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Sample assessment 2020

Question and response book

# 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



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## 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.
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### QUESTION 1 (1 mark)

Define the term gene.

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### QUESTION 2 (4 marks)

Explain how the process of classifying ecosystems is an important step toward effective ecosystem management of an old-growth forest.

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**QUESTION 3 (4 marks)**

Explain two of the differences between DNA found in eukaryotes and prokaryotes.

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**QUESTION 4 (4 marks)**

Describe the process of making recombinant DNA in terms of insertion of DNA fragments and joining of DNA.

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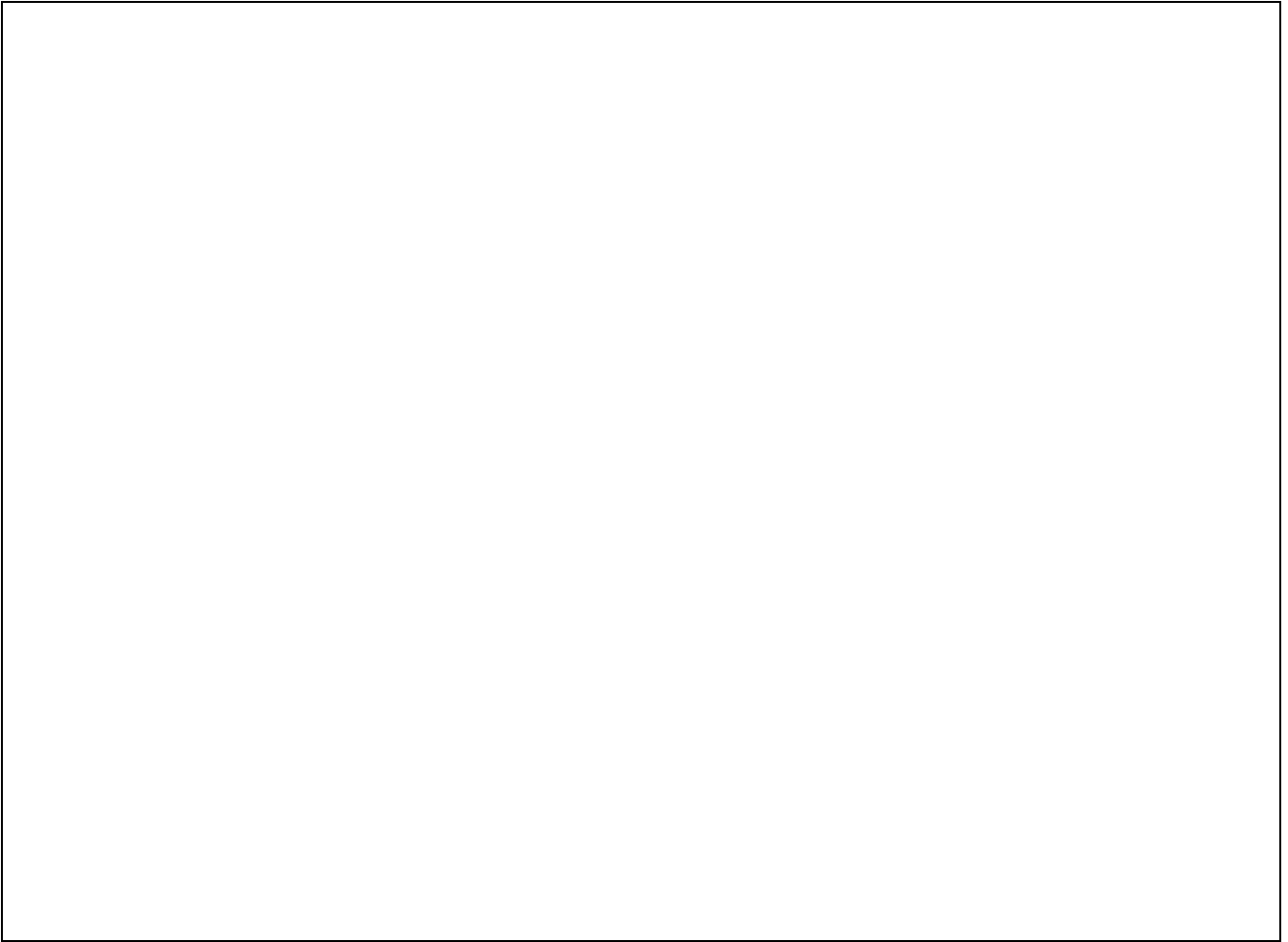
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**QUESTION 5 (4 marks)**

