QATs
Quality Assessment Tasks

Centre Number

Student Number

2009

TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

Biology

Total marks – 100

Section I Pages 3-23

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 16-29
- Allow about 1 hour and 45 minutes for this part

Section II Pages 24-29

25 marks
- Attempt ONE question from Questions 30-34
- Allow about 45 minutes for this section

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using blue or black pen
- Draw diagrams using pencil
- Use Multiple Choice Answer Sheet provided
- Write your Centre Number and Student Number at the top of this page and the Multiple-Choice Answer Sheet provided

Blank Page

Centre Number

Student Number

YEAR 12 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION 2009

BIOLOGY – 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 have changed 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 ○

ATTEMPT ALL QUESTIONS

Question	**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 ○

Section I

75 marks

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

Use the Multiple Choice Answer Sheet provided

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1 In what form are nitrogenous waste products transported in the mammalian blood?

(A) Urea

(B) Uric acid

(C) Ammonia

(D) Nitrogen gas

2 Which process can be used to explain how water moves from root tissue to the sites of photosynthesis in the plant?

(A) Translocation

(B) The pull of the transpiration stream

(C) The upward movement of water in the phloem tissue

(D) The downward movement of water in the xylem tissue

3 A patient who had their adrenal gland removed was found to have low sodium and high potassium ion levels in their blood.
What was the most likely cause of these ion levels?

(A) A lack of the hormone aldosterone

(B) A lack of both aldosterone and ADH

(C) A lack of antidiuretic hormone (ADH)

(D) An oversupply of aldosterone and ADH

4 The mosquito has a diploid chromosome number of 6 (3 homologous pairs).
Which of the following best describes the result of meiosis in the mosquito?

(A) Two cells each of which has 3 chromosomes

(B) Four cells each of which has 6 chromosomes

(C) Two cells each of which has 6 chromosomes

(D) Four cells each of which has 3 chromosomes

5 This question refers to the two diagrams below.

Diagram 1. The effect of temperature on the activity of four enzymes A, B, C and D.

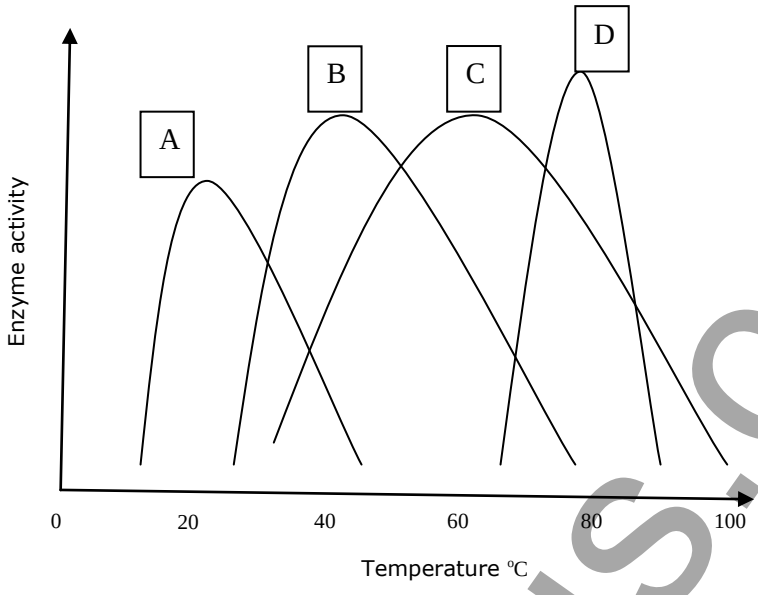
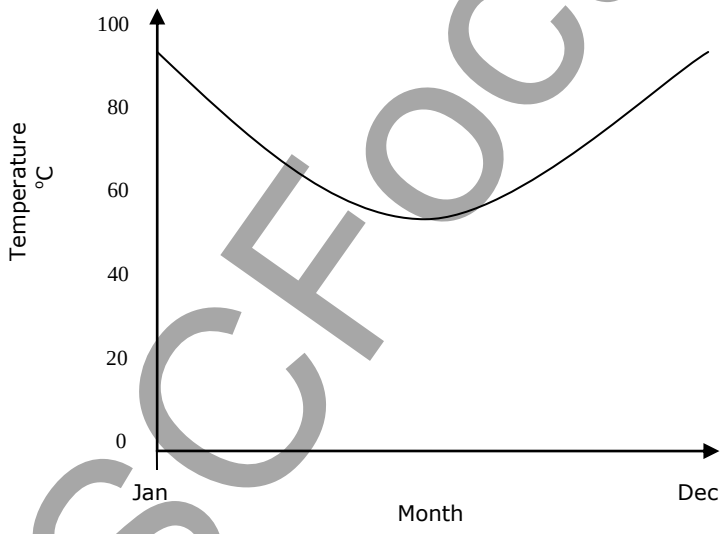


