

TERTIARY ENTRANCE EXAMINATION, 1990  
QUESTION/ANSWER BOOKLET

HUMAN  
BIOLOGY

Please place one of your student  
identification labels in this box

STUDENT SEA NUMBER—In figures

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In words

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TIME ALLOWED FOR THIS PAPER

Reading time before commencing: 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 3-17  
PART II Pages 18-33  
PART III Pages 34-37  
Page 38  
Page 39

Space for rough work  
Spare graph sheet

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. Please check carefully, and if you have any unauthorised material with you, hand it to the supervisor BEFORE reading any further.

SEE PAGE 2

INSTRUCTIONS TO CANDIDATESPART 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 41-49 80 marks

This part consists of nine (9) diagram and short answer questions. These should be answered in the spaces provided in the Question/Answer Booklet.

Write your answers in blue or black ball point or ink pen.

Plot the graph in question 49(a) using a '2B' pencil.

PART III

Questions 50-53 40 marks

This part consists of four (4) essay questions.

Answer ONE question from Section A and ONE question from section B.

The essays 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 student SEA 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 Booklet to the back of your Question/Answer Booklet with the paper binder provided.

PART 1

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. Receptors for hearing are found in the
  - (a) middle ear.
  - (b) cochlea.
  - (c) ampulla
  - (d) semicircular canals.

Question 2 refers to the table below.

CLASSIFICATION	MARIJUANA	ALCOHOL	ASPIRIN
A	analgesic	hallucinogen	sedative
B	stimulant	sedative	analgesic
C	hallucinogen	sedative	analgesic
D	hallucinogen	stimulant	analgesic

2. The CORRECT classification of the drugs marijuana, alcohol and aspirin is

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

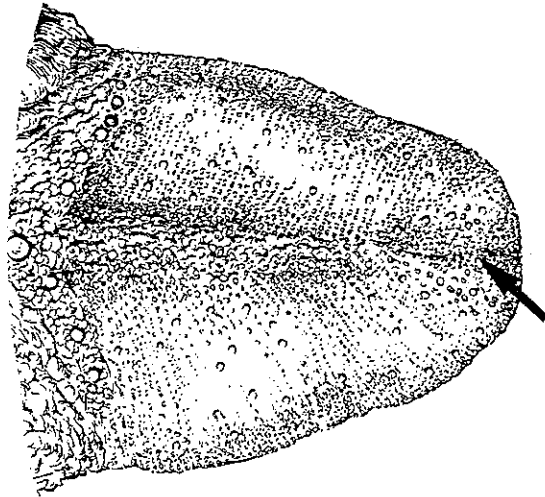
3. A person bitten by a redback spider was given an injection to combat the effect of the bite. The injection would contain an

- (a) antibiotic.
- (b) antigen.
- (c) antibody.
- (d) allergen.

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SEE PAGE 3

Question 4 refers to the diagram of the tongue below.



4. Taste receptors in the area indicated by the arrow are mainly sensitive to

(a) sweet substances.  
(b) sour substances.  
(c) salt substances.  
(d) bitter substances.

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5. The major function of the Eustachian (auditory) tube is to

(a) allow air pressure to equalize on each side of the tympanic membrane.  
(b) provide space for the expansion of the tympanic membrane.  
(c) maintain balance.  
(d) prevent very loud noises from damaging the middle ear.

6. Which one of the following does NOT act as a body defence against disease ?

(a) Phagocytosis.  
(b) Fever.  
(c) Glycolysis.  
(d) Epidermis.

7. Loss of memory would be caused by damage to the

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

8. Which of the following is a CORRECT description of a disease being transmitted by a vector ?

(a) A bite by a mosquito resulting in malaria.  
(b) An injection with an infected needle causing AIDS.  
(c) Inhalation of water droplets from a sneeze causing influenza.  
(d) Consumption of contaminated meat causing food poisoning.

9. Which of the following is CORRECT ?

(a) A virus does not have any RNA or DNA.  
(b) A virus cannot reproduce outside a living cell.  
(c) A virus has a cell wall.  
(d) A virus has a cell membrane.

