2008

Higher School Certificate

Trial Examination

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
- Write your student number and/or name at the top of every page

Total marks – 100

Section I – Pages 2 – 18
Total marks (75)
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 16–28
- Allow about 1 hour and 45 minutes for this Part

Section II – Pages 19 – 36
Total marks (25)
Attempt ONE question from Questions 29–33
Allow about 45 minutes for this section

This paper MUST NOT be removed from the examination room

STUDENT NUMBER/NAME: .....

STUDENT NUMBER/NAME: .....

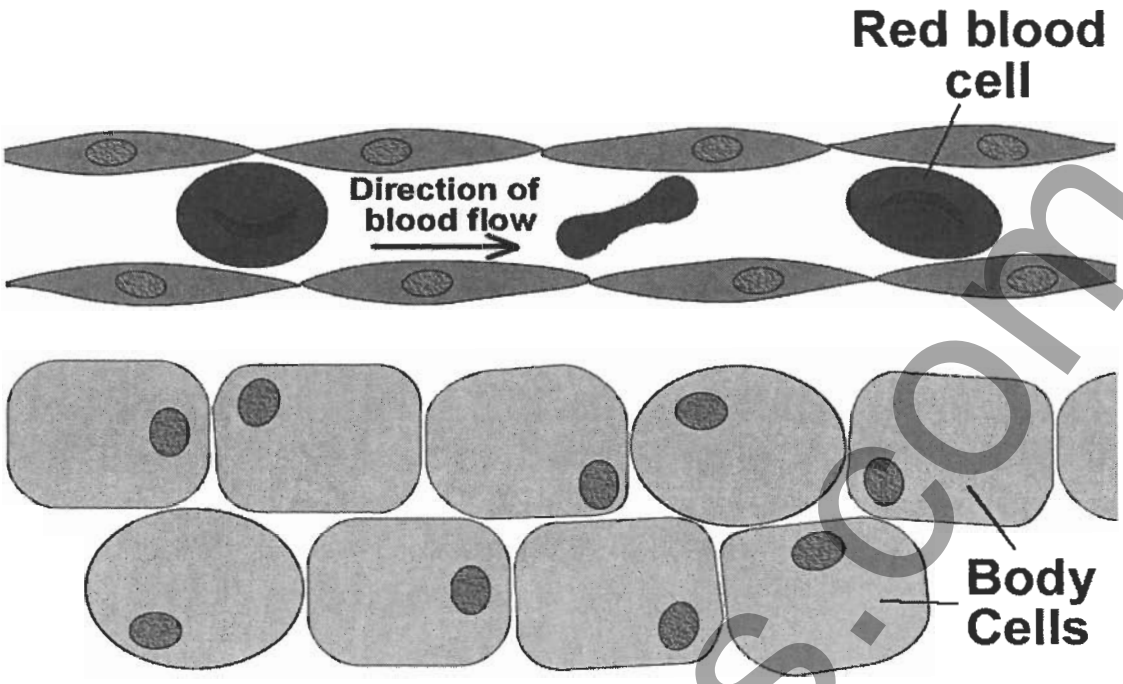
Section I
Total marks (75)

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

Select the alternative A, B, C or D that best answers the question and indicate your choice with a cross (X) in the appropriate space on the grid below.

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

1. The image below shows a longitudinal section of a human blood vessel.



Which of the following correctly identifies the type of blood vessel?

(A) A vein, because of the presence of a one-way valve
(B) A capillary, because the walls are thin to allow diffusion of gases
(C) An artery, because of the presence of large nucleated cells in the walls of the vessel
(D) An venule, because it has thick muscular walls

2. How is *active transport* different to *passive transport*?

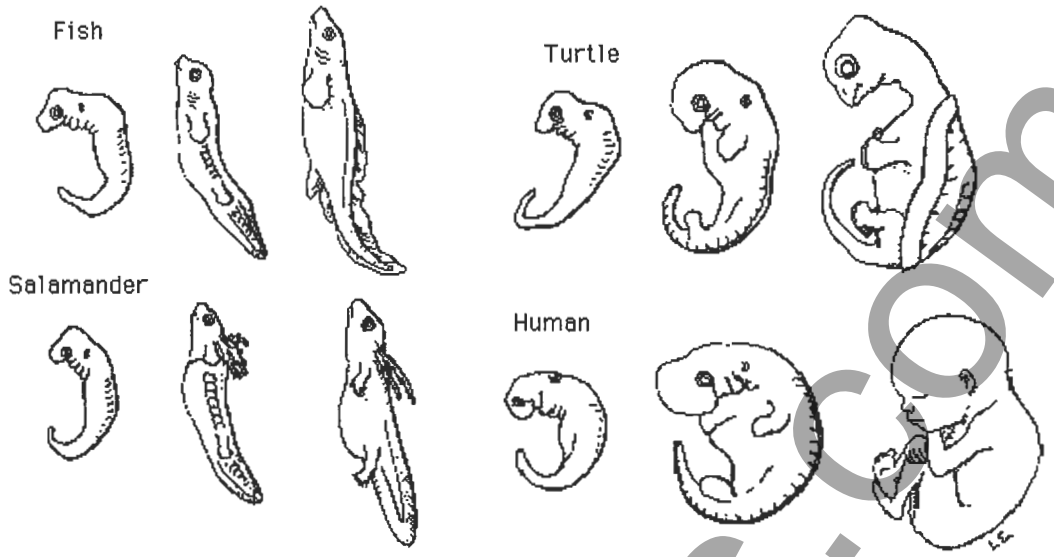
(A) Active transport occurs in the kidney; passive transport does not.
(B) Diffusion is an example of passive transport, osmosis is an example of active transport.
(C) Passive transport involves the movement of water, active transport involves only the movement of glucose.
(D) Active transport uses energy to move substances against a concentration gradient; passive transport does not.

