TERTIARY ENTRANCE EXAMINATION, 1995

QUESTION/ANSWER BOOKLET

HUMAN BIOLOGY

Please place your student identification label in this box

SEA 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

TO BE PROVIDED BY THE CANDIDATE

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

Special Items: A 2B 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 THE PAPER

Part		No. of questions available	No. of questions attempted	Marks available
I	Multiple Choice	40	ALL	80
II	Diagram and Short answer questions	9	ALL	80
III	Extended answer questions	4	1 from Section A 1 from Section B	40

Total marks = 200

INSTRUCTIONS TO CANDIDATES

PART I should be answered on the separate Multiple Choice Answer Sheet. Use a '2B' 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.

AT THE END OF THE EXAMINATION

Carefully check that you have placed your Student Identification Label, and that you have written your SEA Student Number in figures and words, in spaces provided on the front cover of this Question/Answer Booklet.

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PART I

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

IN EACH QUESTION CHOOSE THE BEST ALTERNATIVE.

1. Scientists investigating the prehistory of the human species derive a lot of information from artefacts.

   Artefacts are best described as

   (a) objects deliberately made by human ancestors.
   (b) objects that have been buried by human ancestors.
   (c) evidence of the former presence of human ancestors.
   (d) evidence of the culture of human ancestors.

2. *Homo erectus* is considered to have been

   (a) the earliest hominid to use stone tools.
   (b) responsible for Palaeolithic cave paintings in Europe.
   (c) the first hominid to deliberately use fire.
   (d) almost entirely dependent on plants for food.

3. Scientists investigating a cave found items which were dated as follows:

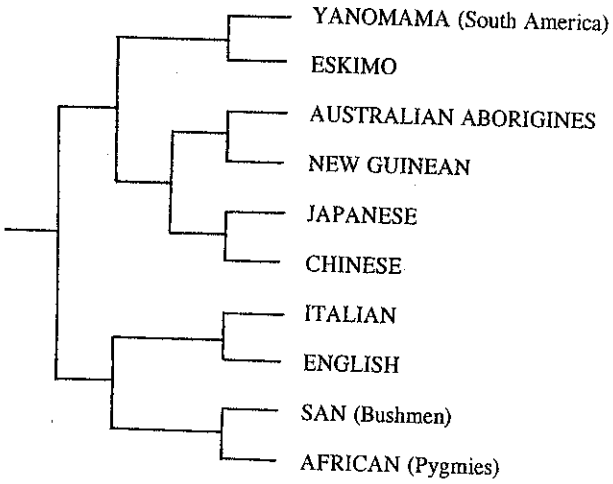
   A. cave paintings which were found to be 19 500 years old by dating the pigments using accelerator mass spectrometry radiocarbon dating.
   B. part of a thigh bone that was dated to 16 000 BP using thermoluminescence.
   C. a hand axe that was deeper in the deposit than the thigh bone and was assumed to be about 2000 years older than the bone.
   D. a fragment of cranium found in the same stratum as the thigh bone, but containing less fluorine, indicating that it was younger than the thigh-bone.
   E. a finely chipped stone spear point that appeared to date from the Solutrean cultural period.

   Decide whether each of the items has been given an absolute date or a relative date, then select from the alternatives below the correct description of the dates given.

	Absolute Dates	Relative Dates
(a)	A, B	C, D, E
(b)	A, B, C	D, E
(c)	D, E	A, B, C
(d)	A, B, E	C, D

SEE NEXT PAGE

4. The diagram below shows the relationships between a number of different human populations which were determined using a small number of inherited characteristics.



Which one of the following inferences may be made from the relationships shown above?

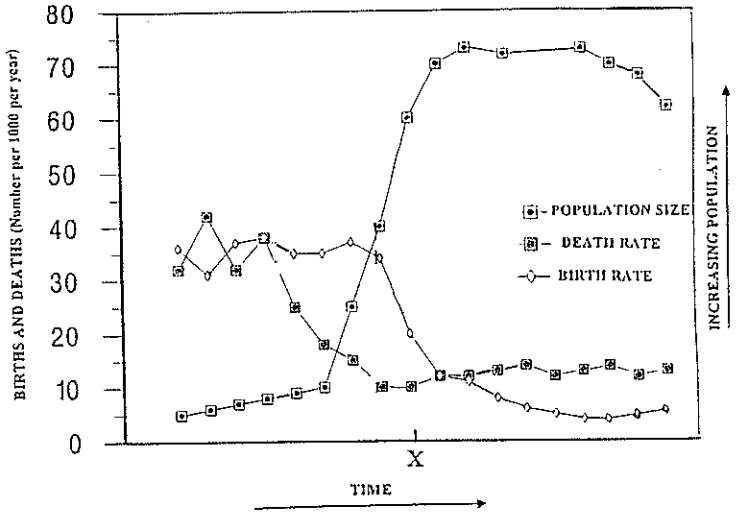
(a) Australian aborigines are more closely related to the Chinese than they are to the Japanese.
(b) New Guineans are more closely related to Eskimoes than they are to the Italians.
(c) The most closely related populations are the Italians and the English.
(d) Bushmen and African pygmies are more closely related than Japanese and Chinese.

5. The table below shows some gases classified according to their polluting effects. Which classification is **correct**?

