

2005

TERM 3

**PRELIMINARY COURSE
EXAMINATION**

BIOLOGY

General Instructions

- Reading time – 5 minutes
- Working time – 90 minutes
- Write using black or blue pen

- Draw diagrams using pencil
- Write your Student Number on the Part A Answer Sheet and the Part B and Part C Question and Answer Book

- Submit your research at the end of Part C. Label your research with your Student Number.

Total marks for this paper: 61

This paper has three parts, Part A, Part B and Part C (Research Skills)

Part A

Total marks (10)

- Attempt all 10 questions in this part
- Allow about 15 minutes for this part

Part B

Total marks (37)

- Attempt all questions
- Allow about 55 minutes for this part

Part C (Research Skills)

Total marks (14)

- Attempt all questions
- Time allowed: 20 minutes
- Submit your research at the end of this part

Part A

Total marks (10)

Attempt all questions

Each question is worth one mark

Allow about 15 minutes for this part

Use the Part A Answer Sheet.

Select the alternative A, B, C or D that best answers the question. Fill in the response circle completely using ink.

Sample $2+4=$ (A) 2 (B) 6 (C) 8 (D) 9

A B C D

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

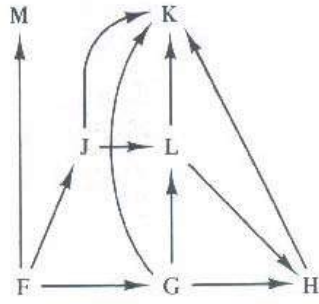
A B C D

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows:

correct

A B C D

Questions 1 to 3 refer to the diagram, which shows a food web. The letters represent different species of organisms in a particular ecosystem.



1. Which species would contain the greatest total biomass for this ecosystem?
 - (A) F
 - (B) H
 - (C) K + M
 - (D) K

2. Which of the species is probably carnivorous?
 - (A) G
 - (B) J
 - (C) L
 - (D) M

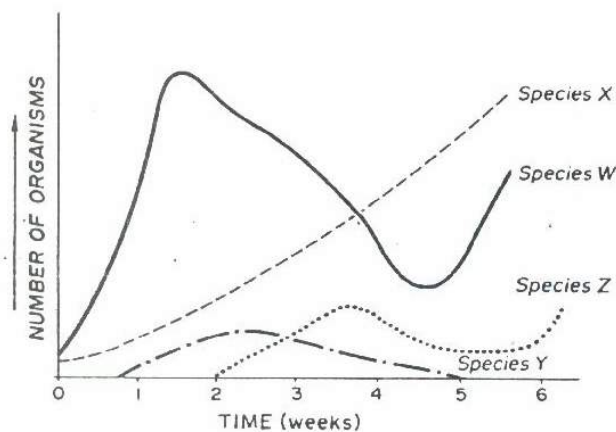
3. If the population of organism 'K' suddenly decreased, what would happen to the numbers of organisms 'H' and 'L' in the short term?
 - (A) H would increase, L would increase
 - (B) H would decrease, L would decrease
 - (C) H would increase, L could increase, decrease or remain the same
 - (D) H would decrease, L could increase, decrease or remain the same

4. The table shows one set of combined transect results for a dry sclerophyll forest ecosystem.

Transect segment (m)	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55
Number of <i>Angophora</i> trees (narrow-leaf)	5	2	3	2	1	0	1	1	0	0	0
Number of <i>Hakea</i> trees (broad-leaf)	0	0	1	1	2	3	4	3	4	3	4
Light intensity (lux)	1200	1150	1200	1250	1100	1200	1130	1210	1200	1100	1190
Slope (degrees)	0	0	0	5	10	10	30	10	15	20	15

According to this data, which abiotic factor has the most effect on the distribution of the *Hakea* trees?

- (A) The number of *Angophora* trees.
- (B) The amount of light.
- (C) The slope of the land.
- (D) The number of pollinators such as possums.
5. The graph indicates the relative size of populations X, W, Z and Y over a period of 6 weeks in a pond ecosystem.

