



## VCE BIOLOGY 2006–2011

### **Relationship between the key knowledge and key skills of the 2000–2005 Study Design and the 2006–2011 Study Design**

The following table provides a comparison of the key knowledge (and some key skills) in the *VCE Biology Study Design 2006–2011* with the 2000–2005 Study Design.

In the *VCE Biology Study Design 2006–2011* there are two areas of study in each unit. For a list of the key skills refer to page 12 of the Study Design.

This document should be read in conjunction with the *VCE Biology Study Design 2006–2011*, *VCE Biology Assessment Handbook* and the ‘Frequently Asked Questions’ published in the *VCAA Bulletin*, August 2005, page 5.

| UNIT 1                 | 2000–2005 STUDY DESIGN   | 2006–2011 STUDY DESIGN   |
|------------------------|--|--|
| <b>Area of Study 1</b> | <p><i>Key knowledge</i></p> <ul style="list-style-type: none"> <li>• ecological groupings of organisms</li> <li>• diversity of living things</li> <li>• principles of classification</li> <li>• identification of organisms</li> <li>• environmental requirements of organisms</li> <li>• components of ecosystems</li> <li>• classification of consumers</li> <li>• energy flow in ecosystems</li> <li>• bioaccumulation of toxins in food webs</li> <li>• cycling of matter</li> <li>• interactions between organisms</li> <li>• population studies</li> <li>• survival within ecosystems</li> </ul> | <p>Unit 2 Area of Study 2</p> <p>Unit 2 Area of Study 1 (part of adaptations)</p> <p>Unit 1 Area of Study 2</p> <p>Unit 2 Area of Study 2</p> <p>Unit 2 Area of Study 2 (bioaccumulation part of the cycling of matter)</p> <p>Unit 2 Area of Study 2</p> <p>Unit 2 Area of Study 2 (as relationships)</p> <p>Unit 2 Area of Study 2 (as population dynamics)</p> <p>Unit 2 Area of Study 2 (as changes to ecosystems over time)</p> |
| <b>Area of Study 2</b> | <p><i>Key knowledge</i></p> <ul style="list-style-type: none"> <li>• the variety and effects of regular short-term environmental change and irregular environmental change on ecosystems</li> </ul>  | <p>Unit 2 Area of Study 2</p>  |

| UNIT 1                 | 2000–2005 STUDY DESIGN  | 2006–2011 STUDY DESIGN   |
|------------------------|---|--|
|                        | <ul style="list-style-type: none"> <li>• longer-term environmental change and its effects on the present-day global distribution of organisms</li> <li>• species adaptations to environmental change</li> <li>• ecological succession</li> <li>• human-induced environmental change</li> </ul>   | <p>Unit 2 Area of Study 2</p> <p>Unit 2 Area of Study 1 (part of adaptations)<br/>Unit 2 Area of Study 2 (part of changes to ecosystems over time)</p> <p>Unit 2 Area of Study 2 (part of changes to ecosystems over time)</p> <p>Unit 2 Area of Study 2</p> |
| <b>Area of Study 3</b> | The key knowledge and key skills are related to conducting and reporting on a scientific investigation (field work).  | <p>Unit 2 Area of Study 2</p> <p>Outcome 2 statement</p> <p>Set of key skills</p> <p>Assessment task</p>   |
| UNIT 2                 | 2000–2005 STUDY DESIGN  | 2006–2011 STUDY DESIGN   |
| <b>Area of Study 1</b> | <p><i>Key knowledge</i></p> <ul style="list-style-type: none"> <li>• provision of energy and nutrients</li> <li>• cellular respiration, photosynthesis and energy conversions</li> <li>• transport of materials in plants and animals</li> <li>• removal of waste products and toxic substances</li> </ul> | <p>Unit 1 Area of Study 2</p> <p>Unit 1 Area of Study 2</p> <p>Unit 1 Area of Study 2</p> <p>Unit 1 Area of Study 2</p>  |