	Greenhouse effect	Smog	Destruction of the ozone layer
(a)	Carbon dioxide and methane	Oxides of nitrogen	Chlorofluorocarbons
(b)	Carbon dioxide and methane	Ozone	Hydrocarbons
(c)	Carbon dioxide and chlorofluorocarbons	Hydrocarbons	Methane
(d)	Chlorofluorocarbons	Ozone	Carbon dioxide and methane

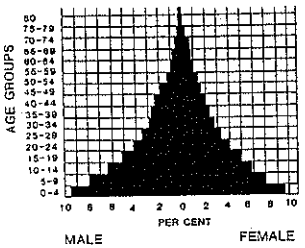
SEE NEXT PAGE

6. The graph below shows changes that occur in a country's birth rate, death rate and population during its development.

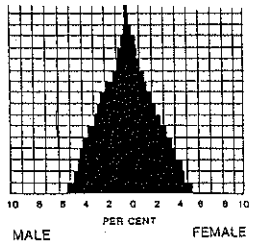


Which of the population pyramids below represents a country whose development is at time X on the graph?

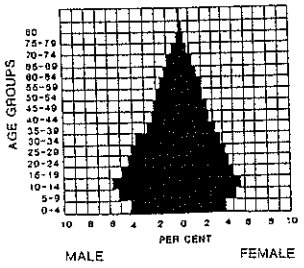
(a)



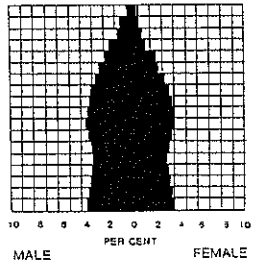
(b)



(c)



(d)



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7. The origin of human populations can be traced to common ancestral groups

(a) on the basis of inherited similarities and differences.
(b) by considering the geographical area occupied by each population.
(c) by investigating similarities and differences in language between populations.
(d) by considering inheritance and culture together.

8. The statement that "the hominids evolved during the Miocene epoch (5 to 24 million years ago)" is

(a) a hypothesis.
(b) an observation.
(c) an inference.
(d) a theory.

9. At present the Neanderthals are considered by most scientists to be

(a) a type of *Homo erectus*.
(b) members of the same species as modern humans.
(c) a variation of *Homo habilis*.
(d) a separate species within the genus *Homo*.

10. Which one of the following pairings shows the commonly accepted time of entry of Aborigines into Australia and the place where they migrated from?

	Time of entry (years BP)	Migration from
(a)	at least 50 000	New Guinea
(b)	200 000	Africa
(c)	at least 50 000	South East Asia
(d)	200 000	Polynesia

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11. Which factors, from the following lists, were involved in the evolution of human races?

A. mutations
B. genetic variation
C. gene flow between populations
D. climatic differences
E. acquired characteristics

(a) A and B only
(b) B and E only
(c) A, B and C only
(d) A, B and D only

12. Reduction in the concentration of ozone in the upper atmosphere is likely to lead to

(a) rising sea levels.
(b) increased incidence of cataracts and skin cancers.
(c) increased incidence of skin cancers and rising sea levels.
(d) increased incidence of skin cancers and cataracts and rising sea levels.

13. Before the time of European settlement the Aborigines of South Western Australia had lighter skins and were more stocky in build than the Aborigines of northern regions. These physical differences were probably due to

(a) natural selection.
(b) differences in diet.
(c) random genetic drift.
(d) interbreeding.

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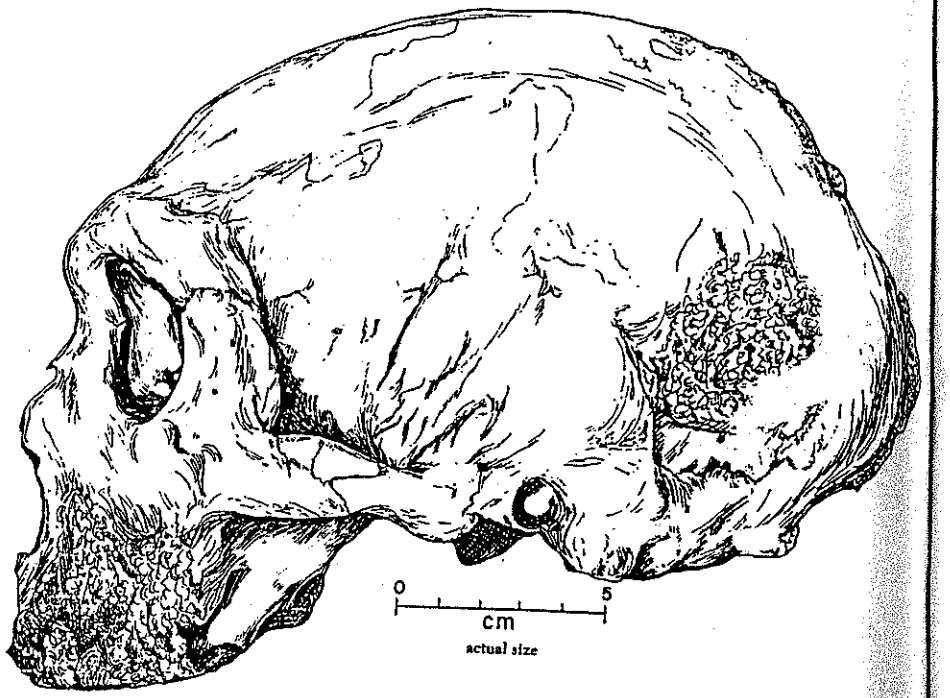
14. The diagram below illustrates a fossil skull that was discovered in a limestone cave near the Italian village of San Felice Circeo in 1939.



