

BIOLOGY 146

Module Layout and Study Guide

2020

FOR ONLINE LEARNING DUE TO COVID-19

For BSc (EDP) Students

Presented by the Department of Botany & Zoology

2nd Semester, 16 Credits

Instructor Information

Module Coordinator and Lecturer:

Dr. Marnel Mouton

marnel@sun.ac.za

Natural Science Building, 2022

Admin and Inquiries:

Me. F. Gordon

fgl@sun.ac.za

Natural Science Building, 3056

General Information

Expectations and Outcomes

By the end of this module students will be familiar with a range of principles and concepts in biology, including:

- Life: Domains and Kingdoms/Groups
- The chemical basis of life
- Biological molecules
 - Carbohydrates
 - Lipids
 - Proteins
 - Nucleic Acids
 - Replication
 - Transcription
 - Translation
- Biological membranes: Structure and transport
- Cell structure and function in pro- and eukaryotes, and plant and animal cells
- Mendel, genes and inheritance
- Vertebrate phylogeny

Online Lectures

Online learning schedule.

WEEK	DATES	THEME	CONTENT	ASSESSMENT
1	27 July – 2 Aug	Introduction (Chapter 1)	Introduction: Biological Concepts	A4 Poster: The domains and kingdoms of Life on Earth
2	3-9 Aug	Water (Chapter 2) Biological molecules (Chapter 3)	Water: Basis of Life Biological molecules: Carbohydrates	Water Pics Quiz #1
3	10-16 Aug	Biological molecules (Chapter 3)	Biological molecules: Lipids and Proteins	Quiz #2
4	17-23 Aug	Biological molecules (Chapter 3+14) DNA replication (Chapter 14)	Biological molecules: Nucleic Acids DNA replication	Test 1: 21 Aug
5	24-30 Aug	From DNA to protein: Transcription and Translation (Chapter 15)	Transcription Protein synthesis	Quiz #3
6	31 Aug – 6 Sept	Biological membranes (Chapter 5)	Structure of biological membranes Transport across biological membranes	Assignment: Drawing of a biological membrane
7	7-13 Sept	Biological membranes (Chapter 5)	Project 1: Power of Poison	Video due: Sun 13 Sept
	14-20 Sept	RECESS		
8	21-27 Sept	Cells (Chapter 4)	Introduction: Chapter 4 Prokaryotic cells Launch: Project 2	Microscopy 'prac'
9	28 Sept-4 Oct	Cells (Chapter 4)	Project 2: Craig who?	Due: Sun 4 Oct (SciComm 146)
10	5-11 Oct	Cells (Chapter 4)	ECM and Cell Junctions	Test 2: 8 Oct
11	12-18 Oct	Animal phylogeny and Vertebrate life (Chapter 27 and 29 in Openstax; Chapters 31 and 32 in Russell et al.)	Animal phylogeny and Vertebrate life	Quiz # 4
12	19-25 Oct	Vertebrate life (Chapter 29 in Openstax; Chapter 32 in Russell et al.32)	Vertebrate life	Fish dissection 'prac'
13	26-30 Oct	Mendel, genes and inheritance (Chapter 12)	Mendel, genes and inheritance	Quiz #5
				Test 3: 11 Nov

Assessment

Flexible assessment. Students need to complete ALL assessments which include:

- A series of **three online tests** (see table below), contributing to 75% of the final mark.
- Two **projects** (see table below).
- **Other online assessments.**

Main Test Assessments	Day	Date	Time	Duration
Semester Test 1	Friday	21 August 2020	To be announced	2 hours
Semester Test 2	Thursday	8 October 2020	To be announced	2 hours
Semester Test 3	Wednesday	11 November 2020	09:00	2 hours

Group Projects	Presentation Type	Due Date
Project 1: 'The Power of Poison'.	Video Presentation	13 September 2020
Project 2: 'Craig who?'	Written Report	4 October 2020 SciComm 146 23 October 2020 Biology

Composition of Test Papers

Papers will consist of multiple-choice questions and written questions. The portion of work covered by the test or exam will be announced prior to the test. It is the responsibility of the student to acquaint him/herself with the content and *time of each test*.

