WESTERN AUSTRALIA

TERTIARY ADMISSIONS EXAMINATION, 1979

HUMAN BIOLOGY

Please place one of your Candidate Identification labels in this box

CANDIDATE'S NUMBER:

In figures | | | | | | |

In words _____

_____

TIME ALLOWED FOR THIS PAPER:
Reading time before commencing: Fifteen minutes
For working of paper: Three hours

MATERIAL TO BE PROVIDED FOR THIS PAPER:

Question Paper comprising PART I	Pages 3 - 27
PART II	Pages 28 - 30
Essay sheets for PART II	Pages 31 - 38
Answer sheet for PART I	Page 40
Space for rough work	Page 39

INSTRUCTIONS TO CANDIDATES: SEE PAGE 2

FOR EXAMINER'S USE ONLY

	1st Mark	Check		1st Mark	Check	
41-60			67			
61			68			
62			69			
63			70			
64			71			
65			1-40			
66						
SUB TOTAL			TOTAL			

INSTRUCTIONS TO CANDIDATES:

Part I consists of 40 multiple choice questions (40 marks), 20 word-completion questions (20 marks), and 5 diagram completion questions (40 marks).

Answer ALL questions in Part I.

Part II consists of three (3) sub-sections. A total of TWO (2) questions has to be answered, but each question MUST come from a different sub-section (10 marks each).

The Answer sheet for questions 1 - 40 is printed on Page 40. At the commencement of the examination OPEN your answer sheet OUT and use it alongside questions 1 - 40.

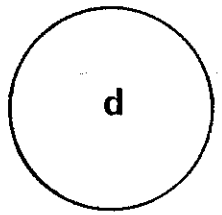
Answer questions 41 - 65 in the spaces provided on the question paper.

The essays for PART II should be written on Pages 31 - 38 of the question paper.

At the end of the examination carefully check that you have written your candidate number in figures and words on both the front cover of the question paper AND on the answer sheet for questions 1 - 40. FOLD your completed answer sheet BACK inside this question paper and hand the question paper to the supervisor.

PART 1

Questions 1 and 2 refer to Figure 1 below which shows one letter of the alphabet as seen under low power of a monocular microscope.



Eyepiece magnification = 10X

Low power objective = 10X

High power objective = 40X

Diameter of low power field = 1.25mm

Figure 1.

1. Which of the following letters was being viewed?

a. **b** c. **d**

b. **p** d. **q**

2. What was the diameter of the high power field of view (in micrometers)?

a. 5,000

b. 312.5

c. 1,250

d. 400

SEE PAGE 4

3. Which of the following are water-borne diseases?

a. malaria and venereal disease

b. tuberculosis and emphysema

c. dysentery and cholera

d. smallpox and diphtheria

4. Which of the following statements is NOT correct about enzymes ?

Enzymes

a. are proteins which increase the rate of chemical reactions in cells

b. are often highly specific for the type of molecule with which they will react

c. catalyze a reaction without themselves undergoing any net change in chemical structure

d. are required in high concentration in order to catalyze a reaction

5. A frog which had its brain destroyed, but which still retained an intact spinal cord, had a piece of paper soaked in acid placed on its skin. Its leg came up and flicked off the paper. The frog did this each time the paper was placed on its skin. This response illustrates

a. conscious control

b. autonomic control

c. existence of a reflex arc

d. a conditioned response

SEE PAGE 5

6. The most vulnerable time for adverse effects on the development of the foetus is during

a. conception

b. the first three months

c. the last three months

d. birth

7. Which one of the following statements about human sperm is correct?

Human sperm

a. carrying an X chromosome will produce genetic males upon fertilisation of the female ovum

b. after ejaculation may remain viable in the female reproductive tract for 10 days

c. formation increases and decreases with the monthly cyclic release of follicle stimulating hormone (FSH) from the male pituitary

d. formation is inhibited at normal body temperature (37^{o} C)

8. The basic difference between the cells of a mouse and an elephant is in

a. their size

b. the genes

c. their metabolic rate

d. cell shape

SEE PAGE 6

9. Which of the following groups of people would have more of the characteristics associated with the "Mongoloid" race?

   a. Eskimos

   b. Australian Aboriginals

   c. Pygmies

   d. Arabs

10. Blood does not usually come into contact with the cells it supplies. Exchange of nutrients and waste material between the blood and the cell occurs through

   a. capillary networks

   b. lymphatic vessels

   c. extracellular fluid

   d. intracellular fluid

11. If the pancreas is removed from an experimental animal one could expect to find an increase in

   a. phosphate metabolism

   b. sugar in the urine

   c. alkalinity of the duodenum

   d. insulin in the bloodstream

12. Muscles which bend a limb at a joint are called

   a. extensors

   b. abductors

   c. flexors

   d. adductors

SEE PAGE 7

13. Vasectomy in the adult human male causes total loss of

   a. erection

   b. fertility

   c. sexual desire

   d. testosterone production

14. When people develop a "drug tolerance" it means that

   a. the dosage must be increased to maintain the same effect

   b. they are addicted to the drug

   c. they are able to cope without the drug

   d. the drug no longer has any effect on them at all

15. A scientist found a group of fossil skull bones of extinct apes in a rock layer. When reconstructed, the skulls were shown to be from three individuals which differed a little in the size and shape of certain physical features. These differences were about the same as differences seen among individuals in a modern chimpanzee population. The scientist classified the fossil skulls into three different species. Such a classification could have been doubtful if she had not considered