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10. Lymphocytes are NOT normally produced in the
- spleen.
  - tonsils.
  - adenoids.
  - liver.
11. Which of the following is the CORRECT description of the pathway taken by a molecule of waste when passing from the blood to excretion in the urine ?
- Glomerulus, ureter, collecting tubule, bladder, urethra.
  - Glomerulus, collecting tubule, ureter, bladder, urethra.
  - Collecting tubule, ureter, glomerulus, bladder, urethra.
  - Collecting tubule, urethra, bladder, glomerulus, ureter.
12. Australian Aboriginal languages show no similarities with those of other geographical races. This probably indicates that
- Aboriginal culture developed more slowly than that of other races.
  - the lack of a written language caused the spoken language to develop differently from those of other races.
  - there was only limited interaction of Aboriginal tribal groups.
  - Aborigines were isolated in Australia for a very long period of time.
13. Carbon monoxide is a serious pollutant because it
- contributes to the greenhouse effect.
  - is able to combine with haemoglobin.
  - causes destruction of ozone in the upper atmosphere.
  - accumulates in crop plants and domestic animals.

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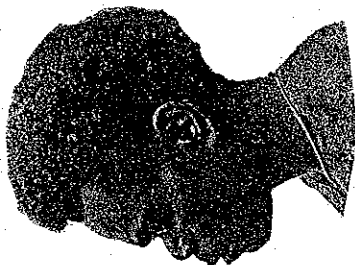
14. The birth rate of a country is the number of babies born during a year.
- babies born during a year.
  - births for a year per thousand people in the population.
  - births for a year per thousand females in the population.
15. Which of the following is a result of cultural evolution ?
- The deaths, from smallpox, of large numbers of Aborigines after Europeans first arrived in Australia.
  - The high infant mortality of Australian Aborigines.
  - Australian Aborigines smearing animal fat on their skins to keep warm.
  - The ability of Australian Aborigines to withstand extreme cold.
16. A population pyramid that has a broad base and tapers quickly to a sharp apex would represent
- low birth rate and high death rate.
  - low birth rate and low death rate.
  - high birth rate and low death rate.
  - high birth rate and high death rate.
17. A population is a group of individuals that
- has genetic continuity through many generations.
  - has cultural continuity through many generations.
  - inhabits a specific geographical area.
  - all of the above.
18. Evidence discovered at many archeological sites around Australia supports the claim that dispersal of the Australian Aborigines throughout Australia occurred about
- 10 000 - 20 000 years ago.
  - 30 000 - 60 000 years ago.
  - 70 000 - 90 000 years ago.
  - 100 000 - 120 000 years ago.

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Question 19 refers to the photographs below of two individuals A and B.



A



B

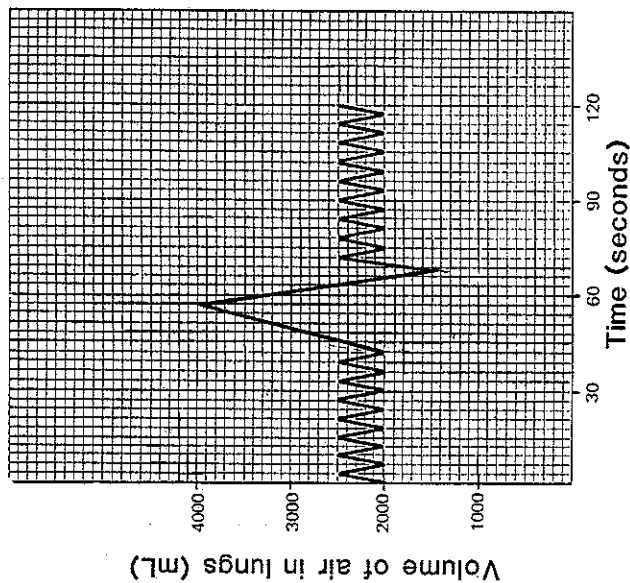
19. Which of the following is CORRECT ?
- (a) Individual A is a member of the Asian geographical race and Individual B is a member of the Melanesian geographical race.
  - (b) Individual A is a member of the Polynesian geographical race and Individual B is a member of the Micronesian geographical race.
  - (c) Individual A is a member of the Melanesian geographical race and Individual B is a member of the East African geographical race.
  - (d) Individual A is a member of the Micronesian geographical race and Individual B is a member of the Asian geographical race.