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.



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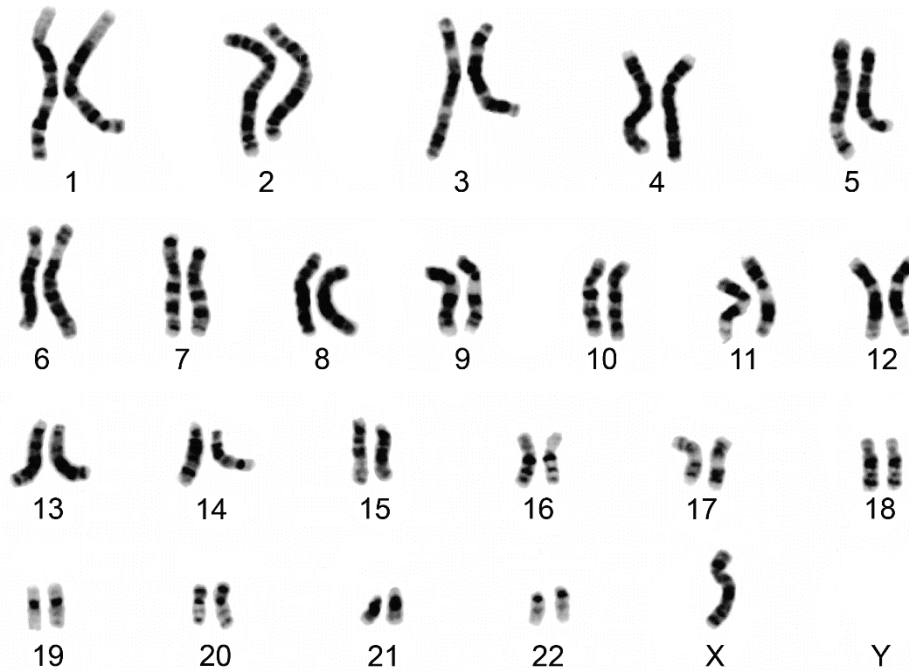
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**QUESTION 6 (2 marks)**

The figure below is a human karyotype.



a) Identify the ploidy change.

[1 mark]

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

[1 mark]

Chromosome number	Monosomy	Trisomy
11	Jacobsen syndrome	
13		Patau syndrome
18		Edwards syndrome
23	Turner syndrome	

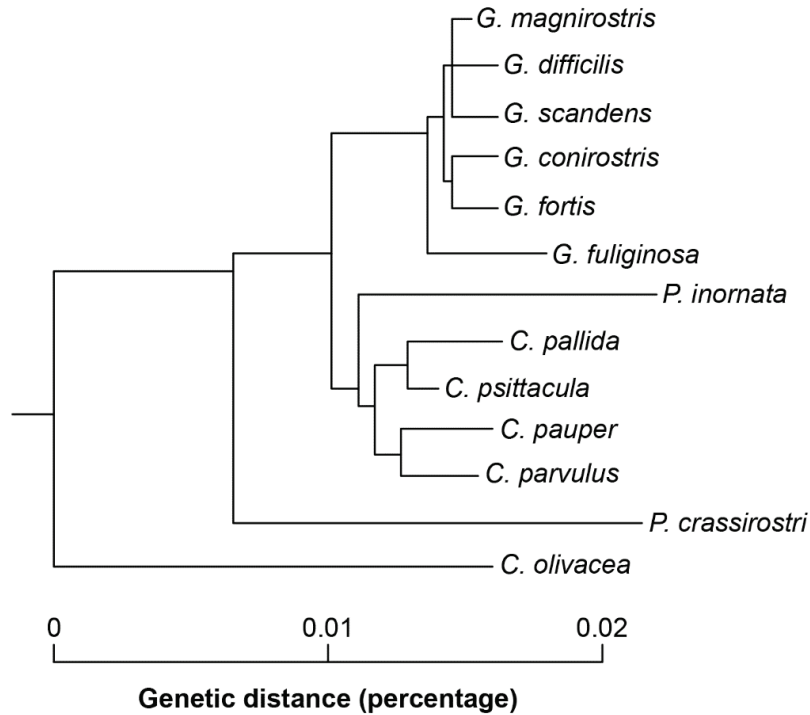
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**QUESTION 7 (6 marks)**

