Time allowed

- Perusal time: 10 minutes
- Working time: 2 hours 30 minutes

Examination materials provided

- Paper One — Question and response book
- Notepaper

Equipment allowed

- QSA-approved equipment
- Non-programmable calculator
- One A4 sheet of EBI question topic research notes

Directions

Do not write in this book during perusal time.

Paper One has three parts:

- Part A — Cell structure and function
- Part B — Physiology of organisms
- Part C — Organisms and ecosystems

Suggested time allocation

- Part A: 40 minutes
- Part B: 55 minutes
- Part C: 55 minutes

Assessment

Assessment standards are at the end of this book.

After the examination session

The supervisor will collect this book.

Take your research notes when you leave for use in Paper Two.
Planning space
Part A — Cell structure and function

Questions 1–7 assess Understanding biology (UB) and Investigating biology (IB).
Attempt all questions. Write your responses in the spaces provided.
Suggested time allocation: **40 minutes**.

**Question 1 (UB)**

a. Sketch a plant cell as it would be seen using an optical microscope. Label only the parts that would distinguish it from an animal cell.

b. Describe the function of one of these parts.

**Question 2 (UB)**

Compare the processes of osmosis and diffusion.
Question 3 (UB)

Identify the internal structures of chloroplasts. Explain how these structures are involved in light-dependent and light-independent reactions.

Question 4 (UB)

Draw a diagram to show the arrangement of phospholipids and proteins in a cell membrane. Annotate the diagram (use arrows, text etc.) to show two different methods of transporting substances across the membrane.
Question 5 (UB)

The graph below shows the effect of temperature on the reaction rate of an enzyme.

Link the shape of the graph to the nature of enzyme action.

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**Question 6 (IB)**

Radioactive isotopes are unstable atoms that emit particles. They “decay” and may become another element altogether. While they are radioactive the actions of the elements can be accurately tracked in an organism.

The table below shows relevant half-lives (the time taken for half the material to decay) of some common elements.

<table>
<thead>
<tr>
<th>Element</th>
<th>Isotope</th>
<th>Half-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>C–11</td>
<td>20.38 minutes</td>
</tr>
<tr>
<td></td>
<td>C–14</td>
<td>5730 years</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H–3</td>
<td>12.35 years</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>N–13</td>
<td>9.97 minutes</td>
</tr>
<tr>
<td></td>
<td>N–16</td>
<td>7.13 seconds</td>
</tr>
<tr>
<td>Oxygen</td>
<td>O–15</td>
<td>122.24 seconds</td>
</tr>
<tr>
<td>Sulfur</td>
<td>S–35</td>
<td>87.44 days</td>
</tr>
</tbody>
</table>

Critically analyse the data to draw conclusions about which isotopes would be most useful in a study of the light-independent cycle of photosynthesis. Justify your conclusion.

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**Question 7 (IB)**

The table below shows the surface area and volume for four different-sized potato cubes.

<table>
<thead>
<tr>
<th>Potato cubes</th>
<th>Cube size (cm)</th>
<th>Surface area (cm²)</th>
<th>Volume (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>54</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>96</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>150</td>
<td>125</td>
</tr>
</tbody>
</table>
a. Create a graph that plots the surface area against the volume of each cube.

b. Describe the relationship between surface area and volume.

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c. Explain how this affects the diffusion of substances into and out of a cell.

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End of Part A
Part B — Physiology of organisms

Questions 1–5 assess Understanding biology (UB) and Investigating biology (IB).
Question 6 assesses Evaluating biological issues (EBI).
Attempt all questions. Write your responses in the spaces provided.
Suggested time allocation: 55 minutes.

Question 1 (UB)
Explain why it is necessary to maintain a constant internal environment for warm-blooded organisms.

Question 2 (UB)
An Australian insect found in the desert only produces uric acid as a nitrogenous waste. Link the reason for this type of waste to the environmental conditions.

Question 3 (UB)
Explain the role of alveoli in changing the gaseous composition of blood.
Question 4 (UB)

The nicotine in cigarettes raises the metabolic rate within the human body, meaning more energy is burnt. People who smoke cigarettes sometimes give the possibility of gaining weight as a reason to not quit smoking. Smoking, however, has very serious effects on most body systems, particularly the circulatory and respiratory systems.

Clearly establish the interrelationships between a cigarette smoker’s various body systems by describing how they are affected by smoking.

Part B continues overleaf
Question 5 (IB)

Design an experiment to investigate how a cold-blooded organism such as a lizard regulates body temperature. Include:

- a hypothesis
- methodology
- how you would address variables
- suitable controls
- planning for replicate treatments
- the type of data you would collect.
Question 6 assesses *Evaluating biological issues* (EBI). Write an extended response below.

**Your response MUST refer to biological principles, concepts and ideas.**

Plan your response carefully. If you write more than one draft, indicate which is to be marked.