Diagram 2. The variation in temperature during a year in a hot spring.



Which enzyme would most likely be found in bacteria that survive in this hot spring throughout the year?

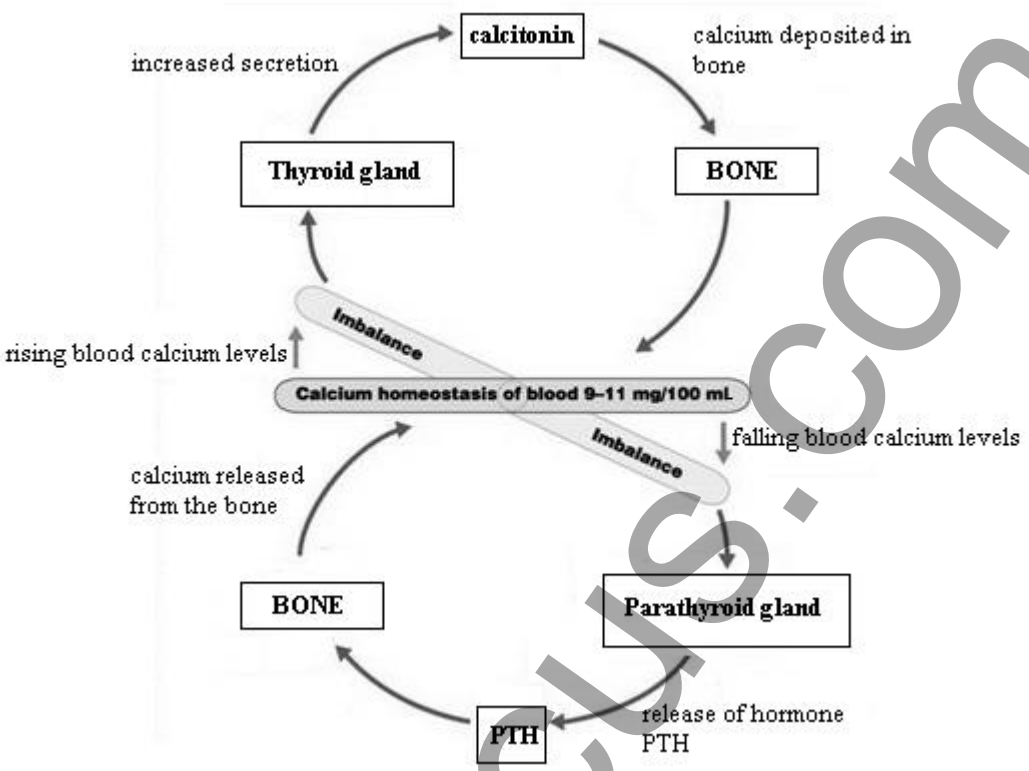
(A) A

(B) B

(C) C

(D) D

6 This question refers to the diagram below that shows how a negative feedback mechanism regulates calcium levels in the blood. The mechanism involves the hormones calcitonin and PTH secreted by the thyroid and parathyroid glands respectively. Calcium can be deposited or released from bone depending on which hormone is present in the blood.



How would the negative feedback mechanism illustrated respond to a rise in the blood calcium level?

(A) Calcitonin levels would decrease

(B) Calcium would be deposited in bone

(C) Calcium would be released from bone

(D) The parathyroid gland would release more PTH

7 In pea plants seed shape exists in two forms, round and wrinkled, the round shape being the dominant form.
What genetic term would be used to describe these two seed shapes?

