



TERTIARY ENTRANCE EXAMINATION, 1996  
QUESTION/ANSWER BOOKLET

HUMAN BIOLOGY

Please place your student identification label in this box

SEA STUDENT NUMBER - In figures

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In words

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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

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 Secondary Education Authority.

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.

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 B	2	1	20
	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.

PARTS II and III 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.

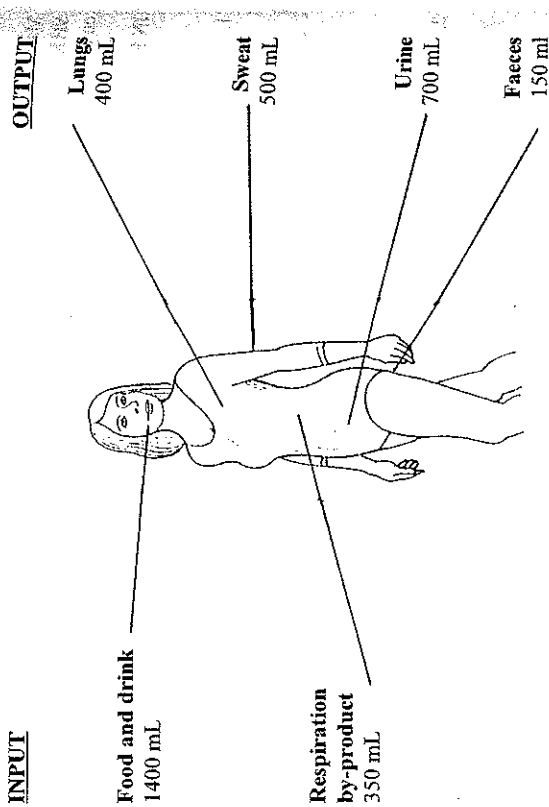
PART I

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.

IN EACH QUESTION CHOOSE THE BEST ALTERNATIVE.

- Which of the following describes the direction of blood flow through the kidney?
  - Renal artery, renal vein, afferent arteriole, efferent arteriole, peritubular capillaries
  - Renal vein, renal artery, afferent arteriole, efferent arteriole, peritubular capillaries
  - Renal artery, efferent arteriole, afferent arteriole, peritubular capillaries, renal vein
  - Renal artery, afferent arteriole, efferent arteriole, peritubular capillaries, renal vein
- Urea is produced during the metabolism of
  - proteins.
  - carbohydrates.
  - lipids.
  - starches.
- Carbohydrates are stored in the liver and muscles as
  - glucose.
  - glycogen.
  - glucagon.
  - glycosides.
- Which **ONE** of the following **DOES NOT** have, as one of its functions, protection against infectious (communicable) diseases?
  - Saliva
  - Plasma
  - Cerebrospinal fluid
  - Tears

Questions 5 and 6 refer to the figure below which shows the input and output of water by the human body during a 24 hour period.



5. The figure above illustrates

- (a) homeostasis.
- (b) dehydration.
- (c) hydration.
- (d) respiration.

6. Water loss from which **ONE** of the following organs is most effective in the control of water balance?

- (a) Lung
- (b) Skin
- (c) Kidney
- (d) Intestine

7. Thirst is a response to

- (a) increased osmotic pressure of the blood and a decrease in blood volume.
- (b) decreased osmotic pressure in the blood.
- (c) decreased secretion of antidiuretic hormone (ADH).
- (d) stimulation of osmoregulators in the posterior pituitary.

SEE NEXT PAGE

8. What is the main function of the rods in the eye?

- (a) Depth perception
- (b) Colour vision
- (c) Vision in dim light
- (d) Accommodation

9. Which **ONE** of the following diseases is strongly associated with **BOTH** cigarette smoking and excessive alcohol consumption?

- (a) Mental deterioration
- (b) Lung cancer
- (c) Heart disease
- (d) Respiratory disease

10. A student used a microscope having the lens combinations shown below.

Ocular	Objective
5X	10X
10X	40X

Using the 5X ocular and 10X objective combination the student measured the field of view to be 5 millimetres. The diameter of the highest power field of view for this microscope would be closest to

- (a) 400 micrometres.
- (b) 600 micrometres.
- (c) 5 000 micrometres.
- (d) 40 000 micrometres.

11. A scientific experiment must have a control. The control is needed to

- (a) ensure only one variable is tested at a time.
- (b) serve as a basis for comparison.
- (c) make the experiment more accurate.
- (d) prevent mistakes being made.

