James Ruse Agricultural High School

2003

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

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 (35)
- Attempt all questions
- Allow about 55 minutes for this part

Part C (Research Skills)
Total marks (16)
- Attempt all questions
- Allow about 20 minutes for 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 ○

1. In 1953, Stanley Miller and Harold Urey conducted a famous experiment. What was the reason for doing this experiment?

   (A) To prove that membranes could form in conditions that were the same as early earth's atmosphere.

   (B) To prove that organic molecules could not form in conditions that simulated early earth's atmosphere.

   (C) To show that organic molecules could form in conditions that were not the same as the atmosphere of early earth.

   (D) To see if organic molecules could form in conditions that simulated early earth's atmosphere.

2. How was the experiment of Miller and Urey important in illustrating the nature and practice of science?

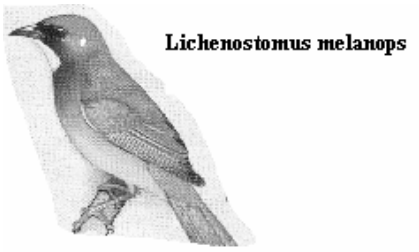
   (A) Urey and Miller's experiment was based upon several different hypothesises about the origin of life.

   (B) The experiments were designed so that other scientists could not replicate them.

   (C) Urey and Miller's experiments were designed to test one hypothesis about the origin of life.

   (D) Urey and Miller proved they could do an experiment that no one else wanted to do.

3. The diagram shows one type of Australian honeyeater.



Which honeyeaters are most similar according to the binomial classification system?

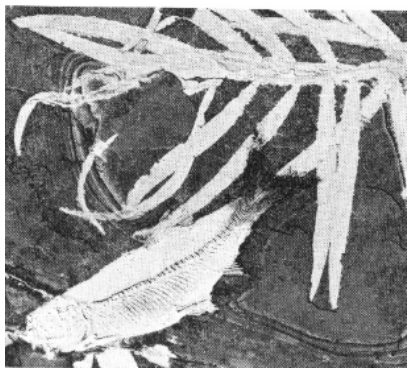
(A) *Meliphaga unicolour* and *Meliphaga albilineata*

(B) *Melithreptus lunatus* and *Meliphaga unicolour*

(C) *Lichenostomus melanops* and *Melithreptus albogularis*

(D) *Lichenostomus melanops* and *Meliphaga albilineata*

4. The diagram shows what was revealed when a layer of sedimentary rock was hit at the edge, splitting the layer of rock apart.



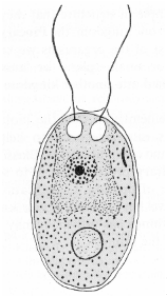
What does this result reveal about the number of organisms that have fossilised, the relative size of the original organisms and the relative ages of the organisms?

	Number of organisms that have formed fossils	Relative size of original organisms	Relative ages of organisms
(A)	Two types of organisms	Both organisms are of different sizes	Both organisms are of the same age
(B)	Two types of organisms	Both organisms are of different sizes	The organisms are of a different age
(C)	Three types of organisms	All organisms are of the same size	All organisms are of the same age
(D)	Two types of organisms	All organisms are of the same size	The organisms are of a different age

5. What evidence is there for the earth's atmosphere changing from an anoxic to oxic atmosphere?

	Geological evidence	Palaeontological evidence
(A)	Stromatolites	Sedimentary rocks containing banded iron formations
(B)	Fossils of autotrophic procaryotes	Fossils of eucaryotic cells
(C)	Sedimentary rocks containing banded iron formations	Ozone development
(D)	Sedimentary rock deposits containing banded iron formations	Fossils of eucaryotic cells

6. The diagrams show several types of living organisms.



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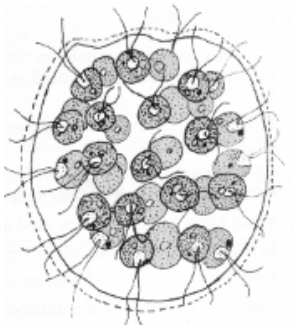