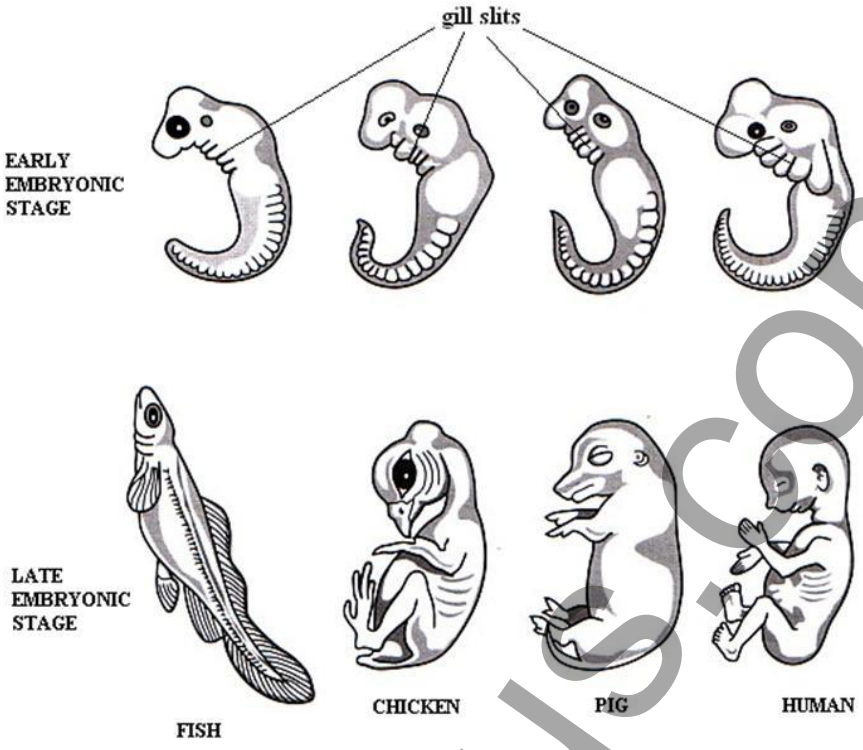
(A) Allele

(B) Genotype

(C) Phenotype

(D) Chromosome

8 This question refers to the diagram below that shows embryonic development in a number of different vertebrates.



How does the information in the diagram help to support the theory of evolution?

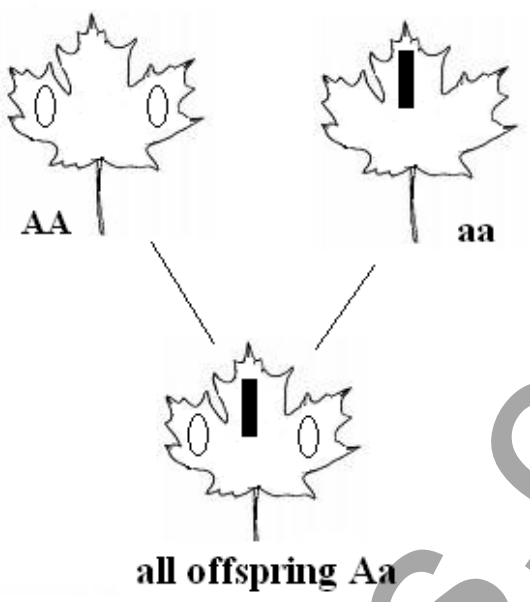
(A) It suggests that humans evolved from pigs

(B) It suggests that fish evolved from chickens

(C) It suggests that all four vertebrates evolved from a common ancestor

(D) It suggests that gill slits developed simultaneously in the embryos of all four vertebrates

