Sample assessment 2020

Biology

Paper 2

Time allowed
- Perusal time — 10 minutes
- Working time — 90 minutes

General instructions
- Answer all questions in this question and response book.
- Write using black or blue pen.
- Respond in paragraphs consisting of full sentences.
- QCAA-approved calculator permitted.
- Planning paper will not be marked.

Section 1 (45 marks)
- 11 short response questions
Section 1

Instructions

• Write using black or blue pen.
• Respond in paragraphs consisting of full sentences.
• If you need more space for a response, use the additional pages at the back of this book.
  − On the additional pages, write the question number you are responding to.
  − Cancel any incorrect response by ruling a single diagonal line through your work.
  − Write the page number of your alternative/additional response, i.e. See page …
  − If you do not do this, your original response will be marked.

QUESTION 1 (1 mark)
Define the term gene.

QUESTION 2 (4 marks)
Explain how the process of classifying ecosystems is an important step toward effective ecosystem management of an old-growth forest.
QUESTION 3 (4 marks)
Explain two of the differences between DNA found in eukaryotes and prokaryotes.
QUESTION 4 (4 marks)
Describe the process of making recombinant DNA in terms of insertion of DNA fragments and joining of DNA.
QUESTION 5 (4 marks)
Describe how the process of independent assortment during meiosis leads to variation in the genotype of offspring. A diagram may be used to demonstrate your response.
QUESTION 6 (2 marks)
The figure below is a human karyotype.

a) Identify the ploidy change. [1 mark]

b) Using the table below, predict the genetic disorder that is likely to occur due to this ploidy change. [1 mark]

<table>
<thead>
<tr>
<th>Chromosome number</th>
<th>Monosomy</th>
<th>Trisomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Jacobsen syndrome</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>Patau syndrome</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>Edwards syndrome</td>
</tr>
<tr>
<td>23</td>
<td>Turner syndrome</td>
<td></td>
</tr>
</tbody>
</table>
QUESTION 7 (6 marks)
The figure below is a cladogram of Darwin’s finches.

a) What is one of the common assumptions of cladistics?  

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b) Infer which species is genetically closest to the common ancestor for the finches shown. Give a reason to support your answer.  

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c) Interpret the cladogram to infer the degree of DNA similarity of all of the species shown.  

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d) Identify two other types of evidence that could be used to determine the relatedness of these organisms. [2 marks]

QUESTION 8 (5 marks)
The figure below is a diagrammatic representation of a grazing food chain showing inputs and losses of energy at each trophic level.

![Food Chain Diagram]

a) Identify what types of energy transfers are represented by the letters A and F in this figure. [2 marks]

A: 

F: 
b) Explain the following processes: [2 marks]

- Energy transformation from solar radiation to autotrophs

- Energy transfer from autotrophs to herbivores

c) Contrast the efficiency of the processes explained in 8b) with subsequent trophic energy transfers. [1 mark]

QUESTION 9 (3 marks)
Explain the concept of ecological succession in a climax ecosystem exposed to a bushfire.
QUESTION 10 (6 marks)
The diagram below is a food web of biota in an Australian rainforest.

a) Analyse the given information to identify the keystone species. [1 mark]

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b) Predict the outcome for the ecosystem of removing the keystone species. Give a reason. [2 marks]

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c) If this rainforest habitat was to become fragmented, identify which mechanism of isolation would most likely influence the gene flow of species. Give two reasons to support your response. [3 marks]

QUESTION 11 (6 marks)

The graphs below show the seasonal patterns of soil temperature (at 10 cm depth), litterfall and total soil respiration in a primary forest (PF) and secondary forest (SF).
a) Compare the ecosystems across a temporal scale using the given data. [4 marks]

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b) Identify an effect of increasing the availability of nutrients on the carrying capacity of this primary forest ecosystem. Give a reason to support your answer. [2 marks]

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END OF PAPER
ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.
ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.
References

Question 6
Figure derived from National Cancer Institute 1997, *Karotype (Normal)*,

Question 7
Figure derived from White, R 2011, *Darwiniana and Evolution: Picturing evolutionary trees*,

Question 11
Graphs derived from Zhou, Z, Jiang, L, Du, E, Hu, H, Li, Y, Chen, D & Fang, J 2013, ‘Temperature and
substrate availability regulate soil respiration in the tropical mountain rainforests, Hainan Island, China’,