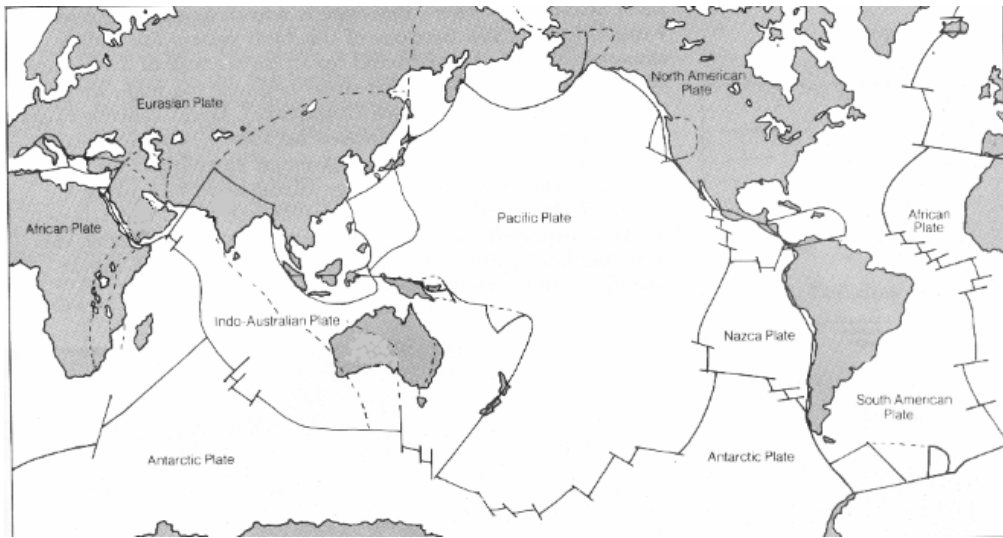


According to this data, what is species Z most likely to be?

- (A) consumer of species of Y
- (B) predator of species W
- (C) producer
- (D) prey for species W

6. Throughout the 1900s, Ocean Grove Nature Reserve in Victoria was an open eucalypt woodland with scattered shrubs. However, in the last decade the reserve is mostly 'succeeding' (changing into) to a scrub of sheoak trees with a ground cover of sheoak leaves and a small amount of native grasses sporadically spread throughout the scrub. What type of interaction is represented by this sequence of events in Ocean Grove Nature Reserve?
- (A) allelopathy
 - (B) commensalism
 - (C) mutualism
 - (D) symbiosis
7. Which is the correct classification hierarchy as devised by Carolus Linnaeus?
- (A) kingdom → family → order → class → phylum → genus → species
 - (B) kingdom → phylum → family → genus → species
 - (C) phylum → class → order → family → species → genus
 - (D) kingdom → phylum → class → order → family → genus → species
8. An unidentified cell type was found to have one chromosome and some ribosomes; besides ribosomes and the cell membrane, there were no other cell organelles observed. Cell division was observed to occur in a different way to mitosis. It was found that the cell membrane was needed for cellular respiration. What type of cell is this?
- (A) eucaryote
 - (B) fungal
 - (C) monocaryote
 - (D) procaryote
9. What is the current model for the sequence of evolution of cellular life forms?
- (A) procaryotes → eucaryotes → colonial organisms → multicellular organisms
 - (B) eucaryotes → procaryotes → colonial organisms → multicellular organisms
 - (C) colonial organisms → eucaryotes → procaryotes → multicellular organisms
 - (D) procaryotes → colonial organisms → eucaryotes → multicellular organisms

10. The Earth's major plates are shown on the diagram.



Which continents once formed the Gondwana landmass?

- (A) Australia, Antarctica, India and North America
- (B) Australia, Africa, Antarctica, India and South America
- (C) Africa and South America
- (D) Australia, Antarctica, India and South America

--	--	--	--	--

Student Number

Part A Answer Sheet

Write your Student Number at the top of this Part A Answer Sheet.

Select the alternative A, B, C or D that best answers the question. Fill in the response circle completely using ink.

1. A ○ B ○ C ○ D ○
2. A ○ B ○ C ○ D ○
3. A ○ B ○ C ○ D ○
4. A ○ B ○ C ○ D ○
5. A ○ B ○ C ○ D ○
6. A ○ B ○ C ○ D ○
7. A ○ B ○ C ○ D ○
8. A ○ B ○ C ○ D ○
9. A ○ B ○ C ○ D ○
10. A ○ B ○ C ○ D ○

--	--	--	--	--

Write your Student Number at the top of this Part B Answer Sheet.