Which one of the following conclusions can be made based on the features shown on the skull?

(a) A primitive feature of this skull is the small cranial capacity.
(b) Prognathism of the jaw indicates that the skull could be classified as *Homo erectus*.
(c) The forehead recedes too much for this skull to be classified as modern *Homo sapiens*.
(d) Since the teeth are not present it is not possible to classify the skull accurately.

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15. Which one of the following characteristics is common to members of the same racial group?

(a) They live in the same geographical area.
(b) They have a high proportion of alleles in common.
(c) They speak a common language.
(d) They have similar skin colour.

16. Which of the following statements **BEST** describes homeostasis?

(a) Homeostasis maintains the core body temperature at a constant level.
(b) Homeostatic mechanisms make the body independent of external changes.
(c) Thirst and hunger are homeostatic mechanisms.
(d) Homeostasis ensures that cells always function at their optimum level.

17. A function of cerebrospinal fluid (CSF) is to

(a) conduct some nerve impulses in the brain and spinal cord.
(b) enable synaptic transmission of nervous messages.
(c) carry nutrients and oxygen to cells of the brain and spinal cord.
(d) maintain the cells of the brain and spinal cord at constant temperature.

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18. A patient was admitted to hospital after complaining of blurred vision. An examination indicated damage to part of the patient's brain. This evidence is most likely to indicate damage to the

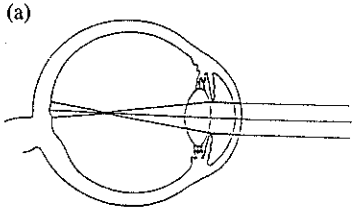
(a) cerebrum.
(b) hypothalamus.
(c) thalamus.
(d) cerebellum.

19. The rods and cones of the eye are located in the

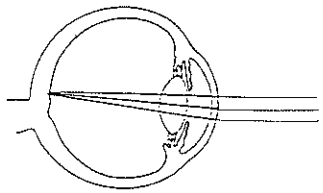
(a) sclera.
(b) retina.
(c) cornea.
(d) choroid.

20. The diagrams below show bending of light rays by the lens of four different eyes. Which eye demonstrates myopia (short-sightedness)?

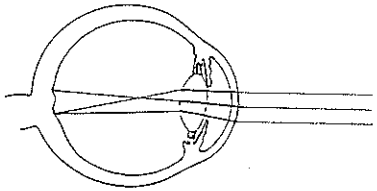
(a)



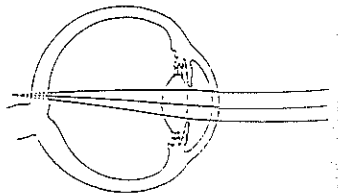
(b)



(c)



(d)



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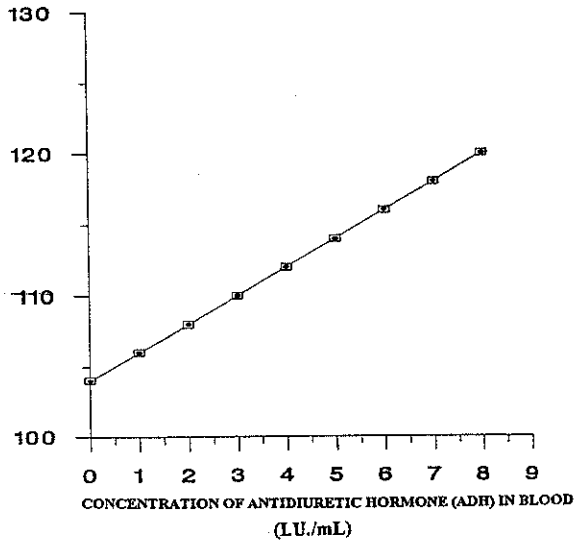
21. The graph below shows the relationship between the concentration of antidiuretic hormone in the blood (on the x-axis) and some variable on the y-axis in a normal healthy individual.



What variable is represented by the Y-axis?

(a) Tubular reabsorption of water
(b) Glomerular filtration rate
(c) Urine output
(d) Renal blood flow

22. Which of the following hormones is secreted by the posterior pituitary gland?

(a) Prolactin
(b) Oxytocin
(c) Aldosterone
(d) Thyrotrophin (thyroid stimulating hormone)

