

Student Number _____

Student Name _____



Sydney Technical High School

**Biology Trial Higher School Certificate Examination
2009**

General Instructions

- Reading time - 5 minutes
- Working time - 3 hours
- Write using black or blue pen
- Draw diagrams using pencil
- Board-approved calculators may be used
- Write your **Name** at the top of this page only
- **Part A Multiple Choice Answer Sheet is on the last page and can be removed to record answers (put your Student Number on it)**
- **Hand all parts of the paper in together**

Total marks - 100

Section I

85 marks

This section has two parts, Part A and Part B

Part A - 15 marks

- Attempt Questions 1-15
- Allow about 30 minutes for this part

Part B - 70 marks

- Attempt Questions 16-29
- Allow about 2 hours for this part

Section II

15 marks

- Attempt all parts of Question 30
- Allow about 30 minutes for this section

Section I

Total marks 85

Part A

Total Marks (15)
Attempt Questions 1-15
Allow about 30 minutes for this part

Use the multiple-choice answer sheet on the last page for Questions 1-15. It can be removed to record answers. 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

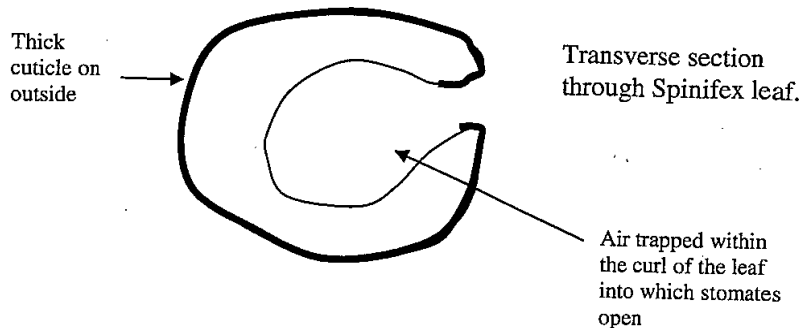
If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

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 draw an arrow as follows:

A B C D
correct
↓

1. Desert grasses, such as Spinifex, have leaves which are curled. They have thick cuticle on the outside surface and their stomates open into the air space created by the curling of the leaf.



The curled leaf is an adaptive feature which helps to conserve water. Which one of the following explains how it does this?

- (A) Curling increases the surface area of the leaf, reducing water loss by evaporation from the stomates.
- (B) Water vapour from the air is trapped inside the leaf, condenses and is absorbed.
- (C) The air inside the curl is more humid than outside air, reducing water loss by evaporation from the stomates.
- (D) Stomates inside the curl are shaded from sunlight, preventing them from opening widely and conserving water.

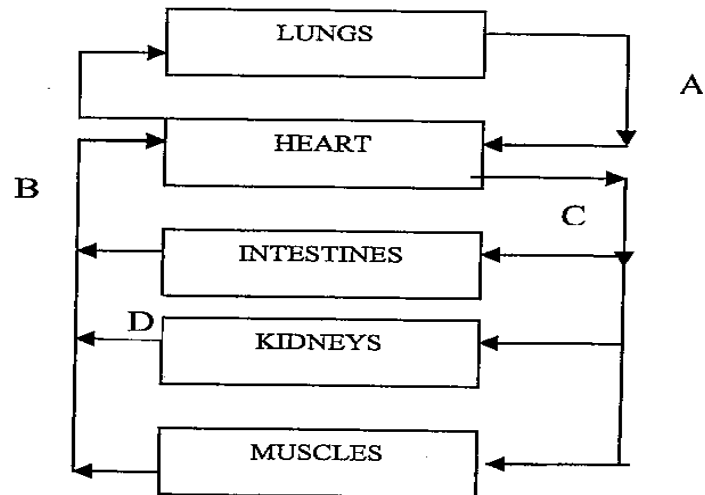
2. What would be the immediate effect of an increase in the secretion of *antidiuretic hormone (ADH)* in the bloodstream of a mammal?

- (A) Increased levels of potassium ions
- (B) Decreased blood pressure and more dilute urine
- (C) Decreased levels of sodium ions
- (D) Increased blood pressure and more concentrated urine

3. Amylase enzyme in saliva digests starch into sucrose. Saliva has a pH of 8. Which of these statements is **NOT** correct?

- (A) The amylase will be inactive in an acidic environment in the stomach..
- (B) The amount of sucrose finally produced will depend on the amount of amylase present.
- (C) The amylase will act more rapidly at 35°C than at 15°C.
- (D) The rate of sucrose production will initially increase with increasing starch concentrations.

