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TERTIARY ENTRANCE EXAMINATION, 1993

QUESTION/ANSWER BOOKLET

HUMAN BIOLOGY

Please place one of your student identification labels 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 comprising

PART I	Pages 3-19
PART II	Pages 20-33
PART III	Pages 34-35
Space for rough work	Pages 36-37
Spare graph sheets	Pages 38-39

Separate Multiple Choice Answer Sheet
Standard Answer Book
Paper Binder

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

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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INSTRUCTIONS TO CANDIDATES

PART I Questions 1-40 80 marks
This part consists of multiple choice questions, which should be answered on the Separate Multiple Choice Answer Sheet.
USE A '2B' PENCIL.
DO NOT USE A BALL POINT OR INK PEN.

PART II Questions 41-50 80 marks
This part consists of ten (10) diagram and short answer questions. These MUST be answered in the spaces provided in this Question/Answer Booklet.
Write your answers in blue or black ball point or ink pen.
DO NOT WRITE ANY ANSWERS TO PART II QUESTIONS IN THE STANDARD ANSWER BOOK.

PART III Questions 51-54 40 marks
This part consists of four (4) extended answer questions.
Answer ONE question from Section A and ONE question from Section B.
The answers for PART III should be written in the Standard Answer Book in blue or black ball point pen 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 the spaces provided on the front cover of this Question/Answer Booklet and Standard Answer Book(s).

At the end of the examination, attach the Standard Answer Book to the back of your Question/Answer Booklet with the paper binder provided.

SEE PAGE 3

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. A connector neuron in the spinal cord would be considered to be part of the

   (a) autonomic nervous system.
   (b) central nervous system.
   (c) peripheral nervous system.
   (d) somatic nervous system.

2. Which ONE of the following would be a "fight or flight response" brought about by the sympathetic division of the autonomic nervous system?

   (a) Decreased heart rate.
   (b) Decreased sweat secretion.
   (c) Increased movement of stomach and intestines.
   (d) Increased release of glucose from the liver.

3. Thyroxine stimulates

   (a) the thyroid gland.
   (b) most cells of the body.
   (c) the hypothalamus.
   (d) the anterior lobe of the pituitary.

4. During the second half of the human ovarian cycle the corpus luteum secretes

   (a) oestrogens and progesterone.
   (b) oestrogens and follicle stimulating hormone.
   (c) luteinising hormone and follicle stimulating hormone.
   (d) luteinising hormone and progesterone.

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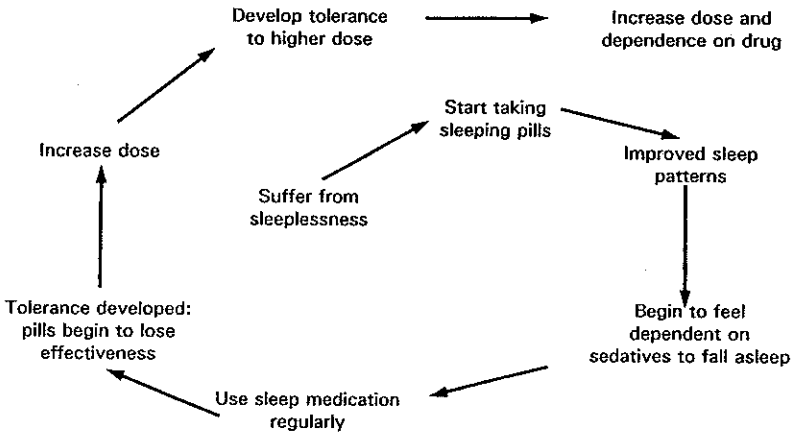
5. The point where a nervous impulse is transferred from a neuron to a muscle fibre is called the

(a) synapse.
(b) neurotransmitter.
(c) motor end plate.
(d) interneuron.

Question 6 refers to the diagram below.



6. The diagram shows that

(a) drugs should not be used for relief from sleep disorders.
(b) only sedatives can lead to drug tolerance and dependence.
(c) drugs can provide long-term relief from sleep disorders provided the dose is gradually increased.
(d) drugs should be used only for short-term treatment of sleep disorders.