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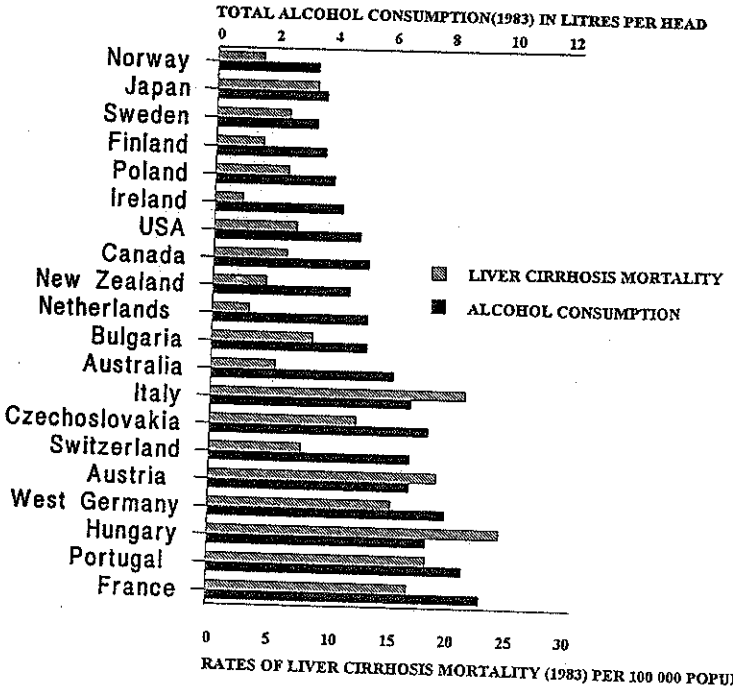
23. The graph below shows the known total alcohol consumption in various countries and the incidence of chronic liver disease in 1983.



Based on the information in the graph, which one of the following statements is **correct**?

(a) People living in Hungary have a higher mortality rate from cirrhosis than those of France, and consume more alcohol.
(b) People living in Portugal have a lower mortality rate from cirrhosis than those of West Germany, and consume more alcohol.
(c) People living in Hungary have a higher mortality rate from cirrhosis than those of Italy, but consume less alcohol.
(d) People living in New Zealand have a higher mortality rate from cirrhosis than those of Ireland, and consume more alcohol.

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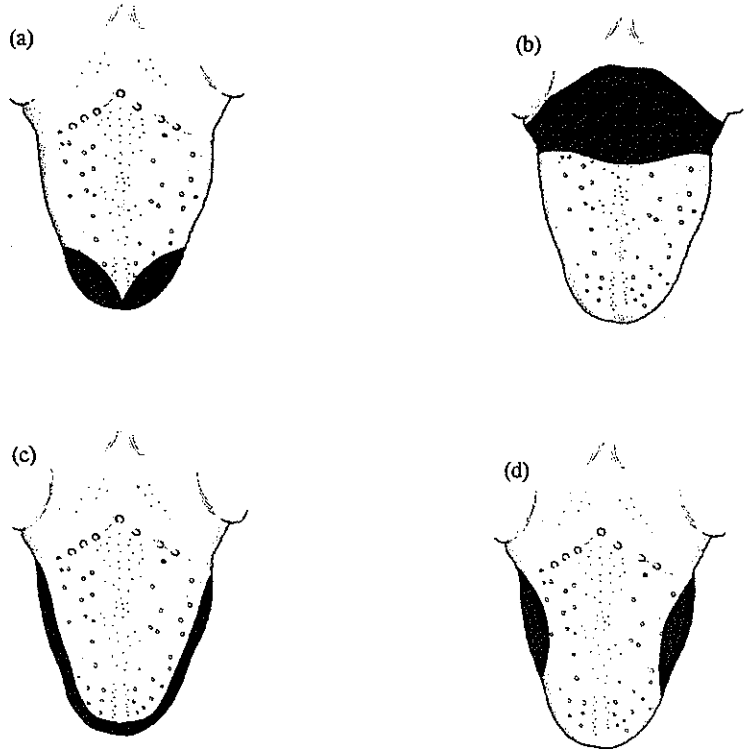
24. The diagrams below represent the distribution of taste receptors **(shaded black)** on the surface of the tongue. Which shaded region in the diagrams represents the area of greater taste sensitivity to sweet substances on the surface of the tongue ?



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25. Which of the following is an essential component of all reflex arcs?

(a) A myelin sheath
(b) A synapse
(c) A Schwann cell
(d) The brain

26. Which structure controls the amount of light entering the eye?

(a) The pupil
(b) The lens
(c) The iris
(d) The ciliary muscle

27. In terms of its effect on the human body alcohol is

(a) a stimulant only.
(b) a hallucinogen and stimulant.
(c) a depressant only.
(d) a hallucinogen and depressant.

28. Cigarette smoke contains many harmful substances. The substance in cigarette smoke **MOST LIKELY** to cause cancer is

(a) tar.
(b) nicotine.
(c) carbon monoxide.
(d) carbon dioxide.

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29. The heart's pacemaker (SA node) is located at the junction of the

(a) superior vena cava and the right atrium.
(b) inferior vena cava and the right atrium.
(c) right atrium and the right ventricle.
(d) left atrium and the left ventricle.

30. A substance was added to a culture dish containing several species of live bacteria. Some time later the culture dish was examined and very few live bacteria remained. The substance must have been

(a) a vaccine.
(b) an antibody.
(c) an antibiotic.
(d) an antigen.

31. The thymus is located

(a) just below the tongue.
(b) above the larynx.
(c) in the thorax (chest).
(d) in the oral cavity behind the palate.

32. T cells mature in

(a) the thymus and secrete antibodies.
(b) bone marrow and secrete antibodies
(c) the thymus and do not secrete antibodies.
(d) bone marrow and do not secrete antibodies.