12. If the concentration of gases like carbon dioxide and methane in the atmosphere increases, it may

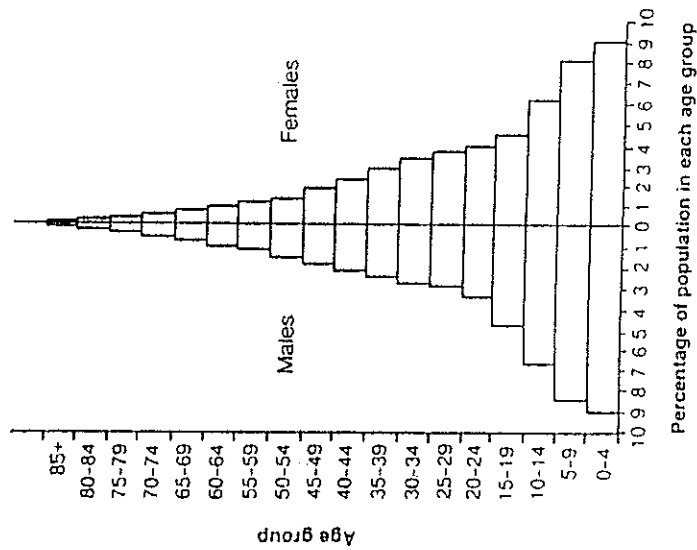
- (a) lead to the destruction of oceanic food chains.
- (b) increase the incidence of skin cancers.
- (c) increase the intensity of ultraviolet radiation reaching the Earth's surface.
- (d) change global weather patterns affecting food production.

SEE NEXT PAGE

13. Which of the following lists includes only renewable energy resources?

(a) Wind energy, solar energy and nuclear energy  
 (b) Wind energy, nuclear energy and tidal energy  
 (c) Solar energy, natural gas and tidal energy  
 (d) Wind energy, solar energy and tidal energy

14. Consider this population pyramid.



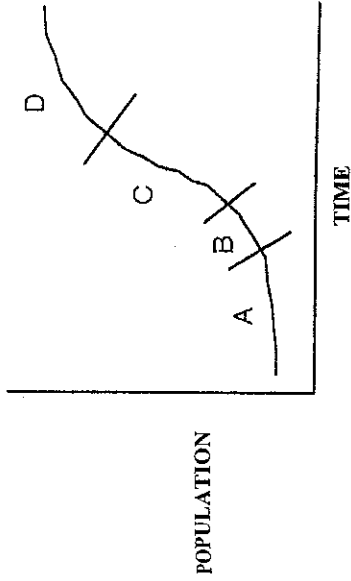
The population pyramid shows that

(a) 24.3 % of the population were males under the age of 10 years.  
 (b) 47.3 % of the population were under the age of 10 years.  
 (c) 23.4 % of the population were females under the age of 10 years.  
 (d) 34.6 % of the population were under the age of 10 years.

SEE NEXT PAGE

Questions 15 - 17 refer to the information which follows.

A small isolated island in the Pacific Ocean was first populated by several families over 100 years ago. After the initial settlement no immigration or emigration occurred. The population from the initial settlement until the present day is represented by the graph below.



15. The birth rate and death rate reach an equilibrium during the graph segment  
 (a) A.  
 (b) B.  
 (c) C.  
 (d) D.
16. The segment of the graph that shows the highest rate of population growth is  
 (a) A.  
 (b) B.  
 (c) C.  
 (d) D.
17. The segment of the graph that shows the biotic potential of the population is  
 (a) A.  
 (b) B.  
 (c) C.  
 (d) D.

SEE NEXT PAGE

18. The remains of an animal are trapped in deep mud which hardens. Over time the remains decay, leaving a cavity which preserves the shape of the animal. The type of fossil represented by the cavity is known as

(a) an impression.  
 (b) a mould.  
 (c) an artefact.  
 (d) a cast.

19. Which of the following is most likely to result from damage caused by a stroke in the cerebellum?

(a) loss of memory  
 (b) impaired motor skills  
 (c) reduced intellect  
 (d) defective vision and hearing

20. The somatic division of the peripheral nervous system is concerned with carrying nerve impulses from

(a) skeletal muscles to the brain via ascending tracts.  
 (b) the brain to internal organs via descending tracts.  
 (c) internal organs to the hypothalamus.  
 (d) the brain to skeletal muscles of the arms and legs.

21. Which ONE of the following is CORRECT?

	Structure	Sympathetic Activity	Parasympathetic Activity
(a)	Urinary Bladder	Contraction	Relaxation
(b)	Salivary Glands	Increased Secretion	Reduced Secretion
(c)	Liver	Increased Glucose Uptake	Increased Release of Glucose
(d)	Bronchioles of the Lung	Relaxation	Constriction

22. A cluster of nerve cell bodies found outside the central nervous system is known as

(a) neuroglia.  
 (b) a ganglion.  
 (c) a synapse.  
 (d) a node.