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**Question 6 (EBI)**

On many farms, chickens raised for meat are fed intensively to achieve quicker growth weights. However, this leads to the chickens generating a lot of body heat. It has been found that appetite is reduced when animals are hot, leading to a subsequent loss of body weight. Selective breeding could be used to develop a featherless chicken to overcome these issues.

However, selective breeding is viewed unfavourably by some groups in the community. Evaluate the physiological effects on chickens, such as growth rates, if they were bred to be featherless. Decide whether this practice is worth pursuing.

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Part C — Organisms and ecosystems

Questions 1–5 assess *Understanding biology* (UB) and *Investigating biology* (IB).
Question 6 assesses *Evaluating biological issues* (EBI).
Attempt all questions. Write your responses in the spaces provided.
Suggested time allocation: **55 minutes.**

**Question 1 (UB)**
Use an example to demonstrate the difference between commensalism and mutualism.

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**Question 2 (UB)**
State whether mainland Australia is a single ecosystem or many. Justify your response by using specific examples.

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**Question 3 (UB)**
Explain the contribution that legumes make to the Nitrogen Cycle.

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Question 4 (UB)

People sometimes remove dead logs and branches from state forests to burn in campfires and wood stoves. Explain how this may eventually lead to long-term changes to the flow of energy and matter in this ecosystem.

Question 5 (IB)

The graph below is of a predator–prey relationship between two mites.

Interpret the graph and determine which line of abundance represents the predator population and which line is the prey. Refer to population dynamics to explain your reasoning.
Question 6 assesses *Evaluating biological issues* (EBI). Write an extended response below. 
Your response MUST refer to biological principles, concepts and ideas.
Plan your response carefully. If you write more than one draft, indicate which is to be marked.

**Question 6 (EBI)**

The Great Barrier Reef consists of almost 3000 separate reefs and 900 islands which protect 2600 kilometres of Queensland coast from the huge waves and currents of the Pacific Ocean. The relatively calm waters of the Reef provide sheltered passage for more than 2000 ships a year.

Shipping accidents and oil spills in the Great Barrier Reef area have the potential to cause an environmental disaster.

Make a justified and responsible decision about ships containing materials potentially dangerous to Great Barrier Reef ecosystems continuing to travel through its waters.
End of Part C

End of Paper One
Additional pages for responses (if required)

Part [ ] Question [ ]
## Assessment standards from the Biology Senior External Syllabus 2006

<table>
<thead>
<tr>
<th>Criterion</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
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<td>The candidate communicates understanding by:</td>
<td>The candidate communicates understanding by:</td>
<td>The candidate communicates understanding by:</td>
<td>The candidate communicates understanding by:</td>
<td>The candidate states terminology and ideas relevant to concepts.</td>
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<tr>
<td></td>
<td>• making links between related ideas, concepts, principles</td>
<td>• explaining ideas, concepts, principles and theories and</td>
<td>• defining and describing ideas, concepts, principles and</td>
<td>• stating ideas and using terminology relevant to concepts and</td>
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<td></td>
<td>and theories to reveal meaningful interrelationships</td>
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<td>recalling interrelationships.</td>
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<td>challenging tasks.</td>
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<td>tasks.</td>
<td>describing interrelationships between them</td>
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<td>• formulating justified researchable questions</td>
<td>• formulating researchable questions</td>
<td>• identifying researchable questions</td>
<td>• using data to answer questions</td>
<td>• providing incomplete methodology, and transcribes data.</td>
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<td>• designing an investigation by providing methodology, addressing</td>
<td>• designing an investigation by providing methodology,</td>
<td>• designing an investigation by providing incomplete methodology</td>
<td>• designing an investigation which provides incomplete</td>
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<td>variables and control, planning replicate treatments and identifying</td>
<td>variables and control and planning replicate treatments</td>
<td>methods with few variables and attempts to include a control</td>
<td>methodology and mentions variables</td>
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<td>• organising data</td>
<td>• attempting to organise data.</td>
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<td>• using data to draw conclusions.</td>
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<td>• evaluating the design of the investigation and the adequacy of</td>
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<td>the data collected and proposing refinements.</td>
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| Evaluating biological issues | The candidate communicates by:  
• critically analysing and evaluating information and data from a variety of sources to determine validity, reliability and bias  
• integrating the information and data to make justified and responsible decisions  
• comparing alternatives and predictions relevant in past, present and future biological contexts. | The candidate communicates by:  
• analysing and evaluating information and data from a variety of sources to determine validity, reliability and bias  
• integrating the information and data to make logical decisions  
• recognising alternatives and predictions relevant in a range of past and present biological contexts. | The candidate communicates by:  
• analysing information and data from a variety of sources to determine validity and bias  
• selecting relevant information and data to make plausible decisions and predictions  
• recognising concepts that form the basis of present-day biological issues in a range of biological contexts. | The candidate communicates by:  
• making statements related to source material  
• making unsupported decisions  
• recognising that a given issue has biological implications. | The candidate communicates by restating supplied information. |
Acknowledgments


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