Queensland Government | QCAA Queensland Curriculum & Assessment Authority

Queensland Curriculum and Assessment Authority

Biology 2025 v1.2

IA1: Sample assessment instrument

This sample has been compiled by the QCAA to assist and support teachers in planning and developing assessment instruments for individual school settings.

Student name	sample only
Student number	sample only
Teacher	sample only
Exam date	sample only

Marking summary

Criterion	Marks allocated	Provisional marks
Data test (10%)	10	
Overall	**10**	

Conditions

Technique	Data test
Unit	Unit 3: Biodiversity and the interconnectedness of life
Topic/s	Topic 1: Biodiversity and populations Topic 2: Functioning ecosystems and succession
Time	60 minutes + 5 minutes perusal
Seen / Unseen	Unseen questions and data sets
Other	QCAA-approved graphics or scientific calculator permitted.

Instructions

Use the datasets to respond to the associated questions in the spaces provided. Each question is associated with the dataset that immediately precedes it.

Dataset 1

Scientists investigated the biodiversity of butterflies in a rainforest near Cairns. Their investigation lasted several months. The scientists recorded the number of each species of butterfly caught in the traps. Table 1 summarises their results.

Table 1: Mean number of butterflies recorded in a rainforest near Cairns

Species of butterfly	Mean number of butterflies		p-value
	Canopy	Understorey	
Hypolimnas alimena (HA)	32	0	< 0.001
Cethosia cydippe (CC)	25	11	< 0.04
Papilio aegeus (PA)	18	21	< 0.08
Papilio ulysses (PU)	9	3	< 0.001

Question 1 (2 marks)

Contrast the mean number of *Papilio aegeus* (PA) and *Papilio ulysses* (PU) caught in the canopy and understorey.

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Question 2 (2 marks)

Draw a conclusion about what the different p-values in Table 1 show. Give reasons for your conclusion.

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Question 3 (3 marks)

Calculate the species diversity for the understorey (to two decimal places) using the following formula:

$$\text{SDI}=1-\left(\frac{\sum n(n-1)}{N(N-1)}\right)$$

where:

N = total number of organisms of all species

n = number of organisms of one species.

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Question 4 (2 marks)

In a follow-up experiment, two butterflies were captured from the understorey of this rainforest.

Determine the probability that the two butterflies were from the same species. Give reasons for your response.

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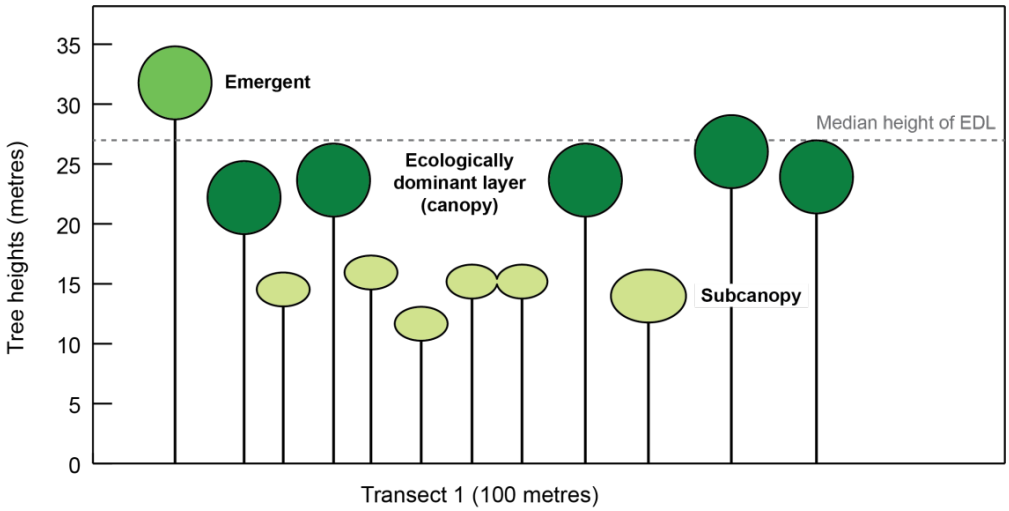
Dataset 2

The data below was collected during a terrestrial field experiment. Multiple 100-metre transects were constructed, and the species, height and percentage canopy cover of each organism were recorded.

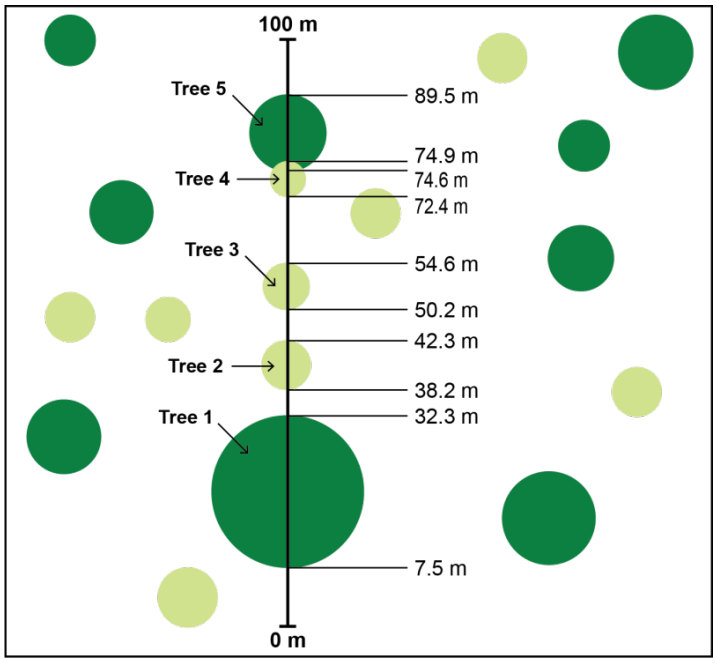
The figures below show data recorded for two different transects at the same site.