The figure below is a cladogram of Darwin's finches.



a) What is one of the common assumptions of cladistics? [1 mark]

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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. [2 marks]

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c) Interpret the cladogram to infer the degree of DNA similarity of all of the species shown. [1 mark]

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

[2 marks]

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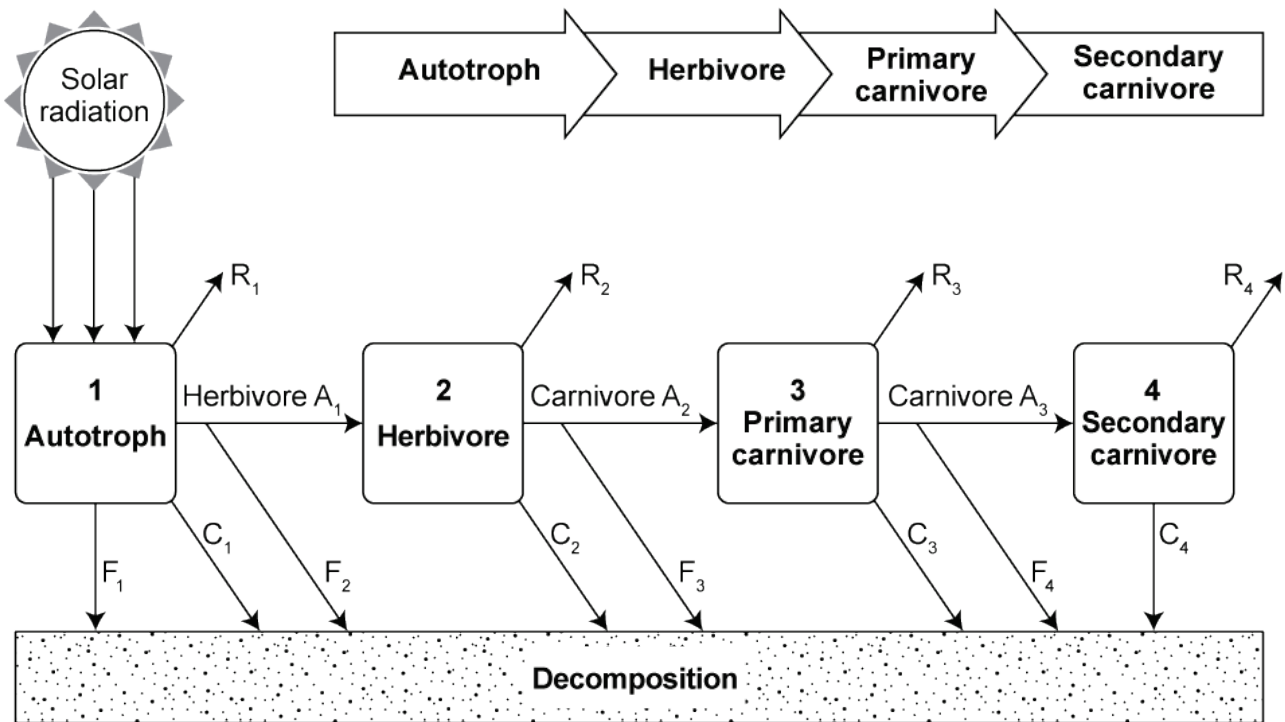
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**QUESTION 8 (5 marks)**

The figure below is a diagrammatic representation of a grazing food chain showing inputs and losses of energy at each trophic level.



