2007 Senior External Examination

Biology

Paper One — Question and response book

Thursday 1 November 2007

9:00 am to 11:40 am

Directions

1. Perusal time: **10 minutes**.
   Do not write in this book during perusal time.
   A blank sheet of paper has been provided for you to write on during perusal time, if required.
   Additional pages for planning are on the reverse of this cover and on pages 14 and 15 for use during the examination.
2. Working time: **2 hours 30 minutes**.
3. Materials provided:
   - blank sheet of paper
   - Multiple-choice response sheet for Part A.
4. Equipment allowed:
   - 2B pencil (for completing the multiple-choice response sheet)
   - eraser
   - normal writing implements
   - other QSA-approved equipment.
5. Paper One has **two** parts:
   - Part A: Questions 1–10 Multiple choice
   - Part B: Questions 1–13 Short response.

   Attempt **all** questions.
6. This book contains:
   - formatted pages for responses to Part B.
7. Clearly cross out any draft work that is not to be assessed.
8. Do not take this book, used or unused, from the examination room. Do not tear out any part of this book. The supervisor will collect this book when you leave the examination room.

Candidate use

Print your candidate number here

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Attach barcode here

Number of books used

Supervisor use only

Supervisor's initials

QSA use only

Marker number

Notes

Suggested time allocation:

Part A: 30 minutes
Part B: 120 minutes.

Assessment:

Paper One assesses the following criteria published in the 2006 senior external syllabus for Biology:

- Understanding biology (UB)
- Investigating biology (IB)
- Evaluating biological issues (EBI).

The criterion assessed by each question is indicated in brackets after each question.

Standards for assessment are at the end of this book.

Planning space

Part A

Multiple choice

Suggested time allocation: 30 minutes.

This part has 10 questions of equal value. Attempt all questions.

Each question has four options, **one** of which is correct or is the best option. Respond to each question by selecting one of the four possible options and blackening the appropriate circle on the multiple-choice response sheet provided. Use a 2B pencil to blacken the circles.

No credit for your response will be given if more than one circle is blackened.

Question 1

Cells are considered to be the simplest unit of life. Which of the following contains only membrane bound organelles?

A spindle, nucleolus, centromere, ribosome

B nucleus, mitochondria, chloroplast, spindle

C centromere, golgi apparatus, ribosome, chloroplast

D nucleolus, golgi apparatus, mitochondria, chloroplast

(UB)

Question 2

The name of the process where new plants and animals replace previous occupants as the habitat changes is called

A mutualism.

B succession.

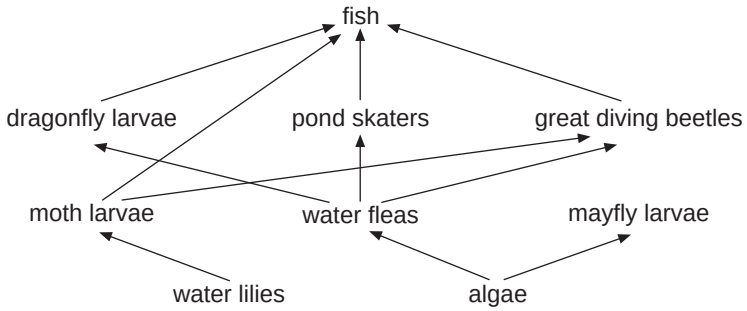
C procession.

D natural selection.

(UB)

Question 3

Consider the information in the food web below.



Which of the following organisms may be considered as a second and third order consumer?

A fish

B algae

C water fleas

D mayfly larvae

(UB)

Question 4

Which of the following statements regarding light-dependent and light-independent stages of photosynthesis is correct?

A The plant collects CO_2 during the light-dependent stage.

B Carbon and oxygen are supplied during the light-dependent stage.

C Light is absorbed by the chloroplasts during the light-independent stage.

D Water is split during the light-dependent stage to release the hydrogen required.

(UB)

Question 5

Which of the following is the correct order for the stages of mitosis following interphase?

