Glenda CHIDRAWI Stephanie HOLLIS

preliminary course

BIOLOGY IN FOCUS

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Contents

To the student

Biology in Focus: Preliminary Course is written specifically to address the rigorous content of the New South Wales Stage 6 Biology syllabus. This book follows the syllabus in a logical order to ensure that all dot points are covered completely. The first-hand and secondary source investigations from column 3 of the syllabus are dealt with at appropriate points in the text.

One of the features of modern biology is the rate at which new terminology is created. Knowledge of some of these terms is essential to understand the subject. Throughout the text, when important terms are introduced they are in **bold type**. These words are defined in the glossary at the back of the book.

A major feature of the New South Wales Biology syllabus is the use of keywords (see the list of definitions of verbs on page viii) in constructing examination questions. An understanding of how to use these key words is essential for success in the HSC. The revision questions in each chapter are designed to test your command of the keywords as well as your understanding of the content of the course.

There is an emphasis in the text on Prescribed Focus Areas (PFAs) and Biology Skills. For more information on how they are dealt with in the text please refer to pages ix–xii. The text is also supported by a NelsonNet student website that contains lists of relevant website references; student worksheets; extension and classroom activities; and sample answers to end of chapter revision questions. See www.nelsonnet.com.au

When preparing for exams, remember that the syllabus is the ultimate guide to what you need to know. But you can be reassured that *Biology In Focus: Preliminary Course* contains the information you need to complete the course work.

Please note: All resources listed throughout the book as available on the Student Resource CD-ROM can now be found on the NelsonNet student website.

List of Board of Studies verbs

Account	Account for: state reasons for, report on Give an account of: narrate a series of events or transactions
Analyse	Identify components and the relationship among them; draw out and relate implications
Apply	Use, utilise, employ to a particular situation
Appreciate	Make a judgement about the value of
Assess	Make a judgement of value, quality, outcomes, results or size
Calculate	Ascertain/determine from given facts, figures or information
Clarify	Make clear or plain
Classify	Arrange or include in classes/categories
Compare	Show how things are similar or different
Construct	Make; build, put together items or arguments
Contrast	Show how things are different or opposite
Critically (analyse/evaluate)	Add a degree or level of accuracy depth, knowledge and understanding, logic, questioning, reflection and quality to (analysis/evaluation)
Deduce	Draw conclusions
Define	State meaning and identify essential qualities
Demonstrate	Show by example
Describe	Provide characteristics and features
Discuss	Identify issues and provide points for and/or against
Distinguish	Recognise or note/indicate as being distinct or different from; to note differences between
Evaluate	Make a judgement based on criteria; determine the value of
Examine	Inquire into
Explain	Relate cause and effect; make the relationships between things evident; provide why and/or how
Extract	Choose relevant and/or appropriate details
Extrapolate	Infer what is known
Identify	Recognise and name
Interpret	Draw meaning from
Investigate	Plan, inquire into and draw conclusions about
Justify	Support an argument or conclusion
Outline	Sketch in general terms; indicate the main features of
Predict	Suggest what may happen based on available information
Propose	Put forward (for example a point of view, idea, argument, suggestion) for consideration and action
Recall	Present remembered ideas, facts or experiences
Recommend	Provide reasons in favour
Recount	Retell a series of events
Summarise	Express concisely the relevant details

Prescribed Focus Areas—an introduction

Many areas of the Preliminary Biology course lend themselves to the study of the *process of science* by focussing on five Prescribed Focus Areas (PFAs), as outlined in the table below. The application of these PFAs has become an important part of the New South Wales Board of Studies Biology Syllabus. PFAs are targeted for examination questions in both the Preliminary and HSC Biology courses.

Examples of how to apply each of the PFAs 1–5 have been provided in this textbook. Wherever an icon appears in the textbook, it signals that a PFA is being addressed and provides the opportunity for students to analyse course content in relation to a particular PFA and to become skilled at applying their area of learning to the particular PFA.

On the NelsonNet teacher website special reference has been given to 'unpacking' each PFA (breaking the 'dot point' down into its component parts) and to assisting teachers to facilitate students in developing the skills needed to address PFAs. Templates or 'scaffolds' have been provided that simplify the process of applying each PFA and these may be used by teachers and/or students in conjunction with any module of work.

In addition to this, the NelsonNet teacher website contains a table which links specific syllabus areas ('dot points') throughout the Preliminary course with each PFA. See www.nelsonnet.com.au.

Linking syllabus 'dot points' to PFAs

Please note: All resources listed throughout the book as available on the Teacher Resource CD-ROM can now be found on the NelsonNet teacher website.

