Section 1
75 Marks

Part A 15 marks
Attempt Questions 1-15
Allow about 30 minutes for this section

Use the multiple choice answer sheet

1. Which of the following statements best describes Mendel's work on inheritance?

(A) Some factors are carried on different chromosomes and some factors are carried on the same chromosome.

(B) Some genetic characteristics are controlled by factors that are co-dominant.

(C) Genes on the X chromosome can be passed from mother to son.

(D) Characteristics are determined by pairs of factors that are inherited independently.

2. If a red flowered snap dragon is crossed with a white flowered one, the progeny will all be pink flowered.
Which of the following is the most correct prediction of the ratios of offspring when a red snapdragon is crossed with a pink snapdragon?

(A) 1 red : 1 pink

(B) 1 pink: 3 white

(C) 1 red : 2 pink: 1 white

(D) 1 red : 1 pink : 2 white

3. In ferrets the brown coat colour is dominant over the white colour. A heterozygous brown female was crossed with a heterozygous brown male. What would be the probability of an offspring being homozygous?

(A) 25%

(B) 50%

(C) 75%

(D) 100%

4. What was the role of Sutton and Boveri in genetics?

(A) They showed chromosomes are made of DNA.

(B) They showed that a full set of chromosomes is necessary for normal development.

(C) They provided evidence that sex-linked genes deviate from the Mendelian pattern of inheritance.

(D) They worked out the base pair rule.

5. What is the function of cytotoxic T-lymphocytes?

(A) They kill and digest specific pathogen cells

(B) They produce antibodies against specific antigens

(C) Engulf and destroy pathogens

(D) Destroy the body cells which have become infected with a pathogen

6. Which of the following is the best explanation for the body's rejection of transplanted tissue?

(A) The antibodies on the transplant are different so that an immune response is triggered.

(B) The transplanted tissue contains pathogens which trigger an immune response.

(C) The immune response is triggered due to the trauma of the transplant process.

(D) The antigens on the transplant trigger the immune response.

7. Which of the following is part of the second line of defence adaptations that fights against invading organisms?

(A) Acid in the stomach

(B) Cilia in the respiratory system

(C) Macrophages in the lymphatic system

(D) Sterile urine in the urinogenital system

8. Which description below correctly identifies the characteristics of the genetic material found in some types of infective agents?

	Contains no nucleic acid, protein only	DNA or RNA in a protein coat	DNA in the cell cytoplasm	DNA in membrane bound nucleus
(A)	Prion	Virus	Bacterium	Protozoan
(B)	Virus	Prion	Bacterium	Protozoan
(C)	Prion	Virus	Protozoan	Bacterium
(D)	Virus	Prion	Protozoan	Bacterium

9. The emphasis of health programmes has changed over time, from being predominantly concerned with treating diseases, to prioritizing the prevention of the spread or incidence of diseases.

Which development in medical science has best led to the prevention of diseases?

(A) The use of chemotherapeutic drugs to treat cancers.

(B) The determination by Pasteur that microorganisms caused decay of foods.

(C) The widespread use of vaccines.

(D) The discovery of penicillin.

10. A group of students conducted an investigation that produced the results shown in the table. Students washed their hands and then touched nutrient agar dishes with their fingers. Some students acted as controls by not washing their hands.

	Unwashed hands	Hands washed with antibacterial soap	Hands washed with normal soap
Number of bacterial colonies grown on agar	58	21	24
Number of fungal colonies grown on agar	34	12	11

Which of the following is the most appropriate hypothesis for this investigation?

(A) Washing hands prevents disease.

(B) Antibacterial soap kills microbes on hands.

(C) Microbes are present on hands.

(D) Antibacterial soap prevents the transmission of disease.

11. What do B cells produce when they bind to an antigen and undergo cell division?

(A) A macrophage and a memory cell.

(B) A memory cell and a killer T cell.

(C) A plasma cell and a macrophage.

(D) A plasma cell and a memory cell.

12. Which of the following statements best describes enantiostasis?

(A) A process of detecting change in the environment and responding to that change.

(B) The maintenance of stable conditions within the cells of an organism, despite fluctuations in the environment.

(C) The maintenance of functioning in organisms that live in highly variable environments.

(D) The speeding up of chemical reactions in cells by lowering the activation energy.

13. After a long day in the sun a worker becomes dehydrated. Which one of the following hormonal responses would best counteract this?

(A). The secretion of ADH to increase the permeability of the collecting ducts.

(B). The suppression of ADH to decrease the permeability of the collecting ducts.

(C). The secretion of aldosterone to boost salt movement into the nephron.

(D). The suppression of aldosterone to decrease salt movement into the nephron.

14. The following equipment is set up in a laboratory for a first-hand investigation: data logger, pH probe, beaker of distilled water and a drinking straw. What could the student be investigating with this equipment?