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Question 7 refers to the information given about three drugs - 1, 2 and 3.

Drug 1 - Moderate risk of physical and psychological dependence, produces relaxation and reduces anxiety, impairs coordination.
Drug 2 - High risk of physical and psychological dependence, produces relaxation and reduces anxiety, relieves pain.
Drug 3 - High risk of physical and psychological dependence, reduces tension, increases risk of cardiovascular disease.

7. Which **ONE** of the following could **correctly** identify the drugs according to the descriptions given above?

	Drug 1	Drug 2	Drug 3
(a)	Alcohol	Nicotine	Heroin
(b)	Heroin	Alcohol	Nicotine
(c)	Nicotine	Heroin	Alcohol
(d)	Nicotine	Alcohol	Heroin

Question 8 refers to the following processes

Amino acids ——> Deaminated amino acids
+
Ammonia ——> Urea

8. The above processes occur mainly in the

(a) kidney.
(b) liver.
(c) muscles.
(d) pancreas.

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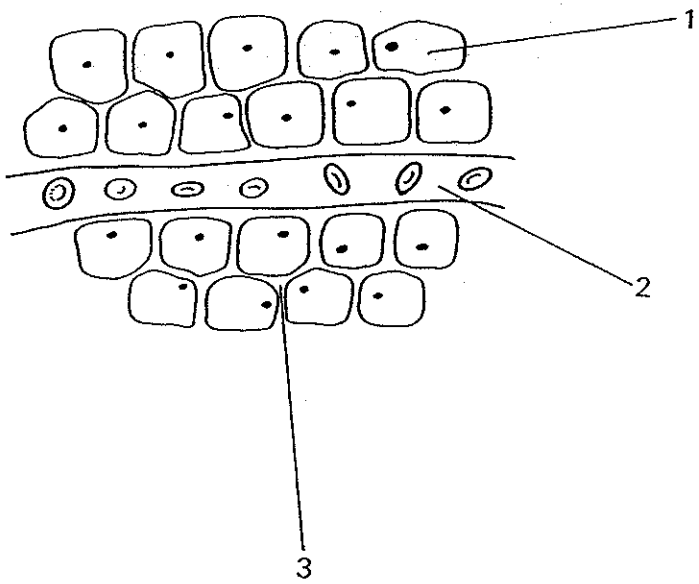
Question 9 refers to the diagram below.



9. Of the parts indicated

(a) 1 is cytoplasm, 2 is plasma and 3 is tissue fluid.
(b) 1 is cytoplasm, 2 is lymph and 3 is tissue fluid.
(c) 1 is tissue fluid, 2 is plasma and 3 is lymph.
(d) 1 is lymph, 2 is tissue fluid and 3 is cytoplasm.

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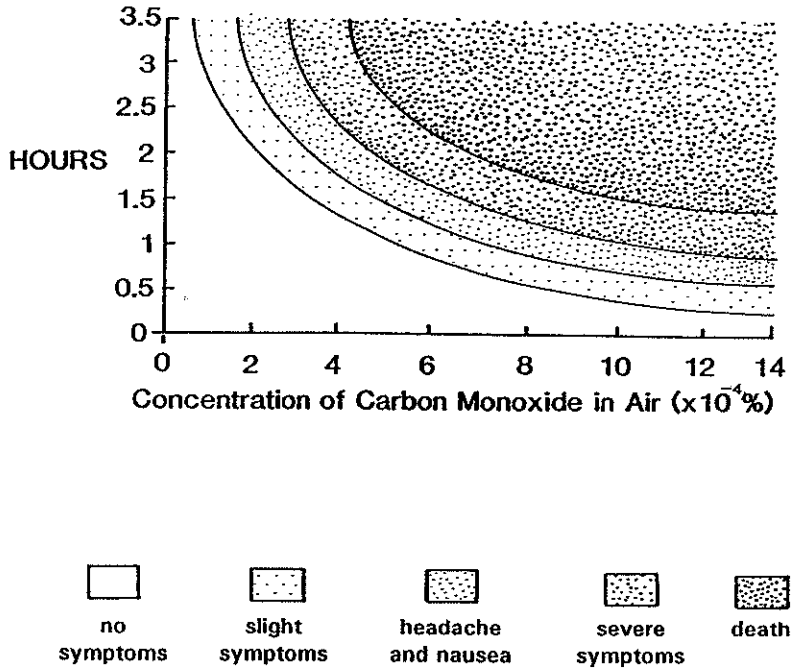
Question 10 refers to the graph below indicating the effect on humans of exposure to carbon monoxide.