SEE NEXT PAGE

23. This question relates to the list below of seven events which occur in a human inner ear.

1. Movement of the hair cells of the Organ of Corti.
2. Movement of the round window.
3. Pressure waves in the endolymph of the cochlea.
4. Movement of the ossicles.
5. Pressure waves in the perilymph of the bony tubes.
6. Pressure relieved by the Eustachian tube.
7. Movement of the oval window.

In the human inner ear a correct sequence of events listed above that leads to hearing is

(a) 7, 5, 3, 6.  
 (b) 4, 2, 5, 1.  
 (c) 4, 7, 5, 3.  
 (d) 7, 5, 3, 1.

24. The medulla oblongata controls

(a) the osmotic concentration of the plasma.  
 (b) food and water intake.  
 (c) muscular movements of the body.  
 (d) heart rate.

25. Hormones work by

(a) acting as receptors in target cells.  
 (b) allowing enzymes to enter target cells.  
 (c) changing the activity of enzymes within target cells.  
 (d) acting as enzymes within target cells they enter.

26. This question refers to the two situations below.

SITUATION 1:	RESPONSE	LENGTH OF RESPONSE
Stretching of patellar tendon	knee jerk reflex	brief
SITUATION 2:	RESPONSE	LENGTH OF RESPONSE
Witness an accident	become shaky	long lasting

The reason for the difference in the length of the response between SITUATION 1 and SITUATION 2 is due to

(a) nerve action being fast while hormonal action may be prolonged.  
 (b) the length of the nerve pathways involved.  
 (c) sympathetic versus parasympathetic control.  
 (d) the time it takes for the adrenal cortex to respond.

SEE NEXT PAGE

27. Calcium and phosphate levels in the bloodstream are controlled by hormones secreted by the

- (a) pancreas.
- (b) parathyroid glands.
- (c) posterior pituitary gland.
- (d) adrenal glands.

28. Human adaptation to extreme cold include

- (a) an epicanthic fold, endomorphy and fat-padded cheek bones.
- (b) a high metabolic rate, ectomorphy and a long head shape.
- (c) a low metabolic rate, endomorphy and a round head shape.
- (d) an epicanthic fold, ectomorphy and light skin pigmentation.

29. Which of the following pairings of an endocrine gland with a secretory product is **INCORRECT**?

- (a) Anterior pituitary - growth hormone
- (b) Follicle - oestrogens
- (c) Pancreas - glucocorticoids
- (d) Anterior pituitary - luteinising hormone

30. Which of the following would be the best example of a kitchen midden?

- (a) A collection of prehistoric cooking implements
- (b) A deposit of empty sea shells
- (c) Charcoal remains suggesting the use of fires for cooking
- (d) An accumulation of various tools, animal and plant remains

31. Differences in body shape between human populations often represent adaptations to

- (a) environmental temperature.
- (b) ultraviolet radiation.
- (c) environmental temperature and ultraviolet radiation.
- (d) heat loss.

SEE NEXT PAGE

Questions 32 and 33 relate to hominid skull anatomy given in the table below.

A	B	C
Low forehead Projecting face	Moderately high forehead	Very high forehead Flat face
Large zygomatic arch	Large brow ridge Small zygomatic arch	Small brow ridge

32. The **CORRECT** evolutionary sequence of earliest to latest hominid skulls is

- (a) C, A, B.
- (b) B, C, A.
- (c) A, B, C.
- (d) B, A, C.

33. Which of the following is **CORRECT**?

- (a) Skull A is *Cro-magnon*, Skull B is *Australopithecus* and Skull C is *Homo erectus*
- (b) Skull A is *Homo erectus*, Skull B is *Australopithecus* and Skull C is *Cro-magnon*
- (c) Skull A is *Cro-magnon*, Skull B is *Homo erectus* and Skull C is *Australopithecus*
- (d) Skull A is *Australopithecus*, Skull B is *Homo erectus* and Skull C is *Cro-magnon*