Figure 1: Tree heights (m) along Transect 1 (100 m)



(Eyre, T. J. et al, 2015)

Figure 2: Canopy cover along Transect 2 (100 m) — using the line intercept method for measuring canopy cover



(Eyre, T. J. et al, 2015)

Table 2: Structural forms of vegetation in Australia (based on Specht 1970)

	Percentage foliage cover of tallest plant layer			
Life form and height of tallest stratum (m)	**Dense (70–100%)**	**Mid-dense (30–70%)**	**Sparse (10–30%)**	**Very sparse (<10%)**
Trees > 30 m	Tall closed-forest	Tall open-forest	Tall woodland	Tall open-woodland
Trees 10–30 m	Closed-forest	Open-forest	Woodland	Open-woodland
Trees 5–10 m	Low closed-forest	Low open-forest	Low woodland	Low open-woodland
Shrubs 2–8 m	Closed-scrub	Open-scrub	Tall shrubland	Tall open-shrubland
Shrubs 0–2 m	Closed-heath	Open-heath	Low shrubland	Low open-shrubland

(Australian National Herbarium, 2015)

Question 5 (4 marks)

Infer which ecosystem is represented in Figure 1 and Figure 2 using Table 2. Justify your response.

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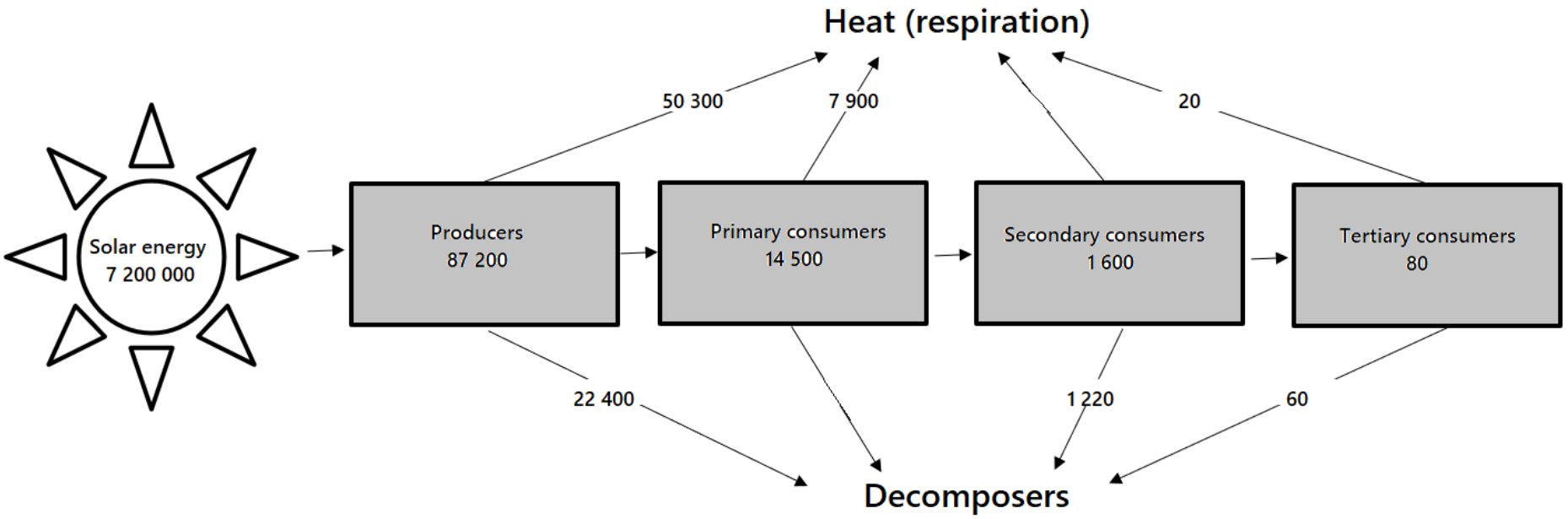
Dataset 3

The diagram below shows energy flow through a model ecosystem, where units are in kJ m^{-2} $year^{-1}$.



Question 6 (2 marks)

Calculate net primary productivity for this ecosystem. Show your working.

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Question 7 (1 mark)

Determine the amount of energy transformed into heat by secondary consumers.

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Question 8 (3 marks)

Contrast the percentage of energy that is transferred to decomposers from producers and primary consumers**.**

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Question 9 (1 mark)

Identify a relationship between gross productivity and trophic level.

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Instrument-specific marking guide (IA1): Data test (10%)

Data test	Cut-off	Marks
The student response has the following characteristics:		
• consistent demonstration, across a range of scenarios, 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 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 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
• demonstration 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 of elements of – application of scientific concepts, theories, models or systems to predict outcomes, behaviours or implications	>10%	2
	>1%	1

Data test	Cut-off	Marks
– 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.		
The student response does not match any of the descriptors above.		0