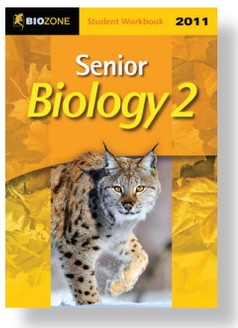
2011: What's New in Senior Biology 2

Thank you for purchasing the **2011** edition of ***Senior Biology 2,*** *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 (see the note on general organizational changes below).



Organizational and General Changes

There have been a large number of organizational changes in this edition of the *Senior Biology 2 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, the material on evolution has shifted into *Senior Biology 1* so that the content for molecular genetics, inheritance, and evolution are held in one volume. Senior Biology 2 now begins with an opening chapter on classification. The material formerly in the chapter "*Pathogens and Disease*" has been rationalized to include the required few case studies and is covered in context within the chapter "*Defending Against Disease*". Material formerly in "*Microbes and Biotechnology*" (an IB Option) is now provided on the IB Options CD-ROM. 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. Human Evolution (previously SB2), which is peripheral to the AP scheme, is now available on the TRC as extension (and also on the IB Options CD-ROM). 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.
- 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 a guide to Latin and Greek roots.
- 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/SB2-2603.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

<u>Literacy activities</u>:

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.

<u>Concept maps</u>:
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

13 Phylogenetic Systematics
A new activity examining the basics of cladistic analysis. Students examine and interpret data associated with different constructions of phylogenetic trees.

28 Animal Symmetry
A new activity examining the types of animal symmetry and how these are associated with different lifestyles.

44 The Hypothalamus and Pituitary
This new activity discusses the role of the hypothalamus and pituitary in linking the nervous and endocrine systems together. This material was previously found as part of '*The Endocrine System'.*

49 The Skin's Role in Homeostasis
An activity examining the many homeostatic roles of the skin. This activity provides some additional background for examining thermoregulation in humans.

55 Hypothermia
The causes and features of hypothermia; a contextual study within which to consider thermoregulatory processes.

59 How Heterotrophs Feed
This activity focuses on the diversity of animal feeding methods, although an overview of nutritional patterns in organisms is provided as a reference.

64 The Teeth of Fish
This activity describes the various types of teeth and feeding methods of fish, providing a complement to the material provided in the *"Dentition in Mammals"*.

65 Dentition in Mammals
Adaptation to diet and the diversity of dentition in mammals. Students are asked to identify animals and diet from the skull structures provided.

73 Systems for Digestion
The second page of this activity has been revised to provide a comparative view of the adaptations for digestion in various animal taxa.

75 Absorbing Nutrients
A comparative view of the adaptations for nutrient absorption in various animal taxa. The cellular transport processes involved in the absorption of various nutrients by the intestinal villi in mammals is also provided as an example of the way in which animals carry out life processes.

77 The Mouth and Pharynx
The first of a series of pages focussing on human digestion. This describes the structure and role of the mouth, pharynx, and teeth in humans.

87 Gas Exchange in Fish
The structure and function of gills and oxygen extraction in fish, with particular emphasis on the importance of the countercurrent exchange system.

89 Gas Exchange in Birds
Part of suite of activities providing a comparative exploration of animals gas exchange systems. The parabronchial lungs of birds are compared with the alveolar lungs of mammals.

95 Measuring Lung Function
Previously part of "*Breathing in Humans*", this activity has been expanded to stand alone as an exploration of how spirometry is used to measure lung function in humans.

100 Review of Lung Function
A review activity providing a self test of the student's understanding of the human gas exchange system.

104 Transport and Exchange Systems
(Previously *Internal Transport in Animals)*, this activity has been revised to include the role of mass transport in animal systems. The questions have been revised accordingly.

105 Blood Vessels
This activity replaces those covering material on arteries, veins, and capillaries. The content covered is much the same and there has been no loss of essential information.

107 Capillary Networks
This activity looks at the structure and function of capillary networks in mammals. Students are asked to recognize different functional states in a capillary bed. The structure and role of portal systems is also discussed.

108 Open Circulatory Systems
This activity describes both simple (insect) and more complex (crab) open circulatory systems.

109 Closed Circulatory Systems
Closed circulatory systems in invertebrates (annelids, cephalopods) are compared with single and double circuit systems in vertebrates.

111 The Heart as a Pump
A comparative examination of heart structure (bony fish, amphibian, mammal).

115 Circulatory Fluids in Invertebrates
The nature and role of hemolymph. The focus is on insects and hemolymph is compared with blood with respect to both structure and function.

119 The Human Heart
The material in this activity was previously covered in '*Vertebrate Hearts*'; the focus is now on the human heart structure and function.