9 The diagram below shows the inheritance of leaf patterns in a plant.



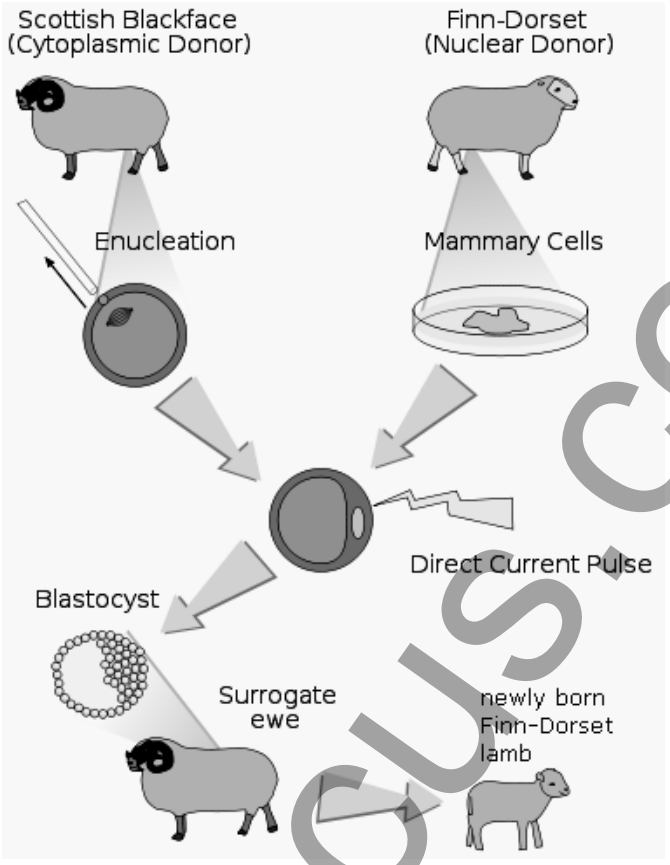
What term is used to describe genes that are inherited in this way?

(A) Linked
(B) Sex linkage
(C) Heterozygous
(D) Co-dominant

10 Which of the following is an example of a microscopic pathogen?

(A) AIDS
(B) Cancer
(C) An insect
(D) The influenza virus

11 This question refers to the diagram below.



What biological process does the diagram above illustrate?

(A) Cloning

(B) Artificial pollination

(C) Artificial insemination

(D) The production of a transgenic species

12 Which of the following best describes malaria?

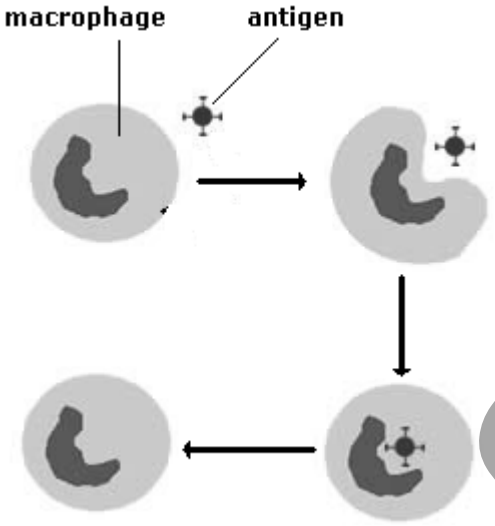
(A) It is a non-infectious disease caused by mutations in the red blood cells

(B) Two hosts are involved but the protozoan parasite attacks the blood cells of only one

(C) It is a disease caused by a virus that involves two hosts for the completion of its life cycle

(D) It is an infectious disease caused by the mosquito when it injects a toxin into the human blood stream

13 This question refers to the diagram below.



What process is the diagram illustrating?

(A) Phagocytosis

(B) The induced fit process of enzyme activity

(C) The destruction of the body's cells by an invading bacterium

(D) A means of absorbing gases such as carbon dioxide into the blood

14 Vaccination is a process that is used to control and prevent disease.
How is the long-term success of vaccination achieved?

(A) By the production of memory cells

(B) By the establishment of passive immunity

(C) Through the production of antigens by the host

(D) By establishing more effective physical barriers

15 This question refers to the table below.

The estimated percentages of particular cancers that can be attributed to smoking for both men and women.

Cancer type	Men (%)	Women (%)
Lung	84	77
Mouth and pharynx	57	51
Oesophagus	54	46
Larynx	73	66
Bladder	43	36
Pancreas	24	19
Stomach	14	11
Anus	48	41

(Cancer Council of NSW)

Which of the following can be deduced from the table above?