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20. Which of the following statements about pollution is INCORRECT ?
- (a) Smog is a mixture of smoke and fog.
  - (b) Acid rain can cause corrosion of metal and stone.
  - (c) Lead and mercury from factory wastes can become cumulative poisons in food chains.
  - (d) Smoke from cigarettes may cause lung cancer to develop in smokers but it is not dangerous to non-smokers.
21. Which of the following statements about the greenhouse effect is INCORRECT ?
- (a) The greenhouse effect is warming of the earth's atmosphere, surface and oceans because certain atmospheric gases absorb heat re-radiated from the earth.
  - (b) Greenhouse gases include carbon dioxide, methane, oxides of nitrogen and chlorofluorocarbons.
  - (c) Destruction of the ozone layer is a major contributor to the greenhouse effect.
  - (d) Rising sea level resulting from the greenhouse effect is due to the expansion of water not to melting of the polar ice caps.
22. The involuntary control of breathing occurs mainly in the
- (a) cerebrum.
  - (b) pons.
  - (c) hypothalamus.
  - (d) medulla.
23. Cardiac output is
- (a) normally about 70-80 beats per minute.
  - (b) calculated by multiplying heart rate (beats per minute) by stroke volume (litres).
  - (c) normally doubled during strenuous exercise.
  - (d) increased by parasympathetic stimulation to the heart.
24. If both the adrenal glands are removed from an experimental animal then
- (a) glucose breakdown in the liver would increase.
  - (b) glucose breakdown in the liver would decrease.
  - (c) glycogen breakdown in the liver would increase.
  - (d) glycogen breakdown in the liver would decrease.

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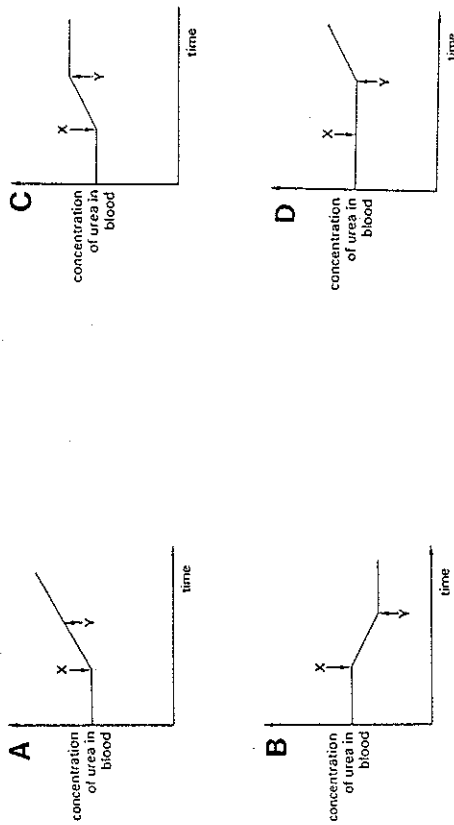
Question 25 refers to the graph below representing the changes in the volume of air (mL) in a person's lungs during a 2 minute (120 second) period.



25. Which of the following statements about the person's breathing is INCORRECT ?
- (a) The person inspired 2500 mL of air during the first 30 seconds and inspired 3000 mL of air during the second 30 seconds.
  - (b) Over the period recorded breathing rate was 8 breaths per minute.
  - (c) Breathing rate was faster during the first 30 seconds than during the second 30 seconds.
  - (d) The total volume of air inspired during the recording was 12 000 mL.

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Question 26 refers to the graphs A, B, C and D below.



26. Which graph shows the effect on urea concentration in the blood after removing a mammal's kidney at time X and its liver at time Y ?

