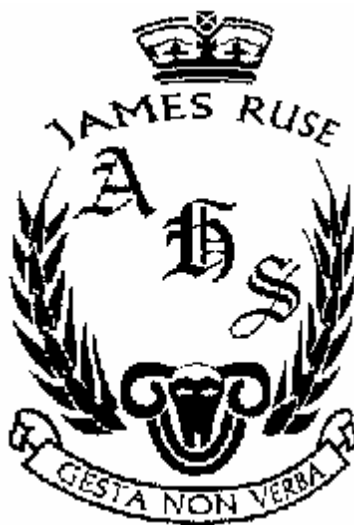




**JAMES RUSE AGRICULTURAL HIGH SCHOOL
TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION
2003**

BIOLOGY

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

Total marks – 100

Section I – 75 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 – 60 marks

- Attempt Questions 16-24
- Allow about 1 hour 45 minutes for this part

Section II – 25 marks (Question 25)

- Allow about 45 minutes for this section

Section I (75 marks)

Part A – 15 marks

Attempt Questions 1-15

Allow about 30 minutes for this part

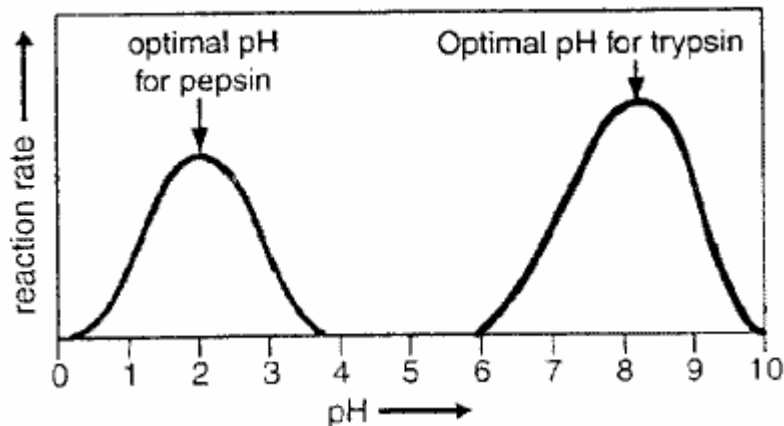
1. What tissue(s) can be seen in the diagram?



- (a) xylem in longitudinal section
(b) phloem in longitudinal section
(c) xylem and phloem in transverse section
(d) xylem and phloem in longitudinal section
2. What is the main form in which nitrogenous waste is carried in mammalian blood?
(a) amino acids
(b) ammonia
(c) uric acid
(d) urea
3. Some fish have an internal salt concentration which is lower than that of the surrounding water. What is the role of the kidney in these fish?
(a) To excrete concentrated urine
(b) To excrete dilute urine
(c) To actively absorb salt
(d) To actively excrete salt
4. Which of the following is the correct information concerning excretion of insects?

Excretory Product	Volume of water needed to remove excretory product	Excretory component
(a) Uric acid	High	Nephrons
(b) Ammonia	Low	Nephrons
(c) Uric acid	Low	Malpighian tubules
(d) Ammonia	High	Malpighian tubules

5. The graph below shows information about two enzymes and enzyme activity at various level of pH. Which statement below is correct?



- (a) Trypsin works better in more acidic conditions than pepsin
 (b) Pepsin works better in more acidic conditions than trypsin
 (c) Trypsin only works in alkaline conditions
 (d) Neither trypsin nor pepsin work in neutral conditions of pH
6. In rabbits, short hair (H) is dominant over long hair (h). the offspring produced from a cross between a short-haired female and a long-haired male were 1 long-haired and 7 short-haired individuals. Which of the following combinations represents the genotypes of the parents?
- (a) Hh and Hh
 (b) HH and hh
 (c) HH and Hh
 (d) Hh and hh
7. Some finches in the Galapagos islands use cactus spines to probe the bark of trees for insects. Woodpeckers in North America use their long, curved beak to remove insects from tree bark. Which of the following terms best describe the development of these similar food-gathering methods?
- (a) Gradual evolutions
 (b) Punctuated evolution
 (c) Convergent evolution
 (d) Divergent evolution
8. Red-green colour blindness is an X-linked recessive trait in humans. A carrier female marries a reg-green colour blind man. What is the probability of their children showing the trait?
- (a) All of their sons will be colour blind and all of their daughters will have normal vision
 (b) Half of their sons and half of their daughters will be colour blind
 (c) Half of their sons will be colour blind and all the daughters will have normal colour vision
 (d) All of their daughters and half of their sons will be colour blind
9. In Andalusian fowls there are three phenotypes –black, blue-grey and white. A heterozygous bird is crossed with a white bird. What is the probability of getting offspring that are black?
- (a) 0%
 (b) 25%
 (c) 50%
 (d) 100%
10. Artificial pollination and insemination
- (a) increase a clone's chance of survival
 (b) quickly and efficiently spread desirable genes through a population
 (c) always increase the genetic diversity of the population
 (d) generally slow down the reproduction rate of the organism involved
11. Which of the following statements describes a correct role of one type of T cell?
- (a) Killer T-cells turn off the immune response
 (b) Suppressor T-cells engulf and destroy antigens
 (c) Helper T-cells help activate B-cells to produce antibodies
 (d) Memory T-cells produce antibodies

