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GOVERNMENT OF WESTERN AUSTRALIA

CURRICULUM COUNCIL

**TERTIARY ENTRANCE EXAMINATION, 1997**

**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 | 10 | ALL | 80 |
| III | Extended answer questions: A | 2 | 1 | 20 |
| | B | 2 | 1 | 20 |

Total marks = 200

## INSTRUCTIONS TO CANDIDATES

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

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

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

SEE NEXT PAGE

# HUMAN BIOLOGY TERTIARY ENTRANCE EXAMINATION 1997

## QUESTION SHEET FOR PART III

**Extended Answers (40 marks)**

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

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### SECTION A.

**ANSWER EITHER QUESTION 51 OR QUESTION 52 – NOT BOTH.**

### QUESTION 51

(a) Characteristics like haemophilia are said to be sex-linked. Explain how sex-linked characteristics are inherited.

(6 marks)

(b) Describe three lines of evidence that have been used to support the idea that humans have evolved from pre-existing life forms.

(6 marks)

(c) Techniques for dating rocks may give a relative or an absolute age. Explain the difference between these terms and describe **one** example of each of the techniques used in giving (i) relative age and (ii) absolute age.

(8 marks)

### QUESTION 52

(a) Skeletal remains of a fossil present in East African sediments consisted of a single complete femur, the left half of a pelvis and a lower jawbone. Scientists agreed that these three remains were definitely hominid. For each of these remains suggest at least three features that would have helped them to establish this classification?

(10 marks)

(b) Describe five physical and five cultural characteristics assumed for *Homo erectus*.

(10 marks)

1997

**SECTION B.**

**ANSWER EITHER QUESTION 53 OR QUESTION 54 – NOT BOTH.**

**QUESTION 53**

(a) Describe the first line of defense the body has to prevent entry of pathogenic organisms into its internal environment.

(10 marks)

(b) Some tissue was transplanted from Maria to Chris. Ten days later the tissue was rejected by Chris. The same transplant procedure was repeated shortly afterwards, with the same people. On this occasion Chris rejected the tissue two days later.

Explain the mechanism for rejection on **both** of these occasions.

(10 marks)

**QUESTION 54**

(a) Describe the role of the various parts of the kidney nephron in the formation of urine.

(14 marks)

(b) Describe the role of the thirst mechanism in regulating water balance.

(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.

**IN EACH QUESTION CHOOSE THE CORRECT ALTERNATIVE.**

---

1. A hypothesis that has been tested many times without being rejected is called

   (a) a control.
   (b) a theory.
   (c) a test.
   (d) an observation.

2. The impulse within a nerve fibre travels from

   (a) dendrites to cell body to axon.
   (b) dendrites to axon to cell body.
   (c) cell body to dendrites to axon.
   (d) cell body to axon to dendron.

3. The largest region of the human brain is the

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

4. The structure at the base of the human brain which connects to the spinal cord is the

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

**SEE NEXT PAGE**

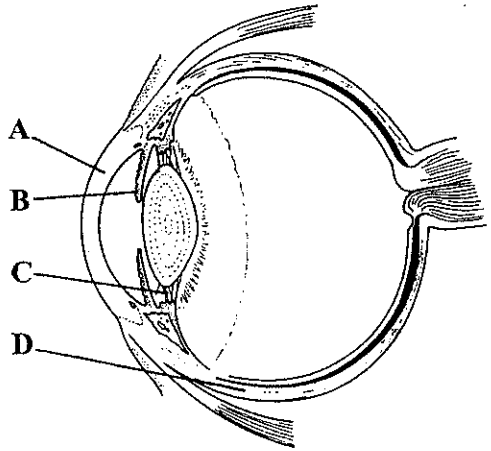
5. The part of the human brain that contains vital centres for regulating heartbeat and breathing is the

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

6. The part of the human brain that contains vital centres for regulating hunger, sleep and thirst is the

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

Question 7 refers to the diagram of the eye below.