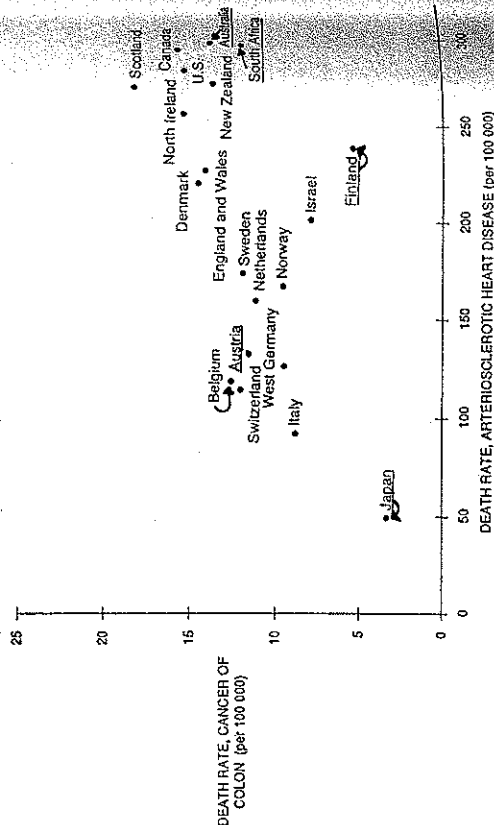
- (a) A
- (b) B
- (c) C
- (d) D

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27. A heroin addict has established tolerance to the drug. Which of the following describes the condition of drug tolerance?

- (a) A wish to take the drug at regular intervals.
- (b) A feeling that the drug is essential to go on living.
- (c) An increased quantity of the drug is necessary to produce the same effect as before.
- (d) The symptoms experienced when no longer taking the drug.

Question 28 refers to the graph below showing the correlation between death rates for cancer of the colon and arteriosclerotic heart disease.



28. The information given in the graph suggests that
- (a) Australians are more likely to die from cancer of the colon than are South Africans.
  - (b) both diseases are geographically determined.
  - (c) Belgians have twice as much chance of dying from arteriosclerosis as the Finns.
  - (d) more people die from arteriosclerosis in Finland than in Japan.

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29. A controlled experiment is one in which

- (a) all variables are controlled.
- (b) all variables are kept constant.
- (c) there are no variables.
- (d) all variables except one are kept constant.

30. Which ONE of the following questions could be resolved by scientific investigation?

- (a) Should more money be spent on research into infertility in humans?
- (b) Should a woman have an abortion if her developing fetus is known to be abnormal?
- (c) Did *Homo sapiens* evolve from Australopithecines?
- (d) Is Cushing's syndrome an inherited disease?

Questions 31 and 32 refer to the following information.

While examining drops of a fluid containing bacteria which form butanoic acid, Louis Pasteur noticed that when the organisms came near the edge of a drop they stopped moving.

31. The process in which Pasteur was involved is best described as

- (a) forming a hypothesis.
- (b) observation.
- (c) questioning results.
- (d) forming a conclusion.

32. Pasteur suggested that the oxygen in the air, near the edge of the drop, may have stopped the bacteria moving. The process involved in making the suggestion is best described as

- (a) making a generalization.
- (b) reaching a conclusion.
- (c) developing a theory.
- (d) forming a hypothesis.

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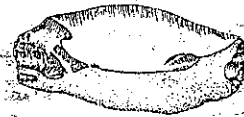
Question 33 refers to the diagrams below of four different stone tools.



A



B



C



D

33. The correct ranking of these stone tools, from least to most advanced, is

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

34. The oldest fossils found on earth are of bacteria-like organisms. They indicate that life on earth began about

(a) 1500 million years ago.  
 (b) 2000 million years ago.  
 (c) 3500 million years ago.  
 (d) 5000 million years ago.

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35. Monkeys, apes and humans are classified in
- (a) the same class and the same order.  
 (b) the same class and different orders.  
 (c) different orders and different families.  
 (d) different classes and different orders.

36. Evolutionary relationships between species can be determined by comparing proteins from the species. The protein structure that is compared is the

(a) sequence of amino acids in the protein molecule.  
 (b) three dimensional shape of the protein molecule.  
 (c) type of amino acids present in the protein molecule.  
 (d) sequence of nucleotides in the protein molecule.

