QATs
Quality Assessment Tasks

Centre Number

Student Number

2010
TRIAL HIGHER SCHOOL CERTIFICATE 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
- Use the multiple-choice answer sheet provided
- Write your Centre Number and Student Number at the top of this page and pages 10 and 25.

Total marks – 100

Section I Pages 3-20

75 marks
This section has two parts, Part A and Part B

Part A – 20 marks
- Attempt Questions 1-20
- Allow about 35 minutes for this part

Part B – 55 marks
- Attempt Questions 21-30
- Allow about 1 hour and 40 minutes for this part

Section II Pages 20-26

25 marks
- Attempt ONE question from Questions 31-35
- Allow about 45 minutes for this section

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2010 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION
BIOLOGY

Part A – 20 marks
Attempt Questions 1-20
Allow about 35 minutes for this part

Use the multiple-choice answer sheet provided for Questions 1-20

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

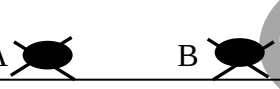
Sample 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

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:



A ⊗ B ⊗ C ○ D ○

1 In guinea pigs, black coat colour is dominant over the white coat colour.

When a heterozygous black guinea pig is mated with a homozygous white guinea pig, what would be the phenotypes of the offspring?

(A) 50% black, 50% white

(B) 75% black, 25 % white

(C) All black

(D) All white

2 Which statement correctly describes a structural feature of a blood vessel?

(A) Veins carry blood away from the heart
(B) Veins have valves
(C) Arteries carry blood under high pressure
(D) Arteries have valves

3 What is the function of antibiotics in managing disease?

(A) They help fight all infectious disease
(B) They help fight bacterial infections
(C) They are produced in response to antigens
(D) They are part of the body's immune system

4 What is the significance of DNA replication?

(A) It allows mutations to occur
(B) The number of chromosomes is halved
(C) It ensures that there is no variation in the offspring
(D) Genetic information is passed on unaltered

5 Which statement correctly describes the activity of enzymes?

(A) An enzyme can catalyse a wide range of reactions
(B) The activity of enzymes will increase as the temperature increases
(C) An enzyme works when its active site fits a specific substrate
(D) All enzymes are able to work efficiently in a wide range of pH

6 Which of the following statements describes the movement of materials through the phloem?

(A) Sugars are moved from one part of the plant to another by fluid pressure

(B) Sugars are moved by diffusion and osmosis

(C) Water and mineral ions are moved by active transport

(D) Mineral ions are moved by diffusion and osmosis

7 A sample of DNA is tested to find the percentage of each base. It was found that cytosine made up 22% of the bases.

What would be the percentage of thymine in the sample?

(A) 28%

(B) 22%

(C) 44%

(D) 25%

8 A student described a pathogen as follows:

'It was microscopic but was lacking cellular structures. It had a protein coat'.

How is this pathogen most likely to be classified?

(A) A prion

(B) A virus

(C) A bacterium

(D) A protozoan

9 Beadle and Tatum's work led to the development of the 'one gene – one protein hypothesis.' Later this was modified to the 'one gene – one polypeptide hypothesis.'

What is the relationship between proteins and polypeptides?

(A) Proteins may be made of one or more polypeptides

(B) A polypeptide can be broken down into several proteins

(C) Polypeptides and proteins are always the same

(D) Polypeptides are composed of amino acids

10 What is the meaning of the term 'enantiostasis'?

(A) The removal of salt from the leaves of a plant growing in saline solution

(B) Maintaining constant water and salt levels in the blood despite external changes

(C) Maintaining a constant internal environment despite external changes

(D) Maintaining metabolic and physiological functions in response to variations in the environment

11 Which statement best describes Koch's contribution to our understanding of disease?

(A) He increased our understanding of the immune response

(B) He showed how diseases could be spread by animal vectors

(C) He discovered how to test if a disease was caused by a specific pathogen

(D) He disproved the theory of spontaneous generation

12 Which of the following would NOT be an adaptation of an ectotherm to cold conditions?

(A) Burrowing underground

(B) Huddling together with others

(C) Reducing blood flow to the skin (vasoconstriction)

(D) Reducing surface area exposed to air

13 A problem with organ transplants is the risk of rejection of the donated organs by the recipient's body.

What is the main reason that this occurs?