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

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- Energy transfer from autotrophs to herbivores

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

[1 mark]

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**QUESTION 9 (3 marks)**

Explain the concept of ecological succession in a climax ecosystem exposed to a bushfire.

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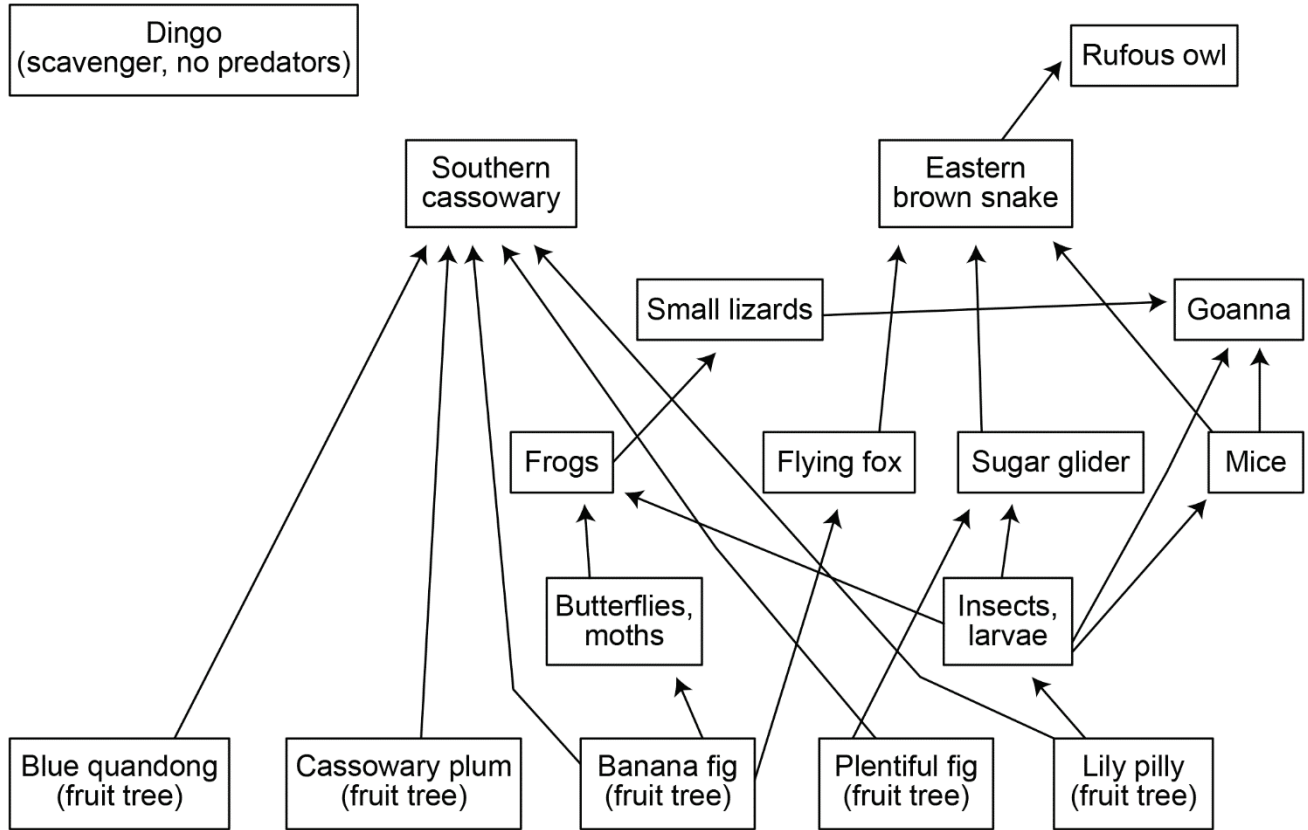
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**QUESTION 10 (6 marks)**