Table of objectives and outcomes—Prescribed Focus Areas

Objectives	**Preliminary Course outcomes**
Students will develop knowledge and understanding of:	*A student:*
1 the history of biology	P1 outlines the historical development of major biological principles, concepts and ideas
2 the nature of biology	P2 applies the processes that are used to test and validate models, theories and laws of science, with particular emphasis on first-hand investigations in biology
3 applications and uses of biology	P3 assesses the impact of particular technological advances on understanding in biology
4 implications of biology for society and the environment	P4 describes applications of biology which affect society or the environment
5 current issues, research and developments in biology	P5 describes the scientific principles employed in particular areas of biological research

Biology Skills—an introduction

During the Preliminary Course, it is expected that students will further develop skills in planning and conducting investigations, communicating information and understanding, scientific thinking and problem-solving and working individually and in teams. Each module specifies content through which skill outcomes can be achieved. Teachers should develop activities based on that content to provide students with opportunities to develop the full range of skills.

Preliminary Course outcomes	**Content**
A student:	*Students will learn to:*
P11 identifies and implements improvements to investigation plans	**11.1 identify data sources to:** a) analyse complex problems to determine appropriate ways in which each aspect may be researched b) determine the type of data which needs to be collected and explain the qualitative or quantitative analysis that will be required for this data to be useful c) identify the orders of magnitude that will be appropriate and uncertainty that may be present in the measurement of data d) identify and use correct units for data that will be collected e) recommend the use of an appropriate technology or strategy for data collection or gathering information that will assist efficient future analysis
	11.2 plan first-hand investigations to: a) demonstrate the use of the terms 'dependent' and 'independent' to describe variables involved in the investigation b) identify variables that need to be kept constant, develop strategies to ensure that these variables are kept constant and demonstrate the use of a control c) design investigations that allow valid and reliable data and information to be collected d) design and trial procedures to undertake investigations and explain why a procedure, a sequence of procedures or repetition of procedures is appropriate e) predict possible issues that may arise during the course of an investigation and identify strategies to address these issues if necessary
	11.3 choose equipment or resources by: a) identifying and/or setting up the most appropriate equipment or combination of equipment needed to undertake the investigation b) carrying out a risk assessment of intended experimental procedures and identifying and addressing potential hazards c) identifying technology that could be used during investigating and determining its suitability and effectiveness for its potential role in the procedure or investigations d) recognising the difference between destructive and non-destructive testing of material and analysing the potentially different results of these two procedures

Preliminary Course outcomes	Content
A student:	*Students will learn to:*
P12 discusses the validity and reliability of data gathered from first-hand investigations and secondary sources	**12.1 perform first-hand investigations by:** a) carrying out the planned procedure, recognising where and when modifications are needed and analysing the effect of these adjustments b) efficiently undertaking the planned procedure to minimise hazards and wastage of resources c) disposing carefully and safely of any waste materials produced during the investigation d) identifying and using safe work practices during investigations
	12.2 gather first-hand information by: a) using appropriate data collection techniques, employing appropriate technologies, including data loggers and sensors b) measuring, observing and recording results in accessible and recognisable forms, carrying out repeat trials as appropriate
	12.3 gather information from secondary sources by: a) accessing information from a range of resources, including popular scientific journals, digital technologies and the Internet b) practising efficient data collection techniques to identify useful information in secondary sources c) extracting information from numerical data in graphs and tables as well as from written and spoken material in all its forms d) summarising and collating information from a range or resources e) identifying practising male and female Australian scientists, the areas in which they are currently working and information about their research
	12.4 process information by: a) assess the accuracy of any measurements and calculations and the relative importance of the data and information gathered b) apply mathematical formulae and concepts c) best illustrate trends and patterns by selecting and using appropriate methods, including computer-assisted analysis d) evaluate the relevance of first-hand and secondary information and data in relation to the area of investigation e) assess the reliability of first-hand and secondary information and data by considering information from various sources f) assess the accuracy of scientific information presented in mass media by comparison with similar information presented in scientific journals
P13 identifies appropriate terminology and reporting styles to communicate information and understanding in biology	**13.1 present information by:** a) selecting and using appropriate text types, or combinations thereof, for oral and written presentations b) selecting and using appropriate media to present data c) selecting and using appropriate formats to acknowledge sources of information d) using symbols and formulae to express relationships and using appropriate units for physical quantities e) using a variety of pictorial representations to show relationships and present information clearly and succinctly f) selecting and drawing appropriate graphs to convey information and relationships clearly and accurately g) identifying situations where use of a curve of best fit is appropriate to present graphical information

