JAMES RUSE AGRICULTURAL HIGH SCHOOL

2004

TERM 3

PRELIMINARY COURSE EXAMINATION

BIOLOGY

General Instructions	Total marks for this paper: 70
• Reading time – 5 minutes • Working time – 120 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 Answerbook.	This paper has two parts, Part A and Part B. Part A Total marks (10) • Attempt all 10 questions in this part • Allow about 20 minutes for this part Part B Total marks (60) • Attempt all questions • Allow about 100 minutes for this part

PART A
Total Marks (10)
Attempt all questions

1. A characteristic which could be used to distinguish between animals and plants is the presence in all cells of the plant of:

   a) a cell membrane
   b) a cell wall
   c) chloroplasts
   d) all of the above

2. An apple orchard infected with aphids was sprayed with a new insecticide. The majority of the aphid population was killed but some appeared to be resistant to the insecticide and over time the population increased. This was due to:

   a) the insecticide causing some aphids to become resistant
   b) the resistant aphids producing a chemical which inactivated the insecticide
   c) some aphids having a natural resistance to the insecticide
   d) those aphids that were killed not being able to mutate quickly enough.

3. Which pair of organisms are most closely related?

   a) *Pseudomys australis* and *Tadarida australis*
   b) *Macropus robusus* and *Macropus antilopinus*
   c) *Phascolarctos cinereus* and *Taphozous kapalgensis*
   d) *Menura superba* and *Potorous longipes*

4. Stromoatolites are found at Shark Bay, Western Australia. These hard, dome-shaped structures are built by which group of organisms?

   a) Cyanobacteria
   b) Methanogens
   c) Protista
   d) Viruses

5. Which of the following best describes conditions on the early earth about 4.5 billion years ago?

   a) cold seas, clouds of water vapour, atmosphere of hydrogen, oxygen, carbon dioxide, methane
   b) warm seas, clouds of water vapour, atmosphere of hydrogen, oxygen, carbon dioxide, methane
   c) cold seas, clouds of water vapour, atmosphere of hydrogen, ammonia, carbon dioxide, methane
   d) warm seas, clouds of water vapour, atmosphere of hydrogen, ammonia, carbon dioxide, methane

6. Cyanobacteria belong to a group called:

a) eubacteria
b) archaea
c) heterotrophs
d) eukaryotes

7. The earliest life on earth would be approximately:

a) 600 million years old
b) 2000 million years old
c) 3800 million years old
d) 5000 million years old

8. Which of the following categories includes the greatest number of different kinds of organisms?

a) genus
b) family
c) order
d) class

9. Read the following statements:

Statement 1: All eukaryotic organisms are multicellular
Statement 2: All multicellular organisms are eukaryotic
Statement 3: All prokaryotic organisms are unicellular
Statement 4: All unicellular organisms are prokaryotic

The correct statement(s) from the above list is (are):

a) 1 only
b) 3 only
c) 2 & 3 only
d) 2 & 4 only

10. Which of the following represent examples of palaeontological and geological evidence for the origin of life on earth?

a) macrofossils, proteins and banded iron formations
b) microfossils, macrofossils and red bed rock formations
c) stromatolites, macrofossils and red bed rock formations
d) microfossils, stromatolites and banded iron formations

Student Number.....

Write your student number at the top of this Part B Answer Book

Part B

Total marks (60)

Marks vary for each question

Answer the questions in the space provided

Question 11 (2 marks)

Identify one technological change and describe how this has contributed to increasing our understanding of the origin of life.

