abstract'.**

The best way to demonstrate and 'extended abstract' answer is to include relevant information you have read from scientific journals/sources.

6.3 Assessment Submission and Feedback

Submission of Assessment Tasks	If assessment tasks are not completed, then they will receive a mark of zero. In the case that they are submitted late, without acceptable special consideration application, then they will be accepted but panelised up to 10% per day they are late. Electronic submissions will be through TurnItIn. In the case of electronic submission, no paper versions will need to be submitted.
Assessment Feedback	**Assessment 1**: Mid-term exam • Marks will be reported back to students via Moodle on 27 March. **Assessment 2**: Practical work • **GFP Plasmid report**: demonstrators will mark and provide written feedback on the reports. The marks will be checked by the coordinators and the marked reports returned electronically via Moodle on 3 April. • **Microarray poster presentations**: peer and academic marker feedback during the poster presentation. Marks will be collated and reported on 1 May. **Assessment 4**: Final exam • No feedback, the course marks will be reported back to students by The University after the end of term exam period.

7. Additional Resources and Support

Textbooks	Alberts *et al.*, *Molecular Biology of the Cell,* 6th ed. (Garland, 2014) – Molecular Cell focus **OR** Watson *et al., Molecular Biology of the Gene*, 7th ed. (Benjamin Cummings, 2013) – Molecular genetics focus
Course Manual	A soft copy will be posted on Moodle and OneNote.
Viral Vectors in Gene Therapy Readings	**Overview**: Emerging Platform Bioprocesses for Viral Vectors and Gene Therapies (http://www.bioprocessintl.com/2016/emerging-platform-bioprocesses-for-viral-vectors-and-gene-therapies/ Gene therapies development: slow progress and promising prospect (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5328344/)

Viral Vector Gene Therapy Case Studies	1. Degenerative eye disease (choroideremia) gene therapy • See report in New Scientist (http://www.newscientist.com/article/dn24879-gene-therapy-restores-sight-in-people-with-eye-disease.html#.UzpP1v6KC70) • Original Lancet journal article available on Moodle 2. Monkey colour vision (dichromatic → trichromatic, male polymorphism) • See report in Nature News (http://www.nature.com/news/2009/090916/full/news.2009.921.html) • Original Nature Article (*Katherine Mancuso, et al.* Nature, *Vol. 461, No. 7261, September 16, 2009.)* available on Moodle
Resources	**The Learning Centre** - http://www.lc.unsw.edu.au **Essay and Assignment Writing** - https://student.unsw.edu.au/essay-and-assignment-writing **Exam Preparation Tips** - https://student.unsw.edu.au/exam-preparation

8. Required Equipment, Training and Enabling Skills

Equipment Required	Personal protection equipment (PPE) such as safety glasses and a lab coat will be required for all practical work.
Enabling Skills, Training Required to Complete this Course	It is expected that all students will have had basic Health & Safety training and completed a safety quiz on Moodle prior to the Week 2 practical.

9. Administration Matters

Expectations of Students	Students are expected to attend all lectures and practical classes. Attendance records will be kept in practical classes. Attendance at less than 80% of classes may result in the grade of UF. Students are expected to maintain an accurate record of their laboratory work in a Laboratory Notebook. This is generally in an electronic or online form like OneNote. Laboratory demonstrators will check and provide feedback on the students records in the Laboratory Notebook. Students are expected to consult the course Moodle site on at least a weekly basis. **Protocols governing email, social networks and discussion forums.** Social networks (i.e. Facebook, Twitter etc) will not be used to share class materials and a way to contact academics including demonstrators/tutors involved in this course. If students have course-related questions, they are encouraged to use discussion forums on the course's Moodle website. These are monitored regularly. If more help is needed, students may send enquiries or requests for appointments from their UNSW email. When sending an email to the course coordinator, a student must state their name, student number and the course in which they are enrolled.
Assignment Submissions	If assessment tasks are not completed, then they will receive a mark of zero. In the case that they are submitted late, without acceptable special consideration application, then they will be accepted but panelised up to 10% per day they are late. If medical grounds preclude submission of a report by the due date, contact should be made with the course authority as soon as possible. Electronic submissions will be through TurnItIn. In the case of electronic submission, no paper versions will need to be submitted.

<table>
<tr><td>Occupational Health and Safety[5]</td><td colspan="4">Biochemical laboratories contain apparatus and chemicals that are potentially dangers 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 Occupational Health & Safety (Hazardous Substances) Regulation 1996, NSW Draft OHS Regulation 2000, and the NSW Workcover Publications and Worksafe National Codes of Practice and Guidance Notes. These policies apply to all university staff and students.

Students are responsible for:

• Complying with the requirements for 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

ALL ACCIDENTS WITH CHEMICAL OR INJURIES MUST BE REPORTED IMMEDIATELY TO YOUR DEMONSTRATOR OR TO A MEMBER OF THE PREPARATION/TECHNICAL STAFF.</td></tr>
<tr><td>Assessment Procedures

UNSW Assessment Policy[6]</td><td colspan="4">Please refer to the specific assessment outline in section 6.</td></tr>
<tr><td>Equity and Diversity</td><td colspan="4">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 (9385 4734 or http://www.studentequity.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.</td></tr>
<tr><td rowspan="2">Administrative and Support Matters

Student Complaint Procedure[7]</td><td>School Contact</td><td>Faculty Contact</td><td>Academic Disability</td><td>Bioscience Student Office</td></tr>
<tr><td>Dr Anne Galea
Acting Director of Teaching

a.galea@unsw.edu.au
Tel: +61 2 9385 8156</td><td>Dr Gavin Edwards
Associate Dean (Academic Programs)

g.edwards@unsw.edu.au
Tel: +61 2 9385 4652</td><td>Dr John Wilson
Science Academic Disability Adviser and School “At risk student” Support

j.e.wilson@unsw.edu.au
Tel: +61 2 9385</td><td>Ms Julna Zhao
Student Advisor (BABS)

unsw.to/webforms
Tel: +61 (2) 9385 8047</td></tr>
<tr><td>Additional Support for Students</td><td colspan="4">• The Current Students Gateway: https://student.unsw.edu.au/
• Academic Skills and Support: https://student.unsw.edu.au/academic-skills
• Student Wellbeing, Health and Safety: https://student.unsw.edu.au/wellbeing
• Disability Support Services: https://student.unsw.edu.au/disability-services
• UNSW IT Service Centre: https://www.myit.unsw.edu.au/</td></tr>
</table>

[5] https://safety.unsw.edu.au/staff-student-resources/students
[6] https://www.gs.unsw.edu.au/policy/assessmentpolicy.html
[7] https://student.unsw.edu.au/complaint

10. UNSW Academic Integrity, Referencing and Plagiarism

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: https://student.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

Referencing

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits**:** honesty, trust, fairness, respect, responsibility and courage.[8] At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity and **plagiarism** can be located at:

- The Current Students site https://student.unsw.edu.au/plagiarism, and
- The ELISE information site https://subjectguides.library.unsw.edu.au/elise/faq

The Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct.

11. Special Consideration and Supplementary Exams

Students who believe that their performance, either during the session 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 compulsory class absences such as (laboratories and tutorials), in-session assessments 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.

You must obtain and attach Third Party documentation before submitting the application. Failure to do so may result in the application being rejected.

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

[8] International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.

11.1 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 in order to ascertain whether or not they have been granted further assessment.

11.2 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 1, 2020 is:

TBA

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. 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.

See here for more details on special consideration (https://student.unsw.edu.au/special-consideration).