3. *In pea plants, the allele for round seeds (R) is dominant to the allele for wrinkled seeds (r).*

What will be the expected ratio of *phenotypes* in the first generation of plants when a heterozygous round pea plant is crossed with a plant that produces wrinkled peas?

(A) 1 round seed : 1 wrinkled seed
(B) 1 Rr : 1 rr
(C) 3 round seed : 1 wrinkled seed
(D) nil wrinkled seed : all round seed

4. The image below represents the early stages of development of four different vertebrate groups.



Which area of study does the image represent in evolutionary theory?

(A) Palaeontology
(B) Biochemistry
(C) Comparative embryology
(D) Comparative anatomy

5. *Red-green colour blindness in humans is an example of sex-linked inheritance.*

Which of the following explains why many more males are affected than females?

(A) Most females with colour blindness die before they reach maturity and so more males are affected.
(B) The gene for colour-blindness is carried on the Y chromosome and thus affects more males.
(C) Mendel's ratios do not relate to human inheritance.
(D) The gene for colour-blindness is carried on the X chromosome and there is no corresponding gene on the Y chromosome.

6. How does *mitosis* assist in maintaining the human body?

(A) It keeps a homeostatic internal environment.
(B) It starts the immune response when a pathogen enters the body.
(C) It produces new cells for repair of damaged or dying cells.
(D) It is the process by which white cells engulf antigens and destroy them.

7. The table below shows the main steps in DNA replication.

Step 1	DNA replication begins with a parent DNA molecule unwinding and unzipping between the nitrogen bases of the two strands.
Step 2	
Step 3	An enzyme, DNA polymerase, aids in the formation of sugar-phosphate bonds attaching one nucleotide to the next and forming the backbone of the new daughter strands.

Which of the following best represents the missing **Step 2**?

(A) The exposed nitrogen bases move into the cytoplasm and join with their complementary nucleotides.
(B) The two new DNA molecules produced have one original parent strand and a newly formed daughter strand.
(C) Free-floating nucleotides attach themselves to their complementary exposed nitrogen bases.
(D) Each unzipped strand of DNA moves into the cytoplasm and attaches itself to a ribosome.

8. Which of the following is the most likely effect *cloning* will have on genetic variability of a population over time?

(A) It increases genetic variability because cloning can produce many thousands more individuals than would naturally occur.
(B) It reduces genetic variability because offspring come from just a few selected individuals.
(C) It increases the genetic variability because humans use cloning to select for favourable alleles.
(D) It has no effect because sexual reproduction will always result in variation in offspring.

9. What is a pathogen?

(A) Any disease-causing agent
(B) A type of bacteria
(C) A microbe that causes food to spoil
(D) A specialised white blood cell that kills microbes by engulfing them

10. What was Pasteur's contribution to our understanding of infectious disease?

(A) He produced a set of postulates to identify the organism which causes a particular disease.
(B) He disproved the theory of spontaneous generation by showing that microbes could only come from pre-existing microbes.
(C) He invented the light microscope and improved milk packaging techniques.
(D) His experiment showed that disease-causing microbes could spontaneously arise from rotten and decaying matter.

