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Curriculum Council

TERTIARY ENTRANCE EXAMINATION, 1998

QUESTION/ANSWER BOOKLET

HUMAN BIOLOGY

Please place your student identification label in this box

STUDENT NUMBER - In figures

In words

TIME ALLOWED FOR THIS PAPER

Reading time before commencing work: Ten minutes
Working time for paper: Three hours

MATERIAL REQUIRED/RECOMMENDED FOR THIS PAPER

TO BE PROVIDED BY THE SUPERVISOR

This Question/Answer Booklet
Separate Multiple Choice Answer Sheet
Question Sheet for Part III (inside front cover of this Question/Answer Booklet)

TO BE PROVIDED BY THE CANDIDATE

Standard Items: Pens, pencils, eraser or correction fluid, ruler

Special Items: A 2B, B or HB pencil for the separate Multiple Choice Answer Sheet and calculators satisfying the conditions set by the Curriculum Council.

IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room.

It is your responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor BEFORE reading any further.

SECTION B.

ANSWER EITHER QUESTION 51 OR QUESTION 52—NOT BOTH.

QUESTION 51

The maintenance of the normal composition of the body fluids is an important role of the kidneys. Describe how the structure of a nephron allows it to carry out this role.

(20 marks)

QUESTION 52

The evolution of hominids can be related to certain physical and cultural advances that improved their survival chances. Describe five physical and five cultural advances that have characterised hominid evolution, giving consideration to how these advances aided survival.

(20 marks)

END OF QUESTIONS

1998

PART I (80 marks)

Mark your answers to Questions 1-40 on the **SEPARATE MULTIPLE CHOICE ANSWER SHEET**, using a 2B, B or HB pencil. If you make an error follow the instructions given to you on your answer sheet.

SELECT THE CORRECT ALTERNATIVE IN EACH OF THE FOLLOWING QUESTIONS.

1. Myelinisation of a nerve fibre

   (a) causes a slower conduction of nerve impulses along the fibre.
   (b) prevents the nerve impulses from jumping along the fibre.
   (c) slows the fibre's return to normal following conduction of an impulse.
   (d) speeds up the passage of nerve impulses along the fibre.

2. The cerebellum of the brain

   (a) lies at the front of the cranial cavity.
   (b) is involved with conscious thought and reasoning.
   (c) coordinates movement and posture.
   (d) contains the cardiac and respiratory centres.

3. The medulla of the brain

   (a) lies at the front of the cranial cavity.
   (b) is involved with conscious thought and reasoning.
   (c) coordinates movement and posture.
   (d) contains the cardiac and respiratory centres.

4. Hypermetropia (long sightedness) describes a condition where

   (a) distant objects are seen clearly but close objects are difficult to focus.
   (b) close objects are seen clearly but distant objects appear fuzzy.
   (c) the curvature of the cornea or lens is not uniform.
   (d) the retina contains an adequate number of rods but no cones.

5. Vibration of the tympanic membrane of the ear

   (a) is important in maintaining balance.
   (b) occurs due to the action of sound waves.
   (c) provides information to the semicircular canals.
   (d) is suppressed by the auditory ossicles.

6. The greatest amount of refraction of light rays entering the eye occurs at the

   (a) cornea.
   (b) aqueous humour.
   (c) lens.
   (d) vitreous humour.

SEE NEXT PAGE

STRUCTURE OF THIS PAPER

Part		No. of questions available	No. of questions to be attempted	Marks available
I	Multiple choice	40	ALL	80
II	Diagram and short answer questions	10	ALL	80
III	Extended answer questions: A	2	1	20
	B	2	1	20

Total marks = 200

INSTRUCTIONS TO CANDIDATES

PART I should be answered on the separate Multiple Choice Answer Sheet. Use a 2B, B or HB pencil, NOT A BALL POINT OR INK PEN.

PART II should be answered in this Question/Answer Booklet. Write your answers in the spaces provided, using a blue or black ball point or ink pen. Draw any diagrams in pencil.

PART III should be answered in this Question/Answer Booklet. Answer on the pages following the end of questions, using a blue or black ball point or ink pen. Draw any diagrams in pencil. The questions for this part have been repeated on a removable question sheet, which is inserted into the front of this booklet, so that you can refer more easily to the questions while answering.

SEE NEXT PAGE

QUESTION SHEET FOR PART III

Extended Answers (40 marks)

Answer ONE question from SECTION A and ONE question from SECTION B. Illustrate your answers with diagrams where appropriate. Up to TWO MARKS may be deducted for poorly structured answers: that is, answers in point form or diagrams not explained in the text of your answers. DO NOT WRITE ANSWERS IN PENCIL. Write your answers on the lined pages in your Question/Answer Booklet following the end of questions.