   a. how fertile each animal was

   b. natural variability in populations

   c. the position of the foramen magnum

   d. evolution in the lineage

SEE PAGE 8

16. The period during which humans settled down to cultivate crops and domesticate animals is known as the

a. mesolithic period

b. neolithic period

c. early palaeolithic period

d. late palaeolithic period

17. Which of the following drugs is abused by the greatest number of adolescents in Australia?

a. marihuana

b. heroin

c. alcohol

d. L.S.D. (lysergic acid diethylamide)

18. The fossil record of our ancestors consists mainly of skeletal evidence because bones

a. contain protein and other organic material which are resistant to acids in the soil

b. are the largest structures in the body

c. are seldom affected by ultra-violet light

d. when penetrated by various mineral salts, are more resistant to decay

SEE PAGE 9

19. In mouth-to-mouth artificial respiration, the rescuer blows air from his respiratory system into that of the victim. Which of the following statements is correct?

a. oxygen in the rescuer's expired air enters the victim's bloodstream and keeps the brain cells alive

b. during inflation of the lungs the intrapleural pressure would decrease

c. this technique would work even if the victim had a hole in the lungs

d. expansion of the victim's lungs is brought about by blowing air in at lower than atmospheric pressure

20. One of the dangerously misleading aspects of contracting syphilis is that

a. a chancre appears on the penis although the real damage occurs in the testes producing defective sperm resulting in sterility

b. there are no warning signs that you have been infected

c. the subsequent sores and rashes clear up without treatment but destruction of nervous and cardiac tissue can occur twenty years later

d. the early warning signs of raised blood pressure and high temperature can be mistaken for a simple infection

21. Rough endoplasmic reticulum contains

a. mitochondria

b. ribosomes

c. fat droplets

d. Golgi bodies

SEE PAGE 10

22. In the pedigree shown in Figure 2 below, squares represent males, and circles represent females. Individuals suffering from a hereditary condition are indicated by shaded symbols, and those who are phenotypically normal are indicated by clear symbols.

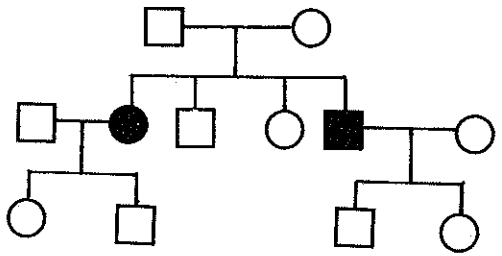


Figure 2.

The condition depicted above appears to be inherited due to

a. an autosomal (i.e. not sex-linked) dominant gene

b. a sex-linked dominant gene (locus on the X chromosome)

c. an autosomal recessive gene

d. a Y chromosome-linked gene

23. Approximately 95 tons of carbon monoxide are emitted into the atmosphere of Los Angeles daily. In 1971 some 10,000 people were advised by their physicians to leave the area because the level of air pollution was dangerous to their health.

Carbon monoxide

a. blocks the exit of carbon dioxide from the alveoli

b. produces an increased rate and depth of ventilation

c. significantly reduces the amount of oxygen dissolved in the plasma

d. binds with the same sites as oxygen on the haemoglobin molecule

SEE PAGE 11

24. Amino acids resulting from the digestive breakdown of protein are mainly absorbed in the -

a. stomach

b. pancreas

c. small intestine

d. large intestine

25. People who have suffered physical damage to the cerebellum would be expected to show symptoms such as

a. very low intelligence rating on I.Q. tests

b. uncoordinated jerky movements of the body

c. an inability to think logically

d. a total lack of autonomic nervous function

26. A person whose blood group is A would be able to receive a limited transfusion of blood only from donors of blood groups

a. B and AB

b. A and AB

c. A and O

d. A and B

27. Overactivity of the thyroid gland results in a higher metabolic rate than normal. Which of the following is <u>unlikely</u> in these people?

a. a greater heat production

b. obesity

c. protruding eyes (exophthalmia)

d. hyperactivity

SEE PAGE 12

28. Which of the following statements about the sensory part of the nervous system is correct?

a. humans are aware of all sensory information coming into the nervous system

b. there is no sensory input to the brain during sleep

c. all sensory input travels to the brain via the spinal cord

d. there is much information in the external environment that we cannot detect

29. The function of all body organs are regulated through the control systems. The control systems of the body

a. include the endocrine glands and the nervous system

b. communicate with the rest of the body by means of nerve impulses only

c. function only when the body is under stress

d. act only under conscious control

30. Study the following table showing birth and death rates for four countries in 1969. Assume immigration and emigration balanced out and had little effect on population size.

Table 1.

Country	Birth Rate (per thousand of population)	Death Rate (per thousand of population)
East Germany	14.0	14.3
Colombia	44.0	11.