

Biology Units 3 & 4

Contents

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Series contents

This series covers the complete VCE Biology Units 3 & 4 course as set out in the *VCE Biology Study Design (from 2022)*, across its five areas of study — What is the role of nucleic acids and proteins in maintaining life? (nucleic acids, proteins and DNA manipulation); How are biochemical pathways regulated? (enzymes, photosynthesis and cellular respiration); How do organisms respond to pathogens? (immunity and disease); How are species related over time? (genetic change and evolution); and How is scientific inquiry used to investigate cellular processes and/or biological change? (the student-designed scientific investigation) — together with the cross-study key science skills that underpin all five. It comprises **twelve content workbooks**, cumulative **topic tests**, and a **practice-examination booklet**. Each content workbook follows the same structure: concise theory, scaffolded and unscaffolded worked examples, graded practice questions, a compact answer key, and fully-worked solutions. The VCE Biology examination allows no calculator and provides no formula or data sheet, and the workbooks are written accordingly.

Assumed knowledge

Chapter 1 — Assumed knowledge: cells, membranes and transport (34 pp)

1A Plasma membrane · 1B Cell types and cell organelles · 1C Membrane transport

Chapter 1 is a Units 1 & 2 revision bridge; its content is assumed background and is not assessed in the graded topic tests or the examinations.

Unit 3 Area of Study 1 — What is the role of nucleic acids and proteins in maintaining life?

Chapter 2 — From DNA to proteins (41 pp)

2A Nucleic acids · 2B The genetic code and gene expression · 2C Proteins · 2D Gene structure and expression

Chapter 3 — DNA manipulation techniques and applications (61 pp)

3A Common DNA tools and techniques · 3B Applications and implications of DNA manipulation · 3C Genetically modified and transgenic organisms · 3D CRISPR-Cas9 and genome editing

Topic 1 Test A (multiple-choice) and Test B (short and extended response), with fully-worked solutions, are included at the end of this workbook.

Unit 3 Area of Study 2 — How are biochemical pathways regulated?

Chapter 4 — Enzymes (25 pp)

4A The role of enzymes · 4B Factors impacting on enzyme function

Chapter 5 — Biochemical pathways: photosynthesis and cellular respiration (74 pp)

5A Photosynthesis · 5B Factors affecting the rate of photosynthesis · 5C Cellular respiration · 5D Factors affecting the rate of cellular respiration · 5E Biotechnological applications of biochemical pathways

Topic 2 Test A (multiple-choice) and Test B (short and extended response), with fully-worked solutions, are included at the end of this workbook.

Unit 4 Area of Study 1 — How do organisms respond to pathogens?

Chapter 6 — Antigens and pathogens: self versus non-self (32 pp)

6A Recognising self from non-self · 6B Cellular pathogens · 6C Non-cellular pathogens

Chapter 7 — The body's immune defences (55 pp)

7A First line of defence · 7B Second line of defence · 7C The lymphatic system · 7D Third line of defence · 7E Active and passive immunity

Chapter 8 — Emergence and treatment of disease (45 pp)

8A Emergence, re-emergence and disease containment · 8B Treatment of disease

Topic 3 Test A (multiple-choice) and Test B (short and extended response), with fully-worked solutions, are included at the end of this workbook.

Unit 4 Area of Study 2 — How are species related over time?

Chapter 9 — Genetic changes in populations over time (57 pp)

9A Mutations · 9B Evolving and non-evolving populations · 9C Approaches to pathogenic evolution · 9D Emergence of a new species

Chapter 10 — Changes in species over time (41 pp)

10A Changes in biodiversity over time · 10B Fossils · 10C Evidence of evolutionary relationships

Chapter 11 — Human change over time (64 pp)

11A Classification and characteristics of modern humans · 11B Migration of modern humans · 11C Classifying newly discovered hominins and evidence for interbreeding

Topic 4 Test A (multiple-choice) and Test B (short and extended response), with fully-worked solutions, are included at the end of this workbook.

Unit 4 Area of Study 3 — How is scientific inquiry used to investigate cellular processes and/or biological change?

Chapter 12 — Scientific investigation, evidence and communication (69 pp)

12A Designing a scientific investigation · 12B Evidence, data and conclusions · 12C Communicating scientific ideas

This chapter also carries the cross-study key science skills, which are drawn on across every area of study and are examinable in their own right.

Topic 5 Test A (multiple-choice) and Test B (short and extended response), with fully-worked solutions, are included at the end of this workbook.

Practice examinations

Chapter 13 — Practice examinations (131 pp)

Six full practice examinations, each mirroring the end-of-year examination (Section A: 40 multiple-choice questions; Section B: about ten short- and extended-response questions; 120 marks; no calculator and no formula or data sheet), graded across two easier, two mid-level and two more demanding papers, each with a full answer key and fully-worked solutions.

This series comprises approximately 670 pages.