SECTION A.

ANSWER EITHER QUESTION 49 OR QUESTION 50—NOT BOTH.

QUESTION 49

What is the difference between passive and active immunity?
Describe, with examples, how the body acquires artificial immunity through the antibody mediated (humoral) response.

(20 marks)

QUESTION 50

It could be expected that the blood glucose levels might fluctuate widely following a meal rich in sugar or after vigorous exercise.

However, there is usually very little change in the concentration of glucose in the blood.
Describe and explain the bodily processes that ensure blood glucose is maintained within normal limits.

(20 marks)

7. The sympathetic nervous system causes

(a) decreased heart rate and dilation of the bronchioles.
(b) constriction of the pupil and increased heart rate.
(c) increased sweating and constriction of blood vessels in the skin.
(d) constriction of the bronchioles and of the blood vessels to the skin.

8. Populations that have become genetically isolated from one another

(a) usually have the same gene frequencies for physical characteristics.
(b) are not subject to random genetic drift.
(c) are subject to similar environmental selection pressures.
(d) may develop into different subspecies that are unable to interbreed.

9. Homologous organs

(a) are used for similar functions but have different structures.
(b) possess a similar structure although they may have different functions.
(c) have a reduced size and appear to have no function.
(d) indicate the animals come from different ancestors.

10. The Eustachian tube (auditory tube)

(a) connects the inner ear to the upper throat.
(b) is normally filled with fluid.
(c) contains the semicircular canals.
(d) prevents air pressure changes damaging the tympanic membrane.

11. The posterior pituitary gland secretes

(a) oxytocin.
(b) growth hormone.
(c) glucocorticoids.
(d) adrenocorticotrophic hormone.

12. A factor that would cause the heart rate to slow down is

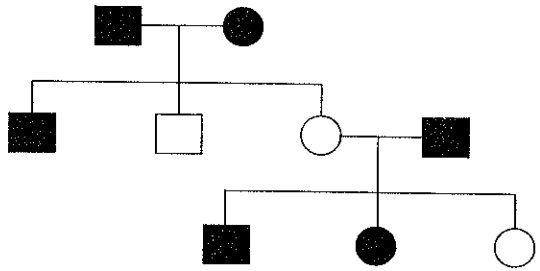
(a) increased sympathetic stimulation.
(b) increased parasympathetic stimulation.
(c) decreased parasympathetic stimulation.
(d) decreased stimulation from the cerebellum.

13. Parts of the nervous system involved in the control of posture are the

(a) hypothalamus, sensory and motor nerves.
(b) medulla oblongata, visual pathways and the spinal cord.
(c) cerebellum, semi-circular canals and the motor cortex.
(d) semi-circular canals, hypothalamus and the visual cortex.

SEE NEXT PAGE

14. Question 14 refers to the pedigree chart below.



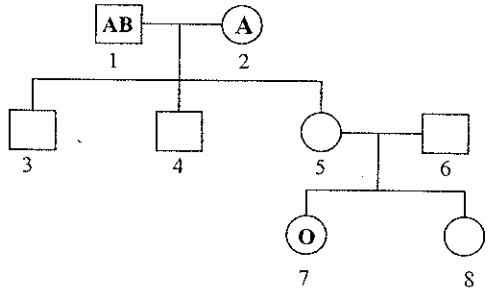
It can be concluded that the shaded characteristic is determined by

(a) an autosomal recessive gene.
(b) an autosomal dominant gene.
(c) an X-linked recessive gene.
(d) an X-linked dominant gene.

15. Increasing carbon dioxide concentration in the blood

(a) occurs during hyperventilation.
(b) will result in stimulation of chemical receptors in the brain.
(c) is not as important as decreased oxygen concentration in stimulating respiration.
(d) will stimulate stretch receptors in the lung.

16. Question 16 refers to the pedigree chart below, which shows the blood groups of three family members (1, 2 and 7).



Regarding the individuals in the pedigree above,

(a) individual 2 must have the genotype $I^A I^A$
(b) individual 3 could be blood group A, AB or O.
(c) individual 5 could be blood group B or O.
(d) individual 6 must have the allele *i*.