34. In the evolution of the primates there has been a trend towards

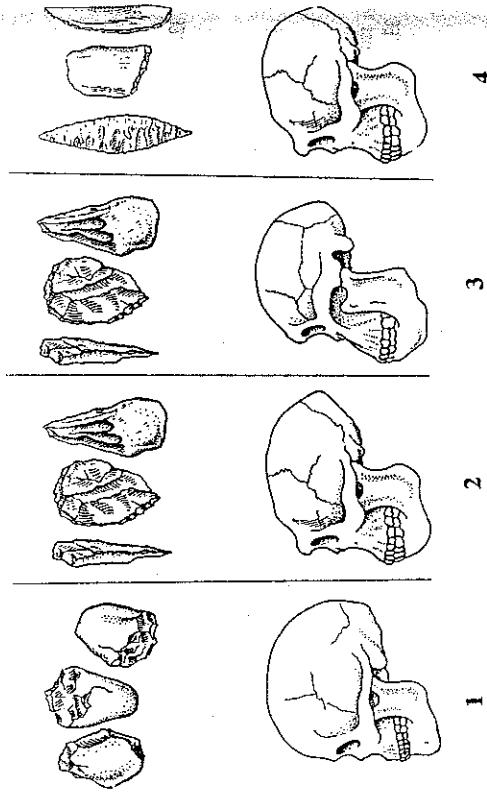
- (a) decreasing period of postnatal care.
- (b) increasing number of offspring.
- (c) increasing importance of vision.
- (d) increasing sense of smell.

35. A near complete hominid skeleton was found in East Africa in an ancient volcanic ash bed dated at 3.9 million years. Its cranial capacity was 410 cm<sup>3</sup>, and it showed little evidence of any skull crests. From the description the fossil was most likely

- (a) *Homo erectus*.
- (b) *Homo habilis*.
- (c) *Australopithecus afarensis*.
- (d) *Australopithecus robustus*.

SEE NEXT PAGE

36. This question relates to the diagram of the hominid skulls and tools below.



Which hominid (represented by its skull) is **CORRECTLY** matched with the tools manufactured by that hominid?

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

37. This question refers to the following list of physical characteristics:

- 1. Small brain size relative to body size.
- 2. Parabolic dental arcade.
- 3. Dental diastema.
- 4. Simian shelf.
- 5. Centrally placed foramen magnum.
- 6. Shortened pelvis.

Characteristics you would expect to find in a fossil Hominid would be

- (a) 1, 2 and 3.
- (b) 2, 3 and 5.
- (c) 4, 5 and 6.
- (d) 2, 5 and 6.

SEE NEXT PAGE

38. Which of the following best defines an ecosystem?

- (a) Interactions of organisms with each other and with the physical environment.
- (b) Portion of the surface of the earth where living things exist.
- (c) A community and its physical environment.
- (d) Members of the same species that inhabit a particular area.

39. This question refers to comments made about AIDS.

- 1. AIDS is caused by a virus known as HIV (Human Immunodeficiency Virus).
- 2. AIDS is "caught" rather than inherited.
- 3. The AIDS virus attacks the immune system.
- 4. Certain cancers are more common in persons affected with AIDS.

Which is **CORRECT**?

- (a) 1 and 3 only.
- (b) 1, 3 and 4 only.
- (c) 2, 3 and 4 only.
- (d) 1, 2, 3 and 4.

40. Members of a racial group are **MOST LIKELY** to

- (a) have a similar culture.
- (b) have the same skin colour.
- (c) have a high proportion of similar genes.
- (d) live in the same geographical area.

SEE NEXT PAGE

## PART II

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.

For EACH of the examples listed below underline the **type of immunity** involved.  
(NOTE THAT 2 WORDS SHOULD BE UNDERLINED IN EACH BOX)

- (a) An adult who had previously suffered with measles is again exposed to the measles virus but does not develop any symptoms of the disease.

Active OR Passive AND Artificial OR Natural

(1 mark)

- (b) An adult having been vaccinated against tuberculosis becomes immune to the disease.

Active OR Passive AND Artificial OR Natural

(1 mark)

- (c) A baby, not breast fed, is exposed soon after birth to the measles virus but does not develop any symptoms of the disease.

Active OR Passive AND Artificial OR Natural

(1 mark)

## QUESTION 41 (continued)

- (d) Explain why the baby mentioned in Question 41 (c) does not develop the symptoms of the disease.

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(2 marks)

- (e) If the baby mentioned in Question 41(c) had been breastfed it may have been more immune. Explain why.

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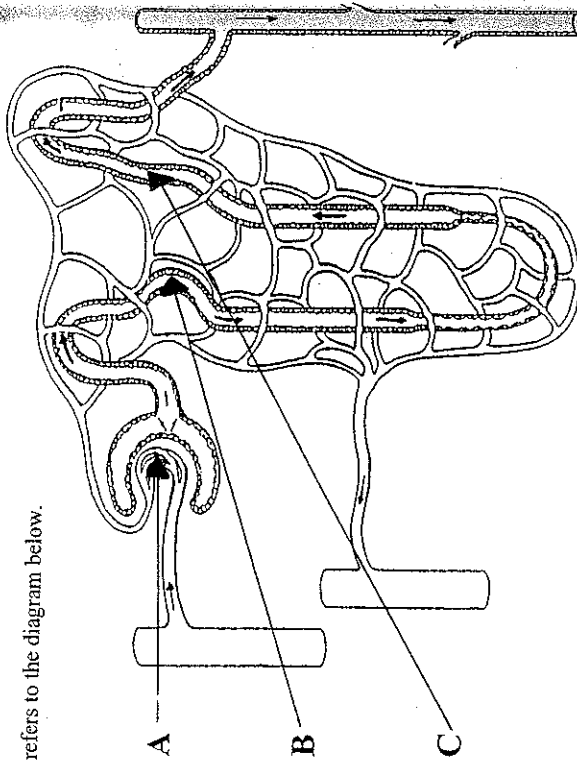
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(2 marks)



QUESTION 42

Question 42 refers to the diagram below.