(A) Antibodies in the transplanted organ react with antigens in the recipient's blood

(B) Immunosuppressive drugs are given to the recipient following the transplant

(C) Transplants can cause infection in the open wounds after surgery

(D) Proteins on the donor organ are different to proteins in the recipients body

14 Following the recent earthquakes in Chile, relief workers became concerned about the possible increase in some diseases such as diphtheria and cholera.

What is the most likely explanation for this happening?

(A) Lower levels of immunity in people in affected areas

(B) Contamination of water supplies

(C) Increased crowding in the disaster relief camps

(D) Lack of food and shelter

15 Both dolphins (mammals) and sharks (fish) possess streamlined body shapes and have fins or flippers for movement in water.

Which of these processes best explains these simiarities?

(A) Convergent evolution

(B) The effects of environment on the phenotype

(C) Evolution from a common ancestor

(D) Divergent evolution

16 Research is being carried out into the development of artificial blood.

What is a reason why this research is needed?

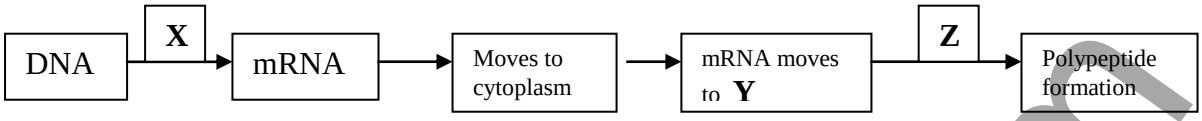
(A) Artificial blood is more effective than normal blood

(B) Artificial blood does not have different blood types

(C) Artificial blood can carry disease

(D) Artificial blood will help when there are shortages of normal blood

17 The flow chart below is a summary of polypeptide synthesis.



What would be the correct labels for **X**, **Y** and **Z**?

	X	**Y**	**Z**
(A)	Translation	Ribosome	Transcription
(B)	DNA replication	Cytoplasm	Translation
(C)	Transcription	Ribosome	Translation
(D)	Translation	Ribosome	tRNA

18 How would the composition of the blood leaving the kidney compare with the blood entering the kidney?

(A) Blood leaving would have more water and urea than blood entering the kidney

(B) Blood leaving would have higher levels of water but lower amounts of urea compared to blood entering the kidney

(C) Blood leaving the kidney would have less urea and water than blood entering

(D) Blood entering the kidney would have less urea and water than blood leaving the kidney

19 In tracing the historical development of our understanding of malaria, there were several significant events or discoveries.

Which of the following is a correct statement concerning what has been learned about this disease?

(A) Malaria is an infectious disease caused by a bacterium

(B) The *Plasmodium* protozoan is known to be the cause of malaria

(C) The female Anopheles was shown to be the cause of the disease

(D) Contaminated water was shown to spread malaria

20 What would be the most likely effect that a reproductive technology such as artificial insemination would have on the genetic composition of a population?

(A) It would reduce the genetic variability of the population

(B) It would increase the genetic variability of the population

(C) It would have no effect on the genetic variability of the population

(D) It would cause an increase in the rate of mutation

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Part B – 55 marks
Attempt Questions 21-30
Allow about 1 hour and 40 minutes for this part

Answer the questions in the spaces provided.
Show all relevant working in questions involving calculations.

Question 21 (3 marks)

Living organisms need to be able to respond to changes in the temperature of their surroundings (the 'ambient temperature') in order to keep functioning. **3**

Describe TWO ways that plants respond to high ambient temperatures.

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Question 22 (5 marks)

The appearance and spread of swine flu highlights the fact that infectious diseases continue to be a serious problem in both developing and industrialised countries, especially as people are now able to travel more easily around the globe. **5**

Discuss the above statement, referring specifically to strategies you have studied that are designed to prevent the spread of infectious disease.

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Question 23 (6 marks)

(a) Use a specific example to show how comparative anatomy provides evidence to support the theory of evolution. **3**

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(b) As technology has advanced, so scientists' understanding of evolutionary relationships has changed. Describe an example where this has happened, identifying the advance in technology that led to the change in thinking. **3**

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Question 24 (5 marks)

(a) Outline the role of aldosterone in the human body. **2**

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(b) Outline why hormone replacement therapy is important for people who cannot produce their own aldosterone. **3**

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Question 25 (4 marks)

(a) What is haemoglobin? **1**

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(b) Explain ONE adoptive advantage of haemoglobin. **3**

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Question 26 (5 marks)

Using a named example, describe a process used to produce a transgenic species and give reasons for the production of this species. **5**