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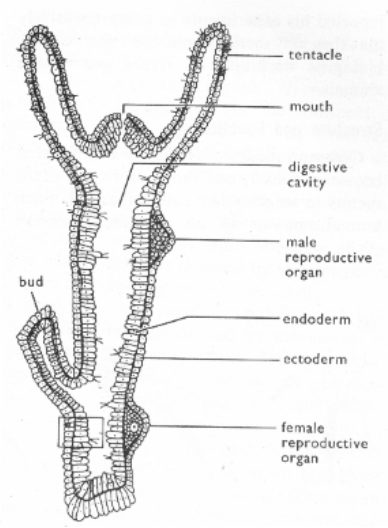

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4

Which diagram represents a colony of organisms?

(A) 1

(B) 2

(C) 3

(D) 4

The next two questions refer to the table, which shows the names of various organisms at some levels in the hierarchical classification system used by biologists.

Classification level	Organism 1	Organism 2	Organism 3	Organism 4
U	Chordata	Chordata	Arthropoda	Chordata
V	Mammalia	Mammalia	Crustacea	Mammalia
W	Carnivora	Carnivora	Decapoda	Carnivora
X	Canidae	Canidae	Palinuridae	Canidae
Y	Canis	Vulpes	Jasus	Canis
Z	lupus	vulpes	lalandei	familiaris

7. What is the name of level "X"?

   (A) Genus

   (B) Order

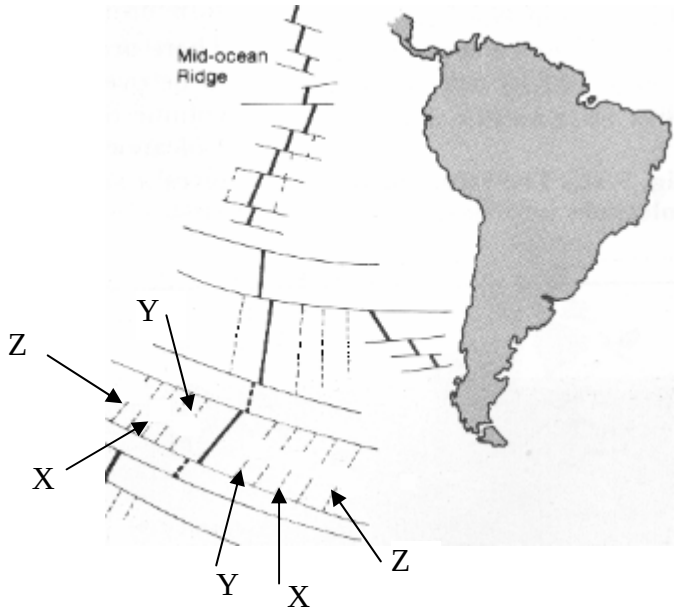
   (C) Class

   (D) Family

8. What list of organisms represents the sequence of having the most similar structural characteristics to having the least similar structural characteristics?

	Most similar structural characteristics → least similar structural characteristics
(A)	1 → 2 → 3 → 4
(B)	1 → 4 → 2 → 3
(C)	4 → 1 → 3 → 2
(D)	3 → 1 → 2 → 4