37. Haemophilia is an inherited disorder controlled by a recessive gene carried on the X chromosome. A normal woman had a haemophilic son and three normal sons. From this it can be concluded, that with respect to the haemophilia gene,

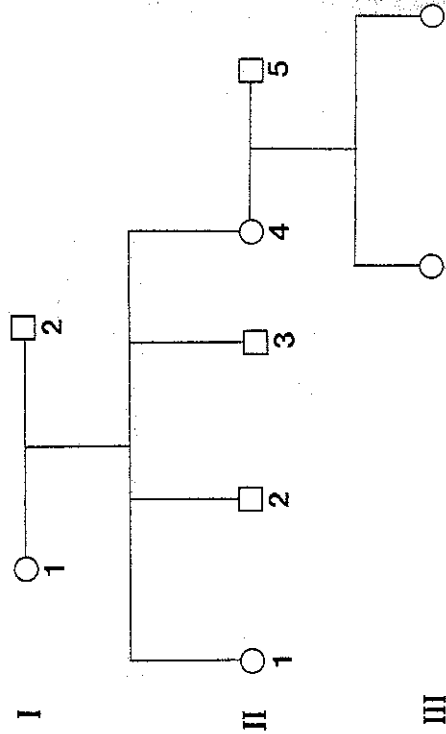
(a) the father was heterozygous.  
 (b) the father was homozygous normal.  
 (c) the mother was heterozygous.  
 (d) the mother was homozygous normal.

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Questions 38 and 39 refer to the following information.

Inheritance of ABO blood groups in humans is controlled by three alleles. The pedigree below shows a number of individuals in a family.



38. If individuals 1 and 2 in the first generation (I) belong to Group AB and Group O respectively, then their offspring in the second generation would be blood group

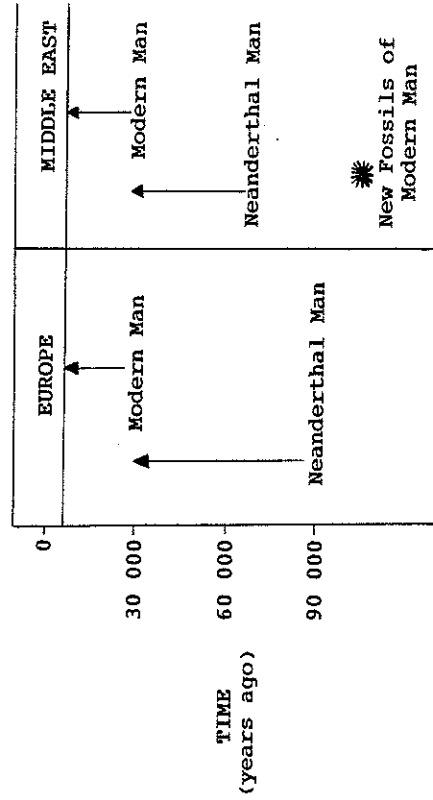
- (a) O.
- (b) AB.
- (c) A or B.
- (d) AB, A or B.

39. If individual III 2 belonged to blood group O her father could have been blood group

- (a) O.
- (b) A or B.
- (c) A, B or AB.
- (d) A, B or O.

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Question 40 refers to the diagram below showing the distribution in time of a group of fossils that had been discovered in Europe and the Middle East and classified as *Homo sapiens*. Newly discovered fossils identified as "Modern Man" were uncovered in the Middle East and dated at 90 000 years ago.



40. Which of the following hypotheses is NOT supported by these data

- (a) Neanderthal and Modern Man were actually different species.
- (b) Modern Man migrated from the Middle East to Europe.
- (c) Neanderthal Man migrated from Europe to the Middle East.
- (d) Neanderthal Man was ancestral to Modern Man.

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QUESTION 43

- (a) Alcohol inhibits antidiuretic hormone (ADH) production in the hypothalamus. What effect would drinking several small glasses of whisky have on a person's urine concentration and urine output.

(1 mark)

- (b) Caffeine causes an increase in blood pressure in the renal glomerulus. If a normal healthy person drank several cups of coffee what would be the effect of this consumption on a person's urine concentration and urine output.

(1 mark)

SEE NEXT PAGE

43. (continued)

The table below refers to Question 43 (c) and shows the relative concentrations of various substances found in plasma, urine and the glomerular filtrate.

NOTE: ++ REPRESENTS A HIGHER CONCENTRATION THAN +

SUBSTANCE	PLASMA	GLOMERULAR FILTRATE	URINE
GLUCOSE	++	++	NIL
PROTEIN	++	+	NIL
POTASSIUM IONS	++	++	+
UREA	++	++	++

- (c) For EACH substance explain how the change in concentration came about.