Medical Certificates & Leave of Absence

If a test, practical or deadline is missed by a student, a valid original medical certificate is required and has to be email to *Ms. Gordon* (fg1@sun.ac.za) within one week of the test or hand-in date. In the case of other unforeseen circumstances such as participation in provincial or national sporting events, we require a letter from the organization or sporting body involved. In these instances, granting of permission to miss tests or deadlines is at the lecturer's discretion, and *is not automatic*. A3 will serve as a sickness test at the end of the semester and will include content of the complete semester.

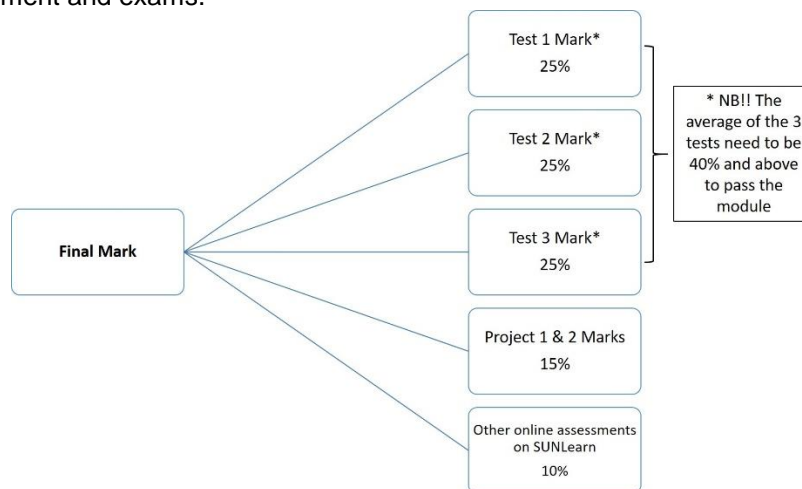
Calculation of Marks

The Final Mark (PP) of a student will consist of the marks you achieve in the three semester tests, a project mark (including two projects) and marks awarded for certain online assessments during the course of the semester. The exact weighting will be determined by the number of evaluations. If assignments are not handed in, a 0% mark will be awarded and if late, a reduced mark. **Please take note that both projects are compulsory assessments and failing to participate or submit in due time, will result in an 'incomplete'**

status, which means that such a student fails the module.

Please take note that *in order to pass this module a PP of at least 50% is needed, as well as an average of $\geq 40\%$ for the three semester tests (contributing to $\pm 65\%$ of the PP).*

Consult the examination section (p115) of the 2020 University Yearbook 1 (General) regarding other rules relevant to assessment and exams.



Course Materials

Required Textbook/s

- **Biology. The Dynamic Science.** Fifth Edition (2019). Eds. J. Russell, P.E. Hertz and B. McMillan.
- **Biology. Openstax College.** <http://openstaxcollege.org>.

Additional Learning Material

- All learning content is available on SUNLearn. Look for each week's content.
- The slides of the lectures represent only a **summary** and should be used as such.
- Additional material (videos and concept questions etc) will also be available on Sun Learn
- Check SunLearn regularly for updates.

Language implementation for this module

The Department of Botany and Zoology recognizes English as the international academic language and a medium through which science can be communicated. It is thus our endeavour to ensure that each and every one of our students are proficient to communicate through the medium of English. We will, however, accommodate our Afrikaans students to the best of our ability.

The following language option will be implemented in this biology module: Lectures will be offered in English and Afrikaans (separate classes). Voice over medium

The materials for learning will be made available as follows:

- Module frameworks/study guides will be available in Afrikaans and English.

- All compulsory reading material will be provided in English. Compulsory reading material (excluding published material) will also be provided in Afrikaans unless it is not reasonably practicable to do so.
- Question papers for tests, examinations and other summative assessments will be available in Afrikaans and English. Students may answer all assessments and submit all written work in either Afrikaans or English.

Summary of Course Content and Chapters

Russell et al. 2019 – 5th Edition

Chapter 1: Introduction to Biological Concepts p 1-23

1. What is life? p 2
2. Characteristics of living organisms p 2-7
3. Biological evolution p 7-10
4. Biodiversity and the Tree of Life p 10-14
5. Biological Research 14-23 Self-study.