7. On the diagram of the eye

(a) A is the cornea, B is the suspensory ligament, C is the iris, D is the sclera.
(b) A is the sclera, B is the suspensory ligament, C is the iris, D is the cornea.
(c) A is the cornea, B is the iris, C is the suspensory ligament, D is the sclera.
(d) A is the cornea, B is the iris, C is the suspensory ligament, D is the retina.





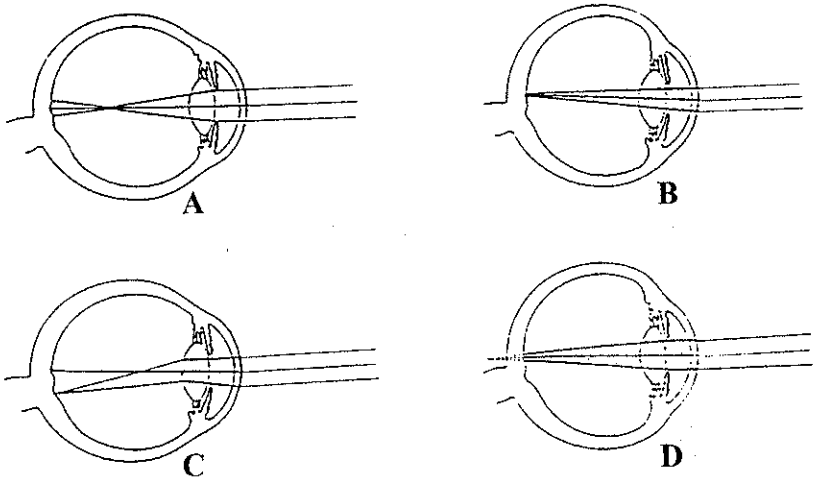
8. Hair cells in the organ of Corti detect

(a) light.
(b) fluid movement.
(c) gravity.
(d) vibrations.

9. Which of the following increases in importance for vision if the level of illumination decreases?

(a) Cones
(b) Rods
(c) Cones and rods equally
(d) Fovea

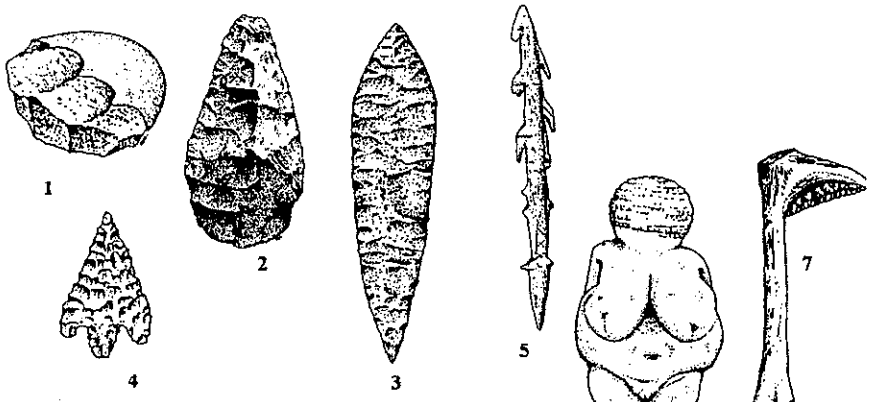
Question 10 refers to the diagrams below.




10. Shortsightedness (myopia) is best indicated by

(a) **A.**
(b) **B.**
(c) **C.**
(d) **D.**

Question 11 refers to the diagrams of artefacts below.




Diagrams from Allan, Richard. (1992) *Human Origins: An introduction to human evolution*, Tutor Courseware

11. Which of these artefacts are likely to have been made by Cromagnon man?

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

12. The species of hominid most likely to have been the first manufacturer of stone tools was

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





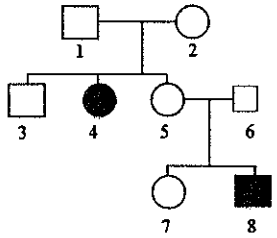
13. In a dig in an East African cave an anthropologist found an ancient hearth that contained the fire-blackened fossil bones of an extinct species of antelope. Nearby at the same level were found stone tools that had been well shaped on two faces to form a hand axe. The occupier of the cave was most likely

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

14. The fossilised remains of a hominid were found in a bed of volcanic ash. The absolute age of the sediments was calculated to be 540 000 years. The means of establishing this age was most likely to have involved

(a) radiocarbon dating.
(b) potassium argon dating.
(c) stratigraphic analysis.
(d) fluorine analysis.