Complete the table below by writing the name of each structure labelled A, B and C, then describe the function of EACH structure within the spaces provided.

STRUCTURE	FUNCTION
A	
B	
C	

(6 marks)

SEE NEXT PAGE

QUESTION 43

Complete the table below by writing the name of the most appropriate gland within the space provided.

NAME OF THE GLAND SECRETING THE HORMONE/S	FUNCTION OF THE HORMONE/S IN THE BODY
	Stimulates water reabsorption from the kidney
	Prompts the development of the corpus luteum
	Regulates sodium balance in the body
	Controls the secretion of many other glands

(4 marks)

SEE NEXT PAGE

## QUESTION 44

A group of researchers wished to compare the ability of two different treatments for relieving tension headache pain. They set up the following test procedure that ran over a six month period:

They selected 57 volunteers and divided the volunteers into three groups.

Group A: 15 persons received treatment A (a commonly used tablet).

Group B: 22 persons received treatment B (a medicated ointment applied to the temples of the volunteers).

Group C: 20 persons received treatment C (an inactive mint extract applied to the temples of the volunteers).

The volunteers were given the alternative treatments to use each time they suffered from a headache. At fixed times after the start of the treatment each volunteer recorded the severity of the headache using the following rating scale:

0 = no headache    1-2 = mild headache    3-4 = moderate headache    5 = severe headache

The results for each group were averaged and are tabulated below:

SEVERITY OF HEADACHE (AVERAGE)		
	GROUP A	GROUP B
MINUTES AFTER TREATMENT		
0	3.70	4.00
5	3.80	3.40
10	3.60	3.15
20	3.20	2.75
45	2.50	2.25
120	2.10	1.80

- (a) Graph this data on the graph sheet provided on the opposite page. (NOTE: A spare graph sheet is provided on the back of this examination booklet). (6 marks)

## QUESTION 44 (continued)

- (b) From the graph you have drawn which treatment seems to give the most rapid relief?  
\_\_\_\_\_ (1 mark)
- (c) For **Group B**, how long after beginning the treatment did it take for the headache to be reduced to a rating of 2?  
\_\_\_\_\_ (1 mark)
- (d) In this experiment what was the dependent variable?  
\_\_\_\_\_ (1 mark)
- (e) List **THREE** considerations the researchers would have needed to make in selecting the sample of volunteers so that their test could be regarded as being valid.  
1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_ (3 marks)
- (f) One variable in this experiment that was difficult to control was the severity of the pain experienced by each person before the experiment began. How was this problem overcome?  
\_\_\_\_\_ (1 mark)
- (g) The severity of the headache is listed in the table as an average. Give **TWO** reasons why was this was necessary?  
\_\_\_\_\_  
\_\_\_\_\_ (2 marks)

SEE NEXT PAGE

## QUESTION 45

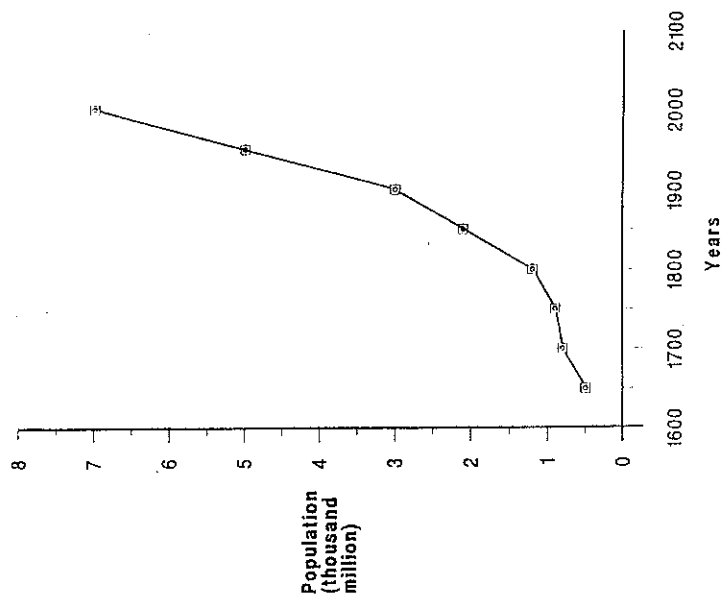
A person's metabolic rate is partly controlled by the thyroid gland. During a long period of cold conditions the metabolic rate is increased.

