DOCUMENT SET 3: INTERNATIONAL RELATIONS, EUROPE

SOURCE 1: John Gaddis, *The Long Peace*, New York: Oxford University Press, 1987 in Brian Hoepper et al, *Changing the World: Inquiries in Modern History*, Milton, Jacaranda Press, 1990, p. 416 (ISBN 0 7016 2241 5).

SOURCE 2: Ralph Sawyer, *Modern World History*, Marrickville: Science Press, 1989, p. 316 (ISBN 0 85583 146 4).

DOCUMENT SET 4: INTERNATIONAL RELATIONS, MIDDLE EAST

SOURCE 1: L Carl Brown, *International Politics and the Middle East: Old Rules, Dangerous Game*, London: Princeton University Press (I B Tauris and Co Ltd), 1984, p. 175 (ISBN 1. 85043 000).

SOURCE 2: William L Cleveland, *A History of the Modern Middle East*, Boulder, Colorado: Westview Press, 1994, p. 323 (ISBN 0 8133 0562 4).

DOCUMENT SET 5: INTERNATIONAL RELATIONS, ASIA

SOURCE 1: Franz H Michael & George E Taylor, *The Far East in the Modern World*, USA: Holt, Rinehart and Winston, revised edition, 1964, p. 772 (Library of Congress Catalog No. 64-16972).

SOURCE 2: John A Garraty, *The American Nation: A History of the United States*, second edition, New York: Harper and Row, 1971, p. 989 (ISBN 8281 0168 X).

DOCUMENT SET 6: FRENCH REVOLUTION

SOURCE 1: Simon Schama, *Citizens. A Chronicle of the French Revolution*, New York: Vintage Books, 1989, p. 304 (ISBN 0 679 72610 1).

SOURCE 2: John Hall Stewart, *A Documentary Survey of the French Revolution*, New York: MacMillan, 1965, pp. 230–231.

DOCUMENT SET 7: RUSSIAN REVOLUTION

SOURCE 1: *Low's Russian Sketchbook*, London: Victor Gollancz, 1932, pp. 80 and 107.

SOURCE 2: David Christian, *Power and Privilege*, Melbourne: Pitman (Longman Cheshire), 1989 (1986), p. 213 (ISBN 0 85896 197 0).

DOCUMENT SET 8: CHINESE REVOLUTION

SOURCE 1: Colin Mackerras et al, *China in Revolution 1850 1976*, History Through Documents, Melbourne: Longman Cheshire, 1993, p. 128 (0 582 91060 9).

SOURCE 2: H R Cowie, *The Modern State, Nationalism and Internationalism*, South Melbourne: Nelson, 1992, p. 309 (ISBN 0 17 008733 6).

DOCUMENT SET 9: AMERICAN REVOLUTION

SOURCE 1: J R Pole (ed.), *The Revolution in America 1754–1788. Documents and Commentaries*, Stanford: Seaford University Press, 1970, p. 36 (ISBN 0 8047 0755 3)

SOURCE 2: John C Miller, *The Federalist Era 1789–1801*, New York: Harper and Row, 1963, between pp.112 and 113.

Curriculum Council

TERTIARY ENTRANCE EXAMINATION, 1999

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.

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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	9	ALL	80
III	Extended answer questions:			
	Section A	2	1	20
	Section 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 the questions.

SECTION A

ANSWER EITHER QUESTION 50 OR QUESTION 51—NOT BOTH

QUESTION 50 (Total 20 marks)

Malaria is a parasitic disease widespread in the tropics and transmitted by mosquitoes. Sickle-cell anaemia is a recessive gene disorder found in a relatively high proportion (up to 40%) of people from tropical Africa and from countries around the Western Indian Ocean. People carrying a single copy of the gene, (Aa), are generally healthy and are less susceptible to malaria than people who do not carry the gene (AA). People who are homozygous for this gene (aa) are also less susceptible to malaria, but develop a form of anaemia that is almost always fatal.