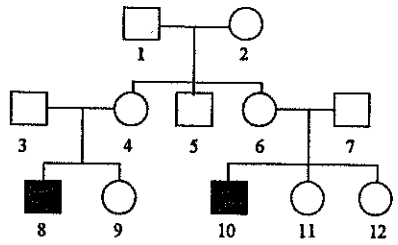
Question 15 refers to the pedigree below showing the inheritance of a recessive characteristic in a family.




15. Which one of the following alternatives lists individuals in this pedigree who are definitely heterozygous for the recessive characteristic?

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

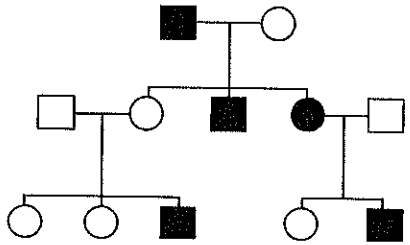
Question 16 refers to the pedigree below of Duchenne type muscular dystrophy which is inherited as a sex-linked characteristic.




16. What is the probability that individual 9 is a carrier of the gene?

(a) 0
(b) 0.25
(c) 0.5
(d) 1

Question 17 refers to the pedigree chart below.



17. It can be concluded that the shaded characteristic is determined by

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





18. During exercise, the rate of the heart beat is controlled by the

(a) hypothalamus.
(b) medulla oblongata.
(c) pons.
(d) adrenal cortex.

19. Cardiac output normally increases in response to

(a) a rise in blood carbon dioxide levels.
(b) an increase in breathing rate.
(c) parasympathetic stimulation of the heart's pacemaker.
(d) a fall in body temperature.

20. Receptors involved in the regulation of heart rate are located in the

(a) aorta, carotid artery and hypothalamus.
(b) medulla oblongata and pulmonary arteries.
(c) hypothalamus and medulla oblongata.
(d) carotid artery, aorta and the heart's pacemaker.

21. During exercise, the release of additional glucose into the bloodstream is controlled by the

(a) secretion of glucagon and adrenaline.
(b) secretion of insulin and noradrenaline.
(c) hypothalamus and adrenal medulla.
(d) pancreatic islets.

22. Gluconeogenesis is the process that leads to glucose being formed from

(a) muscle glycogen.
(b) liver glycogen.
(c) fatty acids and amino acids.
(d) denaturation of proteins.

23. In 1993, the population of Australia was about 18 000 000 and the total number of people that died that year was 120 000. What was the death rate per thousand individuals for that year?

(a) 15
(b) 1.5
(c) 6.6
(d) 66

24. Demographic transition has been observed to occur in populations shortly after an increase in

(a) death rate.
(b) birth rate.
(c) industrialisation.
(d) agricultural knowledge.

25. Which of these pairs of effects is directly related to the thinning of the ozone layer above the Earth?

(a) Rising sea levels and destruction of food webs
(b) Alteration of DNA in cells and an increased frequency of some skin cancers
(c) Melting of the ice caps and rising sea levels
(d) Increased UV light penetration and rising global temperatures