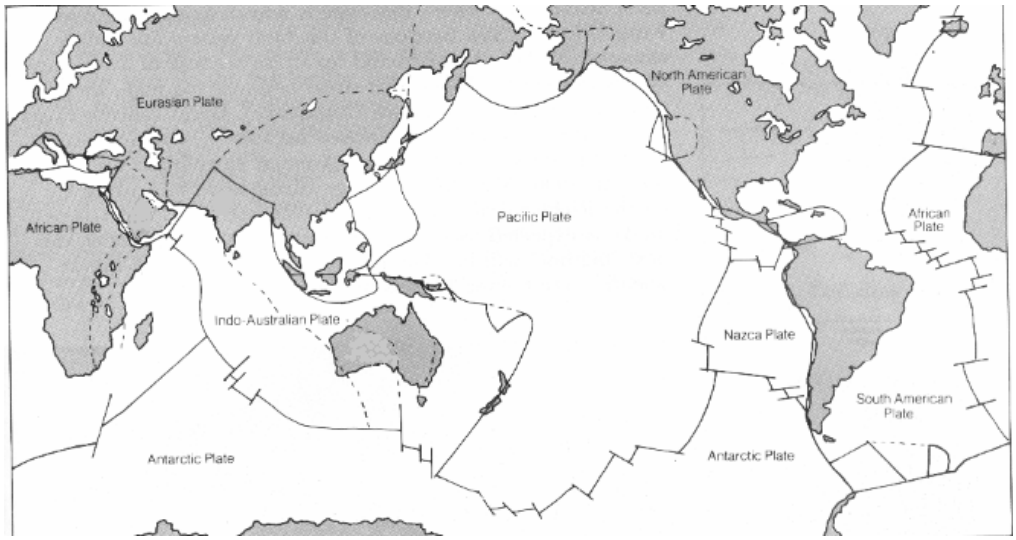
9. The diagram shows some rocks labelled “X”, “Y” and “Z” that are associated with a mid-ocean ridge on the Pacific Ocean floor.



Hold old is each type of rock, “X”, “Y” and “Z”?

	Rock “X”	Rock “Y”	Rock “Z”
(A)	1 thousand years old	10 thousand years old	5 thousand years old
(B)	50 million years old	30 million years old	10 million years old
(C)	30 million years old	10 million years old	50 million years old
(D)	500 years old	1 thousand years old	2 thousand years old

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



Which continents once formed the Gondwana landmass?

(A) Australia, Africa, Antarctica, India and South America

(B) Australia, Antarctica, India and South America

(C) Africa and South America

(D) Australia, Antarctica and India

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 (35)

Attempt all questions

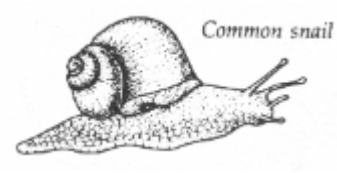
Marks vary for each question

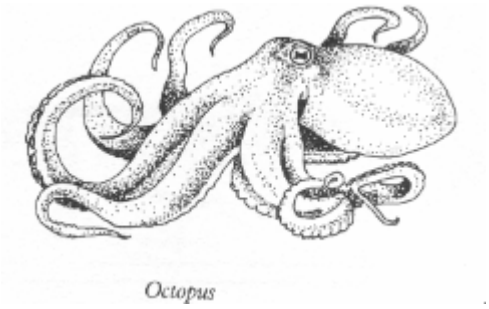
Answer the questions in the space provided

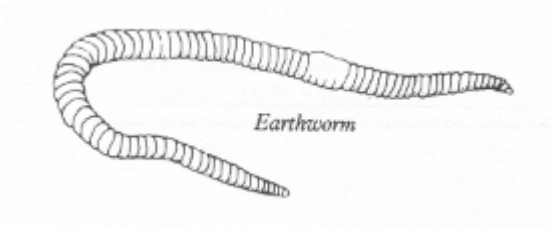
Allow about 55 minutes for this part

Question 1 (2 marks)

The diagrams show various invertebrates.







Construct a dichotomous key in order to key out each organism. (2 marks)

Question 2 (2 marks)

Describe two ways in which the classification of organisms helps us to understand past and present life on earth. (2 marks)

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Question 3 (3 marks)

Complete the table in order to provide information about one type of Archaea bacteria. (3 marks)

Name of Archaea bacteria	Environment where found	Role in its ecosystem

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

Question 4 (3 marks)

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

(a) Describe another scientific theory for the origin of the chemicals of life. (2 marks)

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(b) State one piece of evidence that supports this theory. (1 mark)

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Question 5 (5 marks)