| UNIT 2                 | 2000–2005 STUDY DESIGN  | 2006–2011 STUDY DESIGN  |
|------------------------|---|---|
|                        | <ul style="list-style-type: none"> <li>• water balance</li> <li>• experimental methods used to investigate the requirements for life</li> </ul>   | <p>Unit 2 Area of Study 2</p> <p>Unit 1 Area of Study 1, Outcome 1 statement, set of key skills and assessment task</p>   |
| <b>Area of Study 2</b> | <p><i>Key knowledge</i></p> <ul style="list-style-type: none"> <li>• asexual and sexual reproduction</li> <li>• mitosis</li> <li>• meiosis</li> <li>• reproductive systems in animals</li> <li>• reproductive systems in plants</li> <li>• fertilisation/pollination</li> <li>• provision of nutrients to the developing organism-seeds, yolk, placenta</li> <li>• development and growth in plants and animals</li> <li>• biological basis for modern technologies which enable human intervention in reproductive and developmental processes</li> <li>• experimental methods used to investigate reproduction and development</li> </ul> | <p>Unit 1 Area of Study 2</p> <p>Unit 1 Area of Study 1</p> <p>Unit 4 Area of Study 1</p> <p>Unit 1 Area of Study 2 and Unit 2 Area of Study 1</p> <p>Unit 1 Area of Study 2 (part of reproduction)<br/>Unit 2 Area of Study 1</p> <p>Unit 2 Area of Study 1<br/>Unit 1 Area of Study 2</p> <p>Unit 4 Areas of Study 1 and 2</p> <p>Unit 4 Areas of Study 1 and 2</p> |

| UNIT 3                 | 2000–2005 STUDY DESIGN   | 2006–2011 STUDY DESIGN  |
|------------------------|--|---|
| <b>Area of Study 1</b> | <p><i>Key knowledge</i></p> <ul style="list-style-type: none"> <li>• cellular environments</li> <li>• cell structure, functioning and specialisation</li> <li>• the structure, function and properties of cell membranes</li> <li>• experimental methods used to investigate cells</li> </ul> <p><i>Key skills</i></p> <ul style="list-style-type: none"> <li>• distinguish between prokaryotic and eukaryotic cells</li> <li>• identify cellular organelles and state their functions</li> <li>• compare plant and animal cells</li> <li>• model the structure and functioning of cell membranes</li> </ul> | <p>Unit 1 Area of Study 1</p> <p>Unit 1 Area of Study 1 (general principles)</p> <p>Unit 1 Area of Study 1</p> <p>Unit 1 Area of Study 1, Outcome 1 statement, set of key skills and assessment task</p> <p><i>New key knowledge</i></p> <ul style="list-style-type: none"> <li>• applications of molecular biology in medicine including the design of drugs in medical diagnosis</li> </ul> <p>Unit 1 Area of Study 1</p> <p>Unit 3 Area of Study 1</p> <p>Unit 1 Area of Study 1</p> <p>Unit 1 Area of Study 1 (mostly)<br/>The molecular nature of the membrane remains in Unit 3 Area of Study 1</p> |

| UNIT 3                 | 2000–2005 STUDY DESIGN  | 2006–2011 STUDY DESIGN  |
|------------------------|---|---|
|                        | <ul style="list-style-type: none"> <li>• relate cell functions to the survival of unicellular and multicellular organisms</li> <li>• compare the processes of photosynthesis and cellular respiration</li> <li>• synthesise enzyme action in the functioning cell</li> <li>• use microscopy techniques to section, stain, examine and draw cells</li> <li>• design and/or perform investigations involving enzymes and movement across a cell membrane</li> </ul> | <p>Unit 1 Area of Study 2 (reproduction)<br/>Unit 2 Areas of Study 1 and 2</p> <p>Unit 1 Area of Study 1 (as general treatment of cellular processes)<br/>Unit 1 Area of Study 2 (as obtaining energy)<br/>Unit 3 Area of Study 1 (as the specific stages)</p> <p>Unit 3 Area of Study 1 (enzyme action as a biochemical process)<br/>Unit 1 Area of Study 1 (the general role of enzymes)</p> <p>Unit 1 Area of Study 1</p> <p>Assessment tasks for Unit 3 Area of Study 1 (enzyme action as an example of a biochemical process and/or movement of substances across the cell membrane)</p> |
| <b>Area of Study 2</b> | <p><i>Key knowledge</i></p> <ul style="list-style-type: none"> <li>• homeostasis</li> <li>• nervous and hormonal control systems</li> <li>• detection of and response to changing conditions</li> <li>• feedback mechanisms</li> </ul>  | <p>Unit 3 Area of Study 2 (principles of homeostasis are part of coordination and regulation)</p> <p>Unit 3 Area of Study 2 (part of coordination and regulation)</p> <p>Unit 3 Area of Study 2 (the stimulus response model as part of detecting ‘self’ and ‘non-self’)</p> <p>Unit 3 Area of Study 2 (part of coordination and regulation)</p>  |