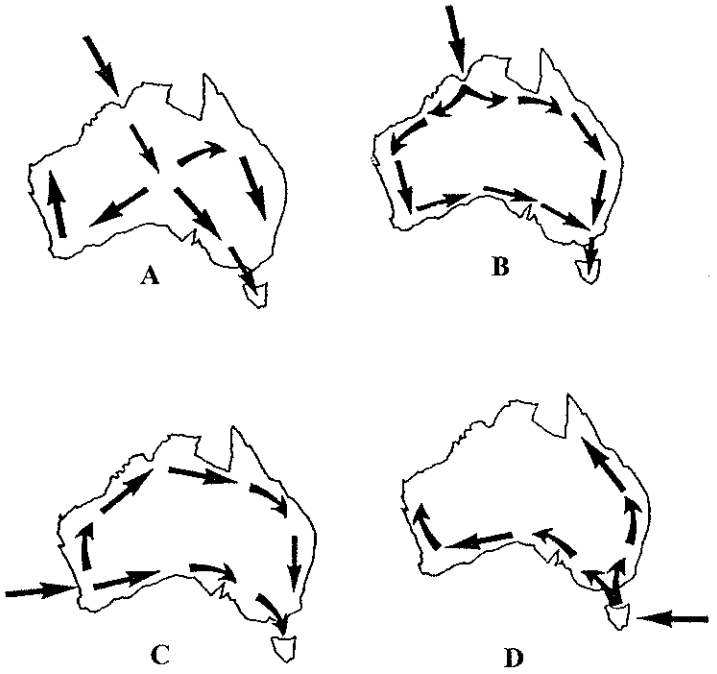
26. The term 'biotic potential' means

(a) the highest possible rate of population increase.
(b) the actual rate of population growth.
(c) a steady population.
(d) a positive interaction between species.





Question 27 refers to the 4 diagrams below.




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

(a) **A**
(b) **B**
(c) **C**
(d) **D**

28. What compounds eventually can be deaminated?

(a) Carbohydrates
(b) Fats
(c) Proteins
(d) Vitamins

29. Which organ is the most important in maintaining the pH of the blood?

(a) Kidney
(b) Liver
(c) Pancreas
(d) Adrenal gland

30. The chemical important in controlling the water balance in the body fluids is

(a) Thyroxine.
(b) Insulin.
(c) Antidiuretic hormone.
(d) Luteinising hormone.

31. Consider the sentence: 'Vast amounts of water pass across the proximal convoluted tubule by a(n)_____ process'.

The missing word in the sentence is

(a) active.
(b) osmotic.
(c) selective.
(d) secretory.

32. If a person cuts their foot on a garden fork, that person may contract tetanus unless a vaccine is given as soon as possible after the injury. What type of immunising process is involved with this vaccine?

(a) Active artificial
(b) Passive natural
(c) Passive artificial
(d) Active natural





33. T lymphocytes have been processed at some stage of their life by which gland or glands?

(a) Testes
(b) Thyroid
(c) Thymus
(d) Tonsils

34. Urea is a waste product formed mainly in the liver from the metabolism of which group of substances?

(a) proteins
(b) carbohydrates
(c) fats
(d) vitamins

35. Urine passes from a kidney to the bladder through the

(a) ureter.
(b) urethra.
(c) uterine tube.
(d) collecting duct.

36. Antibiotics are used in the treatment of infectious diseases. From where are they principally derived?

(a) Lymph nodes
(b) Fungi
(c) Animal plasma
(d) Plants

37. The most accurate description of urine is that it contains

(a) filtered and secreted substances.
(b) filtered substances.
(c) secreted substances.
(d) reabsorbed substances.

38. As a person ages the flexibility of the lens in the eye decreases. This results in

(a) myopia.
(b) astigmatism.
(c) hypermetropia.
(d) a cataract.

39. The pituitary gland synthesises and secretes all of the following hormones **except**

(a) thyroid stimulating hormone.
(b) prolactin.
(c) oxytocin.
(d) growth hormone.

40. The parasympathetic nervous system is involved in

(a) dilating the pupil of the eye; inhibiting secretion of the salivary glands.
(b) constricting the pupil of the eye; stimulating secretion of the salivary glands.
(c) stimulating motility of the gut; increasing heart rate.
(d) inhibiting motility of the gut; decreasing heart rate.