10. Which **ONE** of the following statements is correct, based on the information in the graph?

(a) Concentrations of carbon monoxide less than 1.5×10^{-4}% do not affect humans.
(b) If the concentration of carbon monoxide is more than 7×10^{-4}% then death can occur in two hours.
(c) Although higher concentrations of carbon monoxide kill more quickly, fewer deaths occur at higher concentrations.
(d) More deaths occur over a longer period of time at lower carbon monoxide concentrations.

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11. A student was using a microscope to examine a blood smear. With a 10X ocular (eyepiece) and a 10X objective lens the student was able to count 64 cells in the field of view. The student then changed to a 5X ocular and a 40X objective. Approximately how many cells would now be seen in the field of view?

    (a) 16.
    (b) 32.
    (c) 64.
    (d) 128.

12. Some stone tools were found buried in the floor of a cave. It could be possible to determine the

    (a) absolute age of the tools by radiocarbon dating.
    (b) relative age of the tools by radiocarbon dating.
    (c) absolute age of the tools by their depth in the cave floor.
    (d) relative age of the tools by their depth in the cave floor.

13. If the level of adrenaline in the blood decreased then

    (a) glycogen breakdown in the liver would increase.
    (b) glycogen breakdown in the liver would decrease.
    (c) glucose breakdown in the liver would increase.
    (d) glucose breakdown in the liver would decrease.

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14. The term race is used to describe a population of *Homo sapiens*. Which of the following statements about a race is **CORRECT**?

    (a) The gene pool of a race is completely different from those of other races.
    (b) A race is a pure breeding population, within which gene frequencies remain constant
    (c) A race is a population, with a distinct gene pool, but capable of gene exchange with other races.
    (d) The gene frequencies within a race change only through natural selection.

15. A naked person sitting in a closed room at 22° C would lose heat mainly by

    (a) convection.
    (b) radiation.
    (c) conduction.
    (d) evaporation.

16. In a cross between a black and a white guinea pig, all members of the F1 generation are black. The F2 generation is made up of approximately 3/4 black and 1/4 white offspring. If two F2 white guinea pigs are mated, and a large number of offspring produced, what is the likely colour of the offspring?

    (a) All white.
    (b) All black.
    (c) 3/4 white and 1/4 black.
    (d) 1/2 white and 1/2 black.

17. The following conditions are all inherited :

    (1) Phenylketonuria (PKU).
    (2) Huntington's disease.
    (3) Duchenne muscular dystrophy.

    Which of these diseases would become evident during childhood?

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

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18. When two people of different skin colours mate, their offspring's colour is usually halfway between the parents' skin colours. This is an example of

(a) polygenic inheritance.
(b) random genetic drift.
(c) sex linked inheritance.
(d) natural selection.

19. The disease variegate porphyria is relatively common in Afrikaans populations of South Africa but rare in the other races. Its inheritance can be traced back to two Dutch settlers who arrived in South Africa in the 17th century. The incidence of this disease in the Afrikaners is an example of

(a) the Hardy-Weinberg law.
(b) the founder effect.
(c) natural selection.
(d) random genetic drift.