- (a) Name the thyroid hormone that brings about this response.  
\_\_\_\_\_ (1 mark)
- (b) Why may the body need to increase metabolic rate in cold conditions?  
\_\_\_\_\_  
\_\_\_\_\_ (1 mark)
- (c) Describe the way in which this response is controlled by the hypothalamus.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (5 marks)
- (d) Explain the mechanism that prevents an over- response of this system which would lead to the metabolic rate becoming too high.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (2 marks)

SEE NEXT PAGE

### QUESTION 46

Around the time that modern humans were emerging as a distinct species it is estimated that the human population was about one to two million, climbing slowly until the period shown by the graph below.



- (a) Name **THREE** cultural advances that are thought to have contributed towards the growth illustrated in this graph.

(3 marks)

**SEE NEXT PAGE**

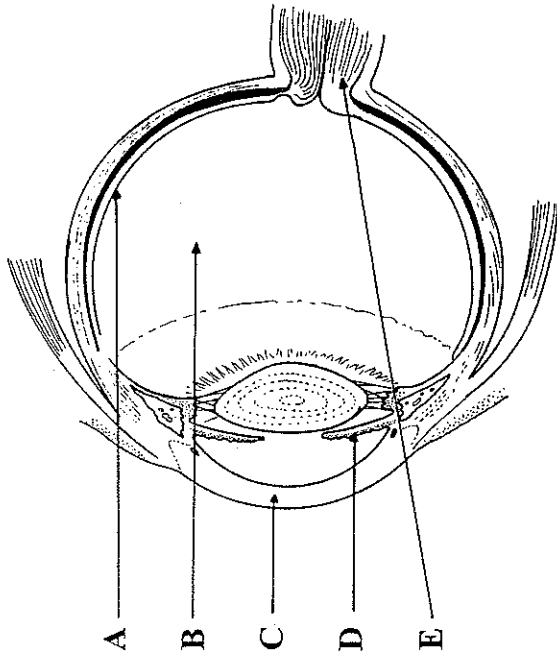
- (b) Australia, U.S., United States of America and some European nations have produced huge surpluses of agricultural produce in recent times. On the other hand starvation and malnutrition have been commonplace in some Third World countries. Give **THREE** reasons for this difference in available food supply.

(3 marks)

**SEE NEXT PAGE**

QUESTION 47

The diagram below shows components of the human eye.



(a) State the function of the structures of the eye labelled A-E.

FUNCTION	
A	
B	
C	
D	
E	

(5 marks)

SEE NEXT PAGE

QUESTION 47 (continued)

(b) After viewing a distant object, describe the mechanisms that allow the eye to focus on an object held close.

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\_\_\_\_\_

(4 marks)

(c) Describe the role of the semicircular canals of the ears in maintaining balance.

\_\_\_\_\_

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\_\_\_\_\_

(4 marks)

SEE NEXT PAGE

QUESTION 48

Question 48 refers to the list of words below.

LIST OF WORDS

autosome  
gene  
allele  
chromosome  
gamete  
trait  
karyotype  
phenotype  
genotype  
X linked  
heterozygous  
homozygous

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

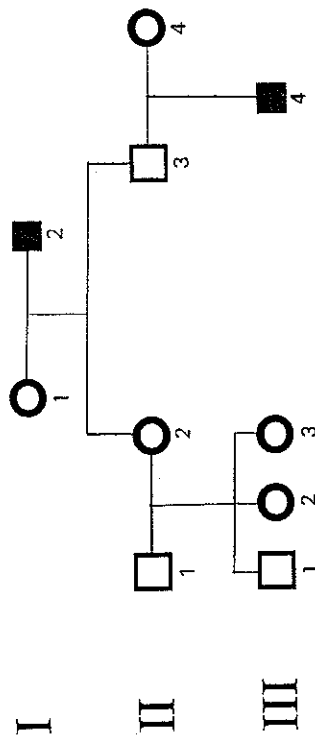
- = \_\_\_\_\_ = an alternative form of a gene.
- = \_\_\_\_\_ = the genetic makeup of an individual for a particular trait.
- = \_\_\_\_\_ = having two different alleles for a given trait.
- = \_\_\_\_\_ = the outward appearance of an organism.
- = \_\_\_\_\_ = chromosome not involved in sex determination.

(5 marks)

SEE NEXT PAGE

QUESTION 49

Question 49 refers to the pedigree below indicating haemophilia, an X-linked genetic disorder.