(6 marks)

SEE NEXT PAGE

QUESTION 44

Complete the following table by naming ONE hormone secreted by EACH endocrine gland and give ONE function for EACH of the hormones.

GLAND	HORMONE	FUNCTION
THYROID		
CORPUS LUTEUM		
POSTERIOR PITUITARY		
ADRENAL CORTEX		
TESTIS		

(10 marks)

SEE NEXT PAGE

QUESTION 45

The dramatic rise in world food production which was achieved during the years 1960 to 1980 has been described as a green revolution.

- (a) List THREE factors which made the green revolution possible.

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(3 marks)

- (b) Has the green revolution resulted in the world's population being better nourished? Explain.

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(2 marks)

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45. (continued)

(c) What is ecosystem decay ? Illustrate with an example.

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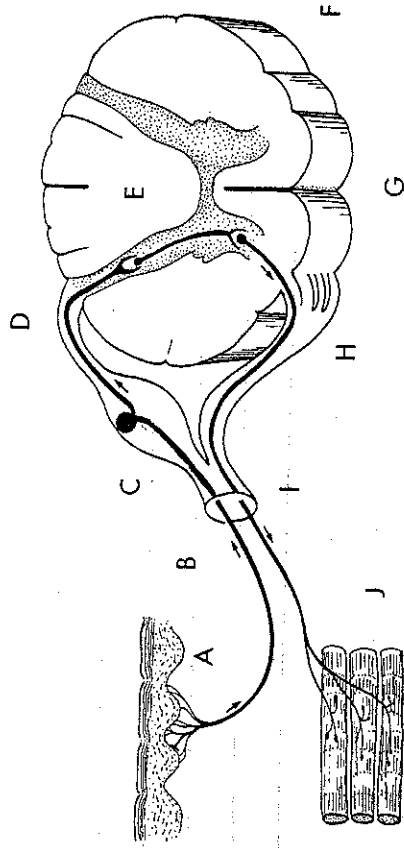
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(2 marks)

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Question 46 refers to the diagram below of a reflex arc.



QUESTION 46

Name the parts of the arc labelled A to J.

A \_\_\_\_\_

B \_\_\_\_\_

C \_\_\_\_\_

D \_\_\_\_\_

E \_\_\_\_\_

F \_\_\_\_\_

G \_\_\_\_\_

H \_\_\_\_\_

I \_\_\_\_\_

J \_\_\_\_\_

SEE NEXT PAGE (10 marks)

## QUESTION 47

Archeologists excavating a site uncovered two skulls. They classified both as belonging to the genus *Homo*. However, on the basis of physical characteristics of the skulls it was decided that skull A must have come from an earlier species than skull B.

- (a) Name THREE physical characteristics that scientists could compare to determine the relative ages of the two skulls.

(3 marks)

- (b) Although considered to be younger, skull B was found at a depth of 1.23 metres, while skull A was found at 0.72 metres. Give ONE reason to account for this.

(1 mark)

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## 47. (continued)

- (c) Explain the difference between absolute and relative ages.

(1 mark)

- (d) Further testing of the skulls showed them to be beyond the range of the radiocarbon dating method. Why is it NOT possible to use radiocarbon dating beyond a certain age?

(2 marks)

- (e) Describe ONE method, other than the principle of superposition, that could be used to help confirm the relative ages of the two skulls.

(1 mark)

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Question 48 refers to the list of biological terms (LIST B) and a definition for these terms given in LIST A below.

## LIST A

1. Structure containing genes.
2. Male or female sex cell.
3. One of the alternative forms of a gene.
4. Process of cell division in which haploid cells are produced.
5. Organism with two different forms of the same gene.
6. The observable characteristics of an organism.

## LIST B

- Allele.  
Heterozygote.  
Phenotype.  
Chromosome.  
Recessive.  
Gamete.  
Meiosis.

## QUESTION 48.

In the space provided adjacent to each definition write in the suitable biological term from LIST B. If no suitable term is given in LIST B leave the space provided BLANK.

## LIST A

1. Structure containing genes
2. Male or female sex cell.
3. One of the alternative forms of a gene.
4. Process of cell division in which haploid cells are produced.
5. Organism with two different forms of the same gene.
6. The observable characteristics of an organism.