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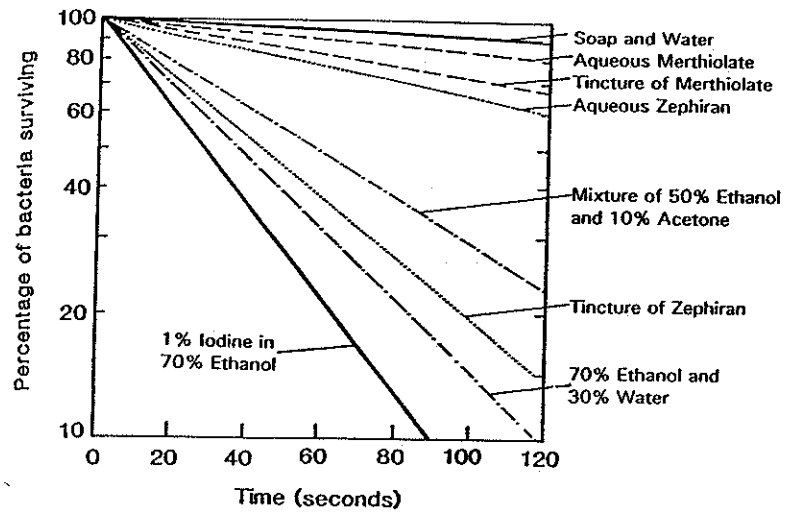
Questions 20, 21 and 22 refer to the following graph demonstrating the effectiveness of various antiseptics.



20. The most effective antiseptic is :

(a) 70% Ethanol and 30% Water.
(b) Soap and Water.
(c) 1% Iodine in 70% Ethanol.
(d) Mixture of 50% Ethanol and 10% Acetone.

21. The antiseptic which kills 50% of the bacteria in one minute is :

(a) Tincture of Zephiran.
(b) Mixture of 50% Ethanol and 10% Acetone.
(c) 70% Ethanol and 30% Water.
(d) 1% Iodine in 70% Ethanol.

22. Which of the antiseptics would take approximately three minutes to kill 90% of the bacteria?

(a) Tincture of Zephiran.
(b) Mixture of 50% Ethanol and 10% Acetone.
(c) 70% Ethanol and 30% Water.
(d) 1% Iodine in 70% Ethanol.

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23. The basic reason for ecosystem decay is that

(a) natural vegetation is cleared for agriculture.
(b) little recycling of matter occurs.
(c) pollution occurs with the development of urban areas.
(d) land degradation occurs due to over clearing and over stocking.

24. Radiocarbon dating depends on the assumption that

(a) radioactive carbon in the atmosphere does not decay.
(b) plants take in radioactive carbon instead of normal carbon.
(c) the rate of formation of radioactive carbon in the atmosphere is equal to the rate of decay.
(d) animals do not metabolise compounds containing radioactive carbon.

25. The body of a human that was discovered was estimated to be at least 6000 years old. Skin and other soft tissues were all very well preserved but the bones were not preserved. It is likely that the body was found in

(a) a very dry desert region.
(b) the ice of a glacier.
(c) volcanic ash.
(d) wet, acid soil.

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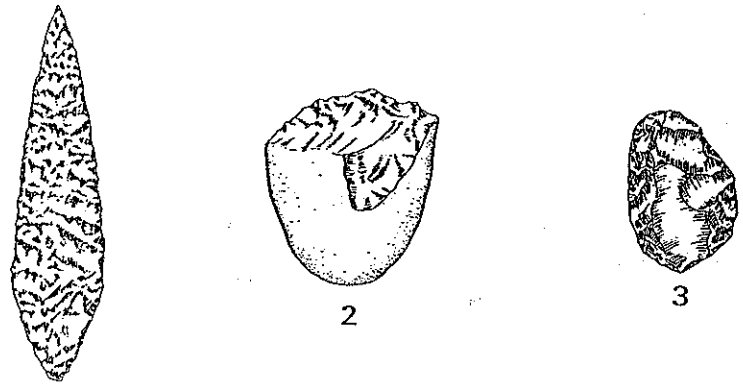
Question 26 refers to the diagram below showing three different stone tools.



26. Which of the following is the **CORRECT** match of tool type with human ancestor?

	Tool 1	Tool 2	Tool 3
(a)	Cro-magnon	*Homo erectus*	*Australopithecus*
(b)	Cro-magnon	*Australopithecus*	*Homo erectus*
(c)	*Homo erectus*	Cro-magnon	*Australopithecus*
(d)	*Homo erectus*	*Australopithecus*	Cro-magnon

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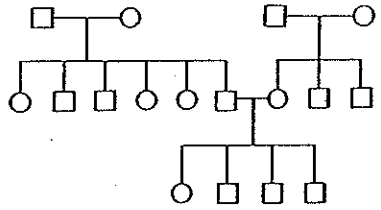
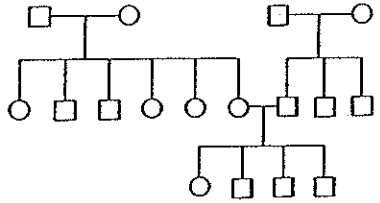
27. A man had two older brothers and three older sisters. He married a woman who had two younger brothers. The couple had four children, a girl and three boys. Which of the following pedigrees **CORRECTLY** represents the families described?

