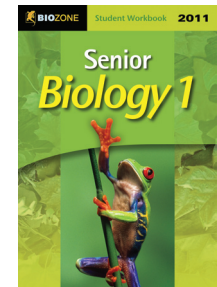


2011: What's New in Senior Biology 1

Thank you for purchasing the 2011 edition of *Senior Biology 1, Student Workbook*. BIOZONE is committed to providing an up-to-date resource that caters for the requirements of students and teachers of biology at senior level (particularly Advanced Placement (AP), International Baccalaureate (IB), and Honors Biology courses). There have been a number of important organizational changes to this edition, primarily associated with a closer alignment to the current Advanced Placement scheme, and a focus on scientific literacy. Please note the few minor errata which are noted at the end of this document.



Organizational and General Changes

There have been a large number of organizational changes in this edition of the *Senior Biology 1 2011* relative to the earlier 2009 edition. This first edition marks the first move in a shift towards more context-based material and an emphasis on scientific literacy and understanding. New features are described in brief as follows:

- In this edition we have brought together the content for molecular genetics, inheritance, and evolution into one volume, and shifted classification and ecology into Senior Biology 2. This reorganization of content follows the schedule of the AP biology program and provides a more cohesive coverage of material in these areas. Extension material is provided on the Teacher Resource CD-ROM (for separate purchase).
- As a consequence of this reorganization, some material has necessarily shifted between volumes. Activities covering statistical analysis are now included on the Teacher's Resource CD-ROM (TRC) together with supporting spreadsheets of the worked examples. Human Evolution (previously SB2), which is peripheral to the AP scheme, is now available on the TRC as extension. Some individual activities, such as "Sampling a Leaf Litter Population", which have been removed because they are peripheral to the AP scheme are now provided as web links, or the material they contain has been incorporated more appropriately into new activities.
- International Baccalaureate students and teachers will find that, although core content has shifted between volumes (Senior Biology 1 and 2), it should be easier to locate material. Activities suitable for HL-only are indicated in the 'Contents', as is material that is not required under the IB scheme (there is a limited amount of this). **IB Options (A-H) are provided as complete units on the IB Options CD-ROM** (for separate purchase). Options C-E are also adequately covered within the workbooks for those making those option choices. See the course guides provided for full account of these choices.
- Material throughout the animal and plant form and function chapters is more comparative than previously in accordance with the AP scheme. Evolution, homeostasis and adaptation are unifying themes throughout.
- Each chapter begins with a concise topic introduction emphasising key concepts, key terms, and brief objectives. The portion of the Advanced Placement (AP) or International Baccalaureate (IB) scheme to which the chapter applies is clearly indicated.
- A contextual approach. We encourage students to become thinkers through the application of their knowledge in appropriate contexts. Many chapters are prefaced with an account examining a 'biological story' related to the theme of the chapter. This approach provides a context for the material to follow and an opportunity to focus on comprehension and the synthesis of ideas.
- Each chapter includes literacy activities, in the form of mix and match, puzzles, games, and concept stories for

comprehension and interpretation. The concept stories, together with the contextual approach, provide the opportunity for students to test their understanding within a real-world context.

- A lead by example approach to teaching techniques and applications in biotechnology. Gene technology can be a difficult area for students so, this year, each application is treated using the same systematic, explanatory approach. This should help students to identify techniques and place them within the appropriate context.
- Periodical references are reduced to highly relevant articles only and are cited on the page to which they most apply. Keen students/teachers can obtain details of the citation in the Appendix (a new feature).
- The Appendix also includes tables for help with SI units and decimal conversions.
- Web links and Related Activities support the material provided on each activity page. We have provided an enhanced list of **web links** for activities (videos and animations) accessed through www.thebiozone.com/weblink/SB1-2597.html. Note that this resource is distinct from the Biolinks, which have long been a feature of the BIOZONE website. Each link provides a video clip or animation of particular relevance to the activity page on which it indicated.
- Model Answers: In response to popular request, the model answers are now provided as a show-hide feature on the non-printable PDF version of the workbook on the Teacher Resource CD-ROM. The regular Model Answers booklet is still available.

☆ New activities in this edition

Literacy activities:

Key Terms: Memory Card Game

An enjoyable way to help students remember words and definitions, with a competitive edge.