Student Number

Part B

Total marks (37)

Attempt all questions

Marks vary for each question

Answer the questions in the space provided

Allow about 55 minutes for this part

Question 1 (2 marks)

The pictures show various invertebrates.



centipede



starfish



spider



scorpion

In the space below, construct a dichotomous key in order to key out each organism. (2 marks)

--	--	--	--	--

Question 2 (2 marks)

Student Number

Describe the difficulties with classifying extinct organisms. (2 marks)

.....

.....

.....

.....

.....

.....

.....

.....

Question 3 (4 marks)

Complete the table in order to compare one type of Archaea bacteria with one type of Eubacteria. (4 marks)

Name of Archaea bacteria	Role in its ecosystem
Name of Eubacteria	Role in its ecosystem

--	--	--	--	--

Write your Student Number at the top of this Part B Answer Sheet.

Student Number

Question 4 (4 marks)

Urey and Miller have been associated with one theory for the origin of the chemicals of life.

(a) Describe Urey's and Miller's theory. (2 marks)

.....

.....

.....

(b) Describe one piece of evidence that supports this theory. (2 marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 5 (3 marks)

Describe how technology has contributed to our understanding of the early evolution of cells on earth. Give an example to assist your answer. (3 marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

--	--	--	--	--

Student Number

Question 6 (4 marks)

Explain the significance of the change from an anoxic to an oxic atmosphere on the evolution of living things. (4 marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

--	--	--	--	--

Student Number

Question 7 (4 marks)

Using the Platypus as an example, describe how the ideas that scientists held about an individual species have been altered as a result of new information and technologies. (4 marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

--	--	--	--	--

Write your Student Number at the top of this Part B Answer Sheet.

Student Number

Question 8 (4 marks)

Evaluate the impact the fossil record has had on our understanding about the evolution of living things. (4 marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 9 (4 marks)

(a) Describe one type of geological evidence that supports the assertion that Australia was once part of a giant landmass called Gondwana. (2 marks)

.....

.....

.....

--	--	--	--	--

Student Number

Question 9 continued.

- (b) Describe one type of biological evidence that supports the assertion that Australia was once part of a giant landmass called Gondwana. (2 marks)

.....

.....

.....

Question 10 (6 marks)

- (a) The grey mangrove was studied at the Field of Mars. Describe one adaptation that this tree has that enables it to survive in its salty water environment. (2 marks)

.....

.....

.....

.....

- (b) Construct one food chain for the sclerophyll forest investigated at the Field of Mars. (2 marks)

- (c) Use the food chain you have constructed in (b) to describe the impact of humans on the sclerophyll forest ecosystem at the Field of Mars. (2 marks)

.....

.....

.....

.....

Part A

	A	B	C	D
1	X			
2			X	
3			X	
4			X	
5		X		
6	X			
7				X
8				X
9	X			
10		X		

Part B

- radial symmetry (starfish)/bilateral symmetry → more than 4 pairs of legs (centipede)/4 pairs or less of legs → tail (scorpion)/no tail (spider). Dichotomous nature of key (1). Each organism is able to be keyed out (1).
- The fossil may not show enough of the organism's body parts or details to enable accurate classification. (1) May not be able to compare the fossil with current day organisms. May not be able to determine what stage of life of an organism is represented by the fossil. (1)
-

Name of Archaea bacteria (1)	Role in its ecosystem (1)
methanogens	Digestion in herbivores; decomposition of organic matter; contributes to the carbon cycle.
halophiles	
thermophiles deep sea bacteria	
Name of Eubacteria (1)	Role in its ecosystem (1)
cyanobacteria	Convert nitrogen into ammonia and ammonium, which are part of the nitrogen cycle.
nitrogen-fixing bacteria	
	Part of the nitrogen cycle.

- (a) The organic molecules needed for forming cells (1) were formed from the chemicals that composed the earth's early atmosphere. (1) (b) They subjected a mixture of gases (CH₄, NH₃, H₂ and H₂O) that were suppose to represent the primordial (early) earth atmosphere to electrical discharges, which represented the lightning of the early earth's atmosphere. (1) The chemicals formed were similar to amino acids. (1)

5. Radiometric dating (1) of rocks has enabled scientists to accurately date the age of rocks and their microfossils. (1) E.g., the microfossil of bacteria found in the chert (1) of WA was found to be approximately 3,465 million years old. Or: electron microscopy has enabled identification of early fossils such as the bacteria found in chert. Or: use of chromatography and mass spectrometers to identify the type of chemicals in meteorites such as the Murchison meteorite.