A metaphase, anaphase, prophase, telophase

B anaphase, telophase, metaphase, prophase

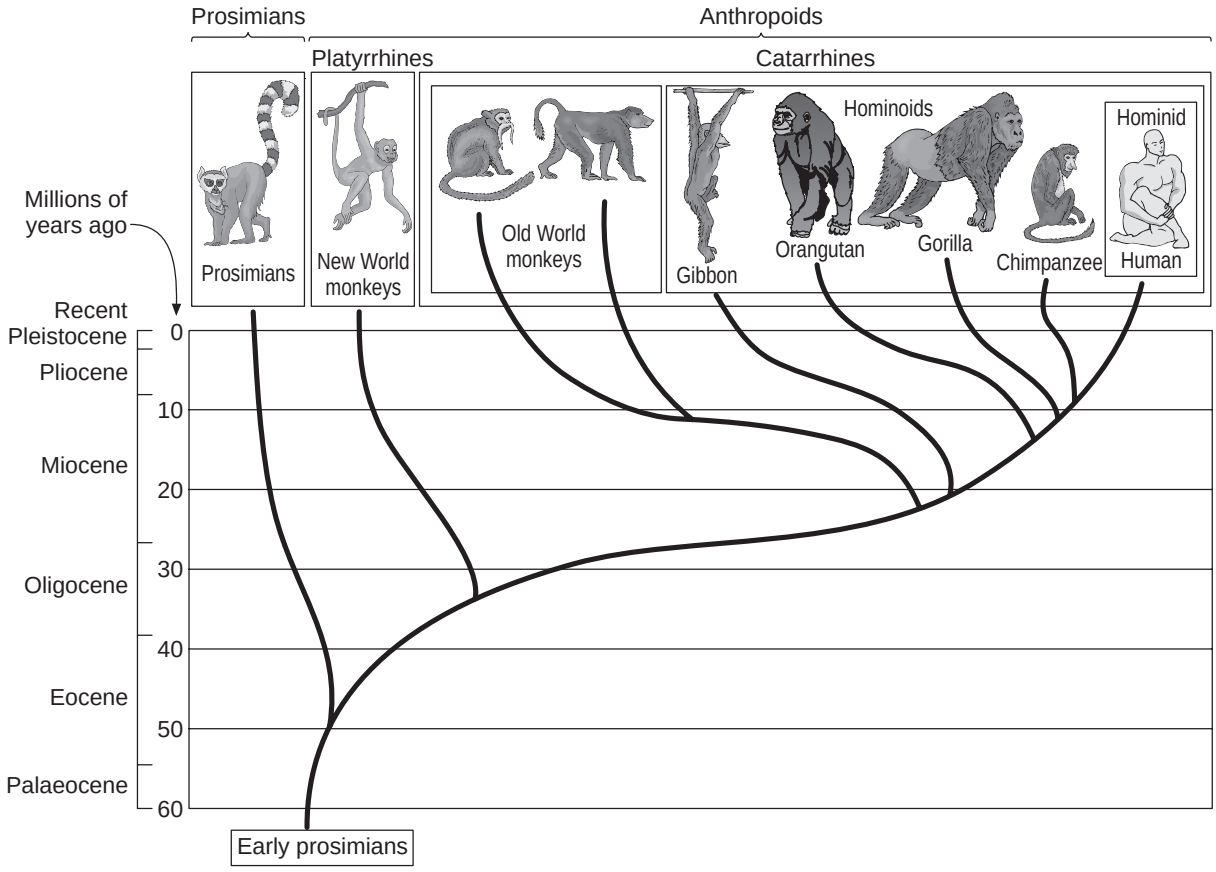
C telophase, metaphase, anaphase, prophase

D prophase, metaphase, anaphase, telophase

(UB)

Question 6

The diagram below depicts a possible evolutionary tree for primates. If a new species of monkey were discovered, whose origins were thought to have been in the late Oligocene period, decide to which group it would be considered most closely related.