123 The Cardiac Cycle
A revision (formerly "*Heart Function*') to provide a better explanation of the pressure and volume changes in the heart during the cardiac cycle. The questions have been revised accordingly.

124 Review of the Human Heart
A review activity providing a self test of the student's understanding of the structure and function of the human heart.

149 Autoimmune Diseases
An examination of the problems that arise when the immune system goes awry. Rheumatoid arthritis and multiple sclerosis are the case studies examined.

150 Antibiotics
Previously *Antimicrobial Drugs*, this activity now focuses on antibiotics and their modes of action in bacteria.

153 Birds with Runny Noses
A comprehension activity covering the adaptations of marine animals for excreting excess salt.

154 Osmoregulation in Water
The key features of osmoregulators and osmoconformers. Students are asked to interpret data relating to crab osmoregulation in diluted seawater.

155 Managing Fluid Balance on Land
This activity compares and explains daily water transfers in non-desert and desert-adapted animals. The role of the loop of Henle (specifically, its length) in water conservation is also discussed.

159 Vertebrate Excretory Systems
The role of gills and kidneys in fish and kidneys in mammals in excretion. Some of this material was previously covered in the activity *Excretion and Osmoregulation*. Questions test student understanding

of the processes involved in ion and nitrogen transfers. Some data interpretation is required.

161 Water Balances in Desert Mammals
The water conserving adaptations of desert adapted species are discussed. Students must plot and interpret data relating to water fluxes in a kangaroo rat.

163 Water Budget in Humans
Daily water transfers in humans are examined in this activity. Questions test student understanding of causes of water losses and imbalances.

169 Kidney Transplants
The causes of renal failure and the role of kidney transplants in patients with chronic kidney failure.

171 Invertebrate Nervous Systems
A comparative examination of nervous system structure in invertebrates. Questions focus on characteristic features and the significance of cephalization.

174 The Vertebrate Brain
A comparative examination of vertebrate brains. Questions focus on the link between regional brain development and sensory emphasis.

179 The Malfunctioning Brain: Alzheimer's
An examination of the characteristics and symptoms of Alzheimer's disease. A contextual activity in which to examine the brain's function.

180 Dopamine, the Brain, and Behavior
The pathways for dopamine metabolism in the brain and how errors in dopamine levels are associated with particular behavior patterns.

183 Reflexes
Previously part of *Neuron Structure and Function*, this activity now focuses specifically on reflexes and their role in innate and protective responses.

191 Adaptations for Vision
A comparative examination of adaptations for vision in mammals.

192 Invertebrate Vision
The structure and function of two very different invertebrate eyes; the insect compound eye and the cephalopod lens eye.

201 Sun Compass Navigation
Navigation in honeybees; students are questioned on their interpretation of the information provided.

202 Homing in Insects
The use of visual and chemical cues in homing insects.

208 Behavior and Species Recognition
The role of courtship and mating behavior in isolating species and ensuring successful breeding.

210 Aggression, Hierarchies, and Resources
The role of aggressive and hierarchical behavior in maximizing resource use in baboons. Students are asked to interpret a diagram with respect to the home ranges and core areas of the baboon troops described.

213 Animal Skeletons
Comparative structures for support in animal taxa: endo-, exo- and hydroskeletons. Questions focus on simple definitions and the relationship between structure and environment.

214 Swimming
This activity describes the adaptations of aquatic animals for swimming: developing propulsion and maintaining stability and buoyancy.

215 Running
An activity exploring the diversity of ways in which terrestrial animals move. Questions focus on locomotory differences between taxa and structural adaptations for speed and agility.

216 Flying
The possession of powered flight is restricted to only three animal taxa and this activity explores the various ways in which these animals have achieved it.

219 The Mechanics of Movement
The action of antagonistic muscles (humans are the example). The role of agonists and antagonists is discussed as are types of body movement. Questions test student understanding of how origin and insertion determine limb movement.

223 The Sliding Filament Theory
Previously part of '*Muscle Structure and Function*', this activity now focuses solely on the sliding filament theory.

224 Muscle Innervation
Comparative examination of vertebrate and invertebrate (arthropod) muscle innervation. Students are asked to make the appropriate comparisons.

248 Growth and Development
Human growth and development, including the role of allometric growth and the rapid growth spurts that characterize certain life stages.

252 The Variety of Plants
Plant diversity and adaptation; an overview of adaptation to environment.

255 Diversity in Leaf Structure
A comparative examination of leaf (or equivalent) structure in bryophytes, ferns, and gymnosperms. Adaptation to environment is emphasized.

257 Angiosperm Leaf Structure
Leaf structure in monocots and dicots compared. Questions focus on structural and functional differences.

260 Angiosperm Stem Structure
Stem structure in monocots and dicots compared. Questions focus on structural and functional differences.

261 Diversity in Stem Structure
A comparative examination of stem (or equivalent) structure in mosses, ferns, and gymnosperms. Adaptation to environment is emphasized.

263 Primary and Secondary Growth in Dicots
The role of meristems in dicots and the tissues generated by the meristems.

265 Leaf and Stem Adaptations
Adaptations to environment in various plant taxa.

298 A Most Accomplished Traveler
A reading and comprehension activity describing the reproductive adaptations of the coconut palm.

299 Wind Pollinated Flowers
This activity examines the structure of wind pollinated flowers. Questions focus on differences between wind and insect pollination.

301 Insect Pollinated Flowers
This activity provides an overview of the structure of a typical insect-pollinated flower and the adaptations of such flowers to maximize pollination efficiency.

306 Events in Germination
Metabolic events in germination including the role of starch mobilization and gibberellic acid.

317 Community Change with Altitude
The changes in physical factors and associated vegetation with altitude in an alpine region of Australia.

323 The Rise and Fall of Human Populations
A comprehension activity examining the reasons for the demise of past human populations and how that information can be used to plan for our own future.

333 Survivorship Curves
Idealized patterns of survivorship in representative animal taxa. Students are asked to compare features of the patterns and related these to life history.

335 Human Demography
The demographic transition model and interpreting different patterns of population age structure.

345 Food Chains
The nature of food chains and how taxa are assigned to different trophic groups.

347 Food Webs
This activity now focuses solely on food webs. Students are asked to construct food chains for a lake community an assemble these into a food web.

349 Cave Food Webs
Reintroduced by popular request; constructing a food web for lightless community.

361 Disturbance and Community Structure
The concept of ecosystem stability and the importance of keystone species to ecosystem function.

363 Primary Succession
An expansion of material previously included in "*Ecological Succession*". This activity examines only primary succession and examines its basic characteristics.

364 Secondary Succession
An expansion of material previously included in "*Ecological Succession*". This activity examines only secondary succession in cleared land and examines its basic characteristics

365 Wetland Succession
Succession in a wetland, from open water to peat bog. Students are asked to examine the physical factors determining the establishment of bog species.

366 The Darkest Depths
This activity describes the nature of the deep ocean hydrothermal vent communities and provides an introduction to food webs.

368 The Modern Atlantis
This comprehension activity uses a newspaper report to examine the plight of the small island nation of Kiribati in an environment of global warming.

377 Biodiversity and Global Warming
The predicted effects of global warming on biodiversity. Data and case studies are provided and students are asked for their interpretation of these.

381 Nitrogen Pollution
This activity describes the effects of excessive human-induced nitrogen inputs and the effects of nitrogen oxides in the atmosphere.

383 Monitoring Aquatic Ecosystems
Indicator species and the role of monitoring in determining ecosystem status and change.

Δ Existing material revised this edition

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

26 Features of Microbial Groups
The questions have been altered in this activity to avoid repetition of content with features of the five kingdoms. It encourages students to expand their general knowledge.

35 Principles of Homeostasis
This activity has been substantially revised and includes both negative feedback (thermoregulation) and positive feedback (fever and childbirth). The questions have been revised.

41 The Endocrine System
The introduction and questions have been revised and the pineal added to the list of endocrine glands. Extra material on the hypothalamus and pituitary is now covered in a separate activity.

45 Hormones of the Pituitary
The second page of this activity covers the physiological effects of growth hormone. The questions have been revised accordingly.

56 Control of Blood Glucose
The graph has been revised to show fluctuations in both insulin and blood glucose. The questions have been revised accordingly.

69 Diversity in Tube Guts
This activity now includes a brief synopsis of peristalsis alongside the comparative view of gut structure. The human gut has been annotated to indicate the phases of food processing in a tube gut.

78 The Human Digestive System
This activity has been substantially revised to clarify the presentation of the material on the stomach and small intestine. The questions have been revised accordingly.

92 Breathing in Humans
This activity now covers only the mechanisms of breathing; the material on spirometry is now in a separate activity. The questions have been revised accordingly.

93 The Human Respiratory System
Minor change to the introduction to this activity. The basic content and questions are unchanged.

129 Infection and Disease
This activity has been substantially revised to include a step by step description of Koch's postulates. The illustrative examples of pathogens and the questions have been revised.

139 Acquired Immunity
This activity has been substantially revised to two pages and now includes coverage of the primary and secondary responses to pathogens.

145 Monoclonal Antibodies
This activity has been substantially revised and now covers two pages, the second being an examination of the mode of action of Herceptin; a monoclonal antibody used in the targeted treatment of breast cancer.

147 HIV/AIDS
This activity has been substantially revised to examine the modes of transmission, treatment and prevention of HIV/AIDS. The material on retroviral replication is now in Senior Biology 1, as part of the examination of the genetics and replication of viral genomes.

165 The Physiology of the Kidney
The diagram on the first page of this activity has been revised to make it clearer. Questions are unchanged.

167 Control of Urine Output
The artwork and the questions for this activity have been revised.

173 Detecting Changing States
The number of illustrative examples for this activity has been increased and the questions have been revised accordingly.

177 The Human Brain
This activity has been expanded to two pages and includes photographic examples and information regarding sensory processing and more material on the structure and role of the brain's ventricles. There are more questions as appropriate to the new material.

181 Neuron Structure and Function
This activity has been substantially revised. The material on reflexes is now covered in a separate activity and the focus is now on the differences between myelinated and non-myelinated neurons and the mechanism of saltatory conduction. The questions have been revised accordingly.

188 The Structure of the Human Eye
The material on visual defects has been removed and the focus is on eye structure and accommodation. The questions reflect this change in focus.

189 The Physiology of Vision
The questions for this activity have been revised. The information presented is essentially unchanged.

195 Animal Communication
The introduction and questions to this activity have been revised.

203 Learned Behavior
This activity now includes material on insight behavior which replaces the material on classical conditioning. The material on operant conditioning (the most common form of learning in animals) has been expanded to include some real life examples.

209 Breeding Behavior
This activity now complements "*Behavior and Species Recognition*' and includes material on the role of territories in successful reproductive behavior.

217 The Human Skeleton
A substantial revision including more information on the role of joints in the movements of the skeleton. The questions have been revised accordingly.

221 Muscle Structure and Function
The material on sliding filament theory is now in a separate activity and more information is provided on the changes in the myofibril banding pattern during contraction. The role of an intact sarcolemma in muscle function is illustrated with reference to Duchenne's muscular dystrophy.

244 The Hormones of Pregnancy
A minor revision to include more information on the role of positive feedback during labor.

303 Fruits
The artwork in this activity has been revised to improve clarity. The questions are unchanged.

309 Biomes
A revision to better present the distribution of the world's biomes. The questions are revised accordingly.

325 Sampling Populations
This activity has been substantially revised to be more relevant and appealing. There are illustrative examples and some data presentation of a sampled community is used to test student understanding of basic principles.

331 Population Growth
The emphasis here is now on human population growth and the questions have been revised.

332 Life Tables and Survivorship
This activity requires that students plot and interpret the life table data provided. Types of survivorship curves are now covered in a separate activity.

346 Energy Inputs and Outputs
A revision focusing on the comparison between a grazing and a detrital food web. Students are asked to identify and explain the differences.

350 Ecological Niche
This activity now incorporates the material on '*Competition and Niche Size*'. the questions have been revised accordingly.

373 The Carbon Cycle
The artwork has been revised and the questions reorganized.

375 Global Warming
Data for greenhouse gas levels have been revised and there are new data presented examining the effect of warming on biological systems and human settlements.

379 The Nitrogen Cycle
A minor revision to the artwork.

385 Nature Reserves
A revision of the artwork and information present, although the questions are unchanged.

Errata Workbook

Page 128: Defending against Disease.
Please add page reference 116 (Blood Clotting) to the sub section *The Body's Defenses*.

Page 170: Responding to the Environment:
Page references for chapter divisions should read:

Nervous Systems, **pages 171-180**

Neuron Structure and Function, **pages 181-186**

Sensory Perception, pages **187-192**

Animal Behavior, pages **193-210**

Page 181: Neuron Structure and Function
British English spelling was used in error for the term neuron in the top half of the diagram (*Brit. alt.* neurone).

Page 251: KEY TERMS list: Axillary bud (not axial)

Erratum Model Answers

Page 26: Control of Urine Output (page 167):

Answer to question 3 was given as 4 and question 4 is missing. Answers should read:

3. The stimulation or inhibition of ADH release results in an adjustment of urine output until homeostasis is restored. The homeostatic adjustment made in response to the ADH release acts back on the hypothalamus to counteract further change.
4. If the active transport of sodium and chloride ions is inhibited in the nephron, so too is the ability to establish the salt gradient required to withdraw water from the filtrate. As a result, the urine passes out without being concentrated.

We hope that you enjoy using Senior Biology 2. We always welcome comments and constructive criticism, and will endeavor to implement suggestions where possible.

The staff at BIOZONE