(a) Define what is meant by natural selection and how it may have resulted in this distribution of this particular genetic disease. (10 marks)

(b) Imagine you are a genetic counsellor dealing with a couple in one of the countries above. A couple wanting to have a family presents for advice. Both are known to be heterozygous for the sickle cell gene. Calculate the percentages of the likely genotypes of their children, and describe the phenotypes and survival prospects of these possible offspring. (10 marks)

QUESTION 51 (Total 20 marks)

The body uses many different types of receptors to sense its environment. Through special senses such as vision and hearing, we can detect very complicated information. Describe how receptors in the eye and ear receive and process variable light and sound information, and communicate this to the brain. (20 marks)

SECTION B

ANSWER EITHER QUESTION 52 OR QUESTION 53—NOT BOTH

QUESTION 52 (Total 20 marks)

(a) The ovarian cycle is an example of an endocrine feedback loop. Describe the sequence of events and the hormonal changes that occur during the ovarian cycle in a non-pregnant woman. (12 marks)

(b) The skin is recognised as our largest and most versatile organ. Describe the skin's role in providing non-specific protection against infection. Include in your work definitions or descriptions of important terms and processes. (8 marks)

QUESTION 53 (Total 20 marks)

(a) Describe and compare a nomadic hunting-gathering lifestyle with an agricultural lifestyle. (14 marks)

(b) Increasing human population and movement to cities places great pressure on the surrounding agricultural land. As a result of this, various types of water pollution have become a major problem in rural areas. Name ONE of these forms of water pollution, list its major causes, and describe ways in which this problem can be addressed. (6 marks)

END OF QUESTIONS

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 the answer sheet.

SELECT THE SINGLE CORRECT ALTERNATIVE IN EACH OF THE FOLLOWING QUESTIONS

1. Late last century, an island in the Pacific suffered a terrible storm in which three-quarters of the population died. While the island's population eventually recovered, there is now a very high incidence of extreme sensitivity to light caused by a recessive mutation. The genetic cause for this is likely to be

(a) differential survival of people who sheltered indoors during the storm.
(b) natural selection through islanders' preference for fishing at night.
(c) descent from a few carriers of the mutation who survived.
(d) excessive exposure to ultraviolet light following the storm.

2. When two individuals, both heterozygous for a single-gene character, are crossed, **all** the offspring happen to resemble their parents for that character. This genetic trait is referred to as

(a) genotypic.
(b) dominance.
(c) phenotypic.
(d) recessiveness.

3. Potassium-argon dating is generally suitable for rocks

(a) under 1000 years old.
(b) between 1000 and 50,000 years old.
(c) between 50,000 and 100,000 years old.
(d) greater than 100,000 years old.

4. In humans, a male baby results when

(a) the egg is fertilised by a sperm carrying a Y chromosome.
(b) the egg is fertilised very early in the menstrual cycle.
(c) the unfertilised egg contains a Y chromosome.
(d) the woman's vaginal fluid is very acid (low pH).

5. The presence of fossil pollen grains in conjunction with human tools at an archaeological site allows us

(a) to date the fossils in relation to the tool assemblage.
(b) to determine the type of vegetation present when the tools became buried.
(c) to identify the type of hominid who may have manufactured the tools.
(d) to find out the geographic location where the tools were made.

SEE NEXT PAGE

6. People living in hot and dry conditions generally have the following major type of body adaptation:

(a) dark curly hair.
(b) long slender noses.
(c) high levels of body fat.
(d) tall, slender body build.

7. Humans throughout the world are considered by scientists to belong to a single species because they all

(a) can interbreed to produce fertile offspring.
(b) make use of manufactured tools.
(c) have binocular colour vision.
(d) use language and symbols as means of cultural transmission.