A Platyrrhines

B Prosimians

C Hominoids

D Hominids

(IB)

Question 7

A previously unidentified organism has been located in a remote terrestrial area of a tropical rainforest. The organism has:

- one pair of antennae
- a tracheal system
- simple eyes
- abdominal segments that appear to carry two pairs of legs each.

As a temporary measure, until laboratory research can be conducted, the table below was used to classify the organism.

Class Diplopoda	Class Chilopoda	Class Insecta	Class Arachnida
Mainly terrestrial	Mainly terrestrial	Mainly terrestrial	Terrestrial
Head, thorax and abdomen	Head, thorax and abdomen	Head, thorax and abdomen	Cephalothorax and abdomen
Simple eyes	Simple eyes	One pair compound eyes, not on stalks	Simple eyes
One pair antennae	One pair antennae	One pair antennae	No antennae
One pair walking legs per segment (but abdominal segments fused in pairs, so it appears there are two pairs of legs per segment)	One pair walking legs per segment; first pair modified as poison claws	Three pairs of thoracic legs; two pairs of wings typically present on thorax	Four pairs thoracic legs
Tracheal system	Tracheal system	Tracheal system	Tracheal system; lung books in some
Example: millipede	Example: centipede	Examples: cockroach, grasshopper	Examples: spiders, ticks

According to the descriptions in the table, the organism is best classified as

A Insecta.

B Arachnida.

C Diplopoda.

D Chilopoda.

(IB)

Question 8

The continuous upwards movement of water in a vascular plant is called

A homeostasis.

B transpiration.

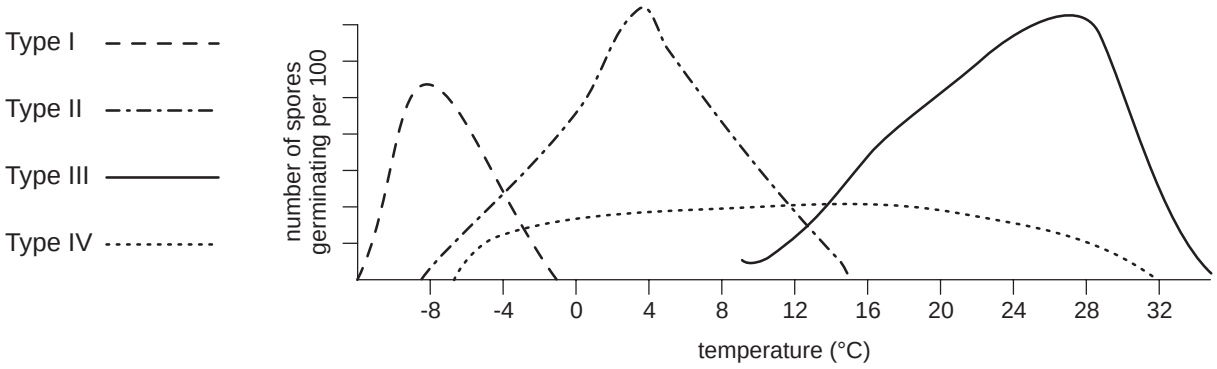
C translocation.

D photosynthesis.

(UB)

Question 9

A certain fungus produces four types of spores. Data obtained from studying spore production and germination is shown in the graph below.



The information on the production and germination of spores tends to indicate that the spores with the widest range of temperature tolerance are

A Type I.

B Type II.

C Type III.

D Type IV.

(IB)

Question 10

Dacus tyroni, the Queensland fruit fly, lays its eggs in soft-skinned fruit. When the larvae hatch, they use the ripening flesh for nourishment to complete their development. To which of the following organisms is *Dacus tyroni* most closely related?

A *Pinuta dacus*

B *Tyroni rosana*

C *Rosana tyroni*

D *Dacus cucumis*

(UB)

End of Part A

Part B

Short response

Suggested time allocation: 120 minutes

This part has 13 questions of equal value. Attempt all questions.

Respond to the questions in the spaces provided.

Question 1

Use the figures in the table below to explain why the deforestation of rainforests has more of a long-term impact than the deforestation of deciduous woodlands.