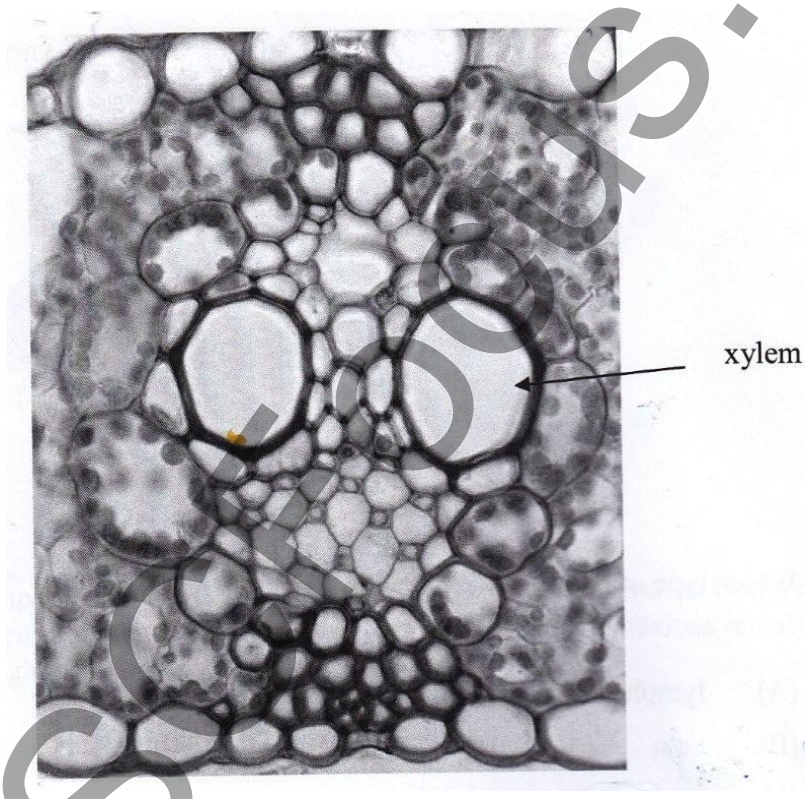
(A) The effect of temperature on enzyme functioning

(B) The effect of pH on enzyme functioning

(C) The effect of carbon dioxide on the pH of water

(D) The effect of substrate concentration on enzyme functioning

15. The photomicrograph below shows a cross section through a vascular bundle. The area of the photomicrograph is:
1.00 mm x 0.80 mm.
What is the diameter of the large xylem vessel indicated?



(A) 200 µm

(B) 20 µm

(C) 2 µm

(D) 0.2 µm

Student Number.....

Write your Exam Number at the top of this Part A Answer Sheet.

Select the alternative A, B, C or D that best answers the question and fill in the response circle 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 ○

Part B- 60 marks
Attempt Questions 16-
Allow about 1 hour and 45 minutes for this section

Answer the questions in the spaces provided

Question 16 (3 marks)

Red Green colour blindness is a sex-linked recessive condition.
In a family a female grandchild is red green colourblind. She examines her parents and grandparents and only one of these six people is colourblind.

In the space below use a pedigree diagram to show all the above mentioned members of the family to explain how she inherited the condition.

Identify carriers and the relative who is also colourblind.

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Question 17 (2 marks)

Outline how artificial insemination can alter the genetic composition of a population?

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Question 18 (6 marks)

Evaluate the importance of collaboration and communication in scientific research that eventually led to the construction of a model of DNA.

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Question 19 (5 marks)

The table shows a list of amino acids and the base sequences on a messenger RNA strand the code for them during protein synthesis.

Amino Acid	mRNA code
Tyrosine	UAU
Glycine	GGG
Alanine	GCG
Phenylalanine	UUU
Arginine	AGG

A section of DNA contained the base sequence:

ATATCCAAACGC-

For the DNA section given, describe the steps by which this code could be used by ribosomes to make a polypeptide.

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Question 20 (7 marks) **Marks**

The cloning of organisms has been assisted by advances in technology.

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

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(b) Use a labelled diagram to outline the major processes used to clone an organism. Show clearly on your diagram which animals are clones. **3**

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Question 21 (6 marks)

This question refers to the article below from the Department of Primary Industries.

> On 24th August 2007, a veterinarian reported to NSW Department of primary Industries (NSWDPI) that he had observed sick horses at Centennial Park in Sydney. The report followed an outbreak of equine influenza (EI) in Japan, the import of stallions from Japan. Laboratory testing revealed the horses at Centennial Park were infected with EI.
>
> The outbreak that eventuated was the most serious emergency animal disease Australia has experienced in recent history. At its peak, 47,000 horses were infected in NSW on 5943 properties, and horse owners and industry workers were facing dark times with major impacts on their livelihood and lifestyle. Humans do not get infected with EI but they can physically carry the virus on their skin, hair, clothing and shoes.
> The campaign led by NSWDPI to eradicate the disease was the largest of its type ever undertaken in Australia, using the latest methods for disease control.
> The disease was eradicated within six months well ahead of predictions and by July 2008 horse industry operations had returned to normal

With reference to this article, discuss strategies for managing this disease and how these could have resulted in such an effective control of the disease.