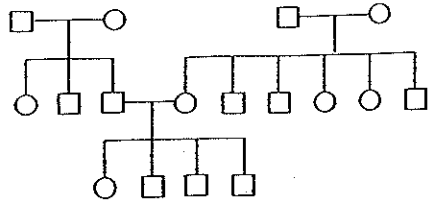
(a)



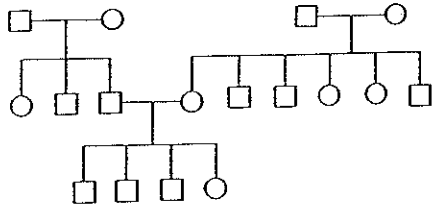
(b)



(c)



(d)



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28. Which of the following statements is/are **CORRECT**?

1. Natural selection can occur if there is variation within a population.
2. Mutations are the only source of variation.
3. Variation is greater within a reproductively isolated population than in one where interbreeding occurs with other groups.

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

29. Which of the following statements is **CORRECT**?

As an isolated population evolves

(a) all unfavourable alleles will be lost.
(b) mutations will occur to suit the population to any environmental changes.
(c) there will be a greater variety of alleles in the population.
(d) the population will have a higher proportion of favourable alleles.

30. Which of the following statements is **CORRECT**?

(a) *Dryopithecus* first appeared in the Pliocene.
(b) *Homo sapiens* first appeared in the Pleistocene.
(c) Australopithecines first appeared in the Miocene.
(d) The genus *Homo* first appeared in the Pliocene.

31. The first human populations began to practise agriculture about

(a) 4 - 6 000 years ago.
(b) 10 - 12 000 years ago.
(c) 18 - 20 000 years ago.
(d) 25 - 30 000 years ago.

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32. Which of the following is a **CORRECT** statement about the ABO blood group system?

(a) Frequencies of the A, B and O alleles do not vary between races.
(b) The Rhesus blood group system is independent of the ABO blood group system.
(c) Each individual possesses three alleles A, B and O for the ABO blood group.
(d) Each person belongs to either the A, B or O blood group.

33. Which of the following **CORRECTLY** describes a kitchen midden?
An accumulation of

(a) artefacts.
(b) fossils.
(c) remnants of human activity.
(d) ancient hearths.

34. The island of New Guinea is occupied mainly by members of which **ONE** of the following geographical races?

(a) Micronesian.
(b) Polynesian.
(c) Melanesian.
(d) Asiatic.

35. Which of the following statements about an individual with an endomorphic somatotype are **CORRECT**?

1. Low surface to volume ratio.
2. High surface to volume ratio.
3. Best adapted to a cold environment.
4. Best adapted to a hot environment.

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

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Question 36 refers to the table below.

MODE of Transport	GGE per passenger per kilometre
Electric Rail	130 units
Bus	94 units
Car	207 units

The table above shows predicted data of greenhouse gas emission (GGE) for Perth in 2001.

The data suggest there is an advantage, with respect to greenhouse gas emission, in using electric rail rather than cars for our mode of transport. Suggested reasons for this advantage could be :

1. electric rail entices people out of cars due to its attraction in speed and comfort.
2. people using rail incorporate a number of trips for shopping or social purposes into the one rail trip.
3. usage of the rail service would cause land use patterns to concentrate around stations and hence travel distances are reduced.
4. for every passenger kilometre transferred to rail there is one passenger kilometre less for cars.

36. Which of the above suggestions would be **CORRECT**?

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

37. All the main adaptations for erect posture and bipedalism evolved in

(a) *Homo erectus.*
(b) *Homo habilis.*
(c) Australopithecines.
(d) Neanderthal man.

