2010 Senior External Examination

Biology
Paper Two — Question and response book

Tuesday 2 November 2010
1 pm to 3:10 pm

Time allowed
• Perusal time: 10 minutes
• Working time: 2 hours

Examination materials provided
• Paper Two — Question and response book
• Notepaper

Equipment allowed
• QSA-approved equipment
• non-programmable calculator

Directions
Do not write in this book during perusal time.
Paper One has two parts:
• Part A — Continuity of life
• Part B — Evolution and diversity

Suggested time allocation
• Part A: 60 minutes
• Part B: 60 minutes

Assessment
Assessment standards are at the end of this book.

After the examination session
The supervisor will collect this book when you leave.
Planning space
Part A — Continuity of life

Section 1 — Short response

Section 1 has eight questions that assess Understanding biology (UB) and Investigating biology (IB). Attempt all questions.

Respond to the questions in the spaces provided.

Question 1 (UB)

Briefly explain the major difference between meiosis and mitosis.

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Question 2 (UB)

In guinea pigs, short hair (S) is dominant over long hair (s). Two short-haired guinea pigs were mated and they produced equal numbers of short-haired and long-haired offspring. Show your working to establish the genotypes of the parents.

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Question 3 (UB)

The Wollemi Pine is one of the world’s rarest plants. The natural population of about 38 plants has very little genetic diversity. Explain why this lack of genetic diversity may affect the ongoing survival of this species.

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**Question 4** (UB)

Draw a graph that shows the changes in thickness of the uterine wall throughout a complete menstrual cycle.

On the graph, explain the effects of one hormone in one stage.

![Graph](image)

**Question 5** (UB)

Choose an organism that produces many offspring (e.g. a fish) and one that produces only one or two at a time (e.g. a horse). Compare and contrast the reproductive strategies of these organisms in relation to the success of the species.

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Question 6 (IB)

Use a pedigree (including an appropriate key that follows biological conventions) to demonstrate the inheritance of a sex-linked recessive gene on a family.

Question 7 (IB)

In snapdragons (a common decorative flowering garden plant), the homozygous conditions are red or white flowers while the heterozygous condition is pink flowers. This is an example of incomplete dominance. Use a Punnett square to show the working used to establish the genotypes and phenotypes of a cross between a white flower and a pink flower.
Question 8 (IB)

The following diagram shows a pedigree for the condition of albinism in humans. People with albinism lack pigment in the hair, skin and eyes.

![Pedigree Diagram]

State the type of inherited trait that albinism demonstrates. Use information provided in the diagram in your response.

End of Section 1
Section 2 — Extended response

Section 2 has two questions that assess Evaluating biological issues (EBI). Write an extended response to one of the questions below.

Your response must refer to biological principles, concepts and ideas.

Plan your response carefully. If you do a first draft and then a final draft, indicate which is the draft to be assessed.

Either

**Question 1 (EBI)**

Critically evaluate the use of transgenic organisms in modern science and agricultural research.

**or**

**Question 2 (EBI)**

The increasing demand for reproductive technologies due to a variety of reasons could result in artificial selection of the human genome.

Justify the development of selection criteria for the use of reproductive technologies based on biological principles. Successful applicants could be people who are unable to reproduce naturally due to genetic disorders.

Tick the question you have chosen:  □ 1      □ 2
Part B — Evolution and diversity

Section 1 — Short response

Section 1 has six questions that assess Understanding biology (UB) and Investigating biology (IB). Attempt all questions.
Respond to the questions in the spaces provided.

Question 1 (UB)

When using the binomial naming system of classification, the first word represents which level of taxonomy?

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Question 2 (UB)

Stinging nettles, blue-bottle jellyfish and wasps are all capable of producing painful stings. From which type of evolution is this characteristic most likely to have evolved?

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Question 3 (UB)

Male kangaroos establish territories containing a number of female kangaroos with whom they mate. They must fight other males to maintain these territories. Male kangaroos are much larger than females and are specifically adapted to establish and defend their territories. In terms of natural selection, explain one advantage and one disadvantage of this type of competition between males.

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Question 4 (UB)

Briefly explain Darwin’s theory of natural selection, using an appropriate example.