11. Which of the following is a *defense barrier* to prevent entry of pathogens into the body?

(A) Antibiotics
(B) White blood cells
(C) T-cells
(D) Cilia

12. After an organ transplant operation, why must patients take drugs that suppress the immune system?

(A) To prevent the body from attacking the transplanted organ as if it were a pathogen
(B) To strengthen the immune system and prevent infection of the transplanted organ
(C) To prevent the transplanted organ from rejecting its new body
(D) To strengthen the transplanted organ and hasten the healing process

13. In what form are salts transported around the human body?

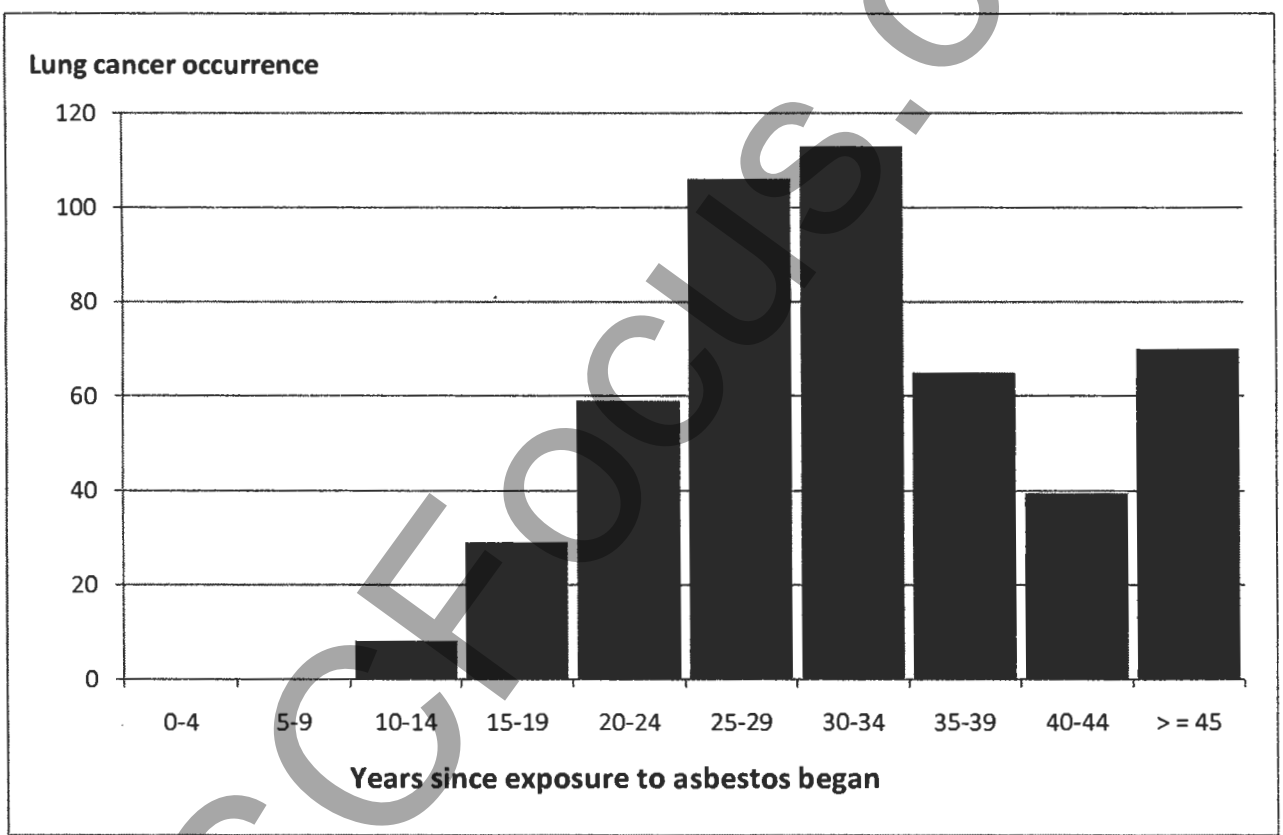
(A) As dissolved ions in the blood plasma
(B) In a protein-coated package called a chylomicron
(C) As bicarbonate ions in red blood cells
(D) As crystals floating in lymph nodes

14. Which of the following best describes *homeostasis*?

(A) Fertilisation to produce a pure-breeding zygote
(B) Cell division to produce haploid gametes
(C) The maintenance of a relatively stable internal environment
(D) The removal of waste products of metabolism from the body

15. Epidemiological studies are used to establish a link between a disease and its causative agent. Asbestosis is a disease leading to lung cancer, caused by long-term exposure to the mineral *asbestos.*

Below is a graph of the occurrence of lung cancer since exposure to asbestos began among a group of asbestos workers.



Which conclusion can be drawn from this graph?

(A) It takes at least 25 years after exposure to asbestos to develop lung cancer.
(B) The peak incidence of lung cancer occurred 25 to 34 years after the initial exposure to asbestos.
(C) None because the sample size is too small to be statistically valid.
(D) After 45 years there is no chance of developing lung cancer from exposure to asbestos.

STUDENT NUMBER/NAME: .....

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.

Question 16 (3 marks) **Marks**

Name an Australian ectothermic animal: _____

(a)(i) For the animal named, identify ONE adaptation that assists in temperature regulation. **1**

.....

.....

(ii) Explain HOW this adaptation helps the animal to regulate its temperature. **1**

.....

.....

(b) Describe ONE response of a named *plant* to temperature change. **1**

.....