Preliminary Course outcomes	**Content**
A student:	*Students will learn to:*
P14 draws valid conclusions from gathered data and information	**14.1 analyse information to:** a) identify trends, patterns and relationships as well as contradictions in data and information b) justify inferences and conclusions c) identify and explain how data supports or refutes an hypothesis, a prediction or a proposed solution to a problem d) predict outcomes and generate plausible explanations related to the observations e) make and justify generalisations f) use models, including mathematical ones, to explain phenomena and/or make predictions g) use cause and effect relationships to explain phenomena h) identify examples of the interconnectedness of ideas or scientific principles
	14.2 solve problems by: a) identifying and explaining the nature of a problem b) describing and selecting from different strategies those which could be used to solve a problem c) using identified strategies to develop a range of possible solutions to a particular problem d) evaluating the appropriateness of different strategies for solving an identified problem
	14.3 use available evidence to: a) design and produce creative solutions to problems b) propose ideas that demonstrate coherence and logical progression and include correct use of scientific principles and ideas c) apply critical thinking in the consideration of predictions, hypotheses and the results of investigations d) formulate cause and effect relationships
P15 implements strategies to work effectively as an individual or as a member of a team	The Preliminary course further increases students' skills in working individually and in teams.

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Life on Earth

Corbis: p. 195; Photolibrary: Table 2.2, Fig. 2.2, Fig. 3.1(b), Fig. 3.2, Fig. 4.6; Photodisc: Fig. 2.4(a); Nature Focus: Fig. 2.4(b); Associate Professor Andrew Drinnon, University of Melbourne: Fig. 2.4(c, d); Associate Professor Christina Cheers, University of Melbourne: Fig. 3.4; Vivienne Cassie-Cooper: Fig. 3.5; Australian National Botanic Gardens: Fig. 4.1

Evolution of Australian Biota

Corbis: p. 233; Photolibrary: Fig. 1.4, Fig. 1.16, Fig. 2.1(a), Fig. 2.4, Table 2.4 (bottom left); Fig. 2.12 (top left), Fig. 2.13, Fig. 3.3, Fig. 3.10, Fig. 3.17, Fig. 3.25(a), Fig. 3.27, Fig. 3.29, Fig. 3.34; iStockPhoto: Fig. 1.6(a, d, e), Fig. 1.7(b), Fig. 2.2, Fig. 2.1(b), Fig. 2.8(a, b, c), Fig. 2.10 (b, left), Fig. 2.12 (bottom centre), Fig. 2.14, Fig. 3.4, Fig. 3.19, Fig. 4.6; ANT Photo Library: Fig. 1.6(b), Fig. 2.5(b), Fig. 2.12 (bottom left, bottom right), Fig. 3.6, Fig. 3.7, Fig. 3.18, Fig. 3.22, Fig. 3.30c, Fig. 4.5; Big Stock Photo: Fig. 1.6(c), Fig. 1.7(a), Fig. 2.3(a), Table 2.4 (top left), Fig. 2.5(a), Fig. 2.10(a), Fig. 2.12 (top centre, top right); © Commonwealth of Australia, Geoscience Australia 2007: Fig. 1.14; Dr Greg Kirby, Flinders University: Fig. 2.3(b); IWH Dunn: Fig. 2.8(d); L. Lumsden: Fig. 2.10 (b, right); marinethemes.com/Kelvin Atkinson: Fig. 3.5; Auscape: Fig. 3.8; EYEDEA: Fig. 3.9; Associate Professor Andrew Drinnon, University of Melbourne: Fig. 3.13; Leanne Poll: Fig. 3.14(a); Peter Taylor: Fig. 3.14(b, d); Pauline Ladiges: Fig. 3.14(c); Australian National Botanic Gardens: Fig. 3.15, Fig. 3.21, Fig. 3.32, Fig. 3.33; Greg Jordan, University of Tasmania: Fig. 3.16; Bab and Bert Wells: Fig. 3.20; A Flowers and L Newman: Fig. 3.25(b); Jared Dunn: Fig. 3.26; Dr Greg Hollis, Senior Biodiversity Officer, Department of Sustainability and Environment: Fig. 4.8

Tables and illustrations

A Local Ecosystem

Adapted from Charles J Krebs, *Ecology: The Experimental Analysis of Distribution and Abundance*, Fig. 13.9, p. 246 (Adison Wesley Longman): Fig. 2.2; Courtesy of Ecological Society of America, Washington DC: Fig. 2.5

Patterns in Nature

Thomas, *Biology: A Functional Approach*, third edition (Nelson & Sons, 1971): Fig. 4.5; Raven & Johnson, *Biology*, fourth edition (McGraw-Hill Irwin, 1995): Fig. 5.1, Fig. 5.3

Evolution of Australian Biota

White M, Australia's Prehistoric Plants, (Methuen Australia, 1984): Fig. 1.3; Raven & Johnson, *Biology*, fourth edition (McGraw-Hill Irwin, 1995): Fig. 3.23, Fig. 4.1, Fig. 4.2, Table 4.1, Table 4.2