8. The main factor that controls the development of skin colouration in humans is

(a) the amount of solar radiation.
(b) living in hot, humid tropics.
(c) genetic inheritance.
(d) prevalence of radiation-induced skin cancer.

9. Which of the features in the following list are descriptive of *Homo habilis*?

i Had a mixed diet including meat
ii Lived between 500,000 and 1 million years ago
iii Had a brain size larger than *Homo erectus*
iv Had smaller teeth than the australopithecines
v Limited to Africa

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

10. The list that contains only **artefacts** is

(a) fossilised bone, fossilised seashell, petrified wood.
(b) petrified wood, stone tool, human footprint in sandstone.
(c) leather clothing in peat bog, fossil pollen grains and human bone.
(d) stone tool, bone tool, rock painting.

SEE NEXT PAGE

11. Which of the following environments would provide the best preservation for human soft tissues?

(a) A river bed.
(b) Volcanic lava.
(c) Alkaline soil.
(d) An acid bog.

12. Upright bipedal locomotion is thought to have first arisen in hominids

(a) at least 10 million years ago.
(b) between 3 and 5 million years ago.
(c) between 1 and 2 million years ago.
(d) less than 1 million years ago.

13. The part of the brain associated with thought and reasoning is the

(a) cerebellum.
(b) medulla oblongata.
(c) cerebrum.
(d) hypothalamus.

14. One function of the cornea of the eye is to

(a) convert light into nervous impulses.
(b) allow light to enter the eye.
(c) regulate the amount of light entering the eye.
(d) maintain the shape of the eyeball.

15. Normal cerebrospinal fluid

(a) contains red blood cells, proteins and fluids.
(b) causes the brain to change shape in response to a blow to the head.
(c) is secreted and absorbed so as to maintain a constant pressure.
(d) flows out from the spinal cord around the motor neurons.

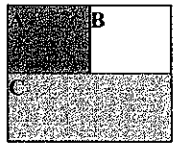
16. The part of the ear that detects head position is the

(a) auditory ossicles.
(b) tympanic membrane.
(c) eustachian (auditory) tube.
(d) semicircular canals.

SEE NEXT PAGE

17. The normal pH of the blood is maintained by the

(a) actions of the lungs and kidneys.
(b) secretion of stomach acid.
(c) loss of urea.
(d) formation of ketones.

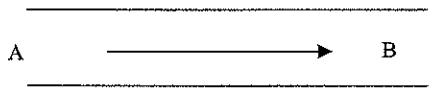


18. The diagram above represents three fluid compartments separated by a semi-permeable membrane. Compartment A contains a very concentrated salt solution, B contains water, and C contains a dilute salt solution. Which of the following is true?

(a) Water will tend to move from A to B and A to C.
(b) Water will tend to move from B to A and B to C.
(c) Salt will tend to move from C to A and A to B.
(d) Water will tend to move from A to B and C to B.

19. The breakdown of excess protein (deamination) in the body results in

(a) uric acid formation from amino acids in the muscles.
(b) urea formation from ammonia in the liver.
(c) urea formation from ammonia in the kidneys.
(d) amino acid formation from urea in the kidneys.



20. The diagram above represents a capillary with the blood flowing through a muscle in the direction of the arrow. Compared to the blood at part A in the capillary, the blood at part B will normally be

(a) higher in oxygen.
(b) lower in carbon dioxide.
(c) higher in fats.
(d) lower in glucose.

21. Antibodies are produced

(a) by T-lymphocytes in response to infection.
(b) by phagocytes exposed to antigens.
(c) by B-lymphocytes in response to antigens.
(d) in response to stimulation by antibiotics.

SEE NEXT PAGE

22. Penicillin is an antibiotic that will

(a) prevent infection by the cold virus.
(b) cause damage to bacterial cell walls.
(c) improve the phagocytosis of fungi.
(d) effectively treat malaria.