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17. The list which contains only fossils is:

(a) petrified wood, stone tool, footprint in sandstone.
(b) petrified faeces, a sea shell embedded in limestone, impression of a leaf in mudstone.
(c) the shape of a sea shell left in limestone, centipede track on mudstone, glacial scratch marks on a rock face.
(d) rock painting, kitchen midden, cooking hearth.

18. Identify the correct comparison between pongids and hominids from the table below:

CHARACTERISTIC	PONGID	HOMINID
(a) Elongated pelvis	present	absent
(b) Dental diastema	absent	present
(c) Carrying angle	present	absent
(d) Transverse arch to the foot	present	present

19. During the evolution of primates it is believed that there has been a trend towards

(a) an increase in the relative size of the cerebellum.
(b) a reduction in the length of the gestation period.
(c) an increase in the importance of visual perception.
(d) an increase in the relative size of the area of the brain devoted to smell perception.

20. At an excavation site in Asia, the remains of a hominid were recovered. Evidence of a ritual burial were found and the remains were dated at 95,000 years old. The cranium was well preserved and had a capacity of 1375 cubic centimetres. The brow ridges were larger than those commonly found in modern humans.

From this description the fossil would most likely be classified as

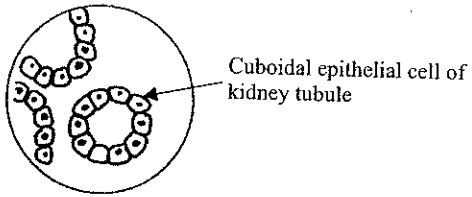
(a) *Homo sapiens.*
(b) *Homo erectus.*
(c) *Homo habilis.*
(d) *Australopithecus africanus.*

21. Primates first appeared on Earth about

(a) 65 million years ago.
(b) 97 million years ago.
(c) 124 million years ago.
(d) 78 million years ago.

SEE NEXT PAG

22. A section of a kidney as examined under high power (400X) of a microscope produced the following image:



Given the high power field of view of the microscope is 0.45 mm, the average width of a cuboidal epithelial cell is closest to

(a) 20 micrometres.
(b) 40 micrometres.
(c) 70 micrometres.
(d) 90 micrometres.

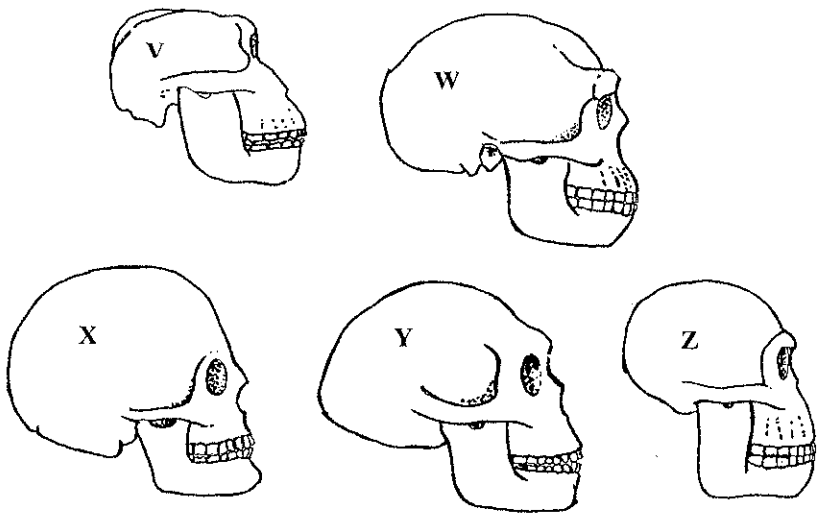
23. Which features in the following list are descriptive of *Homo erectus*?

i. A cranial capacity of 850–1100 cm^3
ii. Fed mainly on a diet of berries and tough fibrous plant matter
iii. Used fire for cooking
iv. Widespread throughout Africa, Europe and Asia
v. Fashioned tools of stone and antler

(a) i, iii and iv only
(b) i, ii and v only
(c) ii, iii and v only
(d) ii, iii and iv only

SEE NEXT PAGE

24. Which listing below correctly identifies the skulls shown in this diagram?



DIAGRAMS NOT TO SCALE

Redrawn from J. Harrison, 1992, *Our Human Species*, Ecopress WA.

(a) V is *Homo erectus*, X is *Homo sapiens sapiens* and Z is *Homo habilis*.
(b) V is *Australopithecus robustus*, W is *Homo sapiens neanderthalensis* and Z is *Homo habilis*.
(c) W is *Homo erectus*, Y is *Homo sapiens neanderthalensis* and Z is *Homo habilis*.
(d) V is *Australopithecus robustus*, X is *Homo sapiens sapiens* and Z is *Homo erectus*.