(a) What is the genotype of individuals

II2? \_\_\_\_\_

II3? \_\_\_\_\_

II4? \_\_\_\_\_ (3 marks)

(b) Which female/s are definite carrier/s?

\_\_\_\_\_ (1 mark)

(c) If II3 and II4 had another child, what is the probability of it being a haemophiliac?

\_\_\_\_\_ (1 mark)

SEE NEXT PAGE

QUESTION 49 (continued)

- (d) If II1 and II2 had another son what is the probability that he will be a haemophilic?

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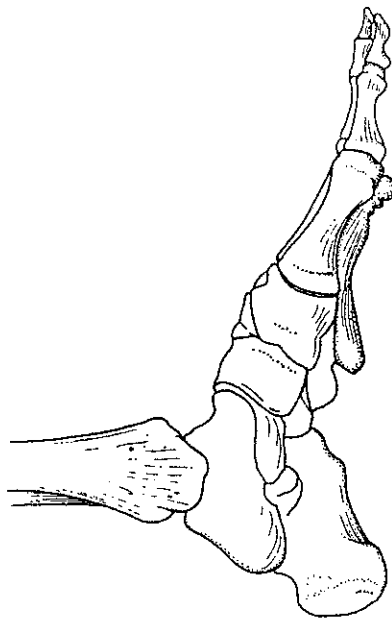
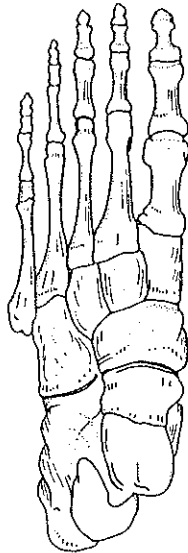
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(1 mark)

SEE NEXT PAGE

QUESTION 50

Question 50 (a) refers to the diagrams below which show top and side views of skeletal features of the human foot.



- (a) List **THREE** skeletal features of the human foot that are adaptations for efficient bipedalism.

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(3 marks)

SEE NEXT PAGE

QUESTION 50 (continued)

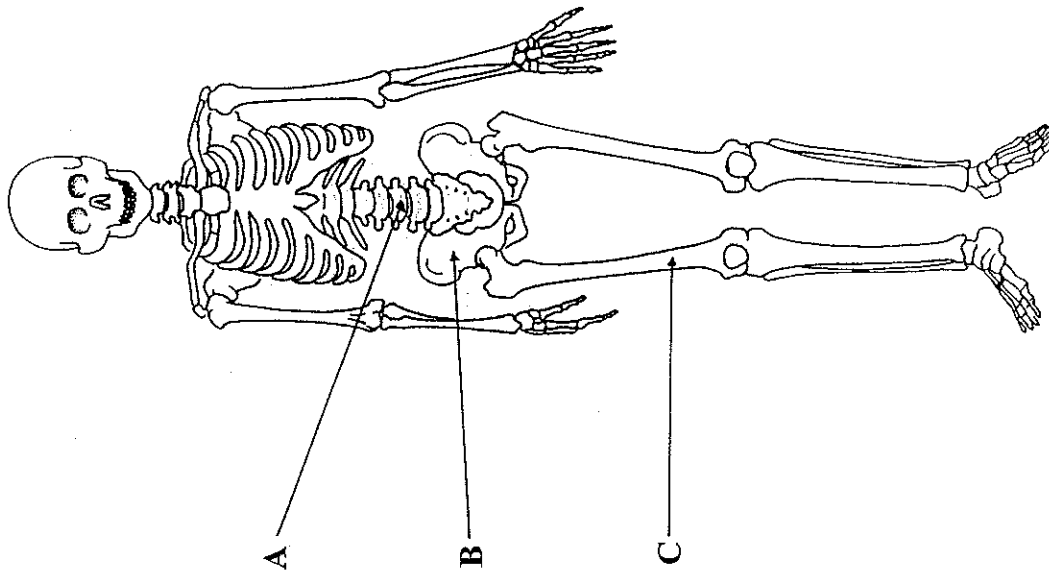
Question 50 (b) refers to the diagram on the opposite page of features of the human skeleton.

- (b) Describe how **ONE** characteristic of **EACH** of the skeletal features labelled A, B and C can be regarded as an adaptation for bipedal walking. Write your answer in the table below.

SKELETAL STRUCTURE	UNIQUE FEATURES MAKING BIPEDAL WALKING POSSIBLE
A	
B	
C	

(6 marks)

SEE NEXT PAGE



SEE NEXT PAGE



## PART III

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 following Question 54 in this booklet.

## SECTION A.

ANSWER EITHER QUESTION 51 OR QUESTION 52 - NOT BOTH.