.....

Question 17 (4 marks)

(a) Define the term *enantiostasis*. **2**

.....

.....

.....

.....

(b) Outline TWO different processes present in plants to regulate salt concentrations in a saline environment. **2**

.....

.....

.....

.....

STUDENT NUMBER/NAME: .....

Question 18 (5 marks) **Marks**

Researchers are trying to develop an artificial substitute for blood.

(a) Suggest THREE advantages of developing this substitute. **3**

.....

.....

.....

.....

.....

.....

.....

.....

(b) Identify TWO changes that occur in mammalian blood as it passes through the pulmonary system. **2**

.....

.....

.....

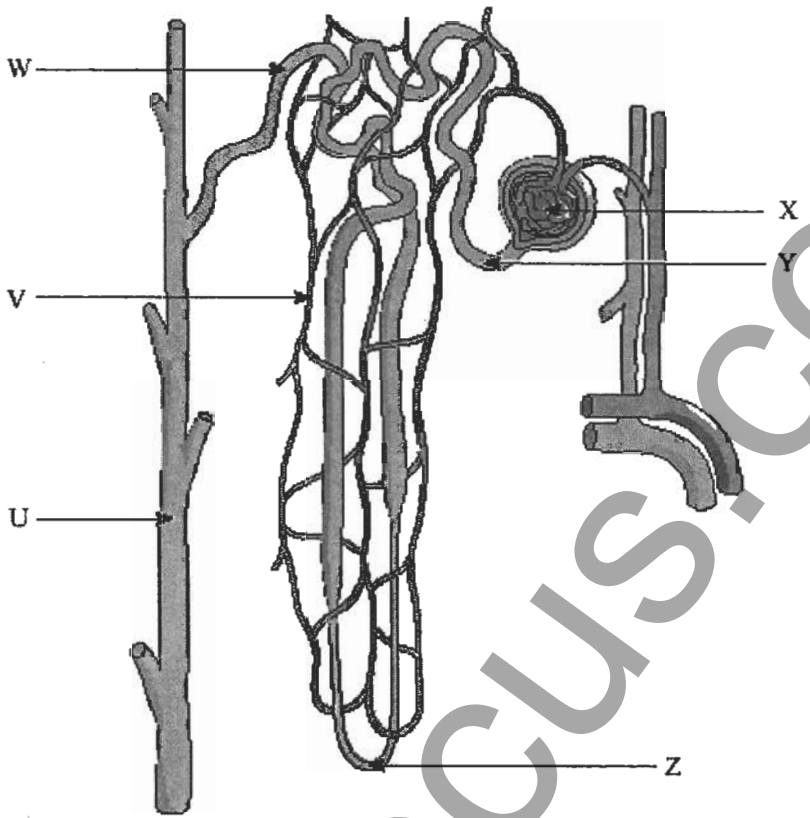
.....

.....

STUDENT NUMBER/NAME: .....

Question 19 (4 marks) **Marks**

The diagram below shows a nephron from a human kidney.



(a) Identify where in the nephron:

(i) filtration occurs **1**

.....

(ii) reabsorption occurs **1**

.....

(b) Describe how the processes of filtration and reabsorption, in the nephron of the kidney, regulate body fluid concentrations. **2**

.....

.....

.....

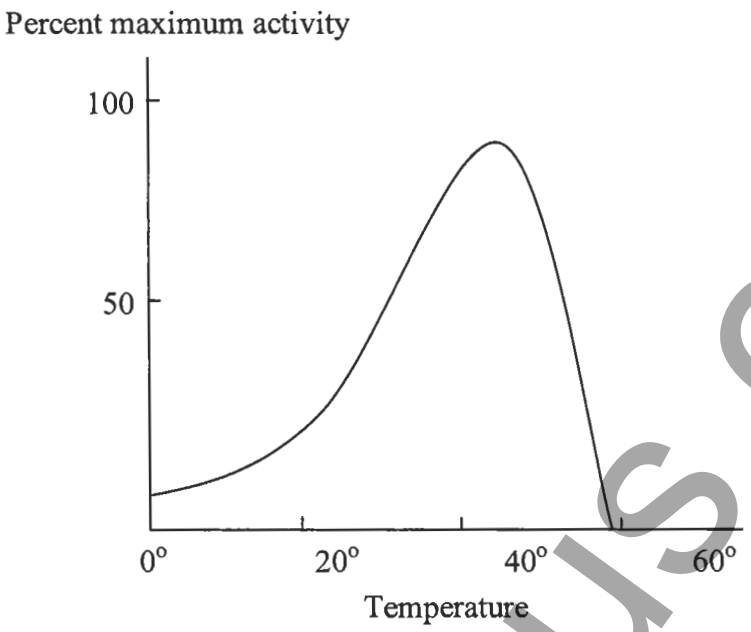
.....

.....