25. A theory concerning the entry of Aboriginal people into Australia which is **NOT** supported by available evidence is that

(a) there were multiple entry points across the north of Australia.
(b) there were several waves of migration corresponding to times when the sea level was changing.
(c) there was a single wave of migration from south-east Asia 150,000 years ago, during the last period of glaciation.
(d) there were several migration waves originating from south China and south-east Asia.

26. Which hominid is shown correctly associated with the tool drawn below?

a	b	c	d
Neanderthal man	Cromagnon man	*Homo habilis*	*Homo erectus*
			

27. Which of the following statements are true for *Homo sapiens neanderthalensis*?

i. They were the first hominids known to make use of fire.
ii. They were the first hominids known to construct shelters.
iii. They were efficient hunters of large animals.
iv. They were users of flint in tool manufacture.
v. They were manufacturers of portable art depicting fertility symbols.

(a) i and iii only
(b) i, ii and iv only
(c) iii, iv and v only
(d) iii and iv only

28. If a population of bacteria is exposed to an antibiotic for long periods of time, the bacteria may lose their susceptibility to the antibiotic because the bacteria have become

(a) tolerant.
(b) attenuated.
(c) resistant.
(d) dependent.

29. Which of the following is a disease caused by bacteria?

(a) Measles
(b) Tetanus
(c) Malaria
(d) Influenza

30. Depletion of the ozone layer is correctly associated with

(a) exhaust gases from jet aircraft.
(b) the manufacture of polystyrene foam plastic.
(c) carbon dioxide.
(d) volcanic gases.

31. The predicted result from the increase in greenhouse gases is

(a) an increasing incidence of skin cancers.
(b) deforestation.
(c) sea water expansion.
(d) eutrophication.

32. Ammonia is produced from the deamination of amino acids. In humans, which of the following substances is the ammonia converted into before excretion by the kidneys?

(a) Urea
(b) Uric acid
(c) Uracil
(d) Ammonium chloride

33. Antidiuretic hormone originates in the

(a) posterior pituitary gland.
(b) anterior pituitary gland.
(c) hypothalamus.
(d) collecting ducts of the kidney.

34. Excessive production of ADH could result in

(a) excessive urine formation.
(b) retention of water in the body.
(c) retention of urine in the bladder.
(d) excessive thirst.

35. The blood vessel which carries blood from the general arterial circulation into a kidney is the

(a) afferent arteriole.
(b) renal artery.
(c) efferent arteriole.
(d) renal vein.

USE THE FOLLOWING TABLE WHEN ANSWERING QUESTIONS 36, 37 AND 38.

Pollutant	Source	Result/s
A	Industry	Acid rain
CFCs	**B**	Hole in the ozone layer.
C	Burning of forests and combustion of fossil fuels.	Increase in global temperatures.

36. The answer missing at **A** should be

(a) methane.
(b) sulfur dioxide.
(c) carbon monoxide.
(d) nitrogen gas.

37. The answer missing at **B** should be

(a) petrol refineries.
(b) sewage farms.
(c) refrigeration plants.
(d) anaesthetic gases.

38. The answer missing at **C** should be

(a) carbon dioxide.
(b) ozone.
(c) chlorine.
(d) smoke.

39. The cause of eutrophication in a waterway is

(a) excessive algal growth.
(b) excess nutrients in the water.
(c) pesticide contamination.
(d) dying fish.

40. Which of these statements is/are true of the way antibiotics work to destroy bacteria? Antibiotics can work by inhibiting bacterial:

i. cell wall synthesis.
ii. protein synthesis.
iii. metabolic processes.
iv. cell membrane synthesis.

(a) i only.
(b) i and iii only.
(c) i, ii and iii only.
(d) i, ii, iii and iv are all true.

END OF PART I

PART II (80 marks)

Write answers to ALL questions on the ruled lines after each question or in the spaces provided within each table. Write your answers in blue or black ball point or ink pen.

QUESTION 41 (12 marks)

A medical research report stated that 50 volunteers who sucked on lemon flavoured tablets containing 13.3 mg of zinc while they had a cold recovered nearly twice as fast as another 50 volunteers given placebo tablets (lemon flavoured tablets containing no zinc). None of the volunteers knew which type of tablet they were sucking.

The participants were told to suck one tablet every two hours while they were awake, starting as soon as the first symptoms of a cold appeared.

(a) State an hypothesis that this experiment was designed to test.