Describe how technology has contributed to the revision of biological classification systems. In your answer you must give an example of how technology has resulted in the refinement of a biological classification system or systems. (5 marks)

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Question 6 (5 marks)

Briefly describe each of the major stages of the evolution of living things. (5 marks)

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Question 7 (4 marks)

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

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

Question 8 (3 marks)

Give one example of a fossil that is evidence for the hypothesis that present-day organisms have evolved from different organisms in the past. Explain why this fossil is evidence for this hypothesis. (3 marks)

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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)

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

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Question 10 (3 marks)

Discuss one piece of research about the evolutionary relationship between an extinct Australian species and an extant Australian species. (3 marks)

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

Part C (Research Skills)

Total marks (16)

Attempt all questions

Marks vary for each question

Answer the questions in the space provided

Allow about 20 minutes for this part

Question 1 (3 marks)

(a) State two types of creditable information resources that could be used to find information about the dot points provided to you. (2 marks)

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(b) Justify why these resources are creditable. (1 mark)

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Question 2 (3 marks)

Describe in relevant detail the research processes you used to find information about "…a current effort to monitor biodiversity". (3 marks)

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Question 3 (2 marks)

Define biodiversity. (2 marks)

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Question 4 (2 marks)

Explain the need to maintain biodiversity. (2 marks)

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

Question 5 (2 marks)

Describe a current effort to monitor biodiversity. (2 marks)

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Question 6 (4 marks)

Describe two ways in which palaeontology assists the understanding of the factors that may determine the distribution of flora and fauna in present and future environments.

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End of paper

Preliminary Course Biology: Term 3 Preliminary Course Examination

Marking Guidelines

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			

1 Legs (Octopus)/no legs → shell (snail)/no shell → cylindrical body (earthworm)/body not cylindrical (Planarium). Dichotomous nature of key. (1) Each organism is able to be keyed out. (1)

2. Classification allows us to work out the relationships between organisms, whether they are living today or lived in the past. This helps us to understand how organisms evolve. (1) Classification makes studying organisms more efficient and effective. Having no order to living things would lead to confusion and time wasting when it comes to studying living things. (1)

3.

Name of Archaea bacteria (1)	Environment where found (1)	Role in its ecosystem (1)
Methanogen	Bogs, deep soils, sewage treatment, intestinal tracts (herbivores)	Digestion (herbivores), decomposition of organic matter (anaerobic), contribute methane to carbon cycle
Thermophiles	Where high temperatures exist	Basis for food chain: use hydrogen sulfide via chemosynthesis to yield nutrients for organisms such as tube worms, mussels etc.

4. Panspermia theory (1): organic molecules on early earth were derived from outer space. (1) Evidence: meteorites contained amino acids. (1)

5. Classification of procaryotes (1): using biochemical technology, it has been possible to sequence (1) the amino acids and the nucleic acids (DNA and RNA) of procaryotes. This revealed that the old classification of procaryotes, which was of two groups (1), the cyanobacteria and the Schizophyta, had to be altered to cater for another group of procaryotes, the Archaea bacteria (1). The Archaea bacteria differed from the other groups, the Eubacteria, on the basis of their RNA sequences and the chemicals used to make their cell wall (1).

Tech used mark (1) differences on basis of teh (1)
old classification (1)
new classification (1)
(1)

(½) stage name (½) stage description linked

6. Organic molecules: these were formed on earth and served as the basis for the formation of amino acids. Membranes (1): amino acids increased in numbers, coming together with other organic molecules to form primitive membranes that eventually form into precursors of cells (microspheres). Procaryotic heterotrophic cells (1): these formed as a result of the primitive membranes staying fixed and creating appropriate conditions for the organic substances in them – a type of cell had formed. Some of these cells began to use sunlight to make energy (photosynthesis) thus forming into the first autotrophic procaryotes. Eucaryotic cells (1): formed as a result of a procaryotic cell consuming another procaryotic cell, according to the endosymbiosis theory. These cells developed the ability to survive using oxygen being created by the autotrophs. Colonial organisms (1): individual eucaryotic cells grouped together according to different environmental pressures but still maintained relative independence. Some groups, however, began to function more effectively with the cells being permanently attached leading to develop of multicellular organisms (1).

