

BIOLOGY 146 Module Layout

2018

For BSc (EDP) Students
Presented by the Department of Botany & Zoology
2nd Semester, **16 Credits**

Instructor Information

**Module Coordinator and
Lecturer: Dr. Marnel Mouton**

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Natural Science Building, 2022

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General Information

Lectures and Practical Classes

3 lectures and 1 practical class (3h) per week:

| Lectures: Time and Venues | | Practicals: Time and Venue | |
|---------------------------|---------------------|----------------------------|----------------|
| Group 1: | | Mon 10h00 - 13h00 | NS 2025 |
| Tue 8h00 | NS 3005 | | |
| Wed 12h00 | NS 3005 | | |
| Thu 12h00 | NS 3005 | | |
| Group 3: | | | |
| Mon 8h00 | MathSci 2002 | | |
| Thu 09h00 | NS 2025 | | |
| Fri 14h00 | NS 2013 or | | |
| Fri 08h00 | NS 2013 | | |

Expectations and Outcomes

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

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

Assessment

Flexible assessment. Includes:

- **Test Marks:** A series of three tests (see table below), contributing to the largest portion of the final mark.
- **Class Marks:** Two group projects tests (see table below) + marks awarded for smaller in-class activities.
- **Practical Marks:** Practical class assignments and practical exam.

| Main Test Assessments | Day | Date | Time | Venue | Duration |
|-----------------------|-----------|------------------|-----------------|-----------------|----------|
| Early Assessment | Tue | 28 August 2018 | 10h00 | NS 2025 | 2 hours |
| Semester Test 1 | Sat | 6 October 2018 | To be announced | To be announced | 2 hours |
| Semester Test 2 | Tue | 13 November 2018 | 14h00 | To be announced | 2 hours |
| Practical Exam | Mon / Tue | 15 October 2018 | 10h00 | NS 2025 | 2 hours |

| Group Projects | Presentation Type | Due Date |
|---|-------------------------|----------------------|
| Project 1: 'The Power of Poison'. | Group Oral Presentation | 29 Aug – 5 Sept 2018 |
| Project 2: 'If I was Craig Venter ...'. | Written Report | 23 September 2018 |

Composition of Test/Exam Papers

Papers will consist of written questions (no multiple-choice questions). The portion of work covered by the test or exam will be announced in class prior to the test. It is the responsibility of the student to acquaint him/herself with the content, *time and venue of each test and exam*.

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 handed in at *Ms. Gordon* within one week of the test or hand-in date. **An oral test will then serve as a sickness test**; schedule an appointment with the lecturer. 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*.

Calculation of Marks

The Final Mark (PP) of a student will consist of the marks you achieve in the three semester tests, a practical mark (including the practical exam + marks awarded for certain practical assignments), as well as a class mark (including two group projects + marks awarded for class assignments and activities) 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 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 (p132) of the 2016 University Yearbook 1 (General) regarding other rules relevant to assessment and exams.

Course Materials

Required Textbook/s

- **Biology. The Dynamic Science.** Fourth Edition (2017). Eds. J. Russell, P.E. Hertz and B. McMillan.
- **Biology 146 Practical Manual.** To be handed out in class and included in the module fees.
- **Biology. Openstax College.** <http://openstaxcollege.org>. (Optional)

Additional Learning Material

- The slides of the lectures are available on SUNLearn. However, this is only a **summary** and should be used as such.
- Additional material, e.g. videos and concept questions will also be available on SUNLearn. Therefore, **regularly check SUNLearn 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). However, practical classes will be conducted mostly in English.

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.
- Practical manuals for the practical classes are available in English and Afrikaans,

Summary of Course Content

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

Russell et al. 2017 – 4th 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 7-9
4. Biodiversity and the Tree of Life p 9-14
5. Biological Research 14-23 Self-study.

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

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 44

1. Formation and Modification of Biological Molecules p 44-49
2. Carbohydrates p 49-52
3. Lipids p 52-56
4. Proteins p 57-64
5. Nucleotides and Nucleic Acids p 65-69

Chapter 4: The Cell: An Overview p 73

1. Basic Features of Cell Structure and Function p 74-78
2. Prokaryotic cells p 78-79
3. Eukaryotic cells p 79-100

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 116-118
4. Exocytosis and Endocytosis p 119-122

Chapter 12: Mendel, Genes and Inheritance p 251

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

Chapter 14: DNA Structure and Replication p 300

1. DNA structure p 304-306 Self study
2. DNA Replication p 306-318

Chapter 15: From DNA to Protein p 323

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

Chapter 31: Animal Phylogeny p 706

1. What is an animal? p 707-708
2. Key Innovations in Animal Evolution p 708-711

3. An Overview of Animal Phylogeny and Classification p 711-713
4. Animals without Tissues: Parazoa p 713-714

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

1. Invertebrate Deuterostomes p 744-746
2. Overview of the Phylum Chordata p 747-749
3. The Origin and Diversification of Vertebrates p 749-752
4. 'Agnathans' p 752-754
5. Gnathostomata: The evolution of Jaws p 754-759
6. Tetrapoda: The Evolution of Limbs p 759-762
7. Amniota: The Evolution of Fully Terrestrial Vertebrates p 762-764
8. Living Lepidosaurs: Shenodontis and Squamates p 764-766
9. Living Archelosaurs: Turtles, Crocodilians and Birds p 767-770
10. Mammalia: Monotreme, Marsupials and Placentals p 770-773