Student No. _____

Barker College

2003
TRIAL HIGHER SCHOOL CERTIFICATE

Biology

ANSWER SHEET

Staff Involved:

- **VBE***
- **RDF**
- **MEB**
- **TER**
- **RSH**

120 copies

AM TUESDAY 12 AUGUST

Section A – Multiple Choice
Choose the best response and fill in the response oval completely

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)
11.	(A)	(B)	(C)	(D)
12.	(A)	(B)	(C)	(D)
13.	(A)	(B)	(C)	(D)
14.	(A)	(B)	(C)	(D)
15.	(A)	(B)	(C)	(D)

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AM TUESDAY 12 AUGUST

General Instructions

- **Reading time – 5 minutes**
- **Working time – 3 hours**
- **Write using blue or black pen**
- **Board-approved calculators may be used**
- **Draw diagrams using pencil**
- **Write your Barker Student Number on all answer pages submitted**

Total marks – 100

Section I **Pages 2 - 16**

Total marks (86)

There are two parts to this section, Part A and Part B

PART A
15 marks
- **Attempt Questions 1 – 15**
- **Allow about 30 minutes for this part**

PART B
60 marks
- **Attempt Questions 16 – 28**
- **Allow about 1 hour and 45 minutes for this part**

Section II **Pages 17 - 20**

25 marks
- **Attempt Question 29**
- **Allow about 45 minutes for this section**

Section I

Total marks – 86

Part A

15 marks
Attempt Questions 1 – 15
Allow about 30 minutes for this part

Use the multiple-choice answer sheet

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

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) 

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1. Which of the following graphs best shows the relationship between external temperature and body temperature for an endotherm and an ectotherm?

2. What is the purpose of the mechanisms of homeostasis?

(A) The maintenance of equal nutrient supply to all tissues.
(B) The excretion of toxic waste products.
(C) The maintenance of a stable cellular environment.
(D) The maintenance of a constant concentration of all blood constituents.

3. Which cell type is represented in the sequence of events illustrated below?

(A) a T-lymphocyte
(B) a B-lymphocyte
(C) a phagocyte
(D) an antibody

4. Which of the following conditions could be treated with antibiotics?

	Condition	**Cause**
(A)	Down Syndrome	additional chromosome
(B)	Rubella	virus
(C)	Pneumonia	bacteria
(D)	BSE	prion

5. In which of the following ways will a person acquire long-lasting natural immunity to a particular antigen?

(A) When they receive a small amount of vaccine by injection.
(B) When they are given antibodies produced by another mammal.
(C) When they respond to the antigen by making antibodies.
(D) When they receive antibodies as a baby during suckling.

6. Refer to the diagram below

Which letters indicate the normal negative feedback control of body temperature?

(A) W and Y
(B) W and Z
(C) X and Y
(D) X and Z

7. In the normal kidney of a human, which of the following substances would **not** be found in the Bowman's capsule?

(A) glucose
(B) haemoglobin
(C) water
(D) urea

8. Many populations of insect pests have developed resistance to chemical pesticides. What does this indicate about their effectiveness in the control of insects?

(A) Pesticides cause mutations in insects.
(B) Complete control of insect pests by chemical means alone is unlikely to be achieved.
(C) Complete control of insect pests by chemical means will take a long time.
(D) The application of chemical pesticides should cease.

9. What is the incubation period for a disease?

(A) The period of time that culture plates are left in an incubator to develop colonies of organisms.
(B) The period of time between the first signs of the disease and the body overcoming

the disease.

(C) The period between infection by a pathogen and the first symptoms.

(D) The period between the the first signs of infection and the first symptoms.

10. The fossil record is an incomplete record of life in the past. In what way is *Achaeopteryx* an important transition fossil in the understanding of evolutionary change?

(A) It provides evidence for the ancestry of amphibians from fish.

(B) It provides evidence for the evolution of reptiles from birds.

(C) It provides evidence for the common ancestry of birds and reptiles.

(D) It provides evidence for the ancestry of the pentadactyl limb.

11. Plants cannot move away from extremes of temperature. Which of the following mechanisms may be employed by plants in response to a large increase in temperature?

(A) Increase the rate of photosynthesis.