**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.

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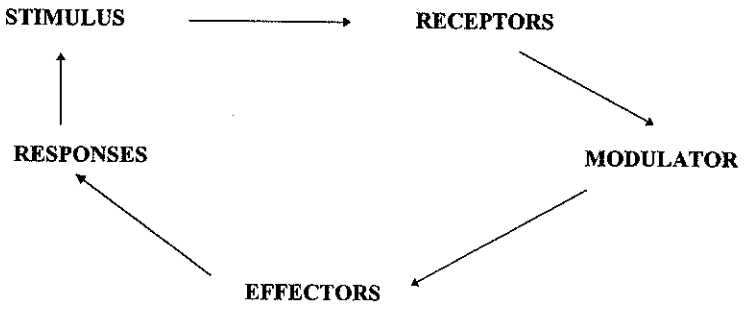
**QUESTION 41.**

(a) The following diagram indicates how excess heat produced during exercise is removed from the body so that a steady temperature is maintained.




With reference to the information above, give examples of each term used in the diagram.

STIMULUS, eg _____

RECEPTORS, eg _____

MODULATOR, eg _____

EFFECTORS, eg _____

RESPONSES, eg _____

(7 marks)

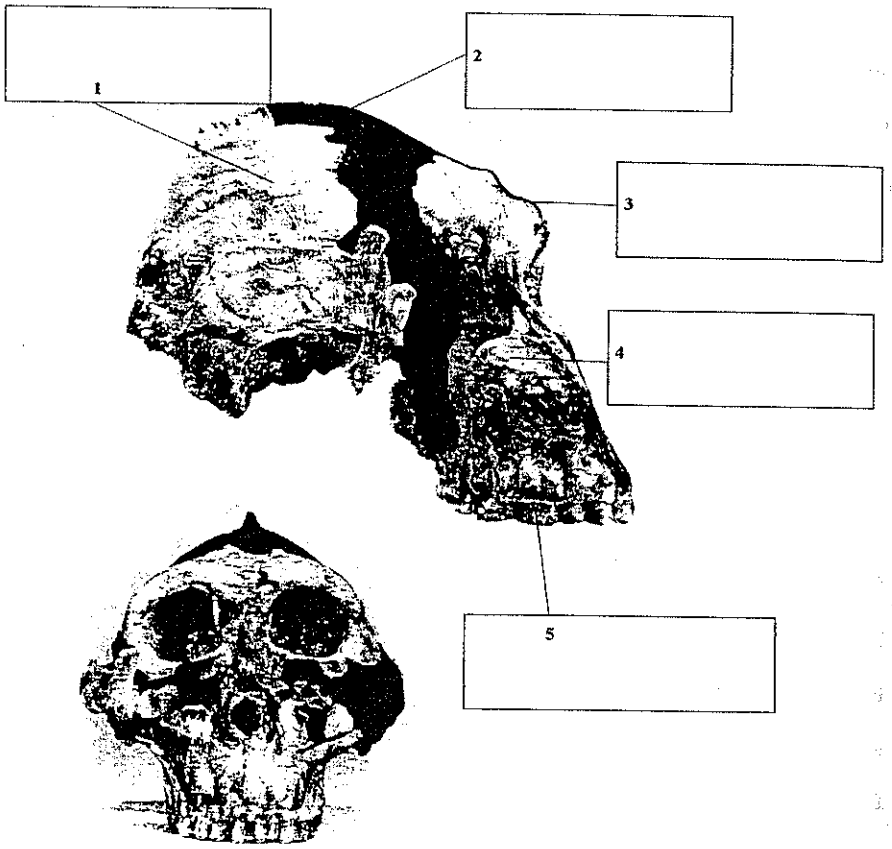
(b) What is the name given to this type of control system?

_____

(1 mark)

**QUESTION 42**

The figure below shows the skull of *Australopithecus boisei*.




(Source: Allan, Richard. (1992) *Human Origins: An introduction to human evolution,* Tutor Courseware)

(a) In the box provided next to each characteristic (labelled **1-5**) state how each characteristic of the skull differs from a typical *Homo sapiens sapiens* skull.