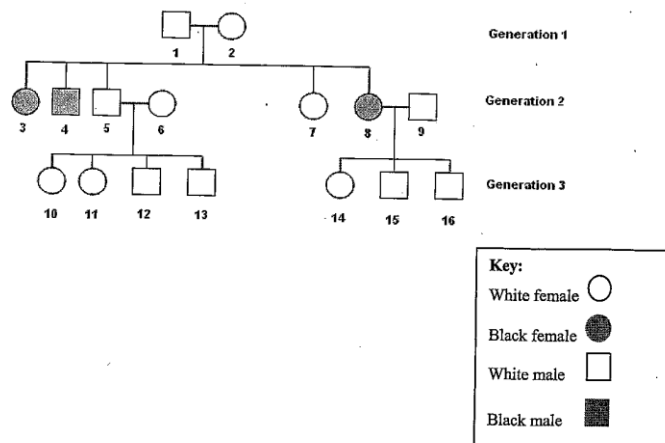
4. The following diagram represents a simple model of the circulation of blood in the human body.



In which of the areas labelled A, B, C and D would be blood have the highest composition of glucose and the lowest level of urea?

- (A) A
 (B) B
 (C) C
 (D) D

5. Bijou Penguins may have black tipped wings or white tipped wings. Black tipped wings are the result of the recessive trait. The following pedigree is for 3 generations of Bijou Penguins.



The possible genotype of individual 5 is:

- (A) WW only
 (B) Ww only
 (C) ww only
 (D) WW or Ww

6. Zoos aim to increase populations of endangered species through breeding programs. In these programs, scientists use pedigrees in their choice of mates for breeding.

Why is this important?

- (A) Unrelated animals are more likely to fight and injure their young.
- (B) Related animals are less likely to mate and produce offspring
- (C) Mating unrelated animals will help to maintain the genetic diversity of the species.
- (D) Mating related animals will help scientists to select for favourable characteristics

7. The development of theories of evolution has always been influenced by the social and political factors of the time.

Which one of the following is a factor which influenced Darwin in delaying the publication of his theory?

- (A) The great majority of society accepted the biblical version of creation, so his theory would provoke great controversy.
- (B) He was not well known in scientific circles, so other scientists would be unlikely to accept his ideas.
- (C) Alfred Russel Wallace had proposed a different theory, which was supported by influential scientists, so he wanted to be sure of his evidence.
- (D) Sea travel was very slow. It took him many years to return home from the Galapagos Islands.

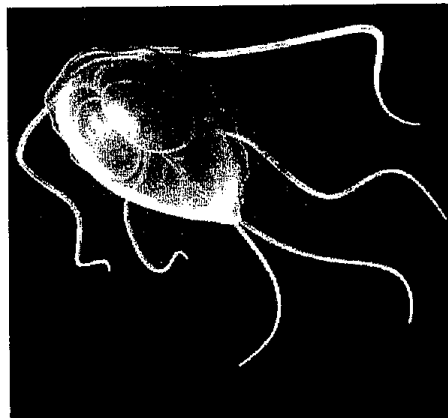
8. The diagram below shows four male gametes that were produced from a single parent cell.



Which of the choices below represents the parent cell?

- (A)
- (B)
- (C)
- (D)

9. Which scientist's work linked the behaviour of chromosomes during meiosis and fertilisation with the inheritance of Mendel's factors:
- (A) Thomas Hunt Morgan
 - (B) Walter Sutton
 - (C) Edward Tatum
 - (D) Maurice Wilkins
10. Chemical analysis of the DNA of a particular organism shows that 35% of the base content present on the molecule is cytosine. Thus the percentage of thymine is:
- (A) 65%
 - (B) 35%
 - (C) 25%
 - (D) 15%
11. Haemophilia is inherited through a sex-linked recessive gene. If a normal couple have a haemophiliac son, predict the chance of their next child suffering the disease.
- (A) 0% chance if a girl
 - (B) 25% chance if a boy
 - (C) 50% chance if a girl
 - (D) 100% chance if a boy
12. Observe the following image of Giardia.



Giardia is an organism that can cause diarrhoea, bloating, stomach cramps, fatigue and weight loss in humans.

Which word best describes this kind of organism?

