

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 Answer Book

2006

TERM 3

PRELIMINARY COURSE
EXAMINATION

Total marks for this paper: 60

This paper has two parts, Part A and Part B.

Part A

Total marks (10)

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

Part B

Total marks (50)

- Attempt all questions
- Allow about 75 minutes for this part

1. What age do scientists estimate the Earth to be?
 - a) 4000 years old
 - b) 4500 years old
 - c) 4.5 million years old
 - d) At least 4 billion years old
2. What probably produced the first oxygen in the Earth's atmosphere?
 - a) sulfur bacteria
 - b) eucaryotic algae
 - c) cyanobacteria
 - d) iron bacteria
3. Which scientist demonstrated that organic molecules could be formed in the presence of electricity and reducing gases?
 - a) A. I. Oparin
 - b) Stanley Miller
 - c) Carolus Linnaeus
 - d) J. B. S. Haldane
4. What are the taxonomic levels used to classify organisms, from least specific to most specific?
 - a) phylum, family, genus, species, order, class
 - b) kingdom, phylum, class, order, family, genus, species
 - c) genus, order, class, phylum, species, family, kingdom
 - d) species, genus, family, order, class, phylum, kingdom
5. What do the layers of stromatolites consist of?
 - a) procaryotic organisms
 - b) single-celled fungi
 - c) algae
 - d) amino acids
6. What is one reason why it is difficult to classify extinct organisms?
 - a) many fossils no longer contain any genetic material, making evolutionary comparisons difficult
 - b) fossils of extinct species are extremely rare
 - c) most extinct organisms are not related to any living organism present today
 - d) it is too hard to compare the bones of extinct organisms with those of living organisms
7. Why was Australia's climate tropical between 600-200 million years ago?
 - a) Australia had broken away from Antarctica and was moving northwards
 - b) Australia was still part of Pangaea and was located near the equator
 - c) There was an ice age during this period
 - d) Australia had broken away from Pangaea and was moving south

8. Which of the following is a feature of meiosis?
- It produces gametes with the diploid (full) number of chromosomes
 - It produces body cells with the haploid (half) number of chromosomes
 - It involves one nuclear division
 - It involves two nuclear divisions
9. What are two adaptations to life on land in terrestrial organisms?
- external fertilisation and soft-shelled eggs
 - internal fertilisation and the production of large numbers of gametes
 - internal fertilisation and waterproof eggs
 - external fertilisation and the production of large numbers of gametes
10. Which of the following events in the formation of the Australian continent are described correctly and in the correct order?
- Australia's climate was tropical; Pangaea split into Gondwana and Laurasia; Australia's climate became cooler as it separated from Gondwana and moved south
 - Australia became drier as it moved north; Laurasia split into Pangaea and Gondwana; Australia separated from Antarctica
 - Australia was part of Gondwana; Gondwana split into Laurasia and Pangaea; the climate became tropical
 - Australia's climate was tropical; Australia moved north and the climate became drier; Australia separated from Gondwana

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Student Number

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

Part B
Total marks (50)
Attempt all questions
Marks vary for each question
Answer the questions in the space provided
Allow about 75 minutes for this part

Question 1 (3 marks)

Describe how recent technology has changed the ideas of scientists about individual species such as the platypus.

Question 2 (3 marks)

Describe three pieces of evidence that support the concept that Australia was once part of a land mass called Gondwana.

Question 3 (6 marks)

Complete the table below to describe two Australian fossils.

Name of fossil	Where was this fossil found?	How has this fossil contributed to our understanding of evolution in Australia?

Question 4 (3 marks)

Outline two reproductive adaptations of a named Australian animal that help to ensure the species continuity.

Question 5 (6 marks)

a) Explain why meiosis and sexual reproduction are important for the survival of species.(2 marks)

b) Contrast the processes and outcomes of meiosis and mitosis (4 marks)

Question 6 (4 marks)

a) Rearrange the following into the order in which they appeared on Earth:

colonial organisms, procaryotic heterotrophic cells, eucaryotic cells, multicellular organisms, membranes, organic molecules, procaryotic autotrophic cells. (2 marks)

b) Give a brief description of the following:

i) colonial organisms; (2 marks)

ii) eucaryotic cells

Question 7 (4 marks)

Describe one piece of palaeontological and/or geological evidence for:

i) the theory that life arose in deep-sea vents (2 marks)

ii) the theory that oxygen accumulated in the atmosphere around 2 billion years ago (2 marks)

Question 8 (8 marks)

Classification is an arbitrary system. Identify the kingdoms present, the criteria used in classification and the advantages and disadvantages for the 3 & 5 kingdom systems of living things.