(1 mark)

(b) In this experiment, what was the independent variable?

(1 mark)

(c) What was the dependent variable in this experiment?

(1 mark)

(d) Identify **four** variables, from the information above, that were controlled in this experiment.

1

2

3

4

(4 marks)

QUESTION 41 (continued)

(e) In addition to the variables you have identified as being controlled in question (d), identify a further two variables which would also need to be controlled. State how you would control each of these variables.

VARIABLE TO BE CONTROLLED	HOW IT CAN BE CONTROLLED
1	
2	

(4 marks)

(f) What would be the consequence of failure by the experimenters to control any one of these variables?

(1 mark)

QUESTION 42 (15 marks)

(a) Fill in the table to contrast the general differences between nervous and hormonal control of the body.

	Nerves	Hormones
Speed of response		
Duration of response		
Specificity of action		

(3 marks)

(b) List **four** health problems that can arise from the long term abuse of alcohol.

(4 marks)

(c) i. What effect does hyperventilation have on the concentration of carbon dioxide in the bloodstream?

(1 mark)

ii. Divers who hyperventilate can risk drowning as a result. Explain why.

(3 marks)

QUESTION 42 (continued)

(d) The ovarian cycle describes the cycle of events that occur in the ovary.

i. Name the two hormones released from the anterior pituitary gland that directly affect the ovaries.

(2 marks)

ii. Name two hormones secreted by the ovary during the cycle.

(2 marks)

QUESTION 43 (7 marks)

(a) Methods of dating of fossils can be classified into two groups, relative and absolute. Distinguish between these two kinds of dating techniques.

(2 marks)

(b) Radiocarbon dating can sometimes be used to determine the age of a fossil. Explain the principles involved in the use of this technique.

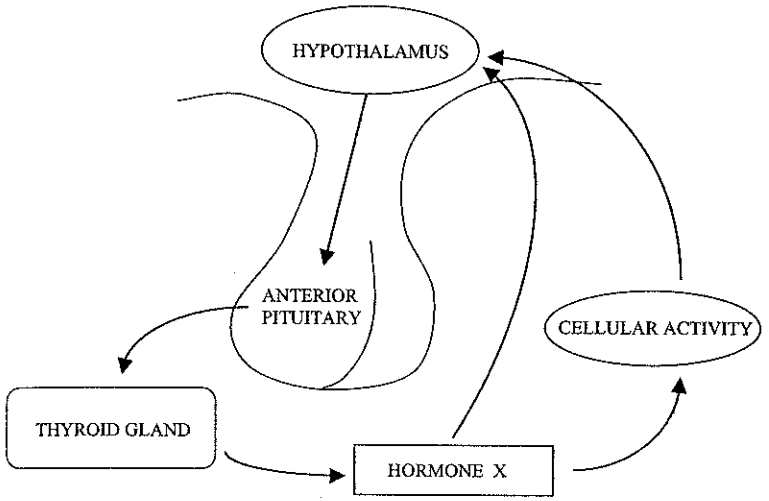
(4 marks)

(c) What is one of the limitations of radiocarbon dating?

(1 mark)

QUESTION 44 (8 marks)

The diagram, below shows how the hypothalamus regulates the secretion of thyroid hormones. Use this diagram to help you complete the questions that follow.



(a) Name two factors that stimulate the hypothalamus to initiate the control system.

1 _____

2 _____

(2 marks)

(b) The hypothalamus responds by secreting _____

that acts on the anterior pituitary to cause it to secrete _____

(2 marks)

(c) What is the name of hormone X released from the thyroid gland?

_____

(1 mark)

(d) List two ways the body responds to the release of hormone X.

_____

_____

(2 marks)

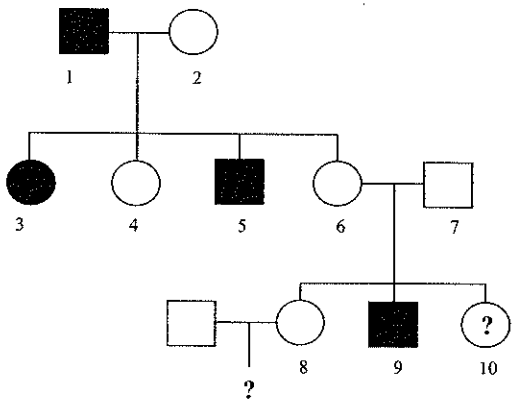
(e) Which phrase is used to describe the kind of mechanism that regulates this system?