## LIST B

(6 marks)

SEE NEXT PAGE

THIS PAGE HAS BEEN LEFT BLANK INTENTIONALLY. SEE NEXT PAGE FOR QUESTION 49.

SEE NEXT PAGE

Question 49 refers to the table below giving the concentrations of glucose (sugar) in the blood taken from an individual during a 5 hour (300 minute) interval. At the start of recording, and for a further 90 minutes, blood glucose level was constant and within normal limits. Following a meal glucose level increased, then decreased back to normal levels within 90 minutes. The individual then went for a 1 hour run. During this 1 hour run blood glucose levels decreased and remained low for a further 60 minutes.

TIME (minutes)	BLOOD GLUCOSE (mg/100mL)
0	100
30	95
60	100 (Glucose concentration normal)
90	105 (Following a meal)
120	150
150	120
180	100 (STARTED A 1 HOUR RUN)
210	95
240	75 (END OF THE 1 HOUR RUN)
270	70
300	75

## QUESTION 49.

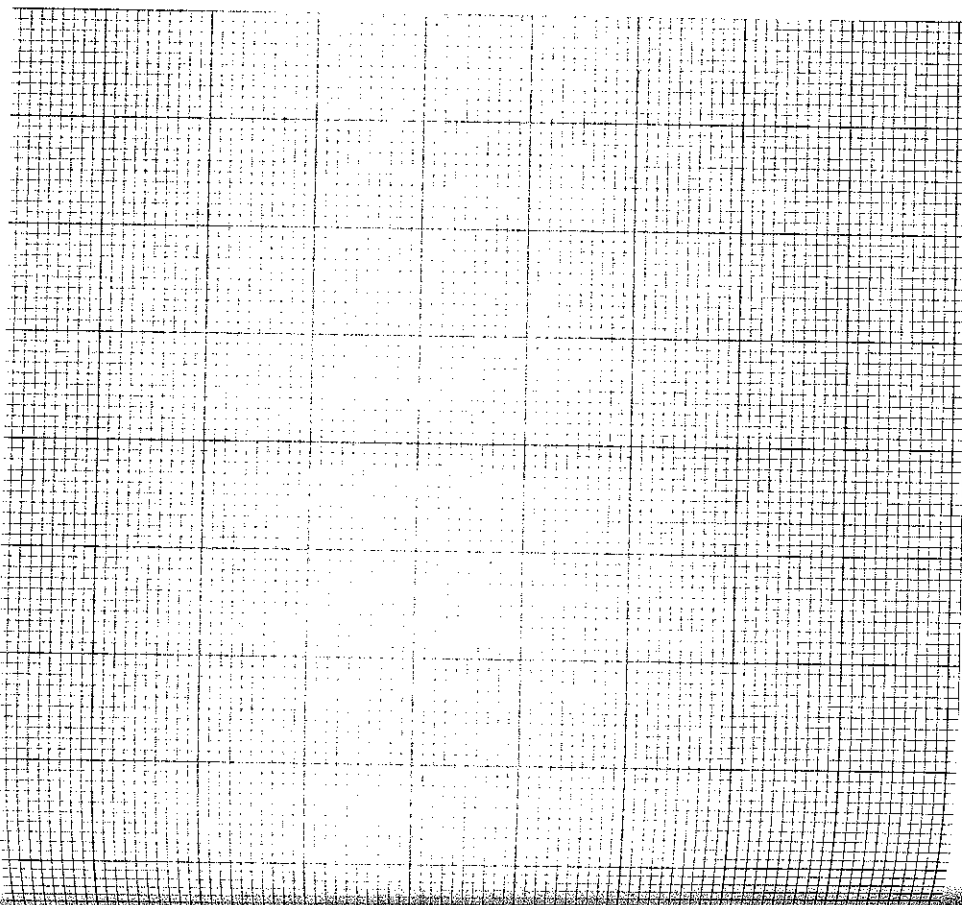
(a) Graph these data on the grid provided ON PAGE 31

(8 marks)

SEE NEXT PAGE

## Question 49 (continued)

NOTE: A SPARE GRID SHEET IS PROVIDED ON THE BACK PAGE OF THIS ANSWER BOOKLET.