(B) Open stomates to allow for heat loss.

(C) Close stomates to allow for water conservation.

(D) Open stomates to allow for water conservation.

12. Which of the following adaptations would decrease the chance of survival for a mammal living in an extremely cold habitat?

(A) low surface area : volume ratio

(B) Being partly aquatic.

(C) Dilation of skin blood vessels.

(D) Migration.

13. Which of the following techniques would be appropriate to measure the extent of the evolutionary relationship two different organisms?

(A) Identifying fossils that are transitional between the two organisms.

(B) Sampling DNA and identifying similarities between the animals listed.

(C) Comparing the anatomical features of each animal.

(D) Comparing the embryos of each animal.

14. Refer to the diagram shown below:

Which of the following scientists pioneered this procedure?

(A) Ronald Ross
(B) Louis Pasteur
(C) Robert Koch
(D) MacFarlane Burnet

15. Epidemiology is the study of the relationship between the incidence of disease and its possible causes.

Which of the following includes essential features of an epidemiological study?

(A) Careful experimental design, data collection from a sample , statistical analysis of the data.
(B) Careful experimental design, data collection from a large sample, statistical analysis of the data.
(C) Careful experimental design, data collection from a large sample, statistical analysis of the data, identification of a treatment.
(D) Careful experimental design, data collection from a sample , statistical analysis of the data, identification of the cause of the disease.

Student No. _____

Section I (continued)

Part B – 60 marks
Attempt Questions 16 – 28
Allow about 1 hour and 45 minutes for this part

Answer the questions in the spaces provided.

Marks

Question 16 (2 marks)

Refer to the haemoglobin dissociation curve shown below to answer the following.

(a) The partial pressure of oxygen in an actively respiring muscle is about 2kPa.
State the percentage saturation of haemoglobin in the capillaries of such a muscle. **1**

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(b) Identify a current technology that allows the measurement of oxygen or carbon dixoide concentrations in blood. **1**

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Student No. _____

Marks

Question 17 (6 marks)

(a) Normal venous pressure in the feet is about 25 mmHg. When a person stands completely still, the blood pressure in the feet rises very quickly to about 90 mmHg.

Apply your understanding of the structure and function of blood vessels to explain this situation. **2**

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(b) The chemical composition of the blood changes significantly as it travels around the body. Describe the main changes in concentration of carbon dioxide in the blood and identify the tissues in which these changes occur. **4**

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Question 18 (4 marks)

(a) In a transplant patient, outline why a transplanted kidney from their identical twin is more likely to survive than a kidney from an unrelated individual. **2**

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(b) Vaccinations are frequently used to prevent infection. Explain the way in which vaccinations are used to prevent the spread and occurrence of a named infectious disease. **2**

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Student No. _____

Marks

Question 19 (4 marks)

The table below shows the relative concentrations of a number of substances in normal blood, blood plasma from someone suffering renal failure and in dialysing fluid used in a kidney dialysis machine.

	Relative concentration in		
Substance	**normal blood plasma**	**blood plasma in renal failure**	**dialysing fluid**
glucose	100	100	125
urea	26	200	0
sodium ions	142	142	133
chloride ions	107	107	105
plasma proteins	80	80	0

(a) Which of the substances will be able to diffuse through the dialysis membrane? **1**

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(b) In which direction will each of these substances diffuse? **1**

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(c) Explain why the dialysing fluid has no urea. **2**

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Student No. _____

Marks

Question 20 (6 marks)

(a) Distinguish between convergent and divergent evolution, using examples of each. **3**

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(b) Black cockatoos from Western Australia show marked differences in their beak structure and food preference to birds found in the eastern regions.

(i) Name the theory that could account for these differences in the two populations. **1**

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(ii) Outline the mechanism involved in this theory. **2**

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Student No. _____

Marks

Question 21 (7 marks)

In the course of your studies you have carried out a first hand investigation to identify microbes in food and water.

Justify the procedure you followed for one of your investigations and the validity of the data you collected. **7**

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Student No. _____

Marks

Question 22 (6 marks)

Many living cells contain the enzyme catalase which catalyses the breakdown of hydrogen peroxide to water and oxygen.

$$2H_2O_2 \xrightarrow{\text{catalase}} 2H_2O + O_2$$

The graph below shows the result of an experiment carried out at 30^oC with a fixed amount

of hydrogen peroxide and a constant pH, using green cabbage extract as a source of catalase.