	3 kingdom	5 kingdom
Names of kingdoms present		
Criteria used to select each kingdom		
Advantages of this system		
Disadvantages of this system		

Question 9 (5 marks)

i) Identify three new technologies that have changed or affected previous classification systems. (3 marks)

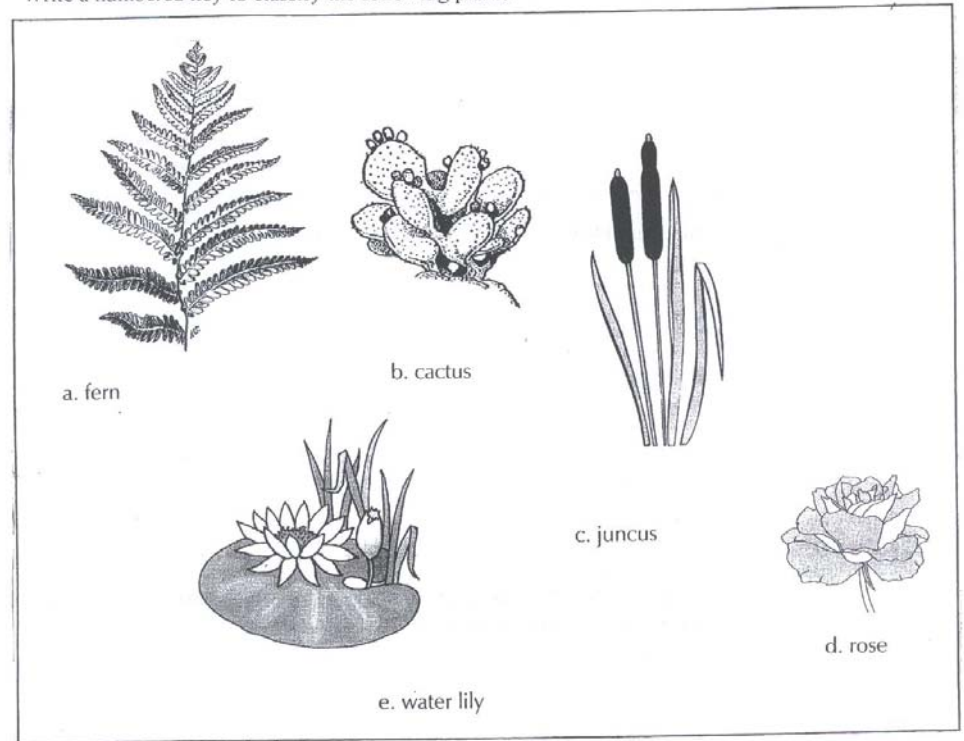
ii) Outline how one of the technologies identified in i) has done this. (2 marks)

Question 10 (3 marks)

Use one example to discuss the ways in which developments in scientific knowledge may conflict with the ideas about the origin of life developed by different cultures.

Question 11 (5 marks)

Construct a numbered Dichotomous Key in order to key out each organism below. Write a numbered key to classify the following plants.



END OF PAPER

ANSWERS			
Student Number			

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

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

Part B

Total marks (50)

Attempt all questions

Marks vary for each question

Answer the questions in the space provided

Allow about 75 minutes for this part

Question 1 (3 marks)

Describe how recent technology has changed the ideas of scientists about individual species such as the platypus.

monotremes represent a unique evolutionary path that branched away from common mammalian ancestor before appearance of marsupials.
* The platypus has 10 sex chromosomes instead of the expected two placed found in other mammals.

* Studies of molar teeth in platypus + fossils of possible ancestors suggest monotremes evolved independently.

* Unique arrangement of electroreceptor units in its bill which help to detect electrical impulses from its prey.

* amino acid sequence of proteins in platypus + echidna milk, different to other mammals

Question 2 (3 marks)

Describe three pieces of evidence that support the concept that Australia was once part of a land mass called Gondwana.

1) When continental margins are matched, such as those between Sth. America + Africa, they fit together quite closely.

2) Fossil evidence found in the continents that once formed Gondwana reveals remains of organisms that are the same age + type eg fossils of Glossopteris

3) Similar organisms can still be found on all former Gondwana continents eg Nothofagus + ratites, suggesting they evolved from a common ancestor that existed when Gondwana was one land mass

Question 3 (6 marks)

Complete the table below to describe two Australian fossils.