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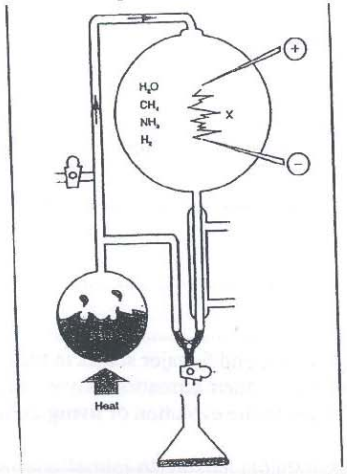
Question 12 (8 marks)

This diagram represents an experiment first conducted in the 1950's.



a) Who conducted this experiment? **(1 mark)**

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b) State a reason for this experiment **(1 mark)**

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c) Describe the experiment (include what X represents) **(3 marks)**

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d) What was the result of the experiment? **(1 mark)**

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e) How did this result contribute to hypotheses about the origin of life? **(1 mark)**

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f) Describe another theory for the origin of the chemicals of life. **(1 mark)**

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Question 13 (7 marks)

Identify 2 major stages in the origin of life and 5 major stages in the evolution of living things. Record these stages in the order of their formation. Give one example of an organism for each of the 5 major stages in the evolution of living things.

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Question 14 (3 marks)

Explain the influence of the Earth's atmosphere on the evolution of living things.

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Question 15 **(6 marks)**

a) Describe the features of the present environment occupied by one of the following: **(2 marks)**
- Archaea
- Eubacteria
- Cyanobacteria
- Nitrogen-fixing bacteria
- Methanogens
- Deep-sea bacteria

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b) Outline any similarities of the past environment of this organism (from part a) with the present environment **(2 marks)**

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c) Identify the role of this organism (from part a) in it's ecosystem **(2 marks)**

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Question 16 **(7 marks)**

In the past, all life was placed into two kingdoms.

a) What were the two kingdoms? **(1 mark)**

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b) What criteria was used to classify organisms into these kingdoms? **(1 mark)**

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c) Outline one disadvantage of a two kingdom classification system **(1 mark)**

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d) Another classification system is the 5 kingdom system. What are the 5 kingdoms? **(1 mark)**

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e) Discuss three advantages of the 5 kingdom system **(3 marks)**

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Question 17 **(7 marks)**

Construct a dichotomous key that could be used to key out the following organisms: mushroom, peaplant, bacterium, fern, starfish, pine tree, moss.

Set out your key in the form 1a, 1b etc

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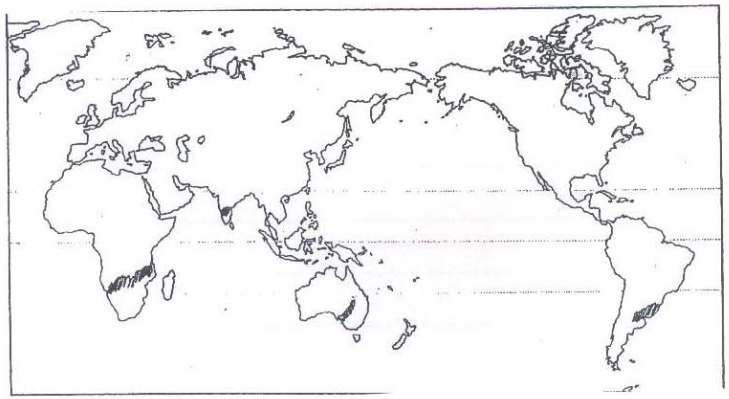
Question 18 **(8 marks)**

The map below shows the present day distribution of *Glossopteris fossils*



a) Describe "*Glossopteris*" and its most common type of fossil. **(2 marks)**

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b) What other continent might you expect to find fossils of *Glossopteris?* **(1 mark)**

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c) Describe how this fossil could be found on such diverse continents. **(3 marks)**

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d) Identify two other evidences that support your answer to (c). **(2 marks)**

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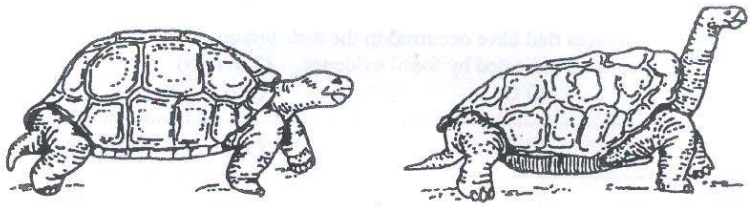
Question 19 (6 marks)

There are two main types of tortoise on the Galapagos Islands. One has a domed shell and short neck and lives on the moister islands; the other variety has a shell that allows its long neck to be raised.