Key Terms: Word Find

A little different from traditional word finds, students must first solve the clue before they can find the word!

Key Terms: Crossword

Crosswords help student literacy in the selected topic. Students will need to know their key terms to solve it.

Key Terms: What am I?

A game requiring students to work in teams to help a team mate correctly determine their unknown word. Flexible format makes it suitable for any size class.

Key Terms: Mix and Match

Match each key term from the topic with its definition.

Concept maps:

There are four concept maps introducing each of the four main sections of the workbook. Although they are not activities, students can refer to them often to map the connections between topics as they cover them and to place their material into a larger context.



Page Activity and description

- 12 Investigations in Field Science**
A reading and comprehension activity providing students with a real-world example of investigative work in the field and is based on methods and catch results from field studies of native black mudfish. Questions focus on understanding how catch rates can be related to a quantitative assessment of habitat suitability.
- 21 Manipulating Raw Data**
A new activity designed to introduce and familiarise students with common techniques for data manipulation (tally charts, percentages, and rates).
- 22 Constructing Tables**
This new activity provides an introduction about how to present data in a tabulated form. It provides clear guidelines about how to construct and present a table to get the most benefit from using this format.
- 23 Constructing Graphs**
This activity introduces students to the basic principles of constructing graphs. It provides an introduction to the specific graphing activities which follow.
- 37 Interpreting Sample Variability**
A two page data handling activity covering the effects of random sampling and sample size on data distribution. Students are provided with second-hand (real) data sets to analyze and comment on.
- 97 How Do We Know? Membrane Structure**
This activity describes how the structure of the plasma membrane can be analyzed and how the results confirm the fluid mosaic model of the cell membrane. Questions test student understanding of the text.
- 113 Estrogen, Transcription, and Cancer**
Exploring the role of estrogen as a switch to regulate immune system function and how a signalling molecule that causes useful mutations can also cause harmful ones.
- 114 Stem Cells**
The differentiation of blood cells from a stem cell progenitor. Students are questioned on the nature of stem cells, their properties, and their potential applications.
- 139 Photosynthesis in C4 Plants**
The basic physiology of C4 metabolism and its role as an adaptation to tropical environments.
- 146 Mitosis vs Meiosis**
Students compare the basic differences in process and genetic outcomes between mitosis and meiosis.
- 149 The Advantages of Sex**
Students are asked to consider the advantages of sexual reproduction. The case study of the topminnow is provided.
- 160 A Gene That Can Tell Your Future?**
A concept story describing the cause of Huntington's Disease, its effects, and how the gene responsible for the disease was found.
- 161 Variation**
The nature of continuous and discontinuous variation and the role of both the environment and genotype in determining phenotype.
- 167 Test Cross**
Using pure breeding lines to determine unknown genotypes. This activity complements the suite of crosses already included in the workbook.
- 202 Does DNA Really Carry the Code?**
A reading and comprehension activity describing the methods used to confirm DNA as an information storage molecule and the unit of inheritance. Students are asked to explain why certain methods were used and what the outcome of those methods were.
- 211 A Review of DNA Replication**
A summary activity covering the basic principles of DNA replication; a test of student understanding.
- 224 The Structure of Viruses**
The nature of viruses: both human viruses and phage. Their role as obligate intracellular parasites is explored.
- 225 Replication in Animal Viruses**
Replication in a typical enveloped virus and in a retrovirus (HIV) is explored. The emphasis is on the genetic mechanisms by which viruses hijack cellular machinery.
- 226 Replication in Bacteriophage**
Lytic and lysogenic cycles in phage. The implications of the lysogenic cycle in the bacterial acquisition of viral genes is discussed.
- 230 Causes of Mutation**
A new activity incorporating portions of two other activities and focussing on the nature of mutagens and the significance of gametic mutations.
- 236 Antigenic Variability in Pathogens**
This activity uses the example of *Influenzavirus* to illustrate how mutations in the DNA coding for the antigenic proteins of viruses confer selective advantage (through evasion of the host's immune system). The implications on human health and production of the 'flu' vaccine are discussed.
- 246 Amazing Organisms, Amazing Enzymes**
A concept story explaining how one of biotechnology's most important techniques, PCR, was successfully developed after isolation of a thermophilic enzyme.
- 257 Forensic Applications of DNA Profiling**
An exploration of the forensic use of DNA profiling.
- 258 Preparing a Gene for Cloning**
This material, previously included in "*Gene Cloning Using Plasmids*", focuses on the preparation of a gene for cloning using reverse transcriptase.
- 259 In Vivo Gene Cloning**
This activity includes an update on gene markers. Material on reverse transcription is in another activity and the questions have been revised accordingly.
- 265 Chymosin Production**
This activity had been revised using the new systematic approach described earlier. The questions have been revised accordingly.
- 267 Golden Rice**
The techniques and involved in engineering a complete biosynthetic pathway in a crop plant. The rationale behind the approach is explored.
- 269 Production of Insulin**
This activity had been revised using the new systematic approach described earlier. The questions have been revised accordingly.
- 275 Investigating Genetic Diversity**
An examination of the use of DNA sequencing to investigate the genetic diversity of arthropod populations in the Antarctic.
- 290 Life in the Universe**
The presence of organic molecules in space and the implications of this knowledge to our understanding of life's origins.
- 303 Protein Homologies**
A revision of some older material to update information regarding both the technique and application of protein homologies to phylogenetic systematics. Molecular clocks are covered in more detail than previously, using cytochrome *c* as the example.