(5 marks)





**QUESTION 42 (continued)**

Fossils of *Homo sapiens neanderthalensis* indicate they were stocky, robust individuals in appearance.

(b) What were the probable environmental conditions at the time of the Neanderthals?

(1 mark)

(c) Explain how their physique may have helped them to survive these conditions.

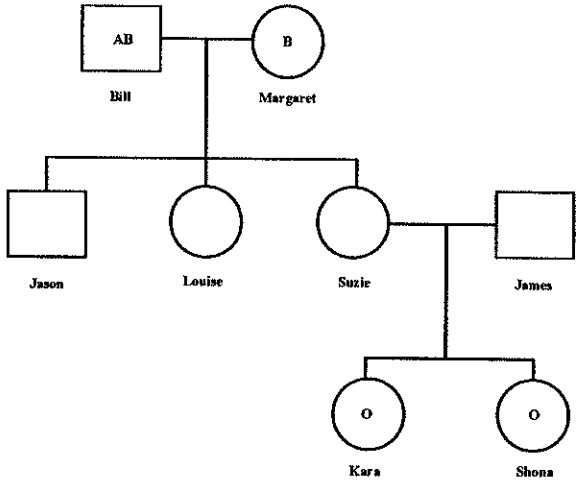
(2 marks)

(d) List four cultural advances that distinguished *Homo sapiens neanderthalensis* from earlier hominids.

(4 marks)

**QUESTION 43**

Question 43 relates to the pedigree below showing the inheritance within a family of blood groups in the ABO system. Blood groups are shown for **some** of the family members ie, Bill, Margaret, Kara and Shona.




In this system three alleles control whether an individual has A, B, AB or O blood group. These alleles are $I^A$, $I^B$ and I.

(a) Which term is used to describe characteristics determined by more than one pair of alleles?

_____

(1 mark)

(b) What are Suzie's possible genotypes?

_____

(1 mark)

(c) What are Suzie's possible phenotypes?

_____

(1 mark)





**QUESTION 43 (continued)**

(d) Calculate the probability that Jason has the same blood group as his father.

_____

(1 mark)

(e) What is the probability that Jason has blood group O?

_____

(1 mark)

(f) What is the probability that Jason and Louise both have blood group B?

_____

(1 mark)

**QUESTION 44**

(a) Draw and label a myelinated motor neuron in the space below.

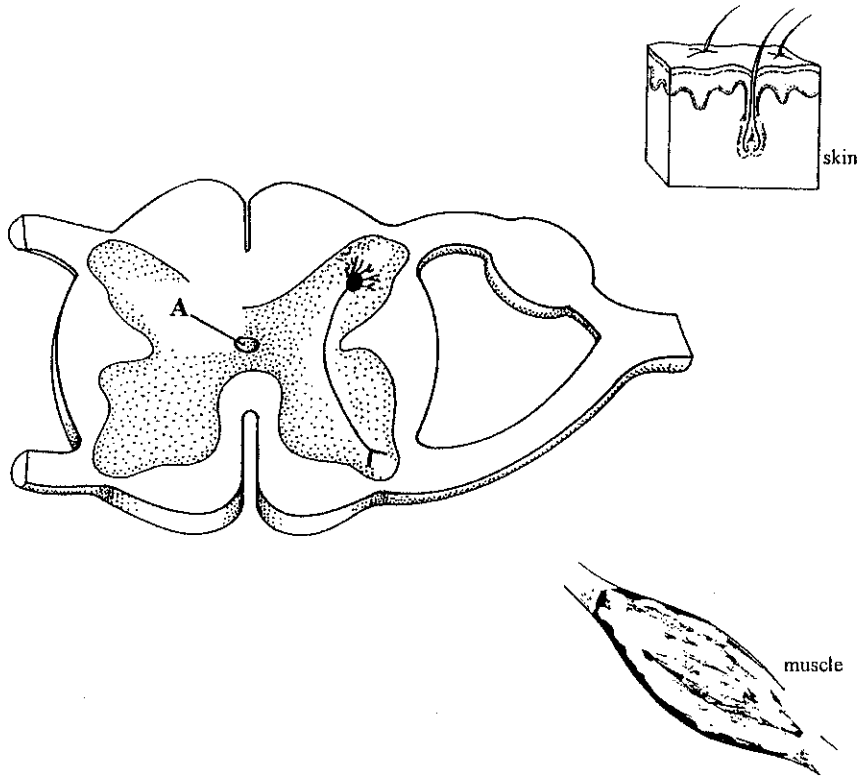
(10 marks)