Chapter 2: Life, Chemistry and Water p 24-42

1. Self study: p 24-34
2. Hydrogen bonds and the Properties of Water p 35-41

Chapter 3: Biological Molecules: The Carbon Compounds of Life p 43

1. Formation and Modification of Biological Molecules p 44-48
2. Carbohydrates p 48-51
3. Lipids p 52-56
4. Proteins p 56-64
5. Nucleotides and Nucleic Acids p 65-69

Chapter 4: The Cell: An Overview p 72

1. Basic Features of Cell Structure and Function p 73-78
2. Prokaryotic cells p 79-80
3. Eukaryotic cells p 80-102

Chapter 5: Membranes and Transport p 104

1. Membrane Structure and Function p 105-111
2. Functions of Membranes in Transport: Passive Transport p 111-116
3. Active Transport p 116-119
4. Exocytosis and Endocytosis p 119-121

Chapter 12: Mendel, Genes and Inheritance p 244

1. The beginnings of Genetics: Mendel's Garden Peas p 245-255

Chapter 14: DNA Structure and Replication p 290

1. DNA structure p 294-296 Self study
2. DNA Replication p 297-309

Chapter 15: From DNA to Protein p 312

1. The connection between DNA, RNA and Protein p 313-319
2. Transcription: DNA directed RNA synthesis p 319-320
3. Production of mRNA's in Eukaryotes p 320-324
4. Translation: mRNA-Directed Polypeptide Synthesis p324-333

Chapter 31: Animal Phylogeny p 682

1. What is an animal? p 683-685
2. Key Innovations in Animal Evolution p 685-687
3. An Overview of Animal Phylogeny and Classification p 687-690
4. Animals without Tissues: Parazoa p 690-691

Chapter 32: Deuterostomes: Vertebrates and their closest Relatives p 718

1. Invertebrate Deuterostomes p 719-722
2. Overview of the Phylum Chordata p 722-724
3. The Origin and Diversification of Vertebrates p 724-726
4. 'Agnathans' p 726-729
5. Gnathostomata: The evolution of Jaws p 729-734
6. Tetrapoda: The Evolution of Limbs p 734-737
7. Amniota: The Evolution of Fully Terrestrial Vertebrates p 737-739
8. Living Lepidosaurs: Shenodontis and Squamates p 739-741
9. Living Archelosaurs: Turtles, Crocodylians and Birds p 742-746
10. Mammalia: Monotreme, Marsupials and Placentals p 746-748

Russell et al. 2017 – 4th Edition

Chapter 1: Introduction to Biological Concepts p 1-23

6. What is life? p 2
7. Characteristics of living organisms p 2-7
8. Biological evolution p 7-9
9. Biodiversity and the Tree of Life p 9-14
10. Biological Research 14-23 Self-study.

Chapter 2: Life, Chemistry and Water p 24-43

3. Self study: p 24-34
4. Hydrogen bonds and the Properties of Water p 35-41

Chapter 3: Biological Molecules: The Carbon Compounds of Life p 44

6. Formation and Modification of Biological Molecules p 44-49
7. Carbohydrates p 49-52
8. Lipids p 52-56
9. Proteins p 57-64
10. Nucleotides and Nucleic Acids p 65-69

Chapter 4: The Cell: An Overview p 73

4. Basic Features of Cell Structure and Function p 74-78
5. Prokaryotic cells p 78-79

6. Eukaryotic cells p 79-100

Chapter 5: Membranes and Transport p 104

5. Membrane Structure and Function p 105-111
6. Functions of Membranes in Transport: Passive Transport p 111-116
7. Active Transport p 116-118
8. Exocytosis and Endocytosis p 119-122

Chapter 12: Mendel, Genes and Inheritance p 251

2. The beginnings of Genetics: Mendel's Garden Peas p 252-264

Chapter 14: DNA Structure and Replication p 300

3. DNA structure p 304-306 Self study
4. DNA Replication p 306-318

Chapter 15: From DNA to Protein p 323

5. The connection between DNA, RNA and Protein p 324-329
6. Transcription: DNA directed RNA synthesis p 329-331
7. Production of mRNA's in Eukaryotes p 331-336
8. Translation: mRNA-Directed Polypeptide Synthesis p336-345