The long-necked variety lives on the drier islands where the vegetation mainly consists of tall shrubs and bushes.

THE TWO MAIN TYPES OF TORTOISE FOUND ON THE GALAPAGOS ISLANDS



a) How would Darwin's theory of evolution explain the evolution of the long-necked form of the Galapagos tortoise? **(4 marks)**

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b) Describe two observations made by Darwin of Australian flora and fauna

(2 marks)

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Question 20 (4 marks)

a) Identify two changes that have occurred in the distribution of two named Australian species as indicated by fossil evidence. **(2 marks)**

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b) Discuss two theories to accounts for these changes. **(2 marks)**

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Question 21 (2 marks)

What was the subject of the debate between Huxley and Wilberforce? Outline each of their arguments.

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END OF TEST

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

Student Number.....

Write your student number at the top of this Part B Answer Book

Part B

Total marks (60)

Marks vary for each question

Answer the questions in the space provided

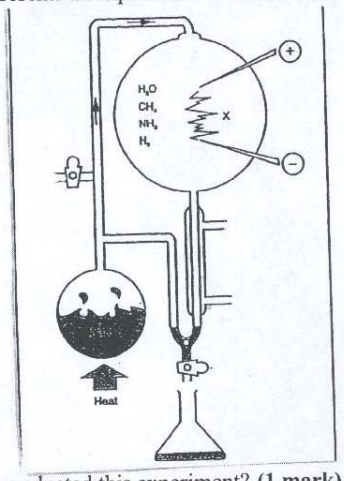
Question 11 (2 marks)

Identify one technological change and describe how this has contributed to increasing our understanding of the origin of life.

* Radioactive dating - for determining the ages of rocks + fossils
* deep sea equipment - study variety of deep sea organisms that live in extreme conditions - possible site of the origin of life on Earth.
* Analyses of molecules of DNA, - DNA sequencing, a a sequencing. Measurement of these differences could reveal how closely related 2 species may be & reveal how long ago these ancestral lineages went their separate ways.
* Space travel - extreme conditions under which bacteria can survive - extreme temps, vacuum conditions, lack of water, high radiation levels
* Microscopes - eg SEM + TEM have assisted in understanding the structure of cyanobacteria
* computer technology - data bases to hold + manipulate such large amts of information about the genomes of many different species

Question 12 (8 marks)

This diagram represents an experiment first conducted in the 1950's.



a) Who conducted this experiment? **(1 mark)**

Urey / Miller.

b) State a reason for this experiment **(1 mark)**

to produce organic molecules from simple inorganic molecules in conditions similar to primitive earth's atmosphere.

origin life!

c) Describe the experiment (include what X represents) **(3 marks)**

3 points

a flask was set up containing the gases (above) to represent the atmosphere of earth. The gases were exposed to a continuous electric discharge (X) representing lightning. The gases were circulated for one week & then the liquid in flask was analysed (for amino acids). closed system

d) What was the result of the experiment? **(1 mark)**

production of organic molecules eg amino acids

e) How did this result contribute to hypotheses about the origin of life? **(1 mark)**

life may have originated on our primitive earth. These organic molecules could eventually form cells.

f) Describe another theory for the origin of the chemicals of life. **(1 mark)**

Panspermia theory - life originated in outer space (& came to earth via meteorites).

Question 13 (7 marks)

Identify 2 major stages in the origin of life and 5 major stages in the evolution of living things. Record these stages in the order of their formation. Give one example of an organism for each of the 5 major stages in the evolution of living things.

1 for order.

½ organic molecules

½ membranes

½ prokaryotic heterotrophic cells eg ½ bacteria

½ prokaryotic autotrophic cells eg ½ cyanobacteria

½ eucaryotic cells eg ½ paramecium, amoeba

½ colonial organisms eg ½ stromatolite, volvox

½ multicellular organisms eg ½ fish, etc.