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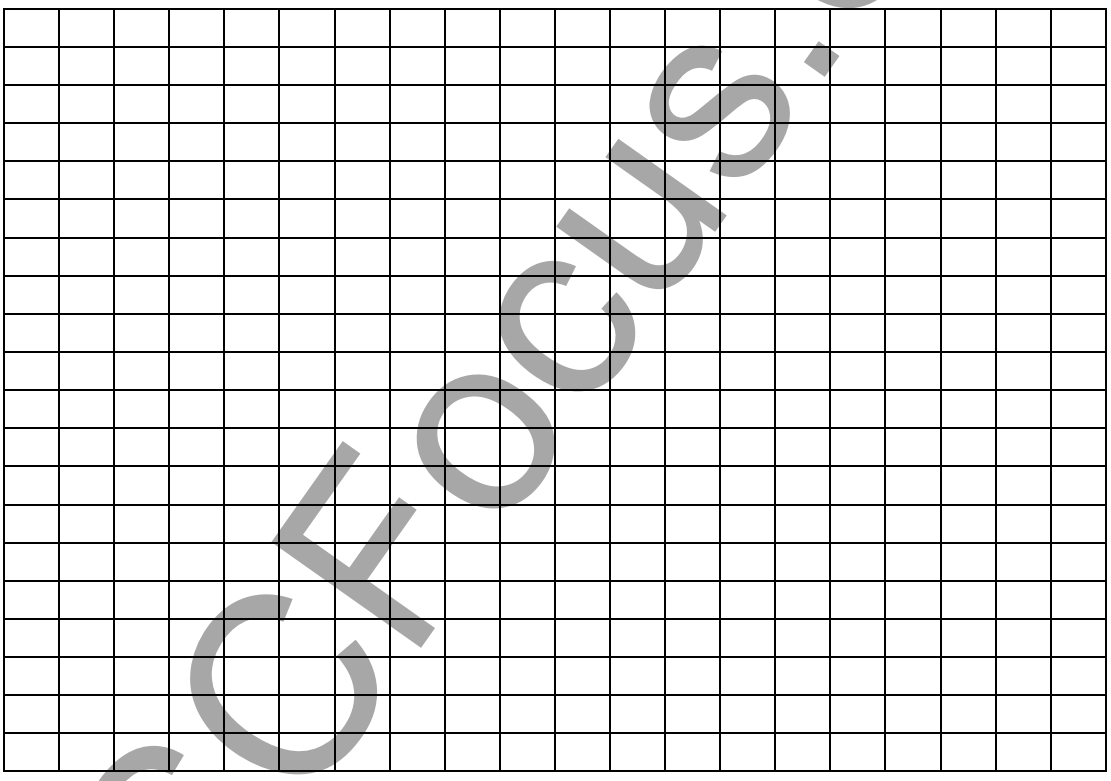
Question 27 (6 marks)

The table below shows the incidence and mortality rates of Coronary Heart Disease in males and females in Australia.

	Males 40-54yr	Males 55-64yr	Males 65-74yr	Males 75-90yr	Females 40-54yr	Females 55-64yr	Females 65-74yr	Females 75-90yr
Incidence (no. per 100 000)	250	600	1200	2800	50	200	500	2000
Mortality (no. per 100 000)	50	130	300	1500	25	50	120	1100

(a) Plot the data using the most appropriate graph in the grid below. **4**



(b) Describe two trends shown in this data. **2**

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Question 28 (6 marks)

(a) Explain why the concentration of water in cells should be kept within a narrow range. **3**

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(b) With reference to a named insect, explain the link between conservation of water and the type of nitrogenous waste excreted. **3**

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Question 29 (7 marks)

It has been just over 200 years since Darwin put forward his theory of natural selection to explain how evolution could occur.

(a) Variation is an essential requirement for evolution. Describe two sources of variation in living organisms. **4**

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(b) Compare the concept of punctuated equilibrium with the gradual process proposed by Darwin's theory. **3**

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Question 30 (8 marks)

On exposure to a pathogen, the body can respond in a variety of ways, from trying to prevent entry of the pathogen to eventually destroying the pathogen after it has invaded the body tissues. **8**

Explain how these defence mechanisms in humans function to maintain our health.

Biology
Section II

25 marks
Attempt ONE question from Questions 31-35
Allow about 45 minutes for this section

Answer the question in a SEPARATE writing booklet.

Show all relevant working in questions involving calculations.