23. When tonsillitis occurs, the tonsils become enlarged and painful. This happens because

(a) the lymph tissue in the tonsils is reacting to an infection.
(b) the tonsils swell to keep infectious organisms from being swallowed.
(c) extra red blood cells are being made to fight an infection.
(d) the spleen is unable to produce enough lymphocytes.

24. As a person starts to become dehydrated through excessive loss of body fluids

(a) dilute urine is produced, due to the action of oxytocin.
(b) water is reabsorbed from the collecting ducts in the kidney.
(c) antidiuretic hormone is released from the anterior pituitary.
(d) thirst receptors in the cerebellum are stimulated.

25. Cell-mediated immunity

(a) causes foreign red blood cells to cling together.
(b) is a non-specific immunity against any foreign cells.
(c) is due to the action of plasma cells.
(d) can occur when memory T cells recognise the invading antigen.

26. The human immunodeficiency virus (HIV)

(a) inactivates helper T cells.
(b) does not induce humoral immunity in an infected person.
(c) has no effect on lymph nodes.
(d) can survive for long periods outside the body.

27. A person's body tries to maintain physiological homeostasis. It does this to

(a) maintain a constant metabolic rate.
(b) prevent anaerobic respiration.
(c) maintain a constant internal environment.
(d) keep the skin temperature constant.

SEE NEXT PAGE

28. Which is a **physiological** effect of excessive and prolonged alcohol use?

(a) A feeling of well-being due to lower inhibitions.
(b) Hypotension.
(c) A reduced functioning of the central nervous system.
(d) A build up of cerebrospinal fluid in the neck area.

29. The major control centres for respiration **and** heart rate are located in the

(a) pons.
(b) cerebellum.
(c) pituitary.
(d) medulla oblongata.

30. Both menstruation **and** ovulation are

(a) cyclic and under nervous control.
(b) under nervous and hormonal control.
(c) steady state and under hormonal control.
(d) cyclic and under hormonal control.

31. Cardiac output will be adjusted during times of strenuous activity by

(a) parasympathetic stimulation.
(b) pituitary secretions.
(c) a combination of hormones classified as steroids.
(d) sympathetic stimulation.

32. Glycogen is used

(a) to help maintain the concentration of glucose in the blood.
(b) to stimulate the process of glycogenesis.
(c) to promote the conversion of excess glucose into deposits of fat tissue.
(d) to stimulate receptor cells in the *islets of Langerhans* to produce glucagon.

33. The **most** important information sent to the Respiratory Centre of the brain would concern the blood concentration of

(a) oxygen.
(b) carbon dioxide.
(c) glucose.
(d) Hydroxide ions (OH^-).

SEE NEXT PAGE

34. The **most** efficient method of losing body heat on a hot dry day would be

(a) conduction to the air.
(b) vasodilation of capillaries in the face and shoulders.
(c) sweating.
(d) vasoconstriction to reduce the amount of heat absorbed by conduction.

35. Which combination works together to reduce the flow of blood to the skin?

(a) Midbrain/decrease in heart rate.
(b) Parasympathetic/vasoconstriction.
(c) Cerebrum/lower cardiac output.
(d) Sympathetic/vasoconstriction.

36. If a population has a death rate of 14 per 1,000 and a birth rate of 28 per 1,000, the overall growth rate would be

(a) 50.0%.
(b) 1.4%.
(c) 14.0%.
(d) 0.5%.

37. If the growth rate of a population is increasing, then the doubling time will

(a) decrease.
(b) increase.
(c) remain constant.
(d) vary with the birth rate.

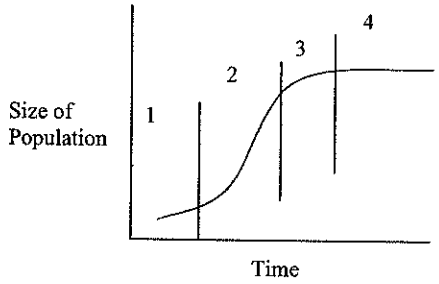
38. The incidence of skin cancer among people of European ancestry has increased significantly in Australia over the last generation. Assuming that no other factors have changed, this is most probably due to

(a) the "Greenhouse effect".
(b) depletion of the Ozone layer.
(c) the effect of "El Nino".
(d) increased air pollution.

