Biology 2019 v1.3

IA1 sample marking scheme

September 2023

Data test (10%)

This sample has been compiled by the QCAA to model one possible approach to allocating marks in a data test. It matches the examination mark allocations as specified in the syllabus (~ 30% apply understanding, ~ 30% analyse evidence and ~ 40% interpret evidence) and ensures that a balance of the objectives are assessed.

Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

2. apply understanding of biodiversity or ecosystem dynamics to given algebraic, visual or graphical representations of scientific relationships and data to determine unknown scientific quantities or features
3. analyse evidence about biodiversity or ecosystem dynamics to identify trends, patterns, relationships, limitations or uncertainty in datasets
4. interpret evidence about biodiversity or ecosystem dynamics to draw conclusions based on analysis of datasets.

Note: Objectives 1, 5, 6 and 7 are not assessed in this instrument.

Queensland Government
QCAA Queensland Curriculum & Assessment Authority
230848
For all Queensland schools

Instrument-specific marking guide (ISMG)

Criterion: Data test

Assessment objectives

2. apply understanding of biodiversity or ecosystem dynamics to given algebraic, visual or graphical representations of scientific relationships and data to determine unknown scientific quantities or features
3. analyse evidence about biodiversity or ecosystem dynamics to identify trends, patterns, relationships, limitations or uncertainty in datasets
4. interpret evidence about biodiversity or ecosystem dynamics to draw conclusions based on analysis of datasets

The student work has the following characteristics:	Cut-off	Marks
• consistent demonstration, across a range of scenarios about biodiversity or ecosystem dynamics, of – selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications – correct calculation of quantities through the use of algebraic, visual and graphical representations of scientific relationships and data – correct and appropriate use of analytical techniques to correctly identify trends, patterns, relationships, limitations and uncertainty – correct interpretation of evidence to draw valid conclusions.	> 90%	10
	> 80%	9
• consistent demonstration, in scenarios about biodiversity or ecosystem dynamics, of – selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications – correct calculation of quantities through the use of algebraic, visual and graphical representations of scientific relationships and data – correct use of analytical techniques to correctly identify trends, patterns, relationships, limitations and uncertainty – correct interpretation of evidence to draw valid conclusions.	> 70%	8
	> 60%	7
• adequate demonstration, in scenarios about biodiversity or ecosystem dynamics, of – selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications – correct calculation of quantities through the use of algebraic, visual and graphical representations of scientific relationships and data – correct use of analytical techniques to correctly identify trends, patterns, relationships, limitations and uncertainty – correct interpretation of evidence to draw valid conclusions.	> 50%	6
	> 40%	5

The student work has the following characteristics:	Cut-off	Marks
• demonstration, in scenarios about biodiversity or ecosystem dynamics, of elements of – selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications – correct calculation of quantities through the use of algebraic, visual or graphical representations of scientific relationships or data – correct use of analytical techniques to correctly identify trends, patterns, relationships, limitations or uncertainty – correct interpretation of evidence to draw valid conclusions.	> 30%	4
	> 20%	3
• demonstration, in scenarios about biodiversity or ecosystem dynamics, of elements of – application of scientific concepts, theories, models or systems to predict outcomes, behaviours or implications – calculation of quantities through the use of algebraic or graphical representations of scientific relationships and data – use of analytical techniques to identify trends, patterns, relationships, limitations or uncertainty – interpretation of evidence to draw conclusions.	> 10%	2
	> 1%	1
• does not satisfy any of the descriptors above.	≤ 1%	0

Task

See IA1 sample assessment instrument: Data test (10%) (available on the QCAA Portal).

Sample marking scheme

Criterion	Marks allocated	Provisional marks
Data test Assessment objectives 2, 3, 4	10	—
Total	**10**	—