	Living plant biomass (kg m^{-2})	New plant material per year (kg m^{-2})	Organic matter in soil (kg m^{-2})
Deciduous woodland	40.7	0.9	1.5
Tropical rainforest	52.5	3.3	0.2

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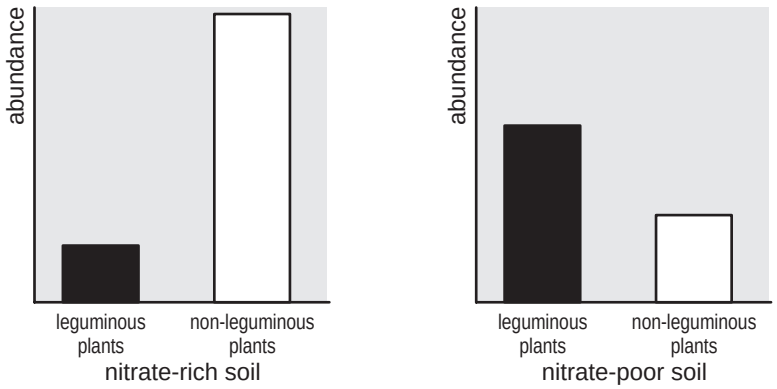
(IB)

Question 2

Legumes are plants that contain a special bacterium that can turn atmospheric nitrogen into nitrates which are a form useful to plants. State why leguminous plants are less abundant in nitrate-rich soil than in nitrate-poor soil.



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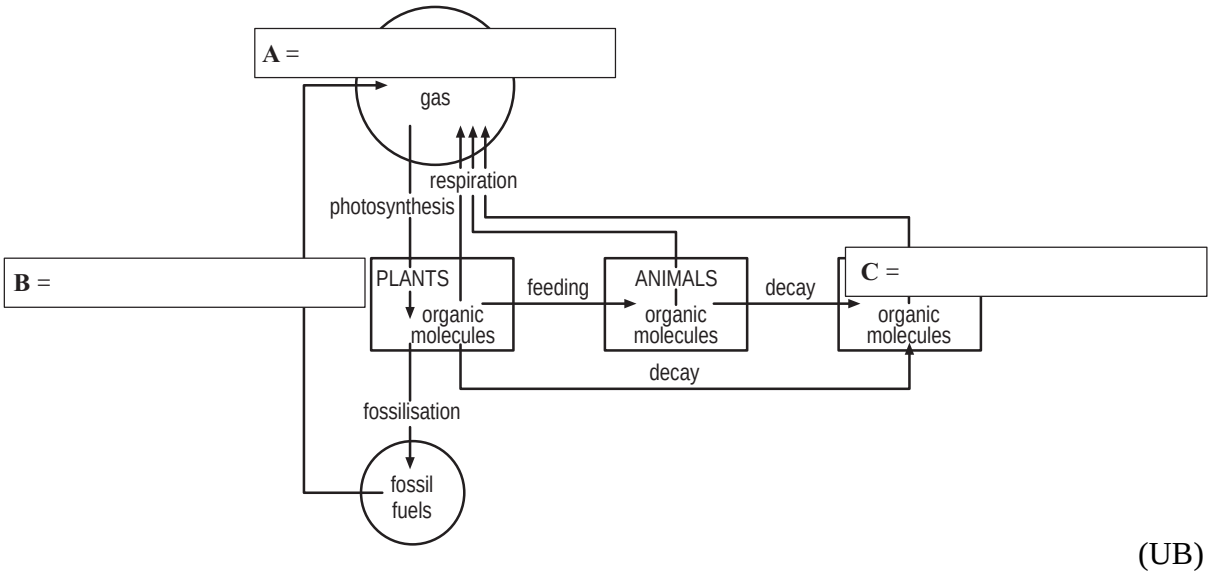
(UB)

Question 3

Fill in the missing labels (A, B and C), in the spaces provided, on the diagram of the carbon cycle below.



(UB)

Question 4

Battery chickens are kept in small temperature-controlled spaces. Explain why they would convert a greater percentage of the energy in chicken feed into primary consumer productivity than free-range chickens, which are free to move around a larger area.