Question 14 (3 marks)

Explain the influence of the Earth's atmosphere on the evolution of living things.

at least 3 influences

- primitive atmosphere - no oxygen :. first cells - heterotrophs, used organic molecules as food
- once oxygen collected, both heterotrophs & autotrophs (less anerobic more aerobic) could use oxygen for respiration for energy. Enormous increase in diversity of life - increase in size & complexity of orgs → eukaryotic → multicellular.
- oxygen can also make ozone (protects from harmful effects of UV) :. greater diversity of life on land, now protected from UV by ozone.

Question 15 **(6 marks)**

a) Describe the features of the present environment occupied by one of the following: **(2 marks)**
- Archaea
- Eubacteria
- Cyanobacteria
- Nitrogen-fixing bacteria
- Methanogens
- Deep-sea bacteria

- mostly aquatic (single or colonies) tranquil waters warm (stromatolites - shallow sea) (Shark bay). phototroph
extreme salinity (lake), near hot springs. limited amount water, & occurrence of $CaCO_3$.

b) Outline any similarities of the past environment of this organism (from part a) with the present environment **(2 marks)**

number stromatolites oldest known fossil - shallow seas were more widespread.
mostly aquatic some free living, in soil, few types marine. some live as part of lichen

c) Identify the role of this organism (from part a) in it's ecosystem **(2 marks)**

they produce oxygen - ancient ones responsible for changing then environment from anoxic to oxic
- autotrophs : starts the food chain. (also some nitrogen fixing some in lichens).

Question 16 **(7 marks)**

In the past, all life was placed into two kingdoms.

a) What were the two kingdoms? **(1 mark)**

plants, animals

b) What criteria was used to classify organisms into these kingdoms? **(1 mark)**

photosynthetic or heterotrophic. Cells walls/no cell walls
locomotion/No locomotion.

c) Outline one disadvantage of a two kingdom classification system **(1 mark)**

does not recognise prokaryotic Vs eucaryotic, difficulty in classifying fungi, difficulty in classifying unicellular orgs with plant, animal features eg euglena

d) Another classification system is the 5 kingdom system. What are the 5 kingdoms? **(1 mark)**

plants, animal, fungi, protista, moneras.

e) Discuss three advantages of the 5 kingdom system **(3 marks)**

recognises the difference between
- prokaryotes & eucaryotes
- fungi & plants
- recognises the difficulty of classifying unicellular orgs that have plant & animal features eg. euglena.

Question 17 **(7 marks)**

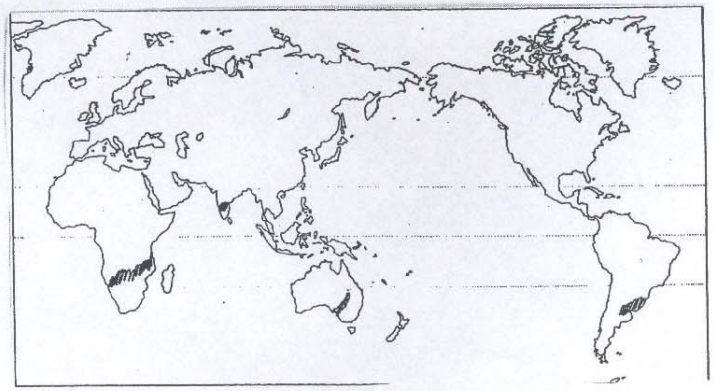
Construct a dichotomous key that could be used to key out the following organisms: mushroom, peaplant, bacterium, fern, starfish, pine tree, moss.

Set out your key in the form 1a, 1b etc

1a prokaryotic - - - - bacterium.
b eukaryotic - - - - 2.
2a chlorophyll present - - - 3
b. no chlorophyll - - - 4
3a Produces seeds - - - 5
b. No seeds - - - 6.
4a Has cones Cell wall present Pine tree. Mushroom
b. No cones No cell walls Peaplant starfish.
5a No cones - - - peaplant
b. Cones pine tree.
6a Xylem present - - - fern
b No xylem - - - moss.