STUDENT NUMBER/NAME: .....

Question 20 (4 marks) **Marks**

The graph below shows the *reaction rate* of an enzyme as temperature changes.



(a) Outline what can be concluded from this graph about the *rate of reaction*. **2**

.....

.....

.....

.....

.....

(b) Using your knowledge of the chemical composition of enzymes, account for the trend in this graph? **2**

.....

.....

.....

.....

.....

STUDENT NUMBER/NAME: .....

Question 21 (4 marks) **Marks**

(a) Describe an example of *hybridisation* within a species. **2**

.....

.....

.....

.....

(b) Explain the advantages of this hybridisation. **2**

.....

.....

.....

.....

Question 22 (6 marks)

(a) Explain how the chromosomes of *gametes* are *different* to the chromosomes in normal human body cells. **2**

.....

.....

.....

.....

(b) Discuss the importance of *gamete formation* and *sexual reproduction* in variability of the resulting offspring. **2**

.....

.....

.....

.....

(c) Outline TWO examples of *environmental factors* affecting the expression of a gene in an individual. **2**

.....

.....

.....

.....

STUDENT NUMBER/NAME: .....

Question 23 (5 marks) **Marks**

(a) Using a NAMED example, outline how an advance in *technology* has changed scientific thinking about genetic relationships. **2**

.....

.....

.....

.....

(b) Assess some of the opposition to acceptance of *evolutionary theory*. **3**

.....

.....

.....

.....

.....

.....

.....

Question 24 (3 marks)

Antibiotics usually kill bacteria or limit their growth. However, some bacteria have become resistant to certain antibiotics. Resistant bacteria can develop when antibiotics are used too often or are not used correctly.

Explain, using the *Darwin/Wallace theory of natural selection*, how this can be described as a modern example of natural selection. **3**

.....

.....

.....

.....

.....

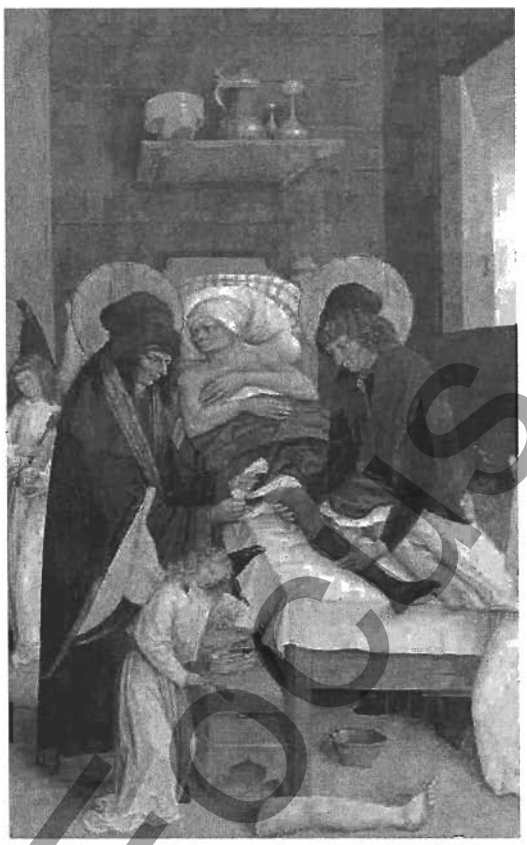
.....

.....

Question 25 (4 marks)

The picture below is a wood panel painting (circa 1500) that depicts the limb transplantation miracle by Saints Cosmos and Damian.

According to legend, Cosmos and Damian were physicians who successfully transplanted the limb of a dead person onto a patient whose leg required amputation.



Considering the above information, could this limb transplantation have been possible? Justify your answer. **4**

.....

.....

.....

.....

.....

.....

.....