SEE NEXT PAGE

38. Some human characteristics have developed by cultural evolution, others by biological evolution. A list of human characteristics is shown below.

1. Tool making ability
2. Skin colour
3. Blood group
4. Body shape
5. Food sharing
6. Home base adaptation
7. Ear wax type

Which of the following **CORRECTLY** classifies the above characteristics?

	Cultural evolution	Biological evolution
(a)	1, 4, 5, 6	2, 3, 7
(b)	3, 4, 5	1, 2, 6, 7
(c)	2, 6, 7	1, 3, 4, 5
(d)	1, 5, 6	2, 3, 4, 7

39. An epicanthic fold :

(a) forms a ridge on the skin of the finger that contributes to the fingerprint.
(b) is a common characteristic of members of the African race.
(c) protects the eye from cold winds, frost and UV radiation.
(d) makes speech sounds possible in some primates.

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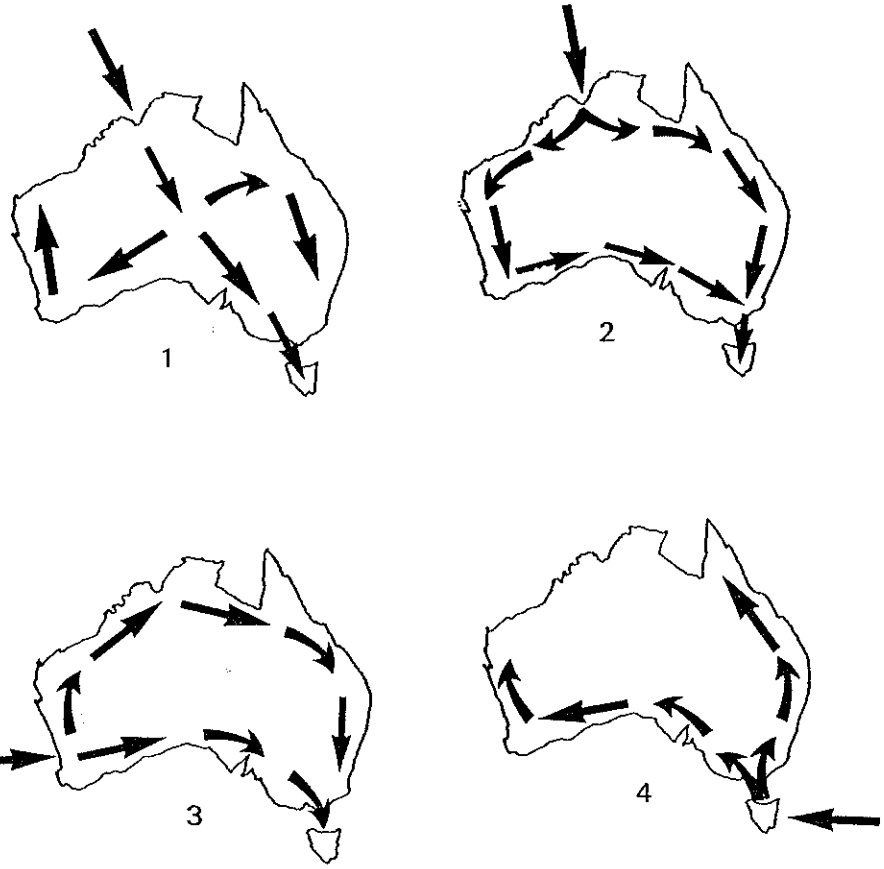
Question 40 refers to the 4 diagrams below.



40. Which of the diagrams above **CORRECTLY** shows the commonly accepted entry point, and path of migration of the Aborigines that colonised Australia?

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

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PART II

Answer **ALL** questions in the spaces provided with each question. **DO NOT** answer questions from this section in the answer booklet intended for your essay answers.

41. Pathogenic organisms can gain access to the body through the structures listed below. Briefly explain **ONE** way in which each is protected against the entry of microorganisms.

(a) Stomach

(b) Eye

(c) Trachea

(d) Ear

(8 marks)

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42. A swimmer having completed ten lengths of an Olympic sized swimming pool found that his breathing rate had increased remarkably. After several minutes his breathing rate had returned to normal.