(A) Smoking contributes to all types of cancer in humans

(B) Smoking is the largest cause of stomach cancer in both men and women

(C) Smoking is more likely to contribute to lung cancer than to pancreatic cancer

(D) The percentage of oesopahgeal cancer attributable to smoking is higher in women than in men

Centre Number

Student Number

Biology
Section I (continued)

Part B – 60 marks
Attempt Questions 16-29
Allow about 1 hour and 45 minutes for this part

Answer the questions in the spaces provided.

Question 16 (4 marks) **Marks**

(a) Using a named example, describe ONE process used by plants for salt regulation in a saline environment. **2**

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(b) Explain why the process you described in (a) is an example of enantiostasis. **2**

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Marks

Question 17 (4 marks)

Explain why the process of filtration in the mammalian kidney nephron is an example of passive transport. **4**

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Question 18 (3 marks)

How has the concept of punctuated equilibrium changed scientific thinking about evolution? **3**

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Marks

Question 19 (3 marks)

This question refers to the information below about two mammals from different groups.

Feature	Echidna	Hedgehog
Appearance		
Geographical distribution and habitat.	Australia and New Guinea in forests, woodlands, shrublands and grasslands, rocky outcrops and agricultural lands.	Europe, Asia and Africa forests, woodlands, shrublands and grasslands, rocky outcrops and agricultural lands.
Diet	Ants, termites, worms and insect larvae	Insects, worms and frogs

Explain how Darwin would have accounted for the evolution of these two similar animals. **3**

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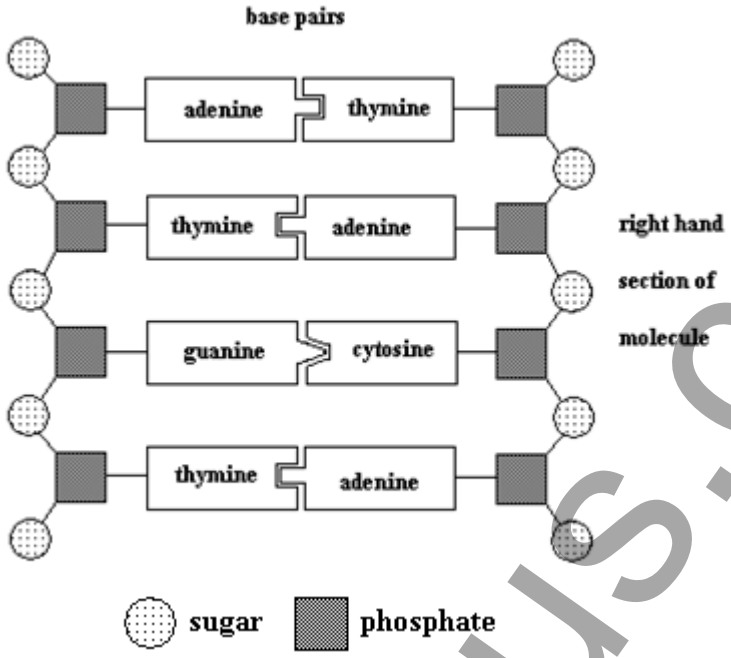
Marks

Question 20 (3 marks)

This question refers to the diagram below that shows a section of a DNA molecule.



In the space below, draw a diagram to show the section of messenger RNA (m-RNA) that would be transcribed from the RIGHT HAND section of this DNA molecule. **3**