(1): example; (1): one aspect related to how the technology has contributed to our understanding of the early evolution of cells. (1): technology stated.

6. The change from an anoxic atmosphere to an oxic atmosphere, an atmosphere that contains approximately 21 % oxygen, was thought to be a result of the evolution of microorganisms that photosynthesised such as the cyanobacteria (approx. 3000 mya). This allowed the oxygen-dependent microbes (1) to evolve, using oxygen in energy-releasing respiration. Eventually, the oxygen molecules in the upper atmosphere formed ozone (1), which absorbs much of the UV light that is harmful to organisms (1). This enabled organisms to survive on land and water. (1) OR (1) for recognising oxic means oxygen-containing.

7. Platypus: In the early 1800s, scientists were baffled by the characteristics that the platypus had. It had some features similar to mammals – fur and being endothermic – yet it had other features that were not associated with mammals. For example, it had a single chamber that appeared to be used for both reproduction and excretion, which is unlike other mammals that give birth to live young. This was reptilian-like (1). The platypus is unique since the scientific classification system in that time considered the reproductive systems important in classifying. Cladwell in 1884 studied platypuses and found they lay eggs (1). Technology has enabled a better understanding of the platypus since then. In the 1980s, the nocturnal nature of the platypus was understood by finding that the platypus has an electro-receptor system in its bill, *enabling it to detect prey* (worms, yabbies)(1). Or, the body temperature of the platypus can *drop and remain low for several days* (torpor) during the winter. Temperature sensors enable scientists to find this feature.

(1): old scheme classification features given (reptilian-like, or bird-like); (1): monotreme confirmed. (1): recent technological-associated discovery described. (1): technology used stated OR (1): elaboration of technology-associated discovery “...electro-receptor in bill helps platypus find prey at night.”

8. (1): evaluate (ascertain the value of) statement with regards to the value of the fossil record on our understanding of evolution: has the fossil record been very useful in helping us to understand evolution? “It has a positive effect” “It is important”; “It has had a great effect” (1): description of evolution (*gradual change*, common ancestral forms, *long period of time*) provided. (gradual change PLUS over long period of time essential for this mark. (1): positive – fossil record shows gradual increase in the number and diversity of organisms over a long period of time. (1): negative – fossil record is incomplete; it does not contain the fossils of all organisms that have thought to have existed on earth. OR “compare present organisms with ancient organisms” (1)

9. (a) Continental margins of continents such as Australia, India, Antarctic, Africa and South America match (1). Other geological evidence: matching rock types found throughout Gondwana continents (tillites, dolerites). (b) Biological evidence: fossils of plants such as *Glossopteris* and *Gangamopteris* are found only on Gondwana continents (1). Primitive marsupials of Australia have similar features in common with marsupials of South Africa.

10. (a) Leaves drop off when they have accumulated salt. (1): mangrove part involved; (1): how the part gets rid of salt in the plant. (b) Nectar → ringtail possum → cat (1): arrows pointing to

consumer; (1): correct chain. (c) (1): relating the food chain to impact of humans; (1): correct description of human impact.

Part C (Research skills)

1. (a) Different sources (1) of information provide the same information (1) about the research material.

OR: *Creditable* organisation or author associated with the information resource (1); elaboration of why it is credible and hence reliable (1) (have well-devised methods associated with obtaining the information; has variety of references; works in the area (scientist) thus having expertise.

(b) People who have scientifically studied the relevant areas are associated with these information resources (1).

Cannot repeat answer of (a) for (b) – reliability is different to validity!

2. (1): credible resources used (university-based or scientific). (1) key words used (specifically what was done to find the information) e.g., “Australian fossils”.

OR (1) library/search engine/Internet used. (1) key words used specific to the task – “Australian fossils”/used index of book/guidelines/or elaboration of the research processes used e.g., “compared one resource with another in order to...”

3. (a) (1): Fossil 1; (1): Fossil 2.

(b) (1): fossil shows features resembling the species – these features are stated;

(1): change mark: explanation regarding how these features relate to the evolution of the organism – features have altered as a result of *changes in the environment* the species has encountered over time;

(1): Australian species provided.

4. (1): similarity;

(1): differences;

(1): current Australian life form(s) (name of Australian fossil mandatory);

(1): more than one similarity or difference provided.