- (A) Pathogen
- (B) Antigen
- (C) Prion
- (D) Bacteria

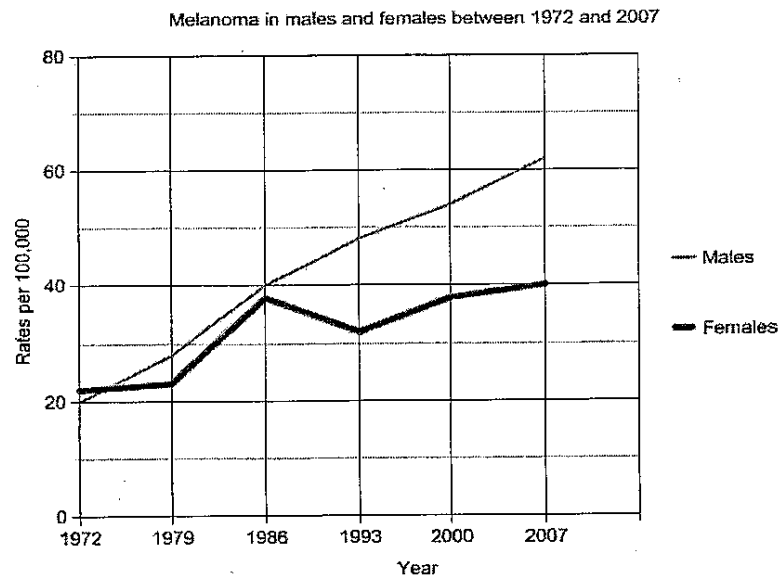
13. One way to transmit a pathogen to a host is by -

- (A) a vector
- (B) a macro-parasite
- (C) An epidemic
- (D) A phagocyte

14. A doctor prescribes antibiotics when a patient has viral pneumonia to –

- (A) Kill the viral pathogen
- (B) Treat bacterial secondary infections
- (C) Build up antibodies to the virus
- (D) Reduce the high fever

15. The following graph shows the rate of occurrence of melanoma in males and females between 1972 and 2007 in NSW.



Which of the following conclusions about the incidence of melanoma over the last 20 years is justified by the graph?

- (A) The rate of occurrence in males has tripled over the last 20 years.
- (B) The rate in females has almost doubled in the last 20 years.
- (C) The higher rate in males is caused by greater exposure to UV light
- (D) The rate in females has shown a plateau trend in the last 20 years.

Section I

Student Number _____

Part B

Total Marks (70)

Attempt Questions 16-29

Allow about 2 hours for this part

Answer this part in the spaces provided.

Marks

Question 16 (3 marks)

Homeostasis is essential for the survival of all organisms. Describe homeostasis and explain why it is important for optimal metabolic efficiency.

3

Question 17 (4 marks)

Describe the adaptations or responses of **one** named Australian **plant** and one named Australian **animal** which assist in temperature regulation.

4

Question 18 (7 marks)

Marks

(a) Describe how oxygen is transported throughout the body

2

(b) Outline why oxygen is needed for living cells in the body.

2

(c) Explain why removal of carbon dioxide from cells is essential.

3

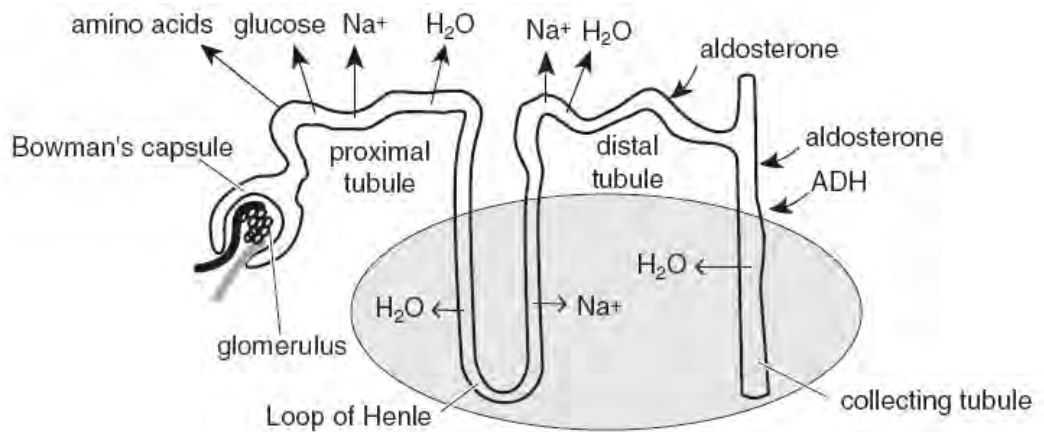
Question 19 (3 marks)

Use a specific transitional fossil as an example to describe how transitional forms provide evidence to support the theory of evolution.