SEE NEXT PAGE

Use the information below to answer **QUESTIONS 39 AND 40.**

A small group of people found an isolated island that was suitable to settle. Since settlement there has been no emigration from, or immigration onto, the island. The graph below shows the population changes from the time of settlement to present day.



39. In which area of the graph would the population have the least impact on the environment?

(a) 1.
(b) 2.
(c) 3.
(d) 4.

40. What could be happening at area 3 of the graph?

(a) Increased birth rates.
(b) Decreased death rates.
(c) Increased environmental pressure on population growth.
(d) Decreased genetic variation in the population.

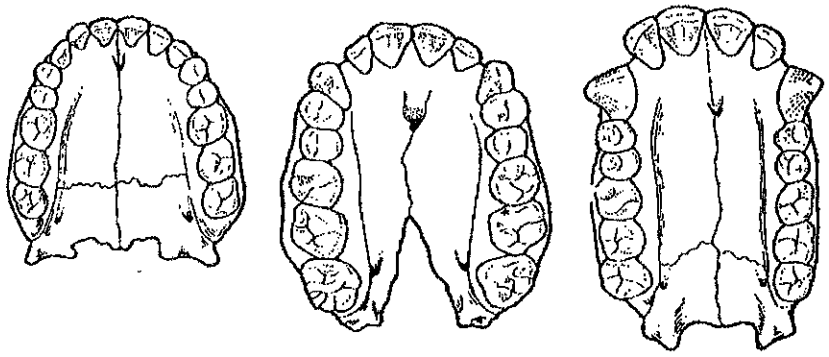
END OF PART I

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 (Total 14 marks)

(a) The diagram is of three lower jaw outlines.



A **B** **C**

(i) Which of the three jaws is that of an ape – A, B or C?

(1 mark)

(ii) Give TWO reasons for your answer.

(2 marks)

(b) "Neanderthal" humans are thought to have lived in Europe around 30,000 years ago.

List **FOUR** skull features of the Neanderthal humans that differed from modern humans.

(4 marks)

QUESTION 41 (continued)

(c) Humans living in small groups separated from larger populations can sometimes show **random genetic drift** in allele frequencies.

(i) Explain what this term means.

_____

_____

(1 mark)

(ii) Give two general examples of events that could result in this process.

_____

_____

(2 marks)

(d) List **TWO** structural body features that would benefit people living in a dry, cold, Arctic environment and explain how each may be hypothesised to be beneficial to survival.

	FEATURE	ADVANTAGE
1		
2		

(4 marks)

QUESTION 42 (Total 5 marks)

LIST OF WORDS

Bipedalism
Cline
Genotype
Karyotype
Homozygous
Homologous
Monogenic
Palaeontology
Pedigree
Phenotype
Polygenic
Population
Prehensibility
Stratigraphy
Superposition

Using the most appropriate word from the list above, complete EACH of the following definitions.

_____ = possessing the same pair of alleles for a given characteristic.

_____ = study of the sequence of rock layers as a means of relative dating.

_____ = walking upright on two legs.

_____ = the type of inheritance where the phenotype is dependent on many pairs of alleles.

_____ = the appearance of an individual as determined by genetic constitution.

(5 marks)

QUESTION 43 (Total 7 marks)

(a) A healthy couple had nine children. Of these, two boys developed haemophilia (a sex-linked character resulting in an inability to form blood clots following injury) while the remaining three boys and four girls had normal blood clotting capacity.

(i) Using "h" for the gene for haemophilia and "H" for the gene for normal blood clotting, correctly write the **mother's** genotype in relation to haemophilia.