33. Which of the following temperatures is closest to normal human body temperature?

(a) 35.2°C
(b) 36.8°C
(c) 38.6°C
(d) 39.2°C

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34. For which of the matings below would you expect equal proportions of homozygous and heterozygous offspring?

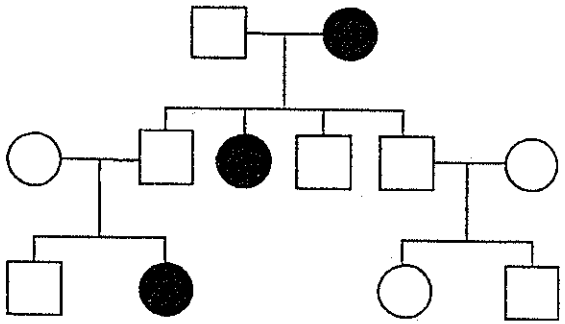
A. RR X Rr
B. Rr X Rr
C. rr X Rr
D. rr X rr

(a) A only
(b) A and B only
(c) A,B and C only
(d) A,B,C and D

35. The degree of similarity between species can be determined by comparing the

(a) type and sequence of nitrogen bases in similar proteins from different species.
(b) type and sequence of amino acids in similar proteins from different species.
(c) type and sequence of amino acids in DNA from different species.
(d) amount of DNA in cells taken from different species.

36. The black symbols in the pedigree below show the occurrence of a particular trait among members of a family.



In the pedigree shown above what is the likely mode of inheritance of the trait ?

(a) Autosomal dominant
(b) Autosomal recessive
(c) X-linked dominant
(d) X-linked recessive

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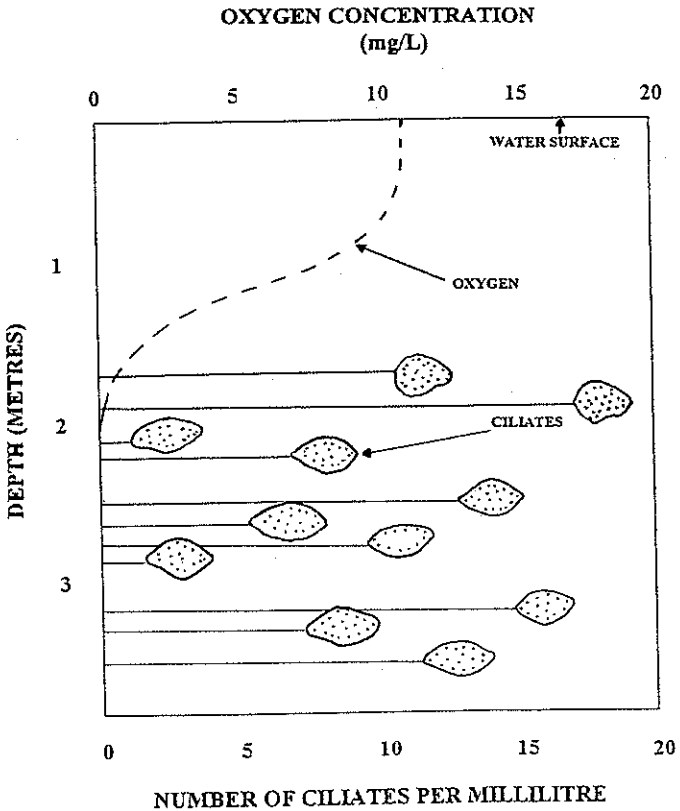
37. Question 37 refers to the diagram below indicating the number of pathogenic ciliates below the surface of a pond and the concentration of oxygen at various depths below the surface of the pond.



Which one of the following conclusions can be made from the information presented in the graph?

(a) Oxygen concentration at a depth of 1.5 metres is half the concentration of oxygen at the surface.
(b) Numbers of ciliates increases with increasing depth below the water surface.
(c) Oxygen concentration must be very low before ciliates can survive.
(d) The independent variable is the number of ciliates.

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38. Question 38 refers to the list below.

From the list below, select the events involved in body temperature regulation during physical work in a hot environment.

A. Body temperature rises above normal.

B. Body temperature rises towards normal.

C. Body heat is conserved.

D. Body heat is generated by muscle activity.

E. Nervous system signals blood vessels in skin to dilate and sweat glands to secrete.

F. Nervous system signals skin blood vessels to constrict and sweat glands to remain inactive.

G. Increase in metabolic rate.

H. If body temperature continues to drop, nervous system signals muscles to contract involuntarily.

I. Body heat is lost by radiation, conduction, convection and evaporation.

J. Body temperature drops towards normal.

K. Body temperature drops below normal.

Which is the correct sequence of events?

(a) A, D and F only
(b) A, D, E, G, I and J only
(c) C, D, E, G, I and K only
(d) D, E, I and K only

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39. Question 39 refers to the following statements about heat loss from the body.

A. The primary means of body heat loss is radiation. The mechanism of heat loss by radiation is similar to heat loss from a lamp bulb.

B. Heat is lost from the body by conduction into the seat of a chair when a person sits down.

C. Heat is lost by conduction to air molecules that contact the body. This heated air moves away from the body and is replaced by cooler air. This circulation of air over a warm surface is called convection.

Which of the statements above describes heat loss from the body?