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(UB)

Question 5

The following information relates to questions (a) and (b) that follow.

The pitcher plant is an insect-eating plant with deep cup-shaped leaves that are filled with liquid. When an insect lands on the rim of a leaf it will often slip in and drown in the liquid. Digestive enzymes, secreted by the leaf, will then break the dead insect down so that the pitcher plant can absorb its nutrients. The leaves of a pitcher plant provide a food-rich environment for a number of different creatures. As well as microorganisms, which feed on the drowned insects, there are populations of mosquito larvae and fly larvae that feed on the microorganisms. There are also parasitic wasps that insert their eggs into the bodies of the fly larvae so that their young will have something to feed on when they hatch.

(a) Within the leaf of a pitcher plant there is a community. What does this community consist of?

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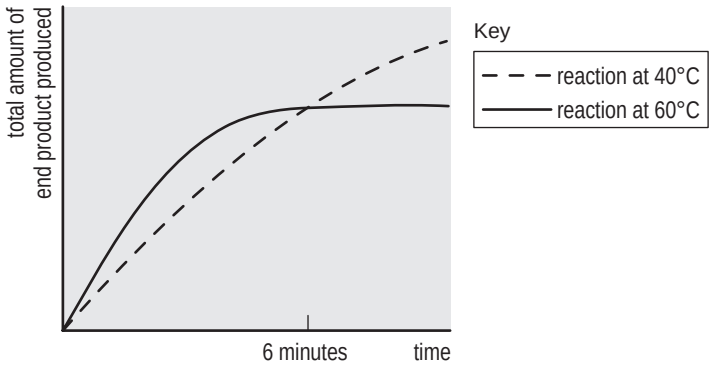
(UB)

(b) Draw a food web to show the feeding relationships that occur within the leaf of a pitcher plant.

(IB)

Question 6

Below is a graph showing the time it takes for a reaction to produce a product under different conditions. Explain the difference in the shape of the two curves both before and after the six-minute point.



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(IB)

Question 7

Explain the difference between diffusion and active transport.

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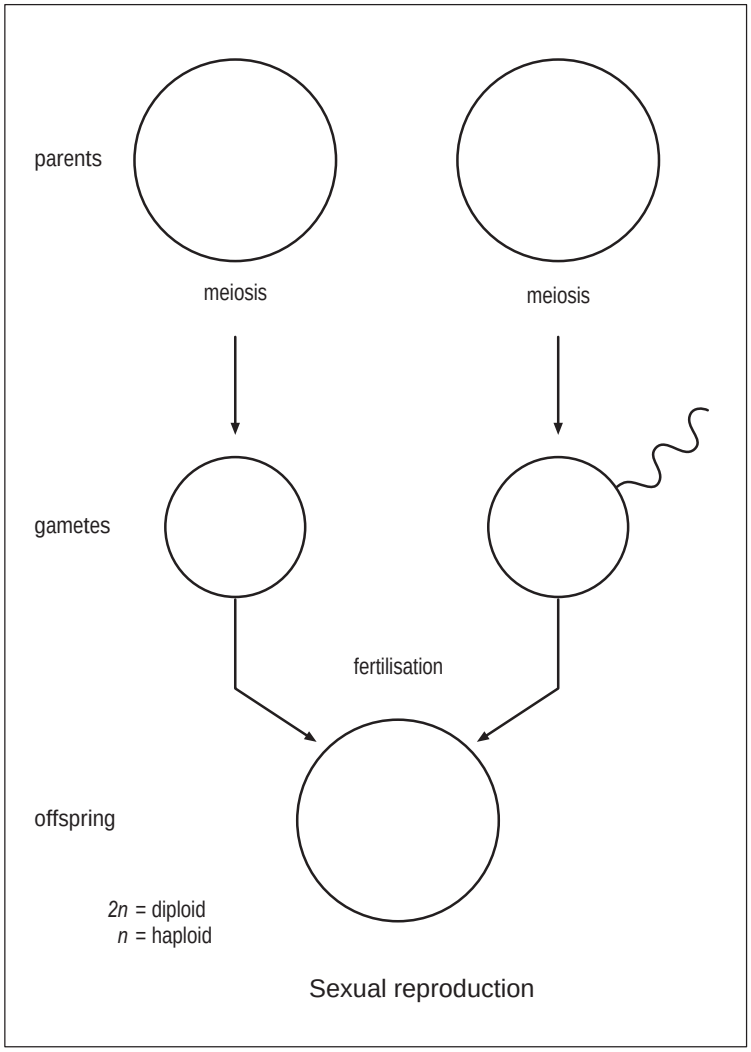
(UB)