_____

(1 mark)

QUESTION 45 (5 marks)

Question 45 relates to the pedigree below. This shows the inheritance, within a family, of the X-linked characteristic known as red-green colour blindness. Shaded individuals possess the characteristic. Individual 10 is a baby and it has not yet been determined if she is affected.



(a) Using the symbol *R* to represent the dominant allele and *r* for the recessive allele:

i. What is the genotype of individual 1?

_____

(1 mark)

ii. What is the genotype of individual 6?

_____

(1 mark)

(b) What is the probability that newborn daughter 10 will be

i. red-green colour blind? _____

(1 mark)

ii. a carrier of the gene? _____

(1 mark)

(c) If daughter 8 has a son by her unaffected husband, what is the probability that this son will be red-green colour blind?

_____

(1 mark)

QUESTION 46 (11 marks)

The Australopithecines were a diverse group of hominids.

(a) From the fossil evidence available, what was their geographical distribution?

_____

(1 mark)

(b) List any two inferences made about how they lived.

_____

_____

(2 marks)

(c) Complete this table for the different Australopithecines. What significant **cranial** characteristic can be used to distinguish the two major Australopithecine groups?

Australopithecine group	Associated species	Cranial characteristic
1.	1. *Australopithecus africanus*	
	2.	
2. Robust Australopithecines	3. *Australopithecus robustus*	
	4.	

(5 marks)

(d) i. What is the name of the earliest species of Australopithecus to evolve?

_____

(1 mark)

ii. Some anthropologists believe that all Australopithecines walked bipedally. List two lines of evidence that anthropologists have put forward to support this claim.

_____

_____

_____

_____

(2 marks)

QUESTION 47 (8 marks)

(a) Many human characteristics are said to form a "cline". Explain the meaning of this term.

(1 mark)

(b) There is some opposition to the classification of humans into racial groups because the concept has been misused. Name and describe one way in which the concept of race has been poorly used.

(2 marks)

(c) Some human populations have special features that could be considered to be adaptations to specific environments.

i. What is an adaptation?

(1 mark)

ii. The Sudanese from Africa typically have a tall and slender body form. What is the term used to describe this somatotype?

(1 mark)

iii. For what kind of environment would this be an adaptation?

(1 mark)

iv. Explain why this body form can be regarded as being an "adaptation".

(2 marks)

QUESTION 48 (14 marks)

(a) i. Define the term "pathogen".

(1 mark)

ii. There are a number of ways whereby infectious agents that cause disease can be transmitted from one person to another. Complete this table, showing on the left four different ways of transmission and on the right, a specific example of a disease transmitted by each.

FOUR DIFFERENT WAYS OF TRANSMISSION	SPECIFIC EXAMPLE OF DISEASE
1.	1.
2.	2.
3.	3.
4.	4.

(8 marks)

(b) What is the difference between an antibiotic, an antibody and an antigen?

Antibiotic:

Antibody:

Antigen:

(3 marks)

(c) Where are lymphocytes (both B and T) matured before being released into the bloodstream?

B lymphocytes

T lymphocytes

(2 marks)

END OF PART II

PART III (40 marks)

Answer ONE question from SECTION A and ONE question from SECTION B. Illustrate your answers with diagrams where appropriate. Up to TWO MARKS may be deducted for poorly structured answers: that is, answers in point form or diagrams not explained in the text of your answers. DO NOT WRITE ANSWERS IN PENCIL. Write your answers on the lined pages in your Question/Answer Booklet following the end of questions.

SECTION A.

ANSWER EITHER QUESTION 49 OR QUESTION 50—NOT BOTH.

QUESTION 49

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Describe, with examples, how the body acquires artificial immunity through the antibody mediated (humoral) response.

(20 marks)

QUESTION 50

It could be expected that the blood glucose levels might fluctuate widely following a meal rich in sugar or after vigorous exercise.

However, there is usually very little change in the concentration of glucose in the blood.
Describe and explain the bodily processes that ensure blood glucose is maintained within normal limits.

(20 marks)

SEE NEXT PAGE

SECTION B.

ANSWER EITHER QUESTION 51 OR QUESTION 52—NOT BOTH.

QUESTION 51

The maintenance of the normal composition of the body fluids is an important role of the kidneys.
Describe how the structure of a nephron allows it to carry out this role.

(20 marks)

QUESTION 52

The evolution of hominids can be related to certain physical and cultural advances that improved their survival chances. Describe five physical and five cultural advances that have characterised hominid evolution, giving consideration to how these advances aided survival.

(20 marks)

END OF QUESTIONS