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]

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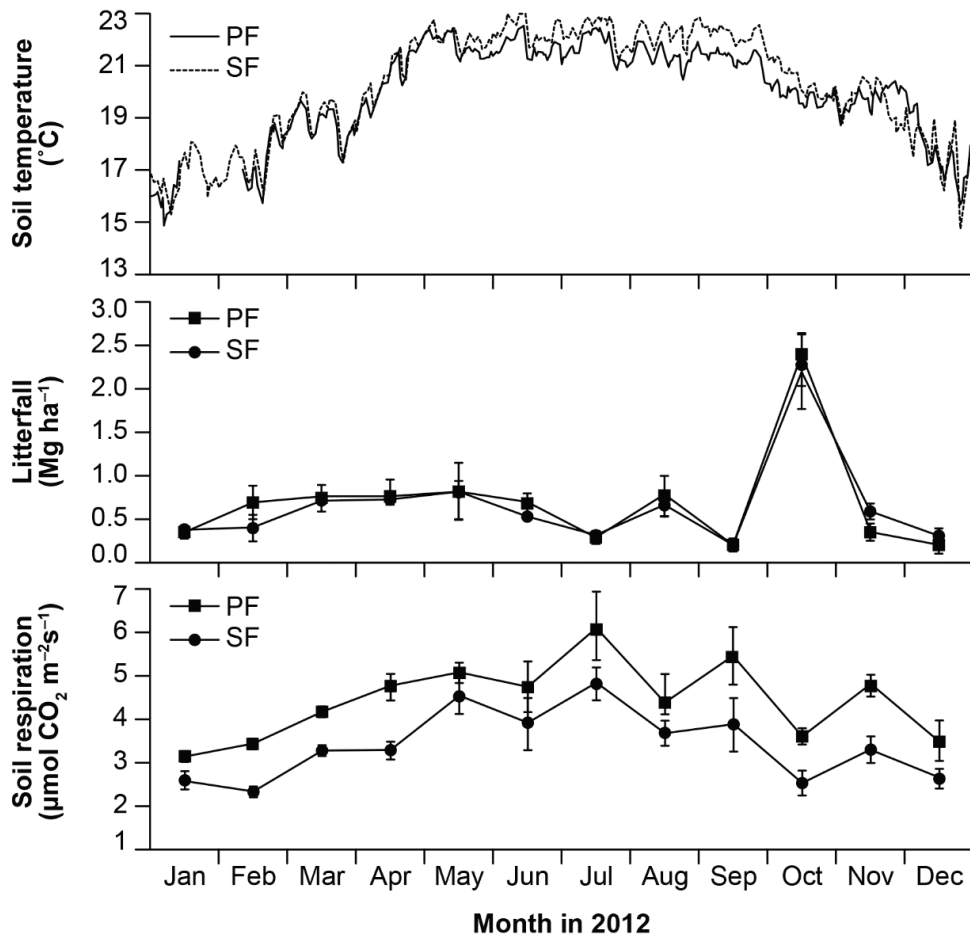
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**QUESTION 11 (6 marks)**

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.

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## References

### Question 6

Figure derived from National Cancer Institute 1997, *Karotype (Normal)*,  
<https://visualsonline.cancer.gov/details.cfm?imageid=2721>.

### Question 7

Figure derived from White, R 2011, *Darwiniana and Evolution: Picturing evolutionary trees*,  
[www.darwiniana.org/trees.htm](http://www.darwiniana.org/trees.htm).

### 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', *Journal of Plant Ecology*, vol. 6, no. 5, pp 325–334, <https://doi.org/10.1093/jpe/rtt034>.



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