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## PART III

ANSWER ONE QUESTION FROM SECTION A AND ONE QUESTION FROM SECTION B. WRITE YOUR ANSWERS IN THE SEPARATE ANSWER BOOK. ILLUSTRATE YOUR ANSWERS WITH DIAGRAMS, WHERE APPROPRIATE. UP TO TWO MARKS MAY BE DEDUCTED FOR POORLY STRUCTURED ESSAYS i.e. ANSWERS IN POINT FORM OR DIAGRAMS NOT EXPLAINED IN THE TEXT OF THE ESSAY. DO NOT WRITE YOUR ANSWERS IN PENCIL.

## SECTION A

(ANSWER EITHER QUESTION 50 OR QUESTION 51 - NOT BOTH)

## QUESTION 50.

- (a) Australian Aborigines and Eskimos live in very different environments. They also differ in certain physical features, that is in their physical appearance.

Select THREE physical features that DIFFER between an Australian Aborigine and an Eskimo and explain how EACH physical feature may be an adaptation to the environment experienced by:

- (i) the Australian Aborigine.
- (ii) the Eskimo.

6 marks

- (b) What does the term "demographic transition" mean? To illustrate your answer to this question describe the population structure of a country which has:

- (i) not yet entered demographic transition.
- (ii) passed through demographic transition.

6 marks

- (c) A country which has passed through the demographic transition would experience problems in the following areas:

- (i) Energy requirements.
- (ii) Agriculture.
- (iii) Industry.
- (iv) Increased life expectancy.

Explain the nature of EACH of these problems.

8 marks

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## SECTION A (continued)

## QUESTION 51.

- (a) Describe the essential components of a feedback loop system.

6 marks

- (b) Explain how BOTH cardiac output and breathing rate are regulated.

10 marks

- (c) Describe the mechanisms resulting in more oxygen being delivered to muscle cells when they become very active during exercise.

4 marks

SEE NEXT PAGE FOR SECTION B

## SECTION B

(ANSWER EITHER QUESTION 52 OR QUESTION 53 - NOT BOTH)

## QUESTION 52.

- (a) In 1858 Charles Darwin and Alfred Russel Wallace proposed the theory of evolution through natural selection.

Describe the basic principles on which the theory is based.

8 marks

- (b) Darwin and Wallace, in the middle of the 19th Century, knew nothing about the science of genetics. Explain how our present day knowledge of EACH of the following can be applied to the theory of evolution through natural selection.

- (i) Genes.
- (ii) Mutations.
- (iii) Gene Frequencies.

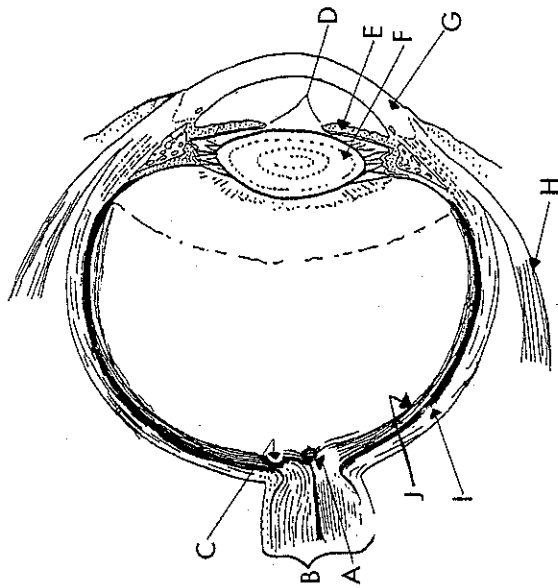
12 marks

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1990

## SECTION B (continued)

## QUESTION 53.



- (a) Write an essay explaining how EACH of the structures labelled A-J on the diagram above are related to vision.

10 marks

- (b) A person is immunized with "Attenuvax" which is a live attenuated measles vaccine.

- (i) Explain how the vaccine differs from the measles virus.
- (ii) Explain how that person's immune system responds to this vaccine.
- (iii) If at a later date that person is infected with the measles virus, describe the immune response that occurs.

10 marks

END OF QUESTIONS