Question 8

Indicate at each stage on the diagram below whether the cell has a haploid or a diploid number of chromosomes.



(UB)

Question 9

Establish the link between ATP (adenosine triphosphate) and ADP (adenosine diphosphate) in providing energy for cellular activities.

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Hint: A diagram may be useful.

(UB)

Question 10

Using information from the table as evidence, explain why the proportions of A + G is approximately equal to the proportions of T + C in both pieces of DNA.

The proportions of the four organic bases in a piece of DNA from a squirrel, in a piece of DNA from a shark, and in a piece of human mRNA (messenger RNA) are given below.

	A	G	C	T/U
Squirrel DNA	29%	21%	22%	28%
Shark DNA	28%	21%	21%	30%
Human mRNA	40%	15%	30%	15%

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(IB)

Question 11

Compare and contrast meiosis I and meiosis II.

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(UB)

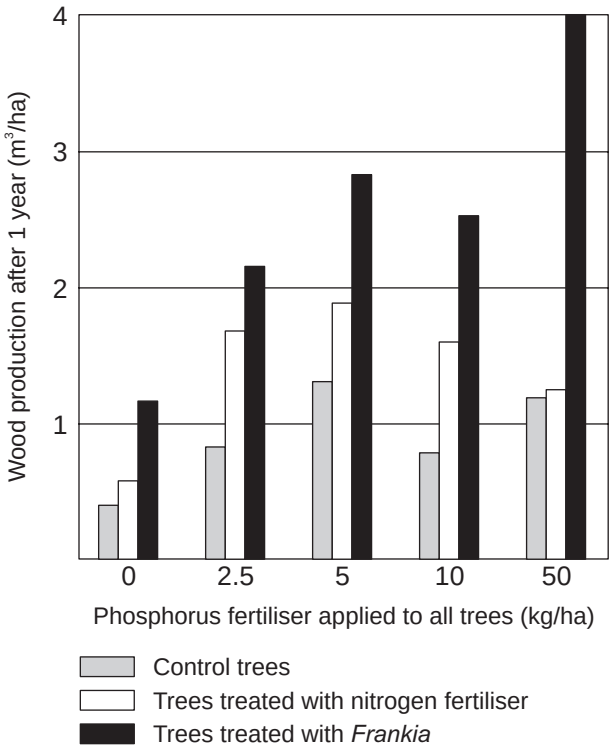
Question 12

Draw a generalised cross section of a leaf including the following labels:
xylem, phloem, mesophyll, epidermis, stoma, guard cells, cuticle.

(UB)

Question 13

The graph below demonstrates the differences in wood production of trees, within a plantation, that were treated in three different ways. *Frankia* are bacteria that can provide nitrogen to a plant without the use of a commercial fertiliser.



Determine the preferred form of management that would maximise wood production and use supporting evidence from the graph to justify your response.

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(IB)

End of Part B

End of Paper One

Planning space

Planning space

Standards associated with exit criteria

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

Criterion	A	B	C	D	E
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.

Acknowledgments

Oxford University Press, UK, and Adam Johnstone for material from *Biology: Facts and Practice for A Level* by Adam Johnstone, published by Oxford University Press, 2001.

Oxford University Press Australia, South Melbourne, and Lorraine Huxley and Margaret Walker for material from *Biology: An Australian Perspective by* Lorraine Huxley and Margaret Walker, published by Oxford University Press Australia, 1998.