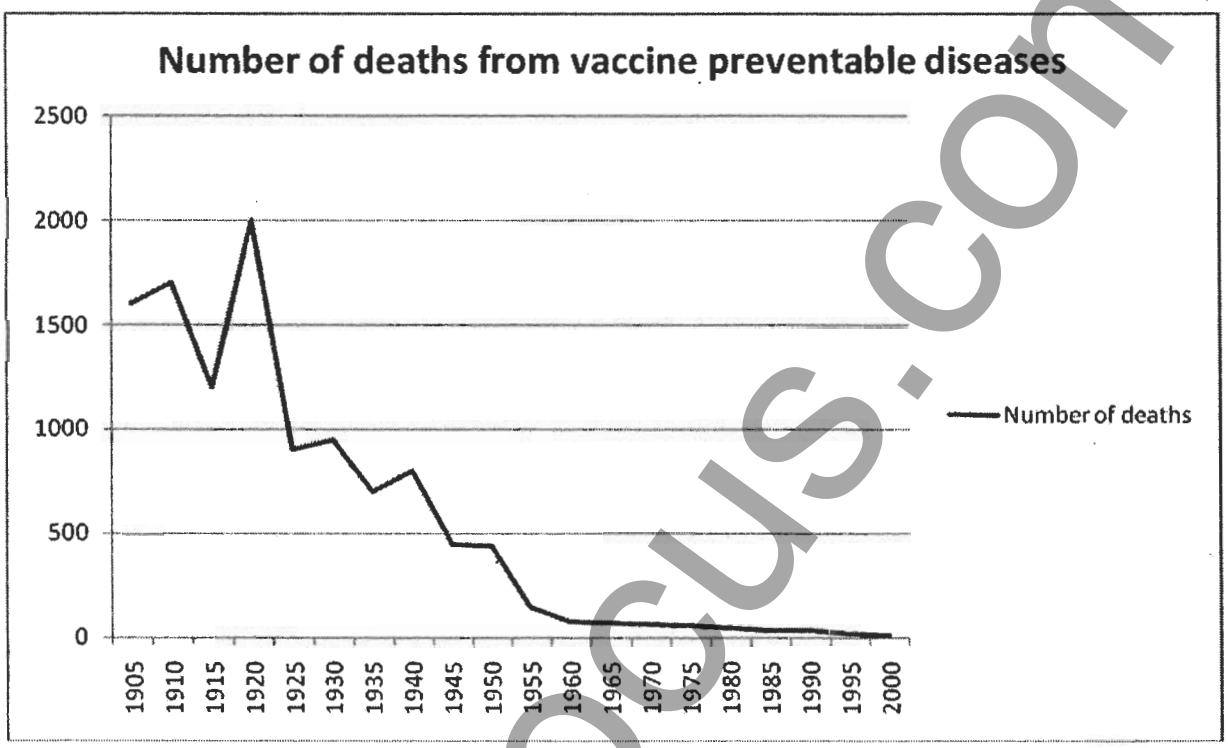
.....

.....

Question 26 (7 marks) **Marks**

Refer to the graph and information below.

Diphtheria vaccine introduced to schools 1932; Tetanus vaccine introduced 1939; Pertussis (whooping cough) vaccine introduced 1942; Polio vaccine introduced 1955; Measles vaccine widely used 1970.



(a) Use the information in the graph to evaluate the effectiveness of vaccination programs in preventing death in children from vaccine preventable diseases. **2**

.....

.....

.....

.....

(b) Outline the way in which vaccinations may prevent disease. **2**

.....

.....

.....

.....

Question 26 continues on the next page

Question 26 (continued) **Marks**

(c) Justify the implementation of compulsory vaccination programs for school age children against the main childhood diseases. **3**

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 27 (3 marks)

Complete the table below for an infectious disease that you have studied. **3**

Infectious disease	
Cause	
Transmission	
Major Symptoms	
Treatment	
Control	

STUDENT NUMBER/NAME: .....

Question 28 (8 marks) **Marks**

(a) During your course of study, you were required to perform an investigation to gather first-hand evidence of pathogens and insects on plants.

Draw a labelled diagram of the evidence you gathered. **4**

Be sure to include in your diagram:

- The name of the type of pathogen or insect pest,
- The evidence encountered,
- An assessment of the overall effect this pathogen or pest has on the plant.

Question 28 continues on the next page

Question 28 (continued) **Marks**

(b) (I) *To keep South Australia free of fruit fly, Primary Industries and Resources SA (PIRSA) has quarantine restrictions on the movement of fruit and vegetables into the State - both produce carried by travellers and on commercially imported produce.*

(II)*The sterile insect technique is also used against outbreaks of fruit fly. This form of integrated pest management involves the release of large numbers of sterilised insects into the environment to mate with wild insects of the same species. Any eggs laid are infertile.*

(i) Explain how EACH of the above strategies are useful in preventing the spread of the fruit fly. **2**

.....

.....

.....

.....

(ii) Both of the above strategies show a shift in emphasis from treatment and control to management and prevention.

Justify this trend. **2**

.....

.....

.....

.....

End of Section I

STUDENT NUMBER/NAME: .....

Section II

Total marks (25)
Attempt ONE question from Questions 29 - 33
Allow about 45 minutes for this part

Answer the questions in the spaces provided.

Question 29 - Communication (25 marks) **Marks**

(a) Draw a flow diagram using the following: **2**

- messenger,
- stimulus,
- effector,
- receptor,
- response.

.....

(b) Observe the image below.

(i) Identify this organ. **1**

.....

Question 29 continues on the next page

Question 29 (continued) **Marks**

(ii) Outline the structure of the organ identified in part b(i). **3**

.....

.....

.....

.....

.....

.....

.....

.....

(c) Identify the meaning of the term *accommodation* and describe how it is achieved in visual communication. **5**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 29 continues on the next page

Question 29 (continued) **Marks**

(d) Explain the cause of colour blindness in humans. **3**

.....