Question 18 **(8 marks)**

The map below shows the present day distribution of *Glossopteris* fossils



a) Describe "*Glossopteris*" and its most common type of fossil. **(2 marks)**

seed fern leaf.

b) What other continent might you expect to find fossils of *Glossopteris*? **(1 mark)**

(other than those found on map)
Antarctica

c) Describe how this fossil could be found on such diverse continents. **(3 marks)**

Evidence for continental drift
All of these continents formed the southern land mass - Gondwana (150 mill yrs ago) & that these continents were connected during the Permian (300 mill yrs ago) Glossopteris is an index fossil of the Permian period). The break up occurred around 135 mill yrs ago. via the movement of the tectonic plate to present position - separated & yet retaining their fossil glossopterids.

or unlikely seeds carried large distance

d) Identify two other evidences that support your answer to (c). **(2 marks)**

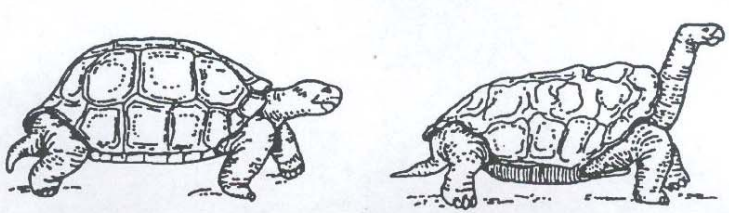
- matching continental margins
- position of mid ocean ridges, spreading zones between cont. plates.
- similarities between present day organisms on Gondwana continents (ratites, southern beech tree)

Question 19 (6 marks)

There are two main types of tortoise on the Galapagos Islands. One has a domed shell and short neck and lives on the moister islands; the other variety has a shell that allows its long neck to be raised.

The long-necked variety lives on the drier islands where the vegetation mainly consists of tall shrubs and bushes.

THE TWO MAIN TYPES OF TORTOISE FOUND ON THE GALAPAGOS ISLANDS



a) How would Darwin's theory of evolution explain the evolution of the long-necked form of the Galapagos tortoise? **(4 marks)**

* variation
* advantageous / disadvantageous traits (long neck)
* survival / reproduction / passing on advantageous traits
* ↑ increase in frequency of long neck variety in the drier islands

b) Describe two observations made by Darwin of Australian flora and fauna **(2 marks)**

* collecting info regarding theory of evolution.

½ for example of each.

flightless squirrels from N. America, pandas, platypus.
* Australian gliders possess (marsupials) – both native bear rats, frog,
specialised loose membranes for flight: planigales – expt:
deers (placentals) & kangaroos (marsupials) – similar digestive systems. suffer assisted cockatoos. etc.

↑ support for "common ancestry"

Question 20 (4 marks)

a) Identify two changes that have occurred in the distribution of two named Australian species as indicated by fossil evidence. **(2 marks)**

rainforests have contracted.
sclerophyll communities & grasslands have spread.
(megafauna).
Ice age
Hardy Bungee

b) Discuss two theories to accounts for these changes. **(2 marks)**

"increasing aridity" – less rainforest replaced with sclerophyll forests
– fire – plants that have fire tolerance – have an advantage. favoured eucalypts rather than rainforest.

Question 21 (2 marks)

What was the subject of the debate between Huxley and Wilberforce? Outline each of their arguments.

Darwin's theory of evolution by natural selection
Wilberforce –
P.T.O.

END OF TEST

(196)

Darwen observed similarity between marsupials of Australia & other countries placentals that live in similar environments & this supported his theory of evolution & common ancestry

eg flying squirrels of Nth America & glider possum of Australia

eg deer & kangaroo share similar digestive systems

21

Subject: Darwens theory of evolution by natural selection as applied to humans common ancestry with apes

Wilberforce believed that the idea of man having common ancestry with apes was against the Christian doctrine. He chose to ridicule Huxley by asking whether it was on his father's or mother's side that he claimed to be descended from apes

Huxley was an advocate of Darwens theory of evolution. Hukley replied that he would rather be related to an ape than to a man who used his position, eloquence & a few hours acquaintance with biology to ridicule a theory which he did not understand.