12. A micro-organism is described as a eukaryotic heterotrophic cell without cell wall. What is the most likely classification of this organism?
- (a) virus
 - (b) prion
 - (c) fungus
 - (d) protozoan
13. Which of the following best identifies the main components of the immune response?
- (a) T-cells, B-cells, antibodies
 - (b) B-cells, antibodies, phagocytes
 - (c) T-cells, antibodies, phagocytes
 - (d) antigens, antibodies, pathogens
14. What is the role of antigens?
- (a) A defence barrier to prevent infection
 - (b) Molecules that trigger the immune response
 - (c) To produce antibodies
 - (d) To engulf dead and damaged cells
15. Which scientist's work contributed to a better understanding of the immune response and the effectiveness of immunisation programs?
- (a) Pasteur
 - (b) Koch
 - (c) Ross
 - (d) McFarlane Burnett

Section I (continued)

Part B – 60 marks

Attempt Questions 16-27

Allow about 1 hour and 45 minutes for this part

16. Identify four defence barriers and how they prevent the entry of pathogens. **(4 marks)**

17. Some Biology students wanted to discover if there were micro-organisms in water. They took samples from bottled water, the laboratory, the canteen tap and school bubblers. **(8 marks)**

- (a) Describe using a step by step procedure how this problem could be tested (3 marks)
- (b) Describe a control for this experiment (1 mark)
- (c) What observations could be made in a school laboratory to compare the water samples? (1 mark)
- (d) Describe how the students could present their results (2 marks)
- (e) Identify two safework practices needed during this investigation (1 mark)

18. **(8 marks)**

- (a) Outline the way in which vaccinations prevent infection. (4 marks)
- (b) Evaluate the effectiveness of vaccination programs in preventing the spread and occurrence of disease, including smallpox, diphtheria and polio. (4 marks)

19. The effect of temperature on the activity of an enzyme present in animal A and B is shown in the table below. **(7 marks)**

Temperature (°C)	0	5	10	15	20	25	30	35	40	45	50	55	60
Activity of Animal A enzyme	0	0	1	2	3	6	12	25	14	4	2	1	0
Activity of Animal B enzyme	0	1	4	8	15	22	25	22	14	9	3	1	0

- (a) Draw a line graph of the data (2 marks)
- (b) Describe the effect of temperature on enzyme activity for animal A and B (2 marks)
- (c) Which animal A or B is an ectotherm and which animal is an endotherm? Explain your answer (2 marks)
- (d) Name one Australian Ectotherm and describe an adaptation that enable it to assist temperature regulation (1 mark)

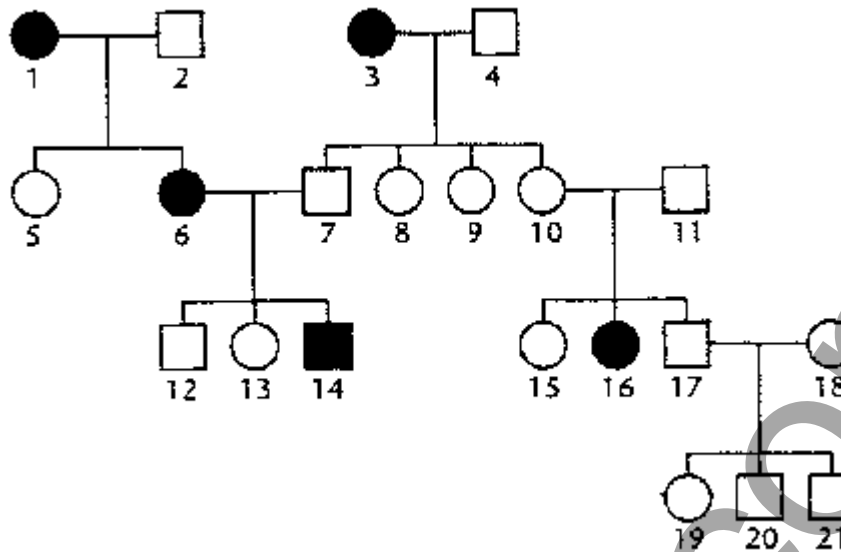
20. Homeostasis often involves a feedback mechanism. **(7 marks)**

- (a) Describe the terms “homeostasis” and “feedback mechanism” (2 marks)
- (b) Use a model to clearly and succinctly explain one example of a feedback mechanism in the human body (5 marks)

21. **(5 marks)**

- (a) Outline the need for oxygen in living cells (1 mark)
- (b) Explain why the removal of carbon dioxide from cells is essential (1 mark)
- (c) Identify a current technology that allows the measurement of oxygen saturation in the blood (2 marks)
- (d) Describe a condition under which this technology may be used (1 mark)

22. Alkaptonuria is a rare genetic disease that causes the formation of coloured cartilage, dark urine and arthritis. **(6 marks)**



This is a pedigree which traces the inheritance of alkaptonuria in a family. The shaded symbols show those affected with alkaptonuria.