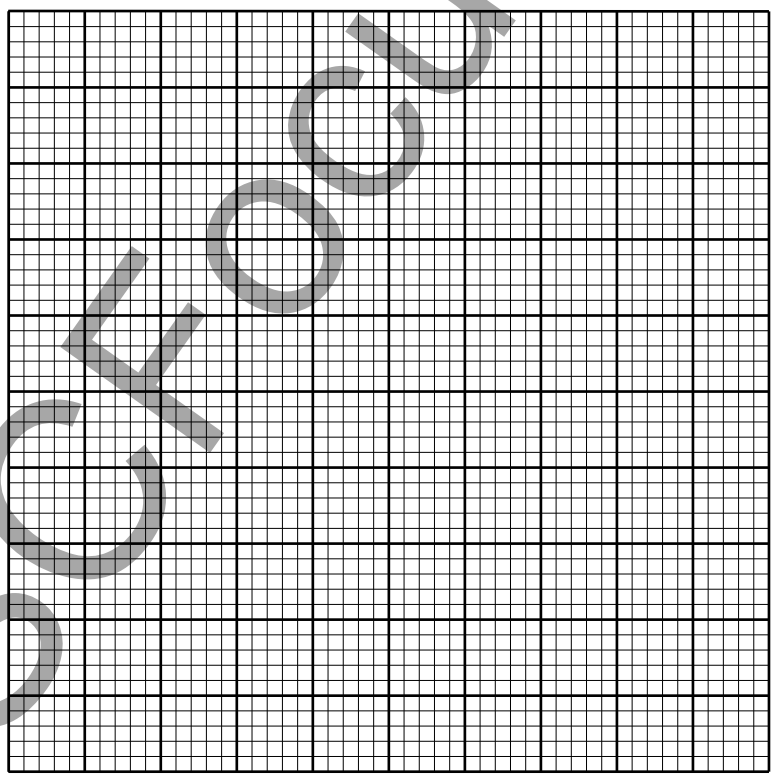
Marks

Question 21 (8 marks)

The data below was collected for a vertebrate over one day in summer.

Time of Day	**Body Temperature (°C)**
06.00	20
08.00	28
10.00	33
12.00	37
14.00	34
16.00	37
18.00	30
20.00	25

(a) Use the data to draw an appropriate graph to show how body temperature varies with time of day. **4**



Question 21 (continued)

(b) Name an Australian organism for which this data could have been collected. **1**

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(c) Suggest how the organism may have responded to account for the change at 14.00 hours. **1**

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(d) Explain how the response in (c) assists in temperature regulation. **2**

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Question 22 (4 marks)

The human body has a number of defences against pathogens.

(a) Identify a defence barrier that prevents the entry of pathogens in humans. **1**

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(b) Distinguish between the defence barrier named in (a) and the immune response mediated by B-lymphocytes. **3**

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Marks

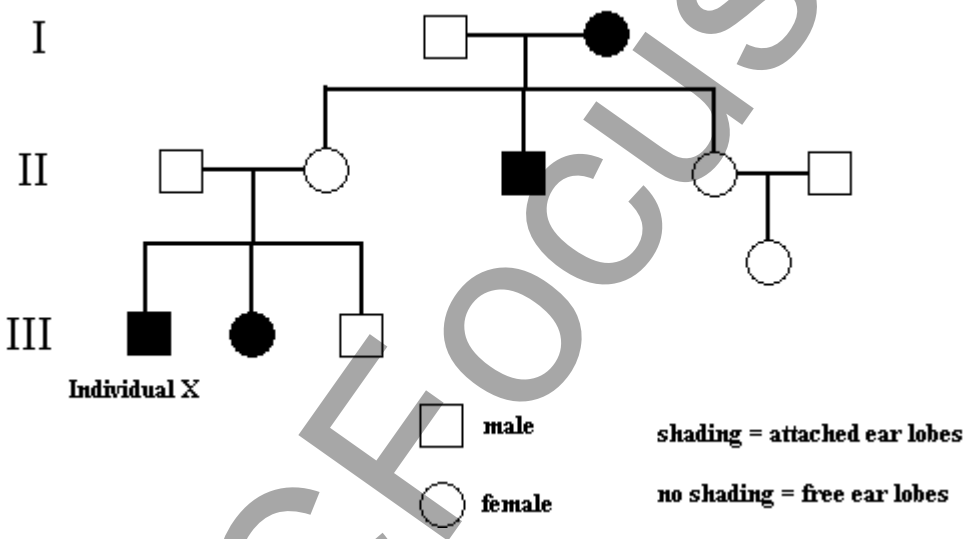
Question 23 (4 marks)

The pictures below show a human characteristic inherited through a single gene.

Attached ear lobes

Free ear lobes

The diagram below shows a pedigree for ear lobe attachment in a family.