.....

.....

.....

.....

.....

.....

.....

(e) Outline the path of a sound wave through the ear.

In your answer, identify the energy transformations that occur in hearing sound. **5**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 29 continues on the next page

Question 29 (continued) **Marks**

(f)(i) During your study of 'Communication' you were required to perform a first-hand investigation to gather information about the mammalian eye.

Describe the method you used. In your answer, identify the equipment you used. **3**

.....

.....

.....

.....

.....

.....

.....

.....

(ii) Relate ONE of the structures of the eye to its function.

In your answer, refer to your results. **3**

.....

.....

.....

.....

.....

.....

.....

.....

End of Question 29

STUDENT NUMBER/NAME: .....

Question 30 - Biotechnology (25 marks) **Marks**

(a) Artificial selection is an example of early biotechnology.

Describe the changes that have occurred as a result of artificial selection for:

(i) one group of animals- **3**

.....

.....

.....

.....

.....

.....

(ii) one group of plants- **3**

.....

.....

.....

.....

.....

.....

.....

Question 30 continues on the next page

Question 30 (continued) **Marks**

(b) Using an example, describe how tissue engineering is used in modern medicine. **4**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(c) Discuss the benefits of *strain isolation methods* used in the 20th century. **5**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 30 continues on the next page

Question 30 (continued) **Marks**

(d) Describe a technique for producing *recombinant DNA*. **4**

.....

.....

.....

.....

.....

.....

.....

.....

.....

(e) During your study of 'Biotechnology', you were required to perform a first-hand investigation to demonstrate the use of *fermentation processes*.

Identify the fermentation process you investigated and describe the method and equipment used. **3**

.....

.....

.....

.....

.....

.....

(f) Describe the results you obtained and state the conclusion that was drawn. **3**

.....

.....

.....

.....

.....

.....

End of Question 30

STUDENT NUMBER/NAME: .....

Question 31 – Genetics: The Code Broken? (25 marks) **Marks**

(a) Transcription and translation are two processes that are involved in the production of a protein.

Describe the production of a sequence of amino acids from DNA. **6**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Identifying the relationship between species was previously based only on structural similarities. Advances in technology have changed the way these relationships are identified.

Discuss the role of chromosome mapping in classification. **4**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 31 continues on the next page

Question 31 (continued) **Marks**

(c) Using an example, explain why selective breeding is used in agriculture. **4**

.....

.....

.....

.....

.....

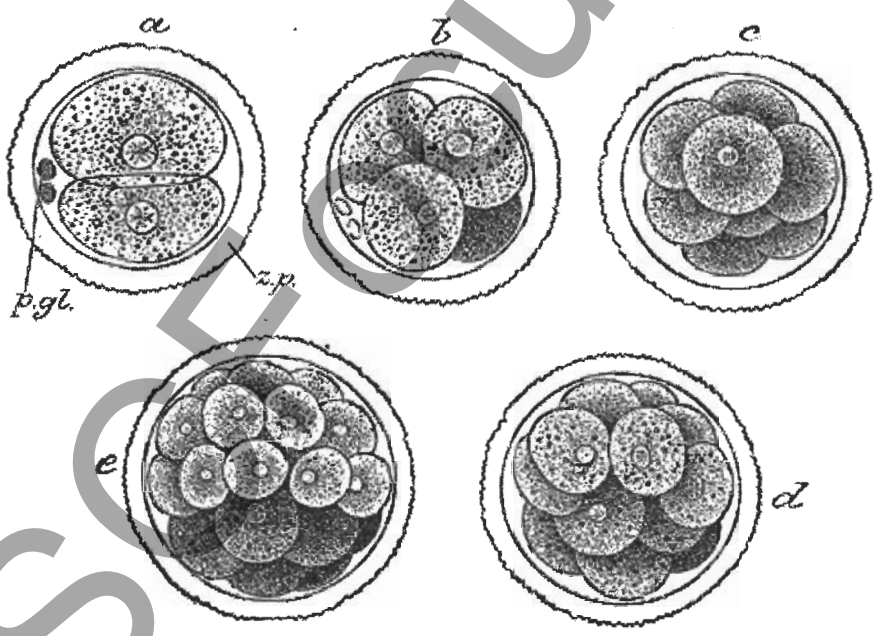
.....

.....

.....

.....

(d) Observe the following image.



Identify the role of genes in embryonic development. **2**

.....

.....

.....

.....

.....

Question 31 continues on the next page

Question 31 (continued) **Marks**

(e) Fill in the following table. **3**

Description	**Name**
Enzyme used to cut DNA	
	Recombinant DNA
Enzyme used to re-establish the sugar phosphate backbone of DNA	

(f) During your study of 'Genetics: The code broken?' you were required to perform a second-hand investigation in order to describe the effect of ONE named and described genetic mutation on human health.