- 305 DNA Homologies**
A revision of the material on DNA hybridization to acknowledge the use of newer sequencing technology in making DNA comparisons. The continued use of DNA hybridization for identifying bacteria is acknowledged.
- 308 The Evolution of Horses**
This activity presents the evolution of the horse as an example of a phylogeny with a rich fossil history. The changes in equids associated with environmental changes are discussed (including body size, limb length, toe reduction, and tooth composition).
- 320 Small Flies and Giant Buttercups**
A concept story introducing students to some simple case studies in modern evolution: speciation in *Drosophila* and in NZ alpine buttercups.
- 321 The Species Concept**
A thorough revision of an earlier activity, updating the data for canid populations and examining the *Ensatina* species complex in the Pacific North-West of the USA.
- 327 Selection for Skin Color in Humans**
This activity provides a high interest exploration of natural selection operating in human populations. Students are asked to consider their preconceptions of race.
- 335 Insecticide Resistance**
The nature and mechanisms of insecticide resistance.
- 350 Isolation and Species Formation**
Geographical and ecological isolation and how these contribute to the formation of a new species.
- 357 Selective Breeding in Animals**
The genetic and phenotypic consequences of selective breeding to produce our domestic livestock breeds.
- 359 Selective Breeding in Crop Plants**
The genetic and phenotypic consequences of selective breeding to produce crop plants.
- 361 Breeding Modern Wheat**
The role of polyploidy in producing modern bread wheat.
- 371 Adaptive Radiation in Ratites**
The ratite family as a case study in adaptive radiation. Students are asked to interpret a phylogenetic tree and to explore the ideas of common ancestry and dispersal.
- 377 Causes of Mass Extinction**
A support activity for extinction examining possible causes of the Earth's past mass extinctions. Ideal extension and high student interest.

△ Existing material revised this edition

Existing activities that have been revised in order to clarify ideas and improve the questions, format, or general content:

Page Activity and description

- 20 Variables and Data**
This activity has been simplified to focus on definitions of variables (rather than choosing a topic to investigate). Students apply their understanding to a series of questions.
- 40 Writing the Methods**
The question for this activity has been revised.
- 57 Amino Acids**
This activity has been revised to focus on the biological roles of amino acids. The questions have been altered to reflect the change in focus.
- 59 Proteins**
Questions 3 and 4 have been revised to require application of knowledge.