**QUESTION 44 (continued)**

The diagram below illustrates only **some** components of the path of a reflex arc.




(b) Complete the diagram by showing the other neurons involved in forming a reflex arc. Label each neuron involved.

(5 marks)

**QUESTION 44 (continued)**

(c) What is contained in the canal labelled **A**?

_____

(1 mark)

(d) Canal A is continuous with other structures in the central nervous system. Name these other structures.

_____

_____

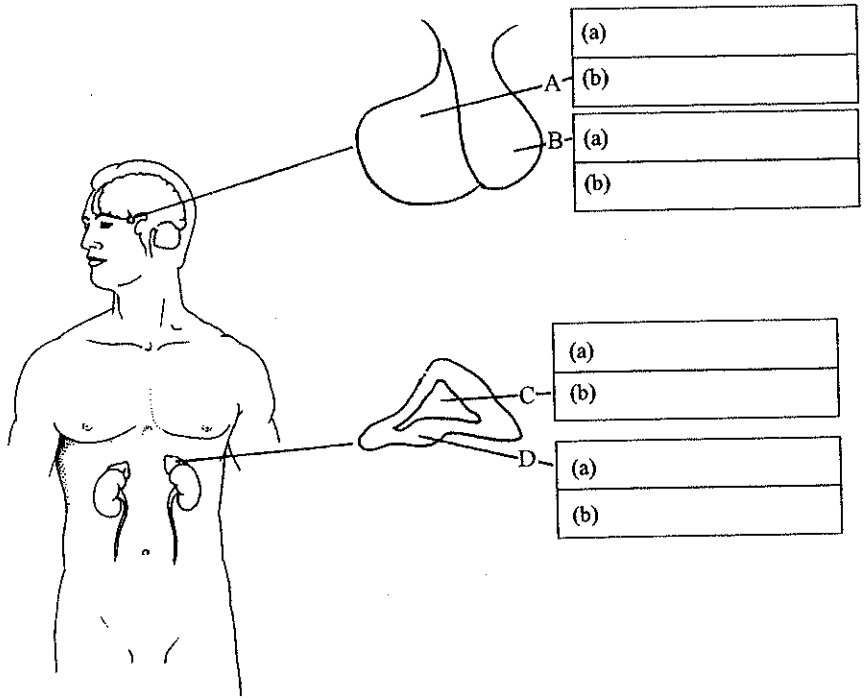
(2 marks)





**QUESTION 45**

The diagram below indicates four endocrine tissues labelled **A, B, C** and **D**.




In the boxes provided for EACH tissue **(A-D)**:

(a) name ONE hormone secreted by that tissue.

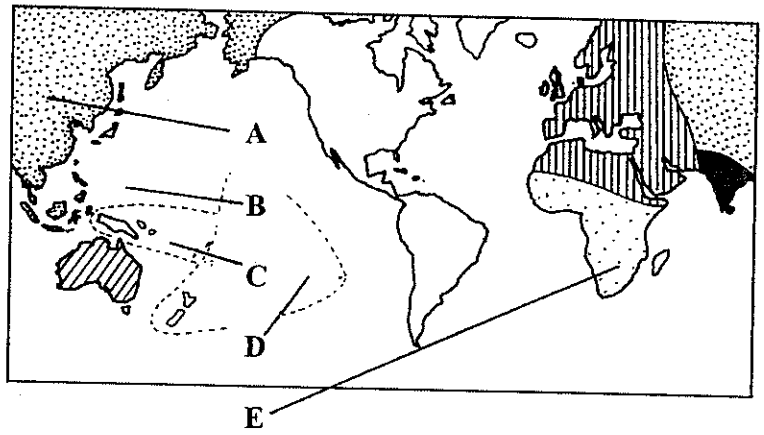
(4 marks)

(b) name ONE principal action of that named hormone on the target tissue.