(a) Define the term *enzyme*. **1**

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(b) Identify the variable in the experiment. **1**

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(c) Explain the shape of the graph between points X and Y. **2**

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Question 22 continues on page 13

Question 22 (continued)

Student No. _____

Marks

(d) Assume the catalase in this experiment has an optimum temperature of $30^{o}C$.

On the pair of axes provided below, draw a curve to predict the volume of O_2 collected per minute, if the experiment had been carried out at 20^oC. **1**

(e) Catalase is an intracellular enzyme, most active in the pH range of 6.5 – 7.5

Describe what would happen to the activity of the catalase if the pH range of its environment was outside this range. **1**

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End of Question 22

Student No. _____

Marks

Question 23 (4 marks)

Identify a named non-infectious disease and discuss its cause, symptoms, occurrence and treatment or management. **4**

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Question 24 (6 marks)

In order to invade a human, an infectious particle must overcome both specific and non-specific defences.

Describe the body's response to an initial viral infection and explain how this reduces the chance of suffering from the disease again.

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Student No. _____

Marks

Question 25 (3 marks)

(a) Outline the historical development of our understanding of the cause of malaria. **2**

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(b) Identify, and briefly describe, a method for the prevention of malaria. **1**

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Question 26 (5 marks)

Mammalian kidneys are very efficient at producing urine of varying concentrations depending on requirements. The table below gives the relative lengths of nephron tubules and maximum urine concentrations in the kidneys of a number of different mammals.

Mammal	Relative tubule length	Maximum urine concentration (arbitrary units)
Rat	5.2	300
Pig	1.3	110
Human	2.6	140
Kangaroo rat	7.8	550
Animal X	9.8	940

(a) Describe and explain the relationship between urine concentration and the relative length of the nephron tubule. **4**

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(b) Propose the natural habitat of Animal X. Justify your choice. **1**

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Student No. _____

Marks

Question 27 (3 marks)

Identify a reason for quarantine procedures in Australia and discuss the effectiveness of such procedures using a named example. **3**

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Question 28 (4 marks)

Australia has a great diversity of habitats, many of which have significant daily and seasonal temperature changes.

Describe and compare the adaptations of **TWO** named Australian examples that assist them in temperature regulation. **4**

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Student No. _____

Section II
25 marks
Attempt Question 29
Allow about 45 minutes for this section

Answer the questions in the spaces provided.

Marks

Question 29 — Communication (25 marks)

(a) (i) Refer to the diagram below.

1. Label the structures X, Y and Z. **1**

2. Describe in which direction a nerve impulse will travel. **1**

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3. Outline how a message passes from one neurone to another. **1**

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Question 29 continues on page 18

Question 29 (continued) **Student No.** _____

Marks

(ii) The diagram below represents an action potential in the membrane of a nerve.

Describe what is happening in the membrane of the nerve at points A, B and C. **3**

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(b) Outline an example of touch, taste and smell as a form of communication in a named animal(s) other than human. **3**

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Question 29 continues on page 19

Question 29 (continued) **Student No.** _____

Marks

(c) (i) The sequence of events in a stimulus reponse mechanism can be modelled as:

stimulus $\rightarrow$ receptor $\rightarrow$ messenger $\rightarrow$ effector $\rightarrow$ response / transmission

Apply this model to an example of a stimulus response mechanism in an animal. **2**

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(ii) Explain how this mechanism assists in the survival of the animal. **2**

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(d) Soldiers fighting in Iraq often wore red goggles when in bright light before going into dimly lit areas. Apply your understanding of the functioning of rod cells to explain the reason for this. **3**

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Question 29 continues on page 20

Question 29 (continued) **Student No.** _____

Marks

(e) Describe the following structures of the mammalian ear and outline how their structure relates to their function.

(i) tympanic membrane: .....

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..... **2**

(ii) ear ossicles: .....

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(i) organ of Corti: .....

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(f) Outline the structures of the larynx that assist in the production of sound. **3**

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End of Paper