Marking scheme symbols and abbreviations

Symbol or abbreviation	Meaning
✓	The preceding section of the expected response is worth one mark.
/	Separates acceptable alternative wordings in the expected response.
()	Terms in brackets are not necessary in the response for the mark to be awarded.
shaded and underlined text	Shaded and underlined text must be included in the response for the mark to be awarded.
Accept converse.	Award the mark even if the answer is stated in its converse form, e.g. 'A comes before B' can be stated as 'B comes after A'.
Accept *min–max*.	Award the mark for any numerical answer that falls within the specified range, e.g. 'Accept 1.5–1.9' means that any answer between 1.5 and 1.9 should be considered correct. This is used in questions that involve a multi-step calculation where differences in rounding in the intermediate steps could result in slight differences in the final answer.
Allow for FT error …	Means 'allow for follow-through error'. Initial errors should only be penalised once. Marks should be awarded for subsequent steps that are correct.
Allow FT error for transcription only.	Follow-through error is only allowed if the student has written down information incorrectly but processed it correctly.
AND	Separates two parts of the response that are both required for the mark to be awarded.
Correct d.p. required.	The answer must be stated to the number of decimal places indicated in the question for the mark to be awarded.
Correct s.f. required.	The answer must be stated to the correct number of significant figures indicated in the question for the mark to be awarded.
Max. # marks.	The maximum number of marks that can be awarded for the question is indicated by #.
OR	Separates acceptable alternative wordings.
OWTTE	Means 'or words to that effect'. This is used in questions where students are unlikely to use the exact wording given in the expected response. If the student's response has the same meaning as the expected response, then the mark should be awarded.
Working not required.	Evidence of working, reasoning or calculations is not required for the mark to be awarded.

The annotations are written descriptions of the expected response for each question and are related to the assessment objectives.

Assessment objective	Marking scheme	Mark allocation
		Note: ✓ = 1 mark
Analyse evidence	**Question 1 (2 marks)** For PU, the difference between the mean number of butterflies in the canopy and understorey (14) is greater than the difference for PA (2).✓ For PU, mean in canopy is greater than (>) the mean in understorey. Whereas, for PA, mean in canopy is less than (<) the mean in understorey.✓	1 mark for contrasting the size of the difference between canopy and understorey. 1 mark for contrasting whether mean in canopy is greater or less than mean in understorey. Accept converse.
Interpret evidence	**Question 2 (2 marks)** The difference in distribution for CC is more likely to be due to chance than the differences in distribution for all other species.✓ This is because p<0.001 is lower than p<0.05.✓	1 mark for correct conclusion about relative probability of differences in distribution. Accept converse. 1 mark for reasons. Accept converse.
Apply understanding	**Question 3 (3 marks)** $N = 35$✓ $\text{SDI} = 1 - \frac{\mathbf{0 \times -1 + 11 \times 10 + 21 \times 20 + 3 \times 2}}{\mathbf{35 \times 34}}$ ✓ $\text{SDI} = 0.55$✓	1 mark for calculation of *N*. 1 mark for correct substitution of values into formula. 1 mark for correct SDI value. Correct d.p. required. Allow FT error for transcription only.
Interpret evidence	**Question 4 (2 marks)** (SDI represents the probability that two individuals randomly selected from a sample will belong to different species.) Probability (different) = 0.55 / 55% / $\frac{55}{100}$ ✓ Probability (same) = 1 – Probability (different) = 0.45 / 45% / $\frac{45}{100}$ ✓	No marks for recalling definition of SDI. 1 mark for interpreting SDI_{canopy} as the probability that butterflies are from different species. Allow for FT error from Question 3. 1 mark for determining the probability of species being the same. Working not required. Allow for FT error from Question 3.

Interpret evidence	**Question 5 (4 marks)** The life form and height of tallest stratum of the ecologically dominant layer (in Figure 1) is Trees 10-30m.✓ Percentage canopy cover (in Figure 2) is 39.7%✓ Therefore, percentage foliage cover of tallest plant layer is a mid-dense canopy (from Table 2).✓ The ecosystem is an open-forest.✓	1 mark for identifying life form and height of ecologically dominant layer. 1 mark for calculating or estimating percentage foliage cover of tallest plant layer. Accept estimate between 35–45%. 1 mark for identifying percentage foliage cover of tallest plant layer. Allow for FT error from previous mark. 1 mark for inferring which ecosystem is represented. Allow for FT error.
Apply understanding	**Question 6 (1 mark)** GP_p = 87 069✓	1 mark for correct quantity.
Apply understanding	**Question 7 (2 marks)** R_h = 14 092 – 6184✓ R_h = 7908✓	1 mark for correct working. 1 mark for correct quantity.
Analyse evidence	**Question 8 (4 marks)** 6184/36 957 = 16.7%✓ 280/6184 = 4.5%✓ 25/280 = 8.9%✓ The trophic level with the highest percentage energy transfer is the herbivores.✓	1 mark for herbivores' energy transfer. 1 mark for consumers' energy transfer. 1 mark for tertiary consumers' energy transfer. 1 mark for identifying the highest energy transfer.