(4 marks)

**QUESTION 46**

The world map below indicates the distribution of human geographical races.




Name the major geographical race found in each of the regions indicated by letters:

**A** _____

**B** _____

**C** _____

**D** _____

**E** _____

(5 marks)





**QUESTION 47**

Using the drug heroin as an example distinguish between "drug tolerance" and "drug dependence".

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4 marks)

**QUESTION 48**

A drug 'LBP', which is administered intravenously, increases the depth of breathing in patients suffering from asthma. In response to patients who dislike injections a new formulation of LBP has been developed which can be administered as an inhalant. Design an experiment (**by answering the following questions**) to test whether the new formulation is an effective treatment.

(a) State a suitable hypothesis.

(1 mark)

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

(1 mark)

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

(1 mark)

(d) What treatment would your experimental group receive?

(1 mark)

(e) What would a suitable control group be?

(1 mark)

(f) Why have a control group?

(1 mark)

(g) What treatment would they receive?

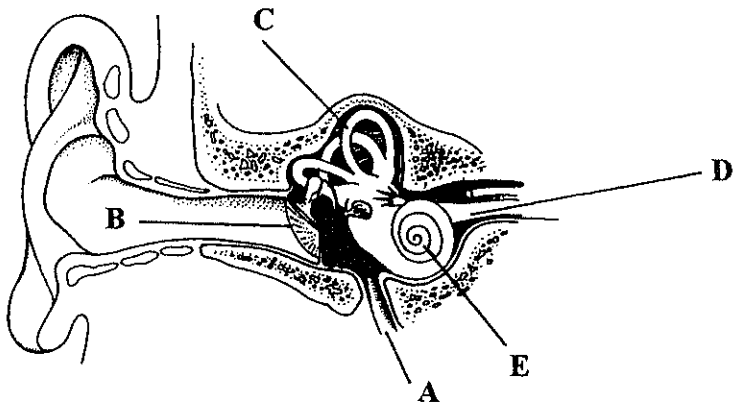
(1 mark)

SEE NEXT PAGE



**QUESTION 49**

The diagram below shows the structure of the human ear.




In the table below state the function of the structures labelled **A-E**.

| STRUCTURE | FUNCTION |
|---|---|
| **A.** | |
| **B.** | |
| **C.** | |
| **D.** | |
| **E.** | |

(5 marks)

SEE NEXT PAGE

**QUESTION 50**

(a) The oceans and waterways of the world are fast becoming heavily polluted. List five pollutants **and** their source.

| Pollutant | Source |
|---|---|
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |

(5 marks)

(b) State **two** methods that can be used to help prevent water and ground pollution.

(2 marks)





**PART III (40 marks)**

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

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**SECTION A.**

**ANSWER EITHER QUESTION 51 OR QUESTION 52 - NOT BOTH.**

**QUESTION 51**

(a) Characteristics like haemophilia are said to be sex linked. Explain how sex-linked characteristics are inherited.

(6 marks)

(b) Describe three lines of evidence that have been used to support the idea that humans have evolved from pre-existing life forms.

(6 marks)

(c) Techniques for dating rocks may give a relative or an absolute age. Explain the difference between these terms and describe **one** example of each of the techniques used in giving (i) relative age and (ii) absolute age.

(8 marks)

**QUESTION 52**

(a) Skeletal remains of a fossil present in East African sediments consisted of a single complete femur, the left half of a pelvis and a lower jawbone. Scientists agreed that these three remains were definitely hominid. For each of these remains suggest at least three features that would have helped them to establish this classification?

(10 marks)

(b) Describe five physical and five cultural characteristics assumed for *Homo erectus*.

(10 marks)