## QUESTION 51

- (a) Destruction of the ozone shield has been a source of major concern over the past decade. Name the pollutants linked with its destruction, two sources of these pollutants and two ways its destruction may affect our well being. (5 marks)

- (b) Two common methods of dating fossils are known as

- (i) carbon-14 dating.  
(ii) potassium argon dating.

Describe how they work. In your answer, explain the limitations of each of these dating methods. (8 marks)

- (c) Describe the way of life of the Neanderthals. (7 marks)

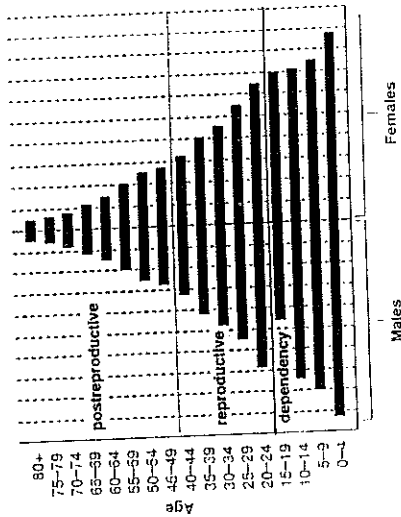
## QUESTION 52

- (a) Explain how evidence that groups of organisms may have had a common ancestor can be derived from comparative studies of

- (i) anatomy (give examples to illustrate) (3 marks)  
(ii) proteins or deoxyribonucleic acid (DNA) (3 marks)

- (b) Explain how adaptations (both physiological and behavioural) unique to the Australian Aborigine enable them to withstand both extreme cold of the desert night and extreme heat of the day. (6 marks)

The figure below indicates the population pyramid for a less developed country with age groups divided into the "dependency", "reproductive" and "post-reproductive" stages.



- (c) How would the percentage population in each of the three stages change if this country's population structure became similar to that of a developed country? (3 marks)

- (d) What factors would be responsible for the changes in the population structure of this country as it underwent this demographic transition? (5 marks)

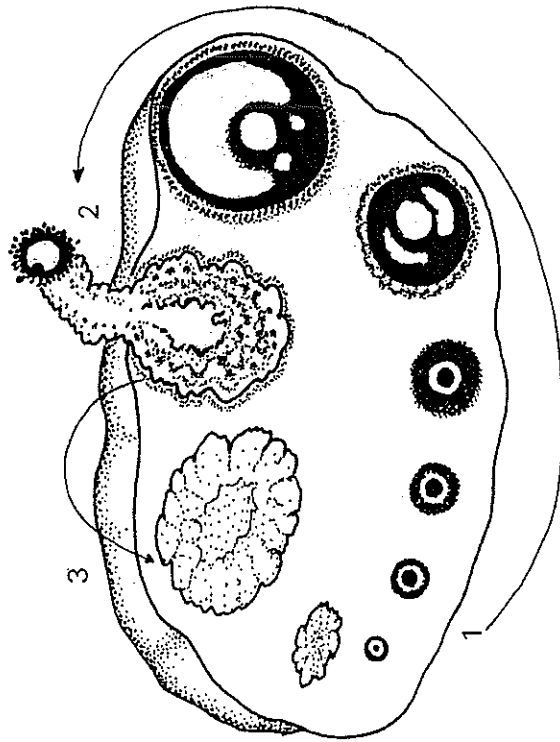
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## SECTION B.

ANSWER EITHER QUESTION 53 OR QUESTION 54 - NOT BOTH.

## QUESTION 53

Question 53 (a) refers to the diagram below illustrating a sequence of changes (shown by the numbers 1, 2 and 3) occurring within the human ovary during a normal menstrual cycle.



- (a) Describe the changes illustrated in the diagram above, then describe the role of hormones in regulating these changes. (10 marks)

- (b) Describe the passage of nerve impulses from the time a person touches a hot object to withdrawing the hand from the hot object. Include in your answer the specific components of the pathway. (10 marks)

SEE NEXT PAGE

## QUESTION 54

Homeostasis is concerned with maintaining a stable internal environment within the body.

- (a) Blood glucose (sugar) level is normally about 70-110 mg/100 mL. Explain

- (i) sources of glucose in the body.
- (ii) reasons for rising and falling blood glucose levels.
- (iii) the importance of confining blood glucose levels within these limits.
- (iv) mechanisms returning blood glucose levels to normal including the role of any hormones and their source. (12 marks)

- (b) The normal rate of the heartbeat, set by the pacemaker, is about 72 beats per minute but, during exercise, it can increase to about 200 beats per minute. Explain the mechanism that causes the heart to beat faster during exercise. (8 marks)

END OF QUESTIONS

SEE NEXT PAGE