Chapter 31: Animal Phylogeny p 706

5. What is an animal? p 707-708
6. Key Innovations in Animal Evolution p 708-711
7. An Overview of Animal Phylogeny and Classification p 711-713
8. Animals without Tissues: Parazoa p 713-714

Chapter 32: Deuterostomes: Vertebrates and their closest Relatives p 743

11. Invertebrate Deuterostomes p 744-746
12. Overview of the Phylum Chordata p 747-749
13. The Origin and Diversification of Vertebrates p 749-752
14. 'Agnathans' p 752-754
15. Gnathostomata: The evolution of Jaws p 754-759
16. Tetrapoda: The Evolution of Limbs p 759-762
17. Amniota: The Evolution of Fully Terrestrial Vertebrates p 762-764
18. Living Lepidosaurs: Shenodontis and Squamates p 764-766
19. Living Archelosaurs: Turtles, Crocodylians and Birds p 767-770
20. Mammalia: Monotreme, Marsupials and Placentals p 770-773

Russell et al. 2014 – 3rd Edition

Chapter 1: Introduction to Biological Concepts p 1-21

1. What is life? p 2
2. Characteristics of living organisms p 2-6
3. Biological evolution p 6-8

4. Biodiversity and the Tree of Life p 8-12
5. Biological Research 12-21 Self-study.

Chapter 2: Life, Chemistry and Water p 22-41

1. Self study: p 22-32.
2. Hydrogen bonds and the Properties of Water p 32-41

Chapter 3: Biological Molecules: The Carbon Compounds of Life p 42

1. Formation and Modification of Biological Molecules p 42-47
2. Carbohydrates p 47-50
3. Lipids p 50-55
4. Proteins p 55-63
5. Nucleotides and Nucleic Acids p 63-70

Chapter 4: Energy, Enzymes and Biological Reactions p 71

1. The role of enzymes in Biological Reaction p 78-81
2. RNA-based Biological Catalysts: Ribozymes p 85-86

Chapter 5: The Cell: An Overview p 90

1. Basic Features of Cell Structure and Function p 91-94
2. Prokaryotic cells p 95-97
3. Eukaryotic cells p 97-118

Chapter 6: Membranes and Transport p 119

1. Membrane Structure and Function p 120-126
2. Functions of Membranes in Transport: Passive Transport p 126-131
3. Active Transport p 131-134
4. Exocytosis and Endocytosis p 134-140

Chapter 12: Mendel, Genes and Inheritance p 239

1. The beginnings of Genetics: Mendel's Garden Peas p 240-251

Chapter 14: DNA Structure, Replication and Organization p 286

1. DNA structure p 290-293 Self study
2. DNA Replication p 293-303
3. DNA Organization in Eukaryotes and Prokaryotes p 304-309

Chapter 15: From DNA to Protein p 310

1. The connection between DNA, RNA and Protein p 311-317
2. Transcription: DNA directed RNA synthesis p 317-318
3. Production of mRNA's in Eukaryotes p 318-321
4. Translation: mRNA-Directed Polypeptide Synthesis p321-331

Chapter 31: Animal Phylogeny p 670

1. What is an animal? p 671-672
2. Key Innovations in Animal Evolution p 672-675

3. An Overview of Animal Phylogeny and Classification p 675-677
4. Animals without Tissues: Parazoa p 677-678

Chapter 32: Deuterostomes: Vertebrates and their closest Relatives p 706

1. Invertebrate Deuterostomes p 707-710
2. Overview of the Phylum Chordata p 710-712
3. The Origin and Diversification of Vertebrates p 712-715
4. 'Agnathans' p 715-716
5. Gnathostomata: The evolution of Jaws p 717-721
6. Tetrapoda: The Evolution of Limbs p 721-723
7. Amniota: The Evolution of Fully Terrestrial Vertebrates p 723-726
8. Testudines: Turtles p 726-727
9. Living Lepidosaurs: Shenodontis and Squamates p 727-728
10. Living Archosaurs: Crocodylians and Birds p 728-732
11. Mammalia: Monotreme, Marsupials and Placentals p 732-734