- indication of vegetation,
- climate,
- compass, extinct/evolutionary pathing,
- phylo. extant - ev. pathing,
- range.

Name of fossil	Where was this fossil found?	How has this fossil contributed to our understanding of evolution in Australia?
diprotodon	Naracoorte, SA	- Comparison with modern wombat shows features that were needed to survive in the changed environment. - Presence diprotodon - Aust. inland grassland.
obolodendron	Reversleigh, Qld. also Tas Tiger - wide dist.	shows that ancient platypus had premolar teeth unlike modern platypus which means they could eat harder, larger food.
procoptodon	Naracoorte SA also marsupial, brown	most likely browser rather than grazer + its extinction may have been due to increasing aridity destroying its food source.
stromatolites	WA	indicates that the earth's early atmospheric oxygen was produced 3 bill. yrs ago.

Sydney, Newcastle.
Noth. - colder water, extensive rainfall.
Lake Eyre / Frome - platypus, kangaroo, dip., noth.
Zaglossus

Question 4 (3 marks)

Outline two reproductive adaptations of a named Australian animal that help to ensure the species continuity.

Blue tongued lizard
- fertilisation is internal to prevent drying out of the gametes
- large numbers of offspring are produced by this lizard to compensate for lack of parental care.

Question 5 (6 marks)

a) Explain why meiosis and sexual reproduction are important for the survival of species (2 marks)

Both important because they result in offspring that are genetically different to their parents, + the more variation present in a particular population, the more likely some individuals are to survive if the environment changes.

b) Contrast the processes and outcomes of meiosis and mitosis (4 marks)

<u>Mitosis</u> - occurs in body cells	<u>Meiosis</u> - occurs in the cell in sex organs
- purpose is for growth, repair, cell replacement, asexual reprod.	- purpose is to produce gamete
- one nuclear division	- two nuclear divisions
- produces two identical diploid daughter cells	- produces four non-identical haploid cells.

Question 6 (4 marks)

a) Rearrange the following into the order in which they appeared on Earth:

colonial organisms, prokaryotic heterotrophic cells, eucaryotic cells, multicellular organisms, membranes, organic molecules, prokaryotic autotrophic cells. (2 marks)
organic molecules, membranes
prokaryotic heterotrophic cells, prokaryotic autotrophic cells, eucaryotic cells, colonial organisms, multicellular organisms

b) Give a brief description of the following:

i) colonial organisms; (2 marks)

These are composed of groups of similar cells clustered together, can be held by a gelatinous matrix eg volvox.

ii) eucaryotic cells

cells with membrane bound organelles eg nucleus, mitochondria, chloroplasts. Examples of cells include algae, protozoa.

Question 7 (4 marks)

Describe one piece of palaeontological and/or geological evidence for:

i) the theory that life arose in deep-sea vents

(2 marks)

Submersible vessels have discovered ecosystems around deep-sea hydrothermal vents that are supported by chemosynthetic bacteria such as sulfur bacteria. This suggests that life could have arisen in these areas as the archaebacteria are among the earliest life forms on earth.

ii) the theory that oxygen accumulated in the atmosphere around 2 billion years ago

(2 marks)

Banded iron deposits showing red-brown iron oxide have been dated at around 2 billion years, it is believed these formed when iron in the rocks reacted with free oxygen in the air. (probably from cyanobacteria). As they generated O_2 iron precipitated as iron oxides (reacted before build up of O_2) - layers of this age - time when O_2 low levels (no banding in abundance O_2).
Uraninite (2bill) ifoxic \rightarrow uranium oxide.

Question 8 (8 marks)

Classification is an arbitrary system. Identify the kingdoms present, the criteria used in classification and the advantages and disadvantages for the 3 & 5 kingdom systems of living things.

	3 kingdom	5 kingdom
Names of kingdoms present	plant animal monera or protista.	plant animal monera fungi protista
Criteria used to select each kingdom	plants: photosynthetic incapable locomotion, cell walls, eucaryotic animal: heterotrophic, capable of locomotion no cell walls, eucaryotic monera: procaryotic	plants: photosynthetic incapable locomotion, cell walls, eucaryotic animal: heterotrophic, capable locomotion, no cell walls, eucaryotic fungi: eucaryotic, heterotrophic, monera: procaryotic protista: eucaryotic, unicellular.
Advantages of this system	recognises that procaryotes have a more primitive structure than eucaryotes	recognises the unique features of fungi, & finds a place for single celled organisms that have both plant & animal features.
Disadvantages of this system	fungi still pose a classification problem using this system.	the protista are too diverse to reveal evolutionary or other similarities between members of this group.