_____

(1 mark)

(ii) What percentage of her four healthy daughters would be likely to be carriers of the disease?

_____

(1 mark)

(iii) If a haemophilic son married into a family with NO history of haemophilia, what can you predict about the likely genotype of their first-born daughter?

_____

(1 mark)

(iv) If a haemophilic son married into a family with NO history of haemophilia, what can you predict about the likely genotype of their firstborn son?

_____

(1 mark)

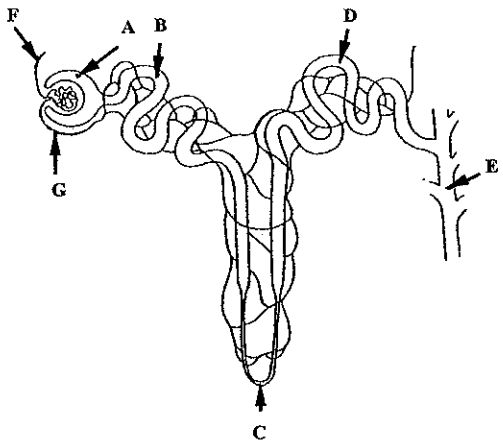
QUESTION 43 (continued)

(b) Draw a correct pedigree from the following information, using the initial letters of the names of the people involved (eg 'N' for Norman). **A freehand drawing is acceptable.**

(3 marks)

Alan is married to Beatrice. They have five children born in the following order, Cheryl, Douglas, Edward, Frederick and George. Sadly, Frederick died as a baby. Cheryl is married to Henry and George is married to Isabelle. Cheryl and Henry have two daughters, Julie (eldest) and Kate. Leonard and Martin are brothers. Their mother is Isabelle.

QUESTION 44 (Total 13 marks)



(a) Name the labelled parts of the nephron above.

A _____

B _____

C _____

D _____

E _____

(5 marks)

(b) Describe the difference between the blood in vessels F and G in terms of

(i) composition

_____

(ii) pressure

_____

(2 marks)

QUESTION 44 (continued) Refer to Diagram on Previous Page

(c) Name two substances other than water that are reabsorbed at the region B of the nephron.

_____

_____

(2 marks)

(d) Name one substance that may be secreted into the region D of the nephron.

_____

(1 mark)

(e) Alcohol has many effects on the body. One of these is to inhibit the release of antidiuretic hormone (ADH). Explain why this would make a person urinate a lot, with reference to the normal effects of ADH on the nephron.

_____

_____

_____

_____

(3 marks)

QUESTION 45 (Total 13 marks)

A drug company has developed a new influenza vaccine that is squirted into the nasal passages. The vaccine has been approved for testing in people, to see if it prevents the symptoms of influenza in people at risk of infection. Consider how an experiment might be designed to test this vaccine, and answer the following questions.

(a) State a suitable **hypothesis** for this experiment.

_____

_____

_____

(1 mark)

(b) What would be the **independent variable** in the experiment?

_____

(1 mark)

(c) What would be the **dependent variable** in the experiment?

_____

(1 mark)

QUESTION 45 (continued)

(d) In this experiment, the subjects would be randomly assigned to two different groups. Using your understanding of scientific method, what name would you use to describe each group, and what would you give to the members of each group to test your hypothesis?

(4 marks)

(e) List **two** variables that would need to be controlled in this experiment.

(2 marks)

(f) What sort of immunity is being induced by a vaccine?

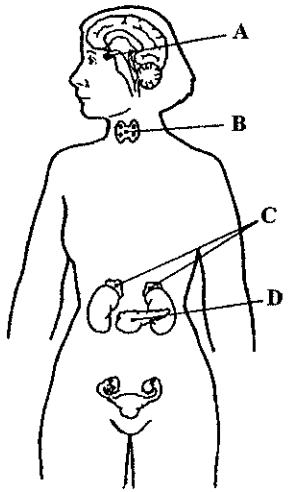
(1 mark)

(g) Describe **three** barriers present within the nasal cavity that will help to keep infection out of the body.