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Question 5 (UB)

Construct a dichotomous key that will correctly classify the following organisms: mammal, bird, reptile, fish, insect.
Question 6 (IB)

The table below shows comparisons between the amino acid sequences in the DNA of echidnas, platypus and kangaroos.

<table>
<thead>
<tr>
<th>Pairs of organisms</th>
<th>Number of amino acid differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platypus – grey kangaroo</td>
<td>35</td>
</tr>
<tr>
<td>Platypus – echidna</td>
<td>10</td>
</tr>
<tr>
<td>Platypus – potoroo</td>
<td>32</td>
</tr>
<tr>
<td>Echidna – potoroo</td>
<td>29</td>
</tr>
<tr>
<td>Echidna – grey kangaroo</td>
<td>34</td>
</tr>
<tr>
<td>Potoroo – grey kangaroo</td>
<td>11</td>
</tr>
</tbody>
</table>

Use a diagram to show the evolutionary relationship between the organisms in the table. Explain your reasoning with specific reference to the data.

End of Section 1
Section 2 — Extended response

Section 2 has **two** questions that assess *Evaluating biological issues* (EBI). Write an extended response to **one** of the questions below.

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

Plan your response carefully. If you do a first draft and then a final draft, indicate which is the draft to be assessed.

Either

**Question 1 (EBI)**

Discuss how **medical technology** could impact on the evolutionary pathways of humans.

**or**

**Question 2 (EBI)**

**Pesticide and antibiotic resistance** is a growing concern in the scientific community.

Critically evaluate how these issues have been able to surface in the last 100 years. Predict the effect of this problem continuing unchecked in the future.

Tick the question you have chosen: 1 2
End of Section 2

End of Part B

End of Paper Two
Planning space
## Assessment standards from the 2006 senior external syllabus for Biology

<table>
<thead>
<tr>
<th>Criterion</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Understanding biology</strong></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 communicates understanding by stating ideas and using terminology relevant to concepts and recalling interrelationships.</td>
<td>The candidate states terminology and ideas relevant to concepts.</td>
</tr>
<tr>
<td></td>
<td>• making links between related ideas, concepts, principles and theories and theories to reveal meaningful interrelationships</td>
<td>• explaining ideas, concepts, principles and theories and describing interrelationships between them</td>
<td>• applying knowledge and understanding to a range of complex and challenging tasks.</td>
<td>• defining and describing ideas, concepts, principles and theories, and identifying interrelationships</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• applying knowledge and understanding to a range of complex and challenging tasks.</td>
<td>• applying knowledge and understanding to a range of complex tasks.</td>
<td>• applying knowledge and understanding to a range of tasks.</td>
<td>• applying knowledge and understanding to a range of tasks.</td>
<td></td>
</tr>
<tr>
<td><strong>Investigating biology</strong></td>
<td>The candidate communicates investigative processes by:</td>
<td>The candidate communicates investigative processes by:</td>
<td>The candidate communicates investigative processes by:</td>
<td>The candidate communicates investigative processes by:</td>
<td>The candidate communicates investigative processes by:</td>
</tr>
<tr>
<td></td>
<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>
</tr>
<tr>
<td></td>
<td>• designing an investigation by providing methodology, addressing variables and control, planning replicate treatments and identifying data to be collected</td>
<td>• designing an investigation by providing methodology, addressing variables and control and planning replicate treatments</td>
<td>• designing an investigation by providing incomplete methodology with few variables and attempts to include a control</td>
<td>• designing an investigation which provides incomplete methodology and mentions variables</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• organising data to identify trends and interrelationships</td>
<td>• organising data</td>
<td>• using data to draw conclusions</td>
<td>• attempting to organise data.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• interpreting and critically analysing data with links to theoretical concepts to draw conclusions relating to the question(s)</td>
<td>• interpreting data and drawing conclusions relating to the question(s)</td>
<td>• using data to draw conclusions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• evaluating the design of the investigation and reflecting on the adequacy of the data collected and proposing refinements.</td>
<td>• evaluating the design of the investigation and the adequacy of the data collected.</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
### Evaluating biological issues

<table>
<thead>
<tr>
<th>Criterion</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
</table>
| 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 that are 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. |
Acknowledgment


*Every reasonable effort has been made to contact owners of copyright material. We would be pleased to hear from any copyright owner who has been omitted or incorrectly acknowledged.*