3

Question 20 (7 marks)

Marks



(a) Identify the structure pictured above. **1**

(b) Describe its overall size and where it is found in the kidney. **2**

(c) Using information from the diagram, explain how the processes of filtration and reabsorption in the above structure regulate body fluid composition. **4**

Question 21 (4 marks)

Marks

Gregor Mendel and Charles Darwin made their respective contributions to genetics and evolutionary theory at about the same time. Darwin's *The Origin of the Species* was published in 1859, while Mendel's paper outlining his work with pea plants was published in 1866.

Compare the responses of the scientific community to the publishing of Darwin's and of Mendel's work and propose reasons for significant differences in the responses.

4

Question 22 (6 marks)

Briefly describe a methodology used in cloning and discuss the potential impact of cloning in agriculture.

6

Question 23 (6 marks)

Marks

Osteoporosis is a disease characterised by low bone mass and deterioration of bone strength. Fragile bones are more prone to fracture. Currently over 2 million Australians are affected by the disease. Osteoporosis can be easily diagnosed with bone density scans.

Researchers are interested in determining the effect of combined dietary calcium and vitamin D supplements on the bone density of healthy young women.

- (a) Design an investigation which will demonstrate the effect of this combined dietary supplement on phenotype. **4**


- (a) Explain why it is necessary to gain approval for the investigation from an Ethics Committee before commencing the investigation. **2**

Question 24 (4 marks)

Marks

Construct a flow chart that shows that changes in DNA sequences can result in changes in cell activity.

4



Question 25 (4 marks)

Distinguish between bacteria and fungi and name one example of a disease caused by each type of pathogen.

4

Question 26 (3 marks)

Marks

You performed an investigation to model Pasteur's experiment to identify the role of microbes in decay. Draw labelled diagrams to show the apparatus used.

3

Question 27 (5 marks)

5

Describe one named infectious disease in terms of its cause, mode of transmission, major symptoms and treatment.

Question 28 (6 marks)

Marks

- (a) Explain why organ transplants should trigger an immune response in the recipient. **1**

- (b) Identify one sign of the inflammatory response that can be stimulated by an organ transplant. **1**

- (c) Draw a labelled diagram to describe the process of phagocytosis that can occur. **2**



- (d) Predict the major consequence of the immune response being triggered after an organ transplant. **1**

- (e) Describe one area of future research into organ transplantation. **1**

Section II

15 marks

Attempt all parts of Question 30

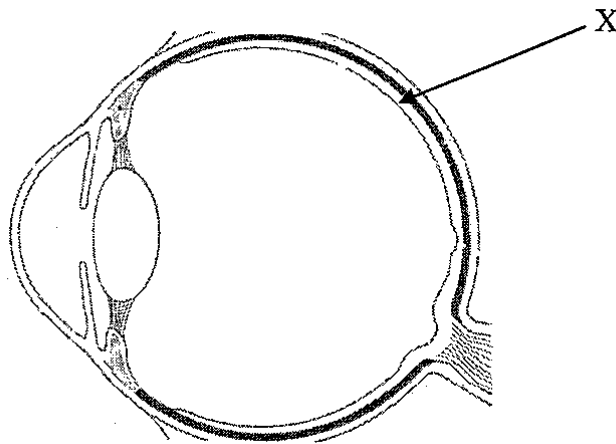
Allow about 30 minutes for this section.

Answer this question in the following pages, clearly marking each section.

Question 30 - Communication (15 marks)

Marks

- (a) A diagram of the human eye is shown below.



- (i) Identify the structure labelled X. 1
- (ii) Relate its anatomic structure to its function. 2
- (iii) Suggest reasons for the differences in range of electromagnetic radiation detected by humans and one other animal. 3
- (b) During the course you performed a first-hand investigation to model the process of accommodation. Assess the value of the model you used. 4
- (c) Cataracts can be age related, radiation induced and also caused by certain infections. Evaluate the impact on society of technology that can be used to treat cataracts. 5

End of Exam

PART A
MULTIPLE-CHOICE ANSWER SHEET

- | | | | | |
|-----|-------------------------|-------------------------|-------------------------|-------------------------|
| 1. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 2. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 3. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 4. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 5. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 6. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 7. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 8. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 9. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 10. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 11. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 12. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 13. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 14. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 15. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |

**STUDENTS SHOULD NOW CONTINUE
WITH PART B**