(a) A only
(b) A and B only
(c) A and C only
(d) A,B and C

40. A function of adrenaline is to

(a) stimulate glycogenolysis in the liver and muscle.
(b) inhibit glycogenolysis in the liver and muscle.
(c) stimulate glycogenolysis in muscle only.
(d) inhibit glycogenolysis in muscle only.

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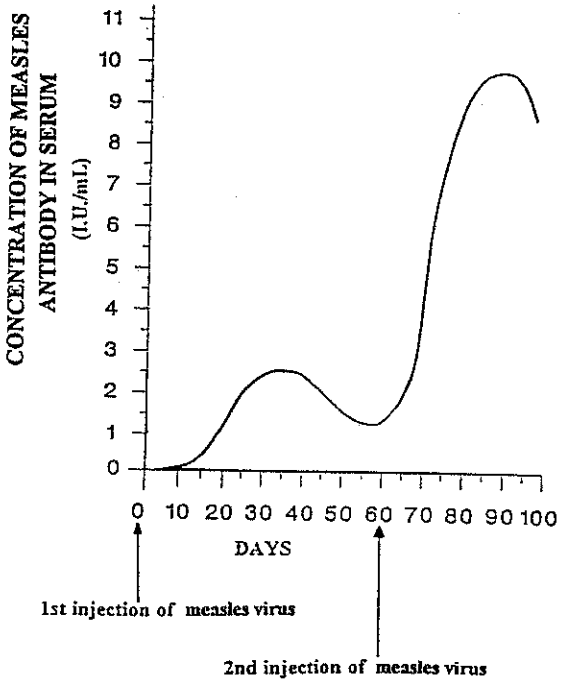
PART II

Answer **ALL** questions in the spaces provided with each question. Write your answers in blue or black ball point or ink pen.

QUESTION 41.

Question 41 refers to the graph below which shows changes in the concentration of antibodies following two identical injections of the measles virus.



(a) Explain why several days elapsed before antibodies against the measles virus were detected in the blood after the first injection.

(2 marks)

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QUESTION 41 (continued).

(b) Why does the concentration of antibody after the second injection of the measles virus increase more rapidly and reach higher levels, than after the first injection ?

(2 marks)

(c) Explain the basis of immunisation (vaccination). Make reference to the graph in your answer.

(4 marks)

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QUESTION 41 (continued).

(d) Would the shape of the graph be the same if the mumps virus was used in the second injection instead of the measles virus ? Explain your answer.

(3 marks)

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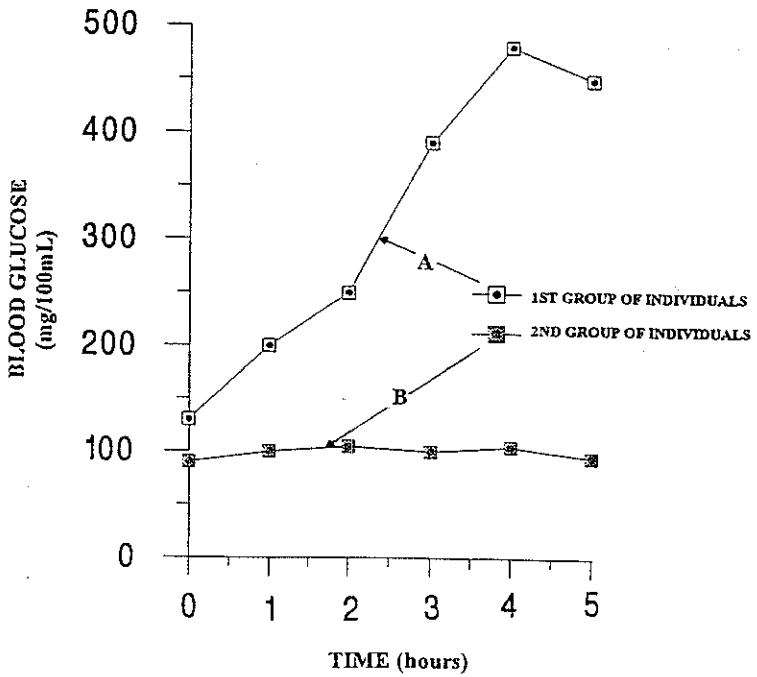
QUESTION 42.

People suffering with the disease diabetes mellitus do not secrete enough insulin.

The members of two groups of individuals (one group consisting of people suffering from diabetes mellitus and the other of people without the disease) each consumed 100 grams of glucose. Their blood glucose concentration was measured for a period of 5 hours. The average results of this test for each group are shown in the graph below.



(a) In the graph above which curve (A or B) represents the group of individuals that suffer diabetes mellitus ?

(1 mark)

SEE NEXT PAGE

QUESTION 42 (continued).

(b) What is the action of insulin ?

_____

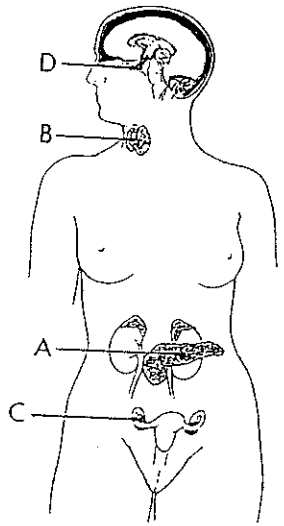
(1 mark)

(c) Name the organ that secretes insulin.