- 61 Enzymes**
A minor change to provide clearer explanations for anabolic and catabolic processes.
- 70 Types of Living Things**
Minor change to include more information on the characteristics of life on the diagram.
- 71 Bacterial Cells**
Minor change with the use of photographs of organisms to describe bacterial forms.
- 93 The Structure of Membranes**
A revision of the diagram to better illustrate structure and how these relate to membrane function. Question 1 is new.
- 105 Ion Pumps**
The cotransport example is now the sodium-glucose symport on the luminal side of the intestinal epithelium. The questions have been revised accordingly.
- 107 Active and Passive Transport**
Question 4 has been revised.
- 108 Cell Division**
A revision to better explain gametogenesis and note the differences between plant and animals in terms of gamete formation. The questions have been revised accordingly.
- 119 Human Cell Specialization**
A new example - goblet cell - is used for question 1(e).
- 121 Levels of Organization**
Minor change to the order in which the details are presented in the diagram.
- 127 The Role of ATP in Cells**
This activity now covers two pages and incorporates the material previously in "*Energy in Cells*". More use of examples and illustrations improves appeal.
- 134 Photosynthesis**
This activity now includes a TEM and the questions have been revised.
- 137 The Biochemistry of Photosynthesis**
The explanatory diagram for this activity has been substantially revised, providing a more diagrammatic (and less artistic) view of the photosystems located in the thylakoid membranes. The generation of ATP and NADPH by non-cyclic phosphorylation and their flow on to the Calvin cycle is more clearly indicated, and the role of cyclic phosphorylation is better explained so that students can answer the questions more easily.
- 155 Human Karyotype Exercise**
Unknown karyotype is now Down syndrome (trisomy 21).
- 186 Pedigree Analysis**
This activity has been expanded to three pages.
- 190 Interactions Between Genes**
This activity has been reorganized to provide clearer examples of epistasis. The questions have been revised.
- 193 Polygenes**
This activity now looks at polygeny using the inheritance of skin color involving three (rather than two) alleles.
- 195 Epistasis**
This activity now includes a wider range of examples.
- 215 Analyzing a DNA Sample**
Question 3 has been revised and students determine a dendrogram a DNA banding pattern.
- 231 The Effect of Mutations**
This activity now focuses on comparing harmful, beneficial, and silent mutations. The questions have been revised accordingly.
- 271 Gene Therapy**
This activity has been substantially revised, providing a new representation of the principle of gene therapy and the vectors.



- 273 Gene Delivery Systems**
This activity describes two case studies in gene therapy: CF and SCID.
- 277 The Human Genome Project**
Minor changes to the information provided on the first page. The intent of the activity and the questions are unchanged.
- 281 Cloning by Nuclear Transfer**
This activity describes cloning by nuclear transfer using the new systematic approach described earlier.
- 283 Plant Tissue Culture**
This activity describes plant tissue culture using the new systematic approach described earlier.
- 311 Oceanic Island Colonizers**
This activity has been revised to include material from "Biogeographical Evidence" and information (from 2009) on the new species of land iguana. There is new material on factors affecting island biota and the questions have been revised accordingly.
- 324 Darwin's Theory**
This activity now includes the illustrative example of shell variation in the grove snail, providing a real-world example of natural variation in populations.
- 326 Natural Selection**
This activity has been reformatted and now includes specific examples for each type of selection.
- 332 The Evolution of Darwin's Finches**
This activity provides more information-rich artwork but the intent and the questions are unchanged.
- 336 The Evolution of Antibiotic Resistance**
This activity now describes some common examples of bacterial resistance to antibiotics as well as examining the development of resistance in bacterial populations through vertical gene transmission.
- 351 Reproductive Isolation**
This activity has been revised with a greater number of specific examples.

Errata Workbook

Page 36: Data refer to fern **sori** (rather than spores). The error does not affect interpretation or handling of the data.

Page 228: I should read "The semi-conservative process by which two identical DNA molecules are produced from a single double-stranded DNA molecule" [Answer: DNA Replication].

Errata Model Answers

Page 7: Key terms: Mix and Match (page 45):

For the following entries, answers should read: Accuracy (Z), Precision (O). These were transposed in error. Note that the definition for precision refers to the precision of a statistic (also called reliability); precision also commonly refers to the repeatability of a measurement.

Page 10: Proteins (page 59):

Answer to question 3 and 4 were not updated and should read:

- Fibrous proteins have a tertiary structure that produces long fibers or sheets, often with many cross-linkages. This makes them very tough physically and ideal as structural molecules e.g. collagen.
- The tertiary structure of globular proteins produces a spherical shape which is critical to their interaction with other molecules, e.g. the active site in enzymes or the recognition sites in regulatory molecules like insulin.

Our apologies for any confusion caused by these errors. We hope that you enjoy using Senior Biology 1. We always welcome comments and constructive criticism, and will endeavor to implement suggestions where possible.

The staff at BIOZONE