(a) What two changes in the swimmer's blood caused the increase in breathing rate? (2 marks)

(b) Where is the respiratory centre that regulates breathing rate? (1 mark)

(c) Name two structures from which the respiratory centre receives information. (2 marks)

(d) Name two structures to which the respiratory centre sends information. (2 marks)

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43. (a) What is a pathogen?

(b) Describe the process of phagocytosis.

(c) What is the function of a memory cell in the immune system?

(6 marks)

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44. (a) If a person with normal vision looks at a distant object and then looks at something close, changes take place in the eye. Explain how the eye changes to enable both the distant and close objects to be seen clearly. (4 marks)

(b) Explain why most people need to wear glasses for reading when they reach the age of about 40 or 50 years. (3 marks)

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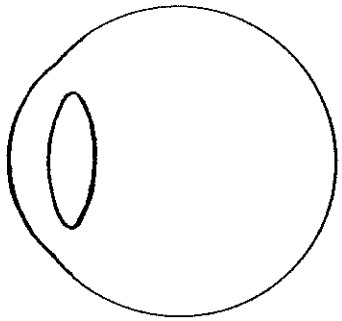
44. (Continued)

(c) On the outline diagram of the eye (below) draw light rays to show why a person with short sight (myopia) cannot see distant objects clearly. (2 marks)



(d) Describe how the eye adjusts to the change in light intensity when a person moves from a dimly lit room into bright sunlight. (2 marks)

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45. (a) Humans stand erect and are bipedal. List **FOUR** features of the human vertebral column and pelvis that make upright stance possible.

(4 marks)

(b) List **FOUR** ways in which the bones of the human foot differ from those of a pongid.

(4 marks)

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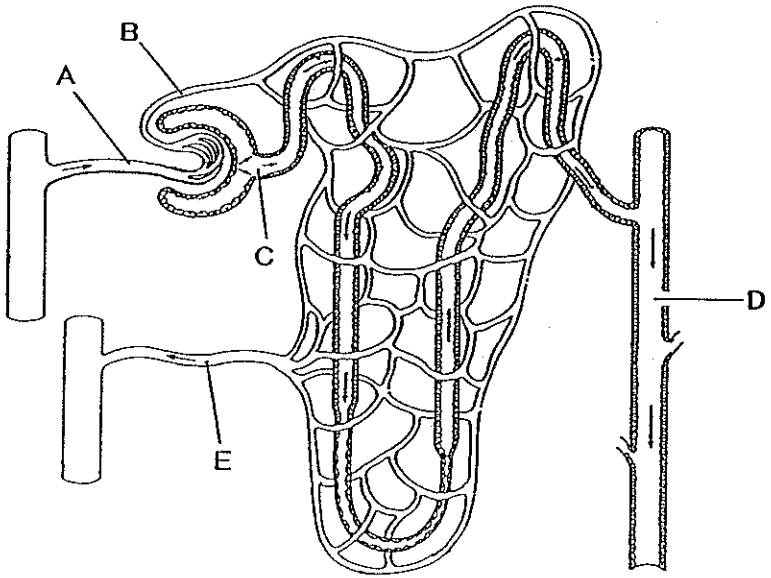
Question 46 refers to the diagram below of the kidney nephron and associated blood vessels.



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46. (a) What is the difference between the blood in vessel A and the blood in vessel B. (2 marks)

(b) What is the difference between the blood in vessel B and vessel E. (2 marks)

(c) What is the difference between the fluid at C and the fluid at D. (2 marks)

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NOTE : If you make an error put a line through this page. Spare grids are provided at the back of this exam booklet.

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47. The table below indicates the percentage of a country's total population that are males and females in age groups ranging from 0-4 years up to 85 and over.