_____

(1 mark)

The diagram below refers to part (d) of Question 42.



(d) Write down the label on the diagram of the human body that correctly indicates the location of the organ that secretes insulin.

ANSWER: _____

(1 mark)

SEE NEXT PAGE

QUESTION 42 (continued).

(e) If the level of glucose in a healthy person's blood drops below normal explain how the liver can quickly return levels to normal again. Your response should name any hormone involved and state the organ secreting that hormone.

_____

_____

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_____

(4 marks)

SEE NEXT PAGE

QUESTION 43.

(a) State a human characteristic that is an example of monogenic inheritance.

_____

(1 mark)

(b) State a human characteristic that is an example of polygenic inheritance.

_____

(1 mark)

(c) Explain the difference between monogenic and polygenic inheritance and the effect on the resulting phenotype.

_____

_____

_____

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_____

(4 marks)

SEE NEXT PAGE

QUESTION 43 (continued).

(d) Phenylketonuria is an inherited disease that affects males and females in approximately equal proportions. Explain how a male child inherits phenylketonuria (PKU) if both his parents are themselves unaffected by the disease.

_____

_____

_____

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_____

_____

(5 marks)

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QUESTION 44.

A student proposed the hypothesis that the time taken to respond to a sound stimulus is less in darkness than in normal daylight. The student measured the response time of a number of people in darkness.

(a) What would be a suitable control for this experiment?

(1 mark)

(b) Why is a control necessary in an experiment?

(2 marks)

(c) Why are such experiments performed on a number of subjects instead of just one or two?

(1 mark)

(d) For the test on response time name **FOUR** variables that would have to be kept constant for the experimental test and the control test.

(4 marks)

SEE NEXT PAGE

QUESTION 44 (continued).

(e) Explain why one of the variables that you listed in your answer to (d) has to be controlled.

(1 mark)

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QUESTION 45.

(a) What is a fossil?

(1 mark)

(b) Of all the millions of human ancestors that must have lived in the past, only relatively little fossil evidence has been found. Give **FOUR** reasons why this should be so.

(4 marks)

(c) Explain how stratigraphy can be used to compare the the age of fossils from different localities.

(3 marks)

SEE NEXT PAGE

QUESTION 45 (continued)

(d) Give **TWO** reasons why stratigraphy is not always a reliable way of determining the age of a fossil.

(2 marks)

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QUESTION 46.

Radiocarbon dating has a number of serious limitations.

(a) Explain why only organic material can be dated using radiocarbon dating.

(2 marks)

(b) Explain why organic material older than about 75 000 years cannot be dated using radiocarbon dating.

(2 marks)

Radiocarbon dating does have a big advantage over fluorine dating.

(c) Explain the advantage of radiocarbon dating compared with fluorine dating.

(3 marks)

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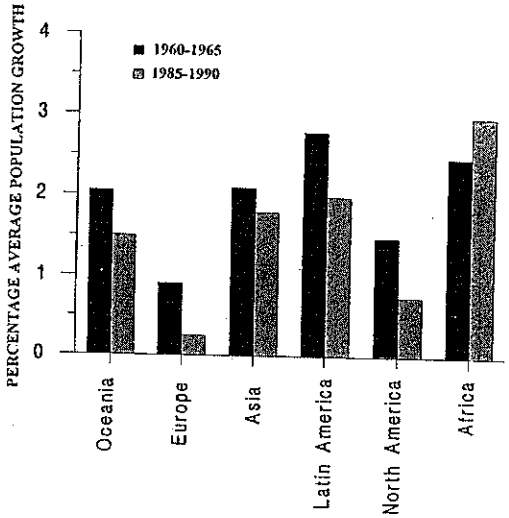
QUESTION 47.

The graph below shows average annual population growth rates for 1960 to 1965 and 1985 to 1990 in a number of geographical areas. Use the graph to answer parts (a), (b) and (c) of this question.



(a) Did world population growth rate increase or decrease between the two sets of data shown in the graph?

(1 mark)

(b) Is the trend in growth rates the same for all parts of the world? Explain how you arrived at your answer

(2 marks)

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QUESTION 47 (continued).

(c) What geographical area of the world has experienced the greatest difference in growth rate between 1965 and 1990?

(1 mark)

(d) List **THREE** advantages of recycling materials such as glass, aluminium and paper.

(3 marks)

(e) Name **TWO** renewable sources of energy that could be utilised more effectively in the future.

(2 marks)

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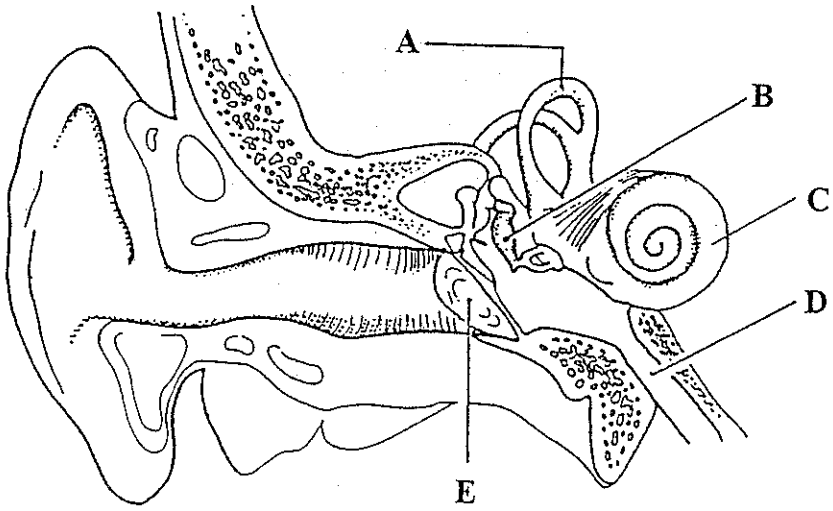
QUESTION 48.