(a) Identify the pattern of inheritance for this trait. **1**

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(b) Use a Punnett square to explain the phenotype of 'Individual X'. **3**

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Question 24 (3 marks)

Recently doctors have successfully carried out the world's first airway transplant using an organ grown from the patient's own cells.
Explain the advantage of this procedure over one using an organ transplant from a donor. **3**

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Marks

Question 25 (5 marks)

(a) Down Syndrome is a chromosomal disorder caused by the presence of all or part of an extra chromosome.
Outline how this disorder differs from an identified nutritional deficiency disease. **2**

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(b) Explain how you could use the information in part (a) to lend support to Darwin's theory of evolution by natural selection. **3**

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Question 26 (4 marks)

Discuss changing methods of dealing with diseases. In your answer refer to one infectious and one non-infectious disease you have studied. **4**

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Marks

Question 27 (3 marks)

(a) Identify ONE product extracted from donated blood. **1**

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(b) Describe the use of the product named in (a) **2**

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Question 28 (4 marks)

(a) Identify ONE method used to treat drinking water in order to minimise the risk of infection from pathogens. **1**

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(b) Explain, using evidence, how the method identified in (a) helps to reduce the risk of infection from pathogens. **3**

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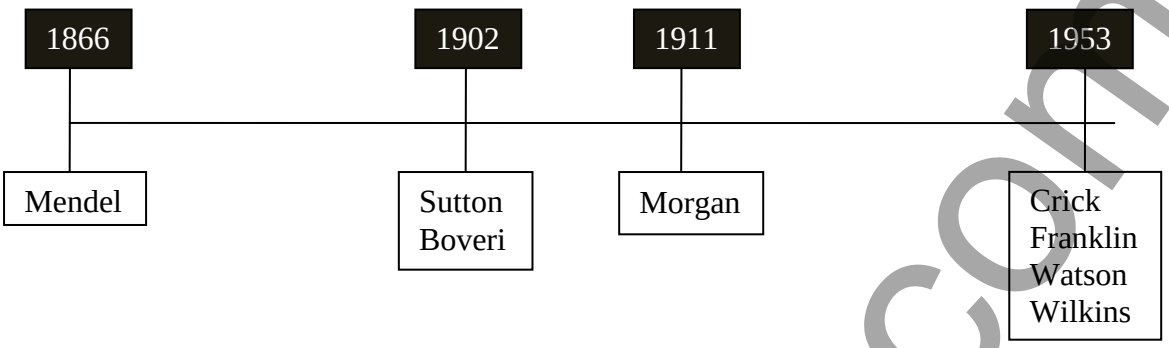
Marks

Question 29 (8 marks)

The timeline below shows publication dates for some major advances in the understanding of genetics and the scientists involved in these publications.



Evaluate how each individual or group of individuals shown on the timeline above have changed the direction or nature of scientific thinking. **8**

Question 29 (continued)

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End of Section I – Part B

2009 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

Biology
Section II

25 marks
Attempt ONE question from Questions 30-34
Allow about 45 minutes for this section

Answer the question in a writing booklet. Extra writing booklets are available.

Question 30 - Communication (25 marks)

Marks

(a) The external environment provides all animals with a range of stimuli, some of which can be used in communication.

(i) Identify the stimulus used in vision. **1**

(ii) Outline further steps needed for visual communication to be effective. **2**

(b) (i) Describe an investigation you undertook to model the process of accommodation in the eye. **3**

(ii) How could you assess the validity of conclusions from information gathered in this investigation? **2**

(c) Compare the structure and function of rods and cones in the human eye. **4**

(d) The nervous system plays a vital role in how we interpret and respond to the external environment.

(i) Briefly outline the pathway used by impulses travelling from EITHER the eye OR the ear to the brain. **2**

(ii) Explain, using specific examples, why it is important for the brain to correctly interpret sensory signals for the coordination of animal behavior. **4**

(e) Future health systems will have to deal with an ever-increasing ageing population and its associated impaired vision and hearing. Fortunately technologies have been developed to deal with these impairments.
Identify these technologies and evaluate their effectiveness in overcoming vision and hearing impairment in an ageing population. **7**

Question 31 - Biotechnology (25 marks)

Marks

(a) There are many ways in which biotechnology can be applied.