(i) Describe the genetic mutation you investigated. In your answer refer to the sources used. **3**

.....

.....

.....

.....

.....

.....

.....

(ii) Describe effects of the genetic mutation on human health. **3**

.....

.....

.....

.....

.....

.....

.....

End of Question 31

STUDENT NUMBER/NAME: .....

Question 32 – The Human Story (25 marks) **Marks**

(a) Identify what is meant by the term *karyotype analysis*. **2**

.....

.....

.....

.....

(b) Outline conditions that may promote fossil formation. **3**

.....

.....

.....

.....

.....

.....

.....

(c) Fill in the following table. **4**

Level of classification	**Group name**	**Human characteristic at this level**
Class	Mammalia	
	Primates	Opposable thumb, nails, binocular vision, eyes facing forward
Family	Hominidae	
Genus		Bipedal, upright posture
Species	*sapiens*	Intricate social system, large brain

Question 32 continues on the next page

Question 32 (continued) **Marks**

(d) Observe the following image.

Describe how *diversity* has occurred in the human population over time. **3**

.....

.....

.....

.....

.....

.....

.....

Question 32 continues on the next page

Question 32 (continued) **Marks**

(e) (i) Outline TWO theories of human migration and evolution. **2**

.....

.....

.....

.....

.....

(ii) Discuss the evidence for ONE of the theories identified in (i). **5**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 32 continues on the next page

Question 32 (continued) **Marks**

(f) During your study of 'the Human Story' you were required to perform a secondary investigation to describe two examples of polymorphism in humans and analyse the evolutionary significance of the phenotypes displayed.

(i) Identify the TWO examples of polymorphism you studied and the sources of information you used. **3**

……

……

……

……

……

……

……

(ii) Describe the evolutionary significance of the phenotypes displayed. **3**

……

……

……

……

……

……

……

……

End of Question 32

STUDENT NUMBER/NAME: .....

Question 33 – Biochemistry (25 marks) **Marks**

(a) Identify the chemical reaction of *photosynthesis*. **2**

.....

.....

(b) Discuss the importance of *reducing* carbon dioxide levels and *generating* oxygen. **5**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(c) (i) Identify TWO *scientists* of the 17th and/or 18th century that contributed to our understanding of plant growth. **2**

.....

(ii) For ONE of the scientists identified in (i), outline their contribution to our understanding of plant growth. **3**

.....

.....

.....

.....

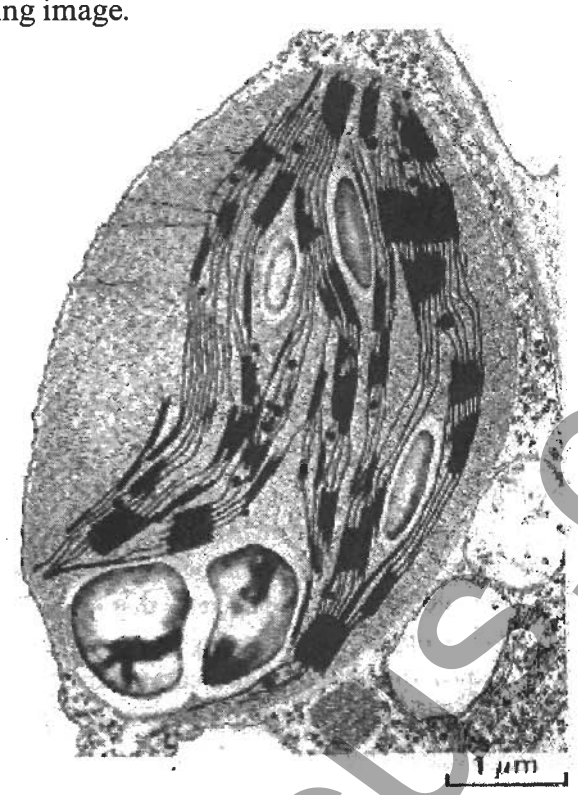
.....

.....

Question 33 continues on the next page

Question 33 (continued) **Marks**

(d) Observe the following image.



(i) Identify the name of the *organelle* pictured above. **1**

.....

(ii) Identify the method by which this image was taken. Justify you answer **2**

.....

.....

.....

(iii) Describe the structure of the above cell component. **4**

.....

.....

.....

.....

.....

.....

.....

.....

Question 33 continues in the next page

Question 33 (continued) **Marks**

(e) During your study of Biochemistry you were required to perform a first-hand investigation to extract, examine and separate pigments from leaves.

(i) Describe the method you used in your investigation. In your answer, identify the equipment you used. **3**

.....

.....

.....

.....

.....

.....

.....

(ii) Describe the results you obtained and state the conclusion drawn. **3**

.....

.....

.....

.....

.....

.....

.....

.....

End of paper