Question 48 refers to the diagram of the ear below.



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QUESTION 48 (continued).

In the diagram on the previous page, name the structures represented by the labels **A** to **E**. What is the function of each structure? Write your answers in the table below.

(10 marks)

Label	Name of Structure	Function
A		
B		
C		
D		
E		

SEE NEXT PAGE

QUESTION 49.

(a) What are the 2 divisions of the autonomic nervous system?

_____

_____

(2 marks)

(b) Which division can cause an increase in heart rate?

_____

(1 mark)

(c) Name **ONE** division and state its effect on the amount of saliva secreted by salivary glands.

_____

(1 mark)

(d) Name **ONE** division and state its effect on movement of the intestines.

_____

(1 mark)

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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 53 in this booklet.

SECTION A.

ANSWER EITHER QUESTION 50 OR QUESTION 51 - NOT BOTH.

QUESTION 50.

Describe the differences between a pongid (such as a chimpanzee) **and** a hominid (such as a human) with respect to the following skeletal structures:

skull
jawbone
spinal column
pelvis

Relate the differences you have described to any differences between the stance, locomotion and way of life of pongids and hominids.

(20 marks)

QUESTION 51.

(a) Describe the chromosome content of a normal human body cell and of female and male gametes. Using your descriptions explain why a fertilised human egg cell has an approximately 50 per cent chance of developing into a male and a 50 per cent chance of developing into a female.
(8 marks)

(b) Some characteristics are said to be sex-linked (X-linked). Explain why these characteristics are described as sex-linked and give an example of a human disorder that is sex-linked.
(4 marks)

(c) If the allele determining a sex-linked disorder is recessive explain how it is possible for a female not to have the disorder but to have sons who have the disorder and sons who do not have the disorder.
(4 marks)

(d) If the allele determining a sex-linked disorder is dominant, a father who has the disorder would always produce daughters who have the disorder. Explain this inheritance pattern.
(2 marks)

(e) Explain how it would be possible to have a pattern of inheritance in which **only** the males could inherit a characteristic and females could never have the characteristic.
(2 marks)

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SECTION B.

ANSWER EITHER QUESTION 52 OR QUESTION 53 - NOT BOTH.

QUESTION 52.

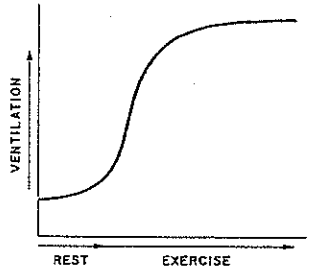
The table below represents the percentage (%) of blood flow to different organs at rest and during exercise.

	Rest		Exercise	
	Percent	Flow (ml/min)	Percent	Flow (ml/min)
Heart	4	200	4	1000
Brain	14	700	3	700
Kidneys	22	1100	1	250
Liver	27	1350	1	300
Muscle	15	750	80	20,000
Bone	5	250	1	250
Skin (cool weather)	6	300	6	1500
Other tissues	7	350	4	1000
Total	100	5000	100	25,000

(a) Explain the reason for the changes in blood supply to each of these organs (shown in the table) and the total change that occurs during exercise.

(9 marks)

The graph below represents changes in ventilation (rate and depth of breathing) that occur when a person begins to exercise.



(b) Describe the mechanisms involved in increasing the rate and depth of breathing during exercise.

(11 marks)

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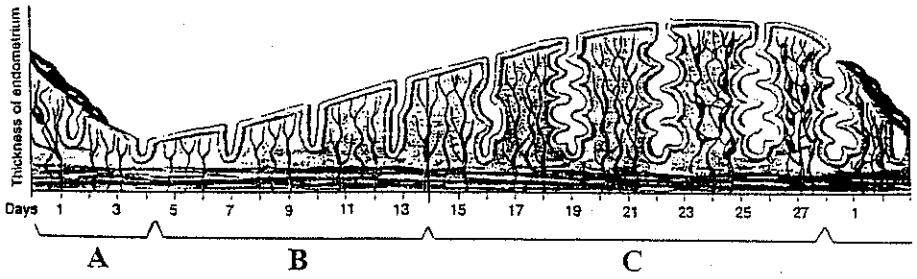
QUESTION 53.

The diagram below shows structural changes that occur in the uterus during a normal menstrual cycle in a human female. Changes also occur in the ovary during this cycle.



(a) Describe the structural changes that occur in both the ovary and uterus during the stages labelled A, B and C.

(6 marks)

(b) Name the pituitary and ovarian hormones involved in bringing about these changes and describe the role of each hormone.

(8 marks)

(c) With reference to one of the pituitary hormones explain the concept of feedback loops.

(6 marks)

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END OF QUESTIONS

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