| UNIT 3 | 2000–2005 STUDY DESIGN   | 2006–2011 STUDY DESIGN  |
|--------|--|---|
|        | <ul style="list-style-type: none"> <li>• control mechanisms and adaptations involved in water balance and the regulation of body temperature and blood glucose in animals</li> <li>• the ways in which modern technology contributes to homeostasis</li> <li>• hormonal control of plant responses</li> <li>• regulation in plants of water balance and carbon dioxide supply</li> <li>• experimental methods used to investigate the response of organisms to changing conditions</li> </ul> <p><i>Key skills</i></p> <ul style="list-style-type: none"> <li>• compare the structures and actions of the nervous and hormonal systems in homeostasis</li> </ul> | <p>Unit 2 Area of Study 1</p> <p>No longer included</p> <p>Unit 2 Area of Study 1 (as plant tropism)<br/>Unit 3 Area of Study 2 (as part of chemical communication)</p> <p>Unit 1 Area of Study 2 (as part of common requirements of living things)<br/>Unit 2 Area of Study 2 (as part of cycling of matter)</p> <p>Unit 3 Area of Study 2 (example of an assessment task)</p> <p><i>New key knowledge</i></p> <ul style="list-style-type: none"> <li>• cell membranes, signalling molecules and signal transduction</li> </ul> <p>Unit 3 Area of Study 2 (note nervous and endocrine systems)</p> |

| UNIT 3                 | 2000–2005 STUDY DESIGN   | 2006–2011 STUDY DESIGN  |
|------------------------|--|---|
|                        | <ul style="list-style-type: none"> <li>• identify the ways in which organisms detect changing conditions</li> <li>• construct flowcharts illustrating feedback mechanisms</li> <li>• identify and explain adaptations involved in water balance and the regulation of body temperature and blood glucose in animals</li> <li>• model hormonal control of plant responses</li> <li>• predict the effect of maintaining water balance in plants on the supply of carbon dioxide</li> </ul> | <p>Unit 3 Area of Study 2</p> <p>Unit 3 Area of Study 2</p> <p>Unit 2 Area of Study 1</p> <p>Unit 2 Area of Study 1 (as plant tropisms)</p> <p>Unit 1 Area of Study 2 (as part of common requirements of living things)<br/>Unit 2 Area of Study 2 (as part of cycling of matter)</p>   |
| <b>Area of Study 3</b> | <p><i>Key knowledge</i></p> <ul style="list-style-type: none"> <li>• characteristics of pathogenic organisms and agents</li> <li>• parasitic infections</li> <li>• aetiology of disease caused by pathogenic organisms and agents</li> <li>• defence mechanisms of plants</li> <li>• defence mechanisms in animals</li> <li>• non-specific and specific immunity in humans</li> </ul>  | <p>Unit 3 Area of Study 2</p> <p>Unit 3 Area of Study 2 (as physical and chemical barriers to infection in plants and animals)</p> <p>Unit 3 Area of Study 2 (as physical and chemical barriers to infection in plants and animals)</p> <p>Unit 3 Area of Study 2 (as the details of cellular and chemical components of the immune response)</p> |