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Question 22 (2 marks)

Describe two mechanisms that allow the interaction between B and T lymphocytes.

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Question 23 (4 marks)

Describe how gene expression is linked with maintenance and repair of body tissues.

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Question 24 (8 marks) **Marks**

A life-saving malaria vaccine could be available in just a few short years.
In the case of malaria, this could mean the difference between life and death for millions of children in Africa.

(a) Describe how two other methods have been used to assist in the prevention of malaria? **2**

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(b) Outline how vaccination could prevent malaria. **3**

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(c) Evaluate the effectiveness of another vaccination program for one named disease **3**

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Question 25 (5 marks) **Marks**

Homeostasis is the maintenance of a stable internal environment.

(A) Using an example of homeostasis, complete the table. **3**

Example of homeostasis: …… …… …… ……	
One way in which changes from the stable state are detected	One way in which changes from the stable state are counteracted
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(b) Explain why homeostasis is important to an organism. **2**

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Question 26 (5 marks)

Construct a table to compare renal dialysis with the function of the kidney.

Question 27 (4 marks)

Identify the form in which each of the substances below is carried in the blood.

a) nitrogen waste……..

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b) oxygen……

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c)lipids……

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d)salts……..……

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Question 28 (6 marks) **Marks**

The kidney filters wastes from the blood.

(a) Draw a diagram of a mammalian kidney and clearly label the regions that are necessary for the excretion of waste products. **4**

Marks

(b) Small mammals living in the desert produce extremely concentrated urine. Explain how this may be related to the structure of their glomeruli. **2**

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Question 29 - Genetics: The Code Broken (25) **Marks**

Answer the question in a writing booklet.

(a) Distinguish between mutations of chromosomes involving rearrangements and chromosome number changes. Describe an example of each. **4**

(b)What is a gene homologue? Describe evidence which suggests the presence of ancestral vertebrate gene homologues in lower animal classes. **3**

(c)A man who has blood type A+ and his wife who has blood type B- have a child who is O-.
Identify the genotypes of both parents and child assuming the genes for ABO and the Rh factor are not linked. Show working to support your answer. **4**

(d) Compare the processes of selective breeding and gene cloning using an example of each. **6**

(e) In sweet peas purple flowers (P) is dominant to red flowers (p); long pollen (L) is dominant to round pollen (l).
When heterozygous individuals are crossed with homozygous recessive individuals the following number and types of plants were produced:

496 purple flowers, round pollen
504 red flowers, long pollen

Explain showing working, if the genes for these traits are linked or on different chromosomes. **4**

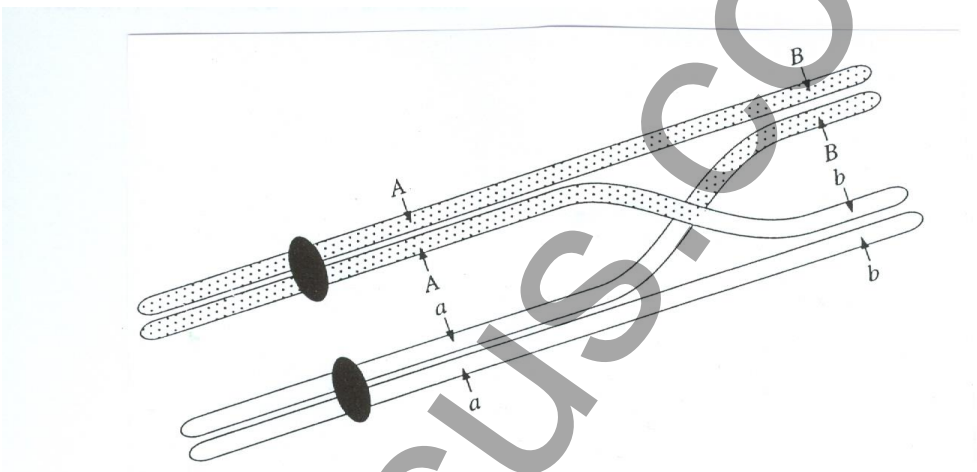
Question 29 continues on next page

(f) The diagram below shows chromosomes during cell division.

(i) What is the name of the process occurring in this diagram?

(ii) What is the name of the type of cell division in which it occurs?

(iii) How can this process assist in chromosome mapping?



END OF TEST