(a) Is alkaptonuria dominant or recessive? Explain your answer (2 marks)

(b) Complete the table: (2 marks)

Number	Phenotype	Genotype
3		
7		

(c) Discuss the current use of pedigrees, such as the one above (2 marks)

23. The photographs below show various steps in meiosis. (8 marks)



(a) Sequence the photographs (A to F) in the order in which these steps occurred in meiosis (1 mark)

(b) Identify two ways in which variations in the gametes can occur in this process, and the photograph(s) in which this occurs (3 marks)

(c) Variation can be increased in other ways. Explain how new alleles could be produced (2 marks)

(d) Explain how an understanding of the source of variation in organisms has provided support for Darwin's theory of evolution by natural selection (2 marks)

24. (7 marks)

(a) Outline the processes used to produce transgenic species (3 marks)

(b) Identify examples of the use of transgenic species and reasons for their production (2 marks)

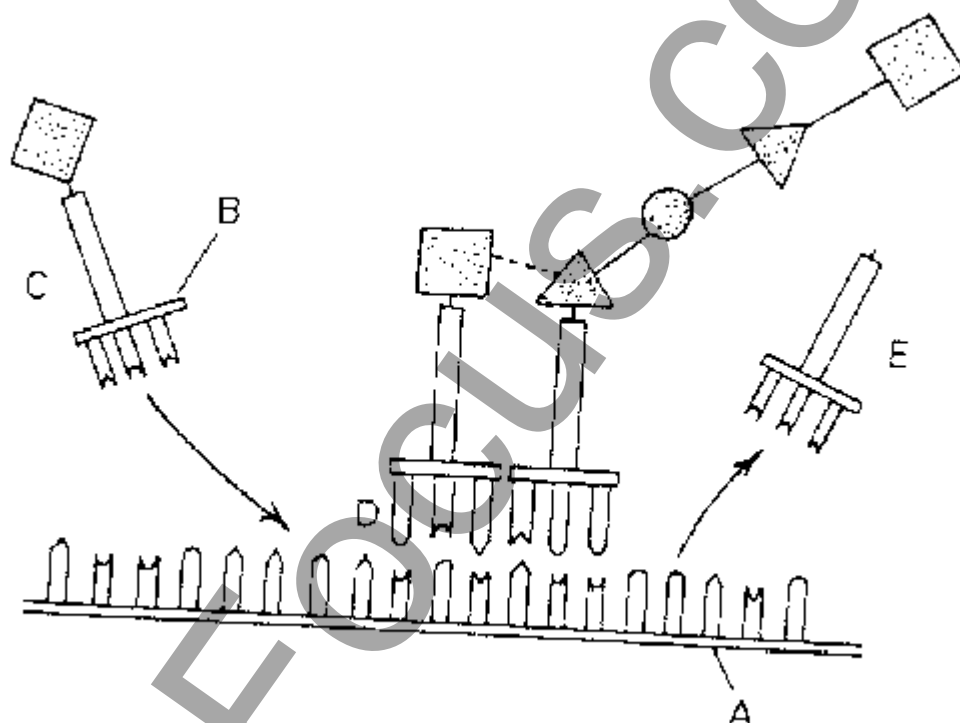
(c) Discuss one ethical issue arising from this technology (2 marks)

Section II: Genetics: The Code Broken? (25 marks)

Allow about 45 minutes for this section

- (a) Construct a table to distinguish gene cloning from whole organism cloning in terms of: (5 marks)
- the processes
 - the products and
 - an example of a use for each
- (b) A woman with blood group type A gives birth to a child with blood group type O. the woman claims that a man whose blood group is type B is the father of the child. Is it possible for these two parents to produce a child with blood group type O?
- Explain your answer and show all relevant genotypes (2 marks)
 - Explain the term "multiple alleles", using the example in this question (1 mark)
 - Give one example of multiple alleles, other than in humans (1 mark)

(c)



- p
peptide synthesis occurs at the surface of ribosomes. In the process, genetic information in a DNA molecule determines the sequence of amino acids that form particular polypeptide molecules. The diagram illustrates polypeptide synthesis.
- Name the molecules labelled A and B (1 mark)
 - Describe what is happening at the stages labelled C, D and E (3 marks)
- (d)
- Outline the procedure to produce recombinant DNA (3 marks)
 - Recombinant DNA has many uses in genetic research. One of the most important is to identify the position of a gene on a chromosome. Explain how the use of recombinant DNA technology can identify the position of a gene on a chromosome. (3 marks)
- (e) Describe the current use of gene therapy to manage a named disease (3 marks)
- (f) Identify one practicing Australian scientist, describe the area of research in which they are currently working and some information about their research (3 marks)