(i) Identify ONE application of biotechnology in aquaculture. **1**

(ii) For the application identified in (i), outline the process used. **2**

(b) (i) Describe an investigation you undertook to test ONE condition that influences the rate of enzyme activity. **3**

(ii) How could you assess the validity of conclusions from information gathered in this investigation? **2**

(c) Discuss, using ONE example of the use of biotechnology, why it is important for scientists to consider ethical and social issues when working in the biotechnology field. **4**

(d) Recombinant DNA technology plays an important role in modern biotechnology.

(i) Briefly outline the function of restriction enzymes and ligases in recombinant DNA techniques. **2**

(ii) Describe how DNA vectors and microinjection can be used in the production of transgenic multicellular organisms. **4**

(e) Over the years modification of traditional uses of biotechnology in fermentation has occurred through changes in technology.
Identify these technologies and evaluate their use in today's fermentation industry. **7**

Question 32 – Genetics: The Code Broken? (25 marks) **Marks**

(a) Inheritance is rarely a simple matter, and many traits are influenced by more than a single gene.

(i) Identify ONE characteristic determined by multiple alleles in an organism other than humans. **1**

(ii) Outline ONE difference between characteristics determined by multiple alleles and those determined through polygenic inheritance. **2**

(b) (i) Describe an investigation you undertook to model linkage. **3**

(ii) How could you assess the validity of the model produced in this investigation? **2**

(c) Discuss the benefits of the Human Genome Project and explain the limitations of the data obtained from the project. **4**

(d) Mutation is one mechanism that can bring about genetic change.

(i) Briefly outline the difference between a base substitution mutation and a frameshift mutation. **2**

(ii) Describe a mutation that occurs in humans and the effect it has on human health. **4**

(e) Much of the work of geneticists today is focused on changing the genetic nature of a species through processes such as gene cloning.
Evaluate how the current use of gene cloning in plants or animals could benefit humans. **7**

Question 33 – The Human Story (25 marks) **Marks**

(a) Classification allows scientists to establish order within the millions of organisms found on Earth, based on similarities and differences between them.

(i) Identify ONE criterion that would allow two organisms to be identified as the same species. **1**

(ii) Outline the characteristics that allow both the Chimpanzee and human to be classified as Primates. **2**

(b) (i) Describe an investigation you undertook to model karyotype analysis. **3**

(ii) How could you assess the validity of information gathered in this investigation? **2**

(c) How can evidence from mitochondrial DNA studies and DNA sequencing be used when comparing groups of living primates to hypothesise about their relationships? **4**

(d) Cultural evolution as well as biological evolution has been important in the human story.

(i) Briefly outline possible cultural impacts that occurred as humans organised themselves into cooperative groups. **2**

(ii) Analyse, using examples, the possible effects of genetic engineering on human evolution. **4**

(e) The pattern of human evolution continues to be debated. Several models have been proposed to explain the evidence collected thus far.
Evaluate the evidence for ONE of these models of human evolution. **7**

Question 34 – Biochemistry (25 marks) **Marks**

(a) The development of an understanding of plant growth took many years and involved the work of many scientists.

(i) Outline the contributions made by Ingen-Housz to this understanding. **1**

(ii) Explain how the contribution made by Ingen-Housz helped Mayer to reach his conclusion about plant growth. **2**

(b) (i) Describe an investigation you undertook to determine the effect of temperature on gas production in pond weed. **3**

(ii) How could you assess the validity of information gathered in this investigation? **2**

(c) Compare the role of the coenzyme NADP with that of the coenzyme ADP in the light-dependent reactions of photosynthesis. **4**

(d) The work of Melvin Calvin was pivotal in our understanding of the biochemistry of photosynthesis. The Calvin Cycle was named after him.

(i) Briefly outline how Calvin used chromatography to deduce the products of photosynthesis. **2**

(ii) Outline the main steps of the Calvin Cycle. **4**

(e) The need to reduce carbon emissions has led to a search for materials that are derived from renewable resources.
Evaluate the potential uses of photosynthesis in developing and replacing materials presently obtained from other non-renewable resources. **7**

End of paper

Centre Number | Student Number

YEAR 12 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION 2009

BIOLOGY – 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 have changed 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 ○

ATTEMPT ALL QUESTIONS

Question	**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 ○