	Per cent of total population	
Age Group (years)	Male	Female
0-4	4.0	3.5
5-9	4.0	3.5
10-14	3.5	3.5
15-19	4.5	4.0
20-24	4.0	4.0
25-29	4.5	4.0
30-34	4.0	4.0
35-39	3.5	4.0
40-44	3.5	3.5
45-49	3.0	2.5
50-54	2.5	2.5
55-59	2.5	2.0
60-64	2.0	2.0
65-69	1.5	2.0
70-74	1.5	1.5
75-79	1.0	1.5
80-84	0.5	1.0
85 and over	0.5	0.5

(a) On the graph paper provided on the opposite page draw a population pyramid for that country. (6 marks)

(b) Has this population undergone demographic transition? With reference to the population pyramid you have drawn give TWO reasons for your answer. (3 marks)

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48. Some gases have a major impact on our environment which has been termed the "greenhouse effect". Name **TWO** such gases and explain how these gases bring about the "greenhouse effect". (5 marks)

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49. A substance contained in human saliva is able to break down starch to sugar. A researcher observed that the substance did not break down starch when diluted with tap water.

(a) Propose **ONE** hypothesis to account for this observation. (1 mark)

(b) Describe a simple experiment that you could perform to test your hypothesis. (5 marks)

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49.(Continued)

(c) What is the independent variable in your experiment? (1 mark)

(d) What is the dependent variable in your experiment? (1 mark)

(e) If your hypothesis is correct what results would you expect from your experiment? (1 mark)

(f) If your experimental results did not support your hypothesis, what would be the next step in your investigations? (1 mark)

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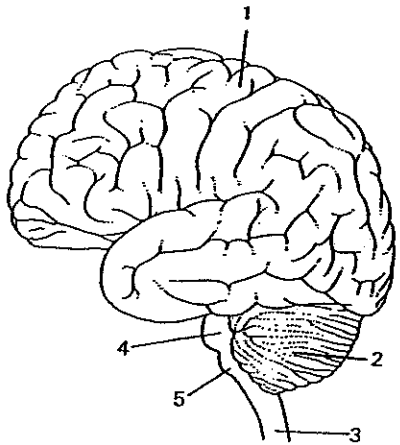
50. The diagram below shows a section through the human brain.



In the table below name the structures labelled 1 to 5 on the diagram and state **ONE** function of each. (10 marks)

STRUCTURE	NAME OF STRUCTURE	FUNCTION OF STRUCTURE
1		
2		
3		
4		
5		

SEE NEXT PAGE

PART III

Answer **ONE** question from **SECTION A** and **ONE** question from **SECTION B**. Write your answers in the **SEPARATE STANDARD ANSWER BOOK**. Illustrate your answers with diagrams where appropriate. Up to **TWO MARKS** may be deducted for poorly structured answers ie answers in point form or diagrams not explained in the text of your answer. **DO NOT WRITE YOUR ANSWERS IN PENCIL.**

SECTION A

ANSWER EITHER QUESTION 51 OR QUESTION 52 - NOT BOTH.

51. Primates show a number of evolutionary trends which are associated with the characteristics below. Describe each of the trends then explain **TWO** reasons why each of these trends has been an important aspect of human evolution.

    Forward facing eyes.
    Flexibility of the thumb.
    Central foramen magnum.
    Dentition.
    Brain complexity.

    (20 marks)

    OR

52. Duchenne type muscular dystrophy is an X-linked disease. Describe the inheritance of this disease. Explain the meaning of, and use each of the following terms in your answer.

    Genes.
    Heterozygous and Homozygous.
    Recessive and Dominant.
    Genotype and Phenotype.
    Autosomes.
    X and Y Chromosomes.

    (20 marks)

SEE NEXT PAGE

SECTION B

ANSWER EITHER QUESTION 53 OR 54 - NOT BOTH.

53. Explain what is meant by homeostasis of body fluids and its importance to normal body functioning. Describe the steady state control system (negative feedback system) that regulates the water content of body fluids. Your answer should include a description of any hormonal and/or nervous regulation involved. Explain the meaning of, and use each of the following terms in your answer.

    Stimulus.
    Response.
    Receptor.
    Effector.
    Modulator.
    Feedback.

    (20 marks)

    OR

54. If a person experienced a sudden drop in environmental temperature, describe how the body would detect this change and the mechanisms which would ensure that body temperature remains normal. In your answer make reference to each of the following.

    Thermoreceptors.
    The hypothalamus.
    Thyroxine.
    Physiological responses.
    Behavioural responses.

    (20 marks)

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END OF QUESTIONS