(3 marks)

QUESTION 46 (Total 9 marks)

The diagram below refers to parts (a) through (c) of Question 46.



(a) In the space provided below, name the organs shown in the diagram of the endocrine system.

A _____ C _____

B _____ D _____

(4 marks)

(b) (i) How does structure **A** have a direct effect on structure **B**?

(1 mark)

(ii) How does structure **B** respond to this effect?

(1 mark)

QUESTION 46 (continued) Refer to Diagram on P. ious Page

(c) (i) If structure **D** was badly damaged, the production of which hormones would be reduced?

_____

_____

(2 marks)

(ii) What general effect would this have on the homeostasis of the body?

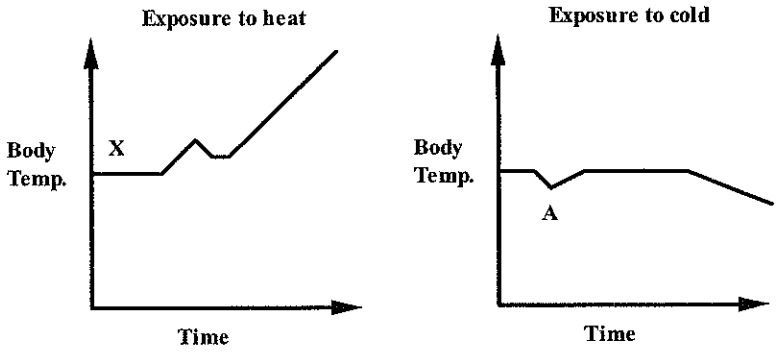
_____

_____

(1 mark)

QUESTION 47 (Total 7 marks)

To investigate the effects that air temperature has on body temperature, a naked subject stood in a room especially designed for controlling air temperature. The subject was exposed to 48° C to monitor the body's response to dry heat. After a rest period, the same subject was then exposed to 5° C to monitor the body's response to dry cold. The data recorded are shown in the graphs below. Use the graphs to answer Question 47.



(a) What would the body temperature be at **X** (in degrees Celsius)?

_____

(1 mark)

QUESTION 47 (continued) Refer to Graph on Previous Page

(b) List **two** physiological adjustments the body is making to cope with the situation at point **A** in the graph, and explain how these may be of benefit.

	ADJUSTMENT	BENEFIT
1		
2		

(4 marks)

(c) Using the information in the graphs alone, did the most **efficient** temperature regulation occur when the subject was exposed to heat or to cold? Give **one reason** for your answer.

_____

_____

_____

_____

(2 marks)

QUESTION 48 (Total 7 marks)

Use the information in the table below to answer parts **(a)** through **(c)** of Question 48.

	COUNTRY		
Indicator	**A**	**B**	**C**
Life expectancy at birth (years)	75	71	44
Infant mortality per 1000 births	6	11	172
Per capita energy consumption: tons of coal (equivalents)	122	40	0.3
Doctors per 1000 people	2	1.3	0.02
Cancer cases per 1000 people	37	30	14
Respiratory problems per 1000 people	63	31	17

(a) Which country is the **least** economically developed? Give **one** reason for your answer based on the information in the table.

(3)

_____

_____

_____

(2 marks)

(b) (i) According to the table, which country do you think would have the most problems with pollution?

_____

(1 mark)

(ii) Give TWO reasons for your answer.

_____

_____

(2 marks)

(c) An accumulation of the metal lead in the body through environmental pollution can cause serious health problems.

List TWO ways in which this pollutant can enter the body.