(i) name

(old) (1) reptilian or bird-like

chain (1) monotreme confirmed

(1) other technological discovery described

(recent)

7. Platypus (1): 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 ("warm-blooded"), 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, which 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 that they do 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 had 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 winter. Temperature sensors enable scientists to find this feature.

8. Crossopterygian (lobe-fin fish) fossil (1): an organism that had the features of a fish (gills, scales and fins) (1) yet also had amphibian features (lobe-fins and an air bladder). This demonstrates the evolutionary step from fish to amphibians. (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. Modern grazing kangaroo (Macropodinae) (1) is extant. Research about the type of ancestors it evolved from is ongoing. For example, fossils at Riversleigh sites show that the bulungamyines rather than the balbarines are the ancestors of the modern kangaroo (1). The shapes of the skull bones and molars (teeth) of the bulungamyines are more similar to the modern kangaroo than those of the balbarines. (1) Bulungamyine fossils are more common in the younger rocks than the balbarines.

Part C

1. (a) Internet (education sites) (1) and university texts (1). (b) People who have scientifically studied the relevant areas are associated with these information sources. (1)

Net (1)
Books (1)
Scientists write them (1)

2. Used the WWW or library (books) (1). Used appropriate search terms such as "biodiversity" and "monitor" as appropriate for the book or WWW (1). Read the articles (Net or texts). Selected the *appropriate material* from the resource (1).

(1) creditable resource used
(1) ↓ extended the search process
(1) Key words (i.e. specifically what was done to find the information)

quantity mark
number (1) / different species (1) / different genus

3. Biodiversity refers to the amount of genetic variation (1) in the gene pool of a species (1). (Or, the number of different species (1) in an ecosystem or number of different types of ecosystems (1).)

or variety of (1) + one other component (1) (e.g. number of, ecosystem level, gene level)

4. Having a greater genetic variation means there is more chance of a species surviving (1) changing environmental conditions (1) including disease-causing organisms. More genetic variation leads to different phenotypes and thus more chance of surviving.

(1) survival (result mark)
(1) greater gene variation (reason mark)
} = explain } give cause and effect relationship

5. Koala numbers are dropping and this may lead to inbreeding depression. By measuring the genetic diversity of koalas (1), conservationalists can develop breeding programs that will lead to more vigorous koala populations. This is achieved by mixing koalas that have enough genetic diversity (1).

(1) name of program
(1) description of what is measured (specific example)

6. Paleontology is the study of fossils. The fossil record suggests that the Australian megafauna (giant possums, giant kangaroos, etc) that existed some 1.5 million years ago became extinct around about 15 000 to 20000 years ago (1). This loss has been a result of two factors. Firstly, the changing Australian environment (1): the rainforests has contracted considerably over this time and even in relatively recent time the forests have contracted further due to the drying out of the Australian continent as it moves towards the equator. Fossil evidence of similar events (1) in the past suggests that this type of drying out may have contributed to the loss of the fauna and flora thus leading to less biodiversity. Another factor is the impact of humans. The appearance of humans coincided with the time the extinctions of megafauna occurred (1). Hunting and agricultural practice may have been the factors acting here. Paleontology helps us to examine what happened in the past: extinctions occurred due to climate, environmental and human influences. If we are to maintain the current standard of biodiversity then we should focus on preserving the environment and the types of organisms that exist today.

(1) fossils help us by: — marking code

correlate between death of megafauna and human occurrence — cf
different plants (fossils) live in different climates — cf
unique organisms in particular environment (Gondwanaland continents) — ef
fossils of extinct organisms — xf

(1) Factors that determine the distribution of organisms in the environment are: — marking code

• presence of other organisms (human predation) — O
• climate factors — C
• environmental change — e

(due to ours of these factors acting)