Page

Question 31 Communication 20

Question 32 Biotechnology 21

Question 33 Genetics: The Code Broken? 22

Question 34 The Human Story 23

Question 35 Biochemistry 24

Question 31 – Communication (25 marks)

(a) Outline the structure and function of **4**

(i) the cornea and
(ii) the retina.

(b) In this topic you have carried out a first-hand investigation to model the process of accommodation. **5**
Outline the method you used in the investigation and justify the appropriateness of this method.

(c) Technology has long been used to help humans overcome problems associated with hearing and vision. **7**
Evaluate the importance of these technologies for communication in human society.

(d) While humans can detect sounds within a certain range of frequencies, other mammals may need to detect sounds of different frequencies. Compare the frequencies of sound detected by TWO other mammals and give a possible reason for any differences. **4**

(e) Show, with the aid of a graph, what is meant by the term 'action potential'. **5**
Use the graph to explain why not all stimuli generate an action potential.

End of Question 31

Question 32 – Biotechnology (25 marks)

(a) Describe the changes in **4**
(ii) one group of animals and
(ii) one group of plants, as a result of artificial selection.

(b) In this topic you have carried out a first-hand investigation to demonstrate the use of fermentation processes in bread OR alcohol production. **5**
Outline the method you used in the investigation and justify the appropriateness of this method.

(c) There are many applications of biotechnology that research have been developed. **7**
Evaluate the importance of these applications using TWO case studies you have completed during this course.

(d) Technological advances have changed the way organisms can be modified to suit society's needs. Compare the processes of artificial selection and recombinant DNA technology. **4**

(e) Describe, using an example, a strain isolation method developed in the 20th Century and explain the benefits of this method. **5**

End of Question 32

Question 33 – Genetics: The Code Broken? (25 marks)

(a) The Human Genome Project has been a major scientific undertaking in recent years. Describe **4**

(i) some benefits and

(ii) some limitations of the information obtained from this project.

(b) In this topic you have carried out a first-hand investigation to construct a model of DNA. **5**

Outline the method you used in the investigation and justify the appropriateness of this method.

(c) Evaluate the potential of reproductive technologies such as selective breeding and cloning to influence agricultural production. **7**

(d) In dihybrid crosses, genes may be passed on independently or the genes may be linked. **4**

Analyse the outcome of dihybrid crosses when both genes are inherited independently or if the two genes are linked.

(e) Describe how transposable genetic elements ('transposons') operate and explain their impact on the genome. **5**

End of Question 33

Question 34 – The Human Story (25 marks)

(a) Describe the primate characteristics found in **4**
(i) prosimians and
(ii) apes.

(b) In this topic you processed information from secondary sources to model DNA-DNA hybridization to show its use in determining relationships. Outline the techniques you used to identify useful information in these secondary sources and assess the reliability of the information gained. **5**

(c) A significant feature of human evolution has been that its cultural development has occurred. Evaluate the evolutionary significance of human cultural evolution compared to other primates. **7**

(d) Humans are believed to have adapted to their environment by a variety of mechanisms. Describe the processes that have led to polymorphism and clinal gradation, using examples to support your answer. **4**

(e) Describe the 'Out of Africa' model and explain how this differs to one other named model that has been put forward to explain human evolution. **5**

End of Question 34

Question 35 – Biochemistry (25 marks)

(a) Describe the structural features of **4**
(i) thylakoids and
(ii) the stroma in chloroplasts.

(b) In this topic you have carried out a first-hand investigation to examine the absorption spectra of leaf pigments. **5**
Outline the method you used in the investigation and justify the appropriateness of this method.

(c) Many materials our society currently uses are made from non-renewable resources and may, in the future, run out. Evaluate the potential of photosynthesis to replace some of these materials. **7**

(d) Photosynthesis is a complex series of reactions. In the series of reactions that make up the Light dependant reaction, compare the functions of photosystems I and II. **4**

(e) Isotopes are a vital tool in the study of many biochemical processes. **5**
These isotopes can be characterized by their 'half-life'. Define, the term 'half-life' and explain how tracers can be used to follow a biochemical pathway.

End of Question 35

Centre Number

Student Number

BIOLOGY – MULTIPLE-CHOICE ANSWER SHEET

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 ⬭
	16	A ⬭	B ⬭	C ⬭	D ⬭
	17	A ⬭	B ⬭	C ⬭	D ⬭
	18	A ⬭	B ⬭	C ⬭	D ⬭
	19	A ⬭	B ⬭	C ⬭	D ⬭
	20	A ⬭	B ⬭	C ⬭	D ⬭