Question 9 (5 marks)

i) Identify three new technologies that have changed or affected previous classification systems. (3 marks)

DNA hybridisation
 tracing mitochondrial DNA
 electron microscopy

ii) Outline how one of the technologies identified in i) has done this. (2 marks)

NA/DNA hybridisation techniques have helped scientists to determine how closely related two different species are by comparing the degree of matching between base pairs when a single DNA strand from each species are allowed to join eg chimpanzees more closely related to humans than to gorillas.

must relate to how changed/affected classification system.

Question 10 (3 marks)

Use one example to discuss the ways in which developments in scientific knowledge may conflict with the ideas about the origin of life developed by different cultures.

eg Australian aboriginals ^{Creationism} believed that supernatural beings emerged from the earth to create plants, animals, landforms etc. This contradicts one scientific view that life arose on earth about 3.5 mill-yrs ago as a the result of a series of chemical reactions + gradual evolution.

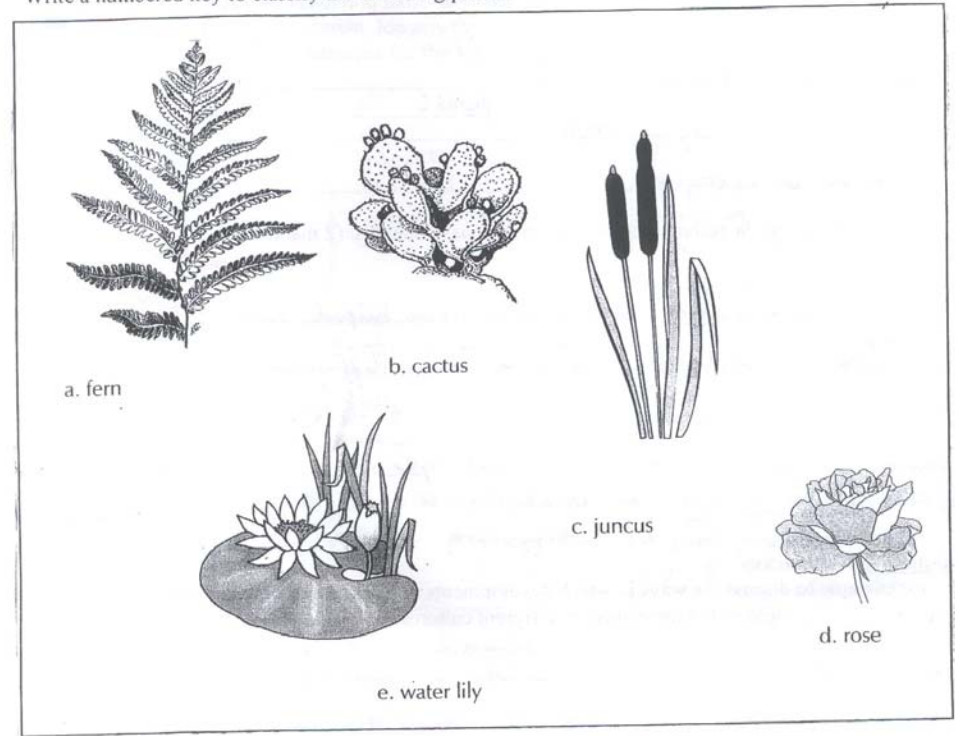
1 - science
 1 - eg other
 - belief

evolutionists don't believe man descended from apes

not a question about Wilberforce/Huxley but would be used if state 'ideas'

Question 11 (5 marks)

Construct a numbered Dichotomous Key in order to key out each organism below. Write a numbered key to classify the following plants.



1A	Thorns present	2	i) construction of dichotomous Key
1B	No Thorns	3	
2A	Succulent leaves	CACTUS	i) for each organism listed correct using structural features
2B	Leaves not succulent	ROSE	
3A	Leaves large + flat	WATER LILY	
3B	Leaves narrow	4	
4A	Divided leaves	FERN	
4B	Leaves not divided	JUNCUS	

END OF PAPER