_____

_____

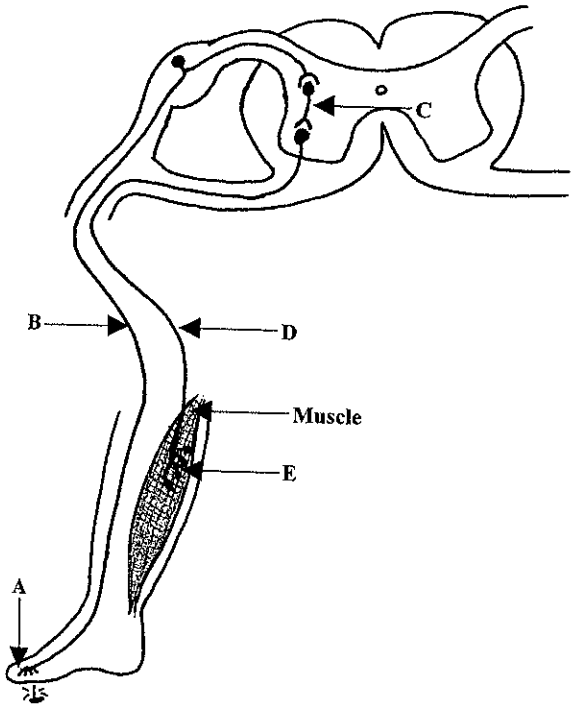
(2 marks)

SEE NEXT PAGE

QUESTION 49 (Total 5 marks)

A spinal reflex allows us to withdraw quickly from a painful stimulus. Use the diagram below of a foot standing on a nail, to help you name the structures that make up a spinal reflex arc.

Spinal Cord



A _____

B _____

C _____

D _____

E _____

(5 marks)

END OF PART II

SEE NEXT PAGE

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 the questions.

SECTION A

ANSWER EITHER QUESTION 50 OR QUESTION 51—NOT BOTH

QUESTION 50 (Total 20 marks)

Malaria is a parasitic disease widespread in the tropics and transmitted by mosquitoes. Sickle-cell anaemia is a recessive gene disorder found in a relatively high proportion (up to 40%) of people from tropical Africa and from countries around the Western Indian Ocean. People carrying a single copy of the gene, (Aa), are generally healthy and are less susceptible to malaria than people who do not carry the gene (AA). People who are homozygous for this gene (aa) are also less susceptible to malaria, but develop a form of anaemia that is almost always fatal.

(a) Define what is meant by natural selection and how it may have resulted in this distribution of this particular genetic disease. (10 marks)

(b) Imagine you are a genetic counsellor dealing with a couple in one of the countries above. A couple wanting to have a family presents for advice. Both are known to be heterozygous for the sickle cell gene. Calculate the percentages of the likely genotypes of their children, and describe the phenotypes and survival prospects of these possible offspring. (10 marks)

QUESTION 51 (Total 20 marks)

The body uses many different types of receptors to sense its environment. Through special senses such as vision and hearing, we can detect very complicated information. Describe how receptors in the eye and ear receive and process variable light and sound information, and communicate this to the brain. (20 marks)

SEE NEXT PAGE

SECTION B

ANSWER EITHER QUESTION 52 OR QUESTION 53—NOT BOTH

QUESTION 52 (Total 20 marks)

(a) The ovarian cycle is an example of an endocrine feedback loop. Describe the sequence of events and the hormonal changes that occur during the ovarian cycle in a non-pregnant woman. (12 marks)

(b) The skin is recognised as our largest and most versatile organ. Describe the skin's role in providing non-specific protection against infection. Include in your work definitions or descriptions of important terms and processes. (8 marks)

QUESTION 53 (Total 20 marks)

(a) Describe and compare a nomadic hunting-gathering lifestyle with an agricultural lifestyle. (14 marks)

(b) Increasing human population and movement to cities places great pressure on the surrounding agricultural land. As a result of this, various types of water pollution have become a major problem in rural areas. Name ONE of these forms of water pollution, list its major causes, and describe ways in which this problem can be addressed. (6 marks)

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END OF QUESTIONS