| <b>UNIT 3</b>          | <b>2000–2005 STUDY DESIGN</b>   | <b>2006–2011 STUDY DESIGN</b>   |
|------------------------|---|---|
|                        | <ul style="list-style-type: none"> <li>• experimental methods used to investigate disease and defence against disease</li> </ul> <p><i>Key skills</i></p> <ul style="list-style-type: none"> <li>• identify characteristics of pathogenic organisms and agents</li> <li>• synthesise ideas about the mechanisms by which organisms defend themselves against pathogenic organisms and agents</li> </ul> | <p>Unit 3 Area of Study 2 (as part of vaccine technologies)</p> <p>Unit 3 Area of Study 2 (as part of cellular and non-cellular agents)</p> <p>Unit 3 Area of Study 2</p>   |
| <b>UNIT 4</b>          | <b>2000–2005 STUDY DESIGN</b>   | <b>2006–2011 STUDY DESIGN</b>   |
| <b>Area of Study 1</b> | <p><i>Key knowledge</i></p> <ul style="list-style-type: none"> <li>• DNA structure and replication</li> <li>• the genetic code and protein synthesis</li> <li>• chromosomes, genes, alleles</li> <li>• mutations</li> </ul>   | <p>Unit 3 Area of Study 1 (structure and general function of DNA and RNA)</p> <p>Unit 4 Area of Study 1 (DNA replication in the context of the cell cycle)</p> <p>Unit 4 Area of Study 1 (gene expression: details of transcription and translation)</p> <p>Unit 3 Area of Study 1 (synthesis of biomacromolecules: proteins)</p> <p>Unit 4 Area of Study 1</p> |

| UNIT 4 | 2000–2005 STUDY DESIGN   | 2006–2011 STUDY DESIGN   |
|--------|--|--|
|        | <ul style="list-style-type: none"> <li>• mitosis and meiosis</li> <br/> <li>• genotype and phenotype</li> <li>• environmental influences on phenotype</li> <br/> <li>• inheritance at one gene locus and two gene loci</li> <br/> <li>• variation</li> <br/> <li>• gene technology (manipulation of genetic material), for example, role of reverse transcriptase, endonucleases, DNA ligases, vectors, polymerase chain reaction (PCR)</li> <br/> <li>• applications of gene technology</li> <br/> <li>• an introduction to social, ethical, legal and economic implications of gene technology</li> <br/> <li>• experimental methods used to investigate mechanisms and patterns of inheritance in organisms</li> </ul> <p><i>Key skills</i></p> <ul style="list-style-type: none"> <li>• investigate DNA structure and replication</li> </ul> | <p>Unit 1 Area of Study 2 (for mitosis)<br/>Unit 4 Area of Study 1 (for meiosis)</p><br><p>Unit 4 Area of Study 1</p><br><p>Unit 4 Area of Study 1 (as one or two genes carried on different pairs of chromosomes)</p><br><p>Unit 4 Area of Study 1</p><br><p>Unit 4 Area of Study 1 (with specific applications to be studied)</p><br><p>Unit 4 Areas of Study 1 and 2</p><br><p>Included in set of key skills (refer to page 12 of study design)</p><br><p>Example of an assessment task for Unit 4 Outcome 1, Task 1 related to genetic crosses</p><br><p>Unit 3 Area of Study 1 (structure and function of DNA and RNA)<br/>Unit 4 Area of Study 1 (principal events in replication)</p> |

| UNIT 4                 | 2000–2005 STUDY DESIGN   | 2006–2011 STUDY DESIGN  |
|------------------------|--|---|
|                        | <ul style="list-style-type: none"> <li>model mitosis and meiosis</li> </ul>  | Unit 1 Area of Study 2 (for mitosis)<br>Unit 4 Area of Study 1 (for meiosis)  |
| <b>Area of Study 2</b> | <p><i>Key knowledge</i></p> <ul style="list-style-type: none"> <li>the causes of variation between individuals</li> <li>factors affecting allele frequencies within a gene pool</li> <li>adaptations</li> <li>selection pressures and natural selection</li> <li>speciation, extinction</li> <li>evidence of evolution</li> <li>divergent, convergent and parallel evolution</li> <li>homind evolution</li> <li>effects of human activity on evolutionary processes</li> <li>methods used to investigate variation, natural selection and evolution</li> </ul> <p><i>Key skills</i></p> <ul style="list-style-type: none"> <li>compare divergent, convergent and parallel evolution</li> </ul> | Unit 4 Area of Study 2<br><br>Unit 2 Area of Study 1<br><br>Unit 4 Area of Study 2<br><br>Unit 4 Area of Study 2 (only divergent and convergent patterns of evolution)<br><br>Unit 4 Area of Study 2 (as patterns and origins)<br><br>Unit 4 Area of Study 2 has been extended to include the impact of cultural and technological change<br><br>Unit 4 Area of Study 2<br><br>Unit 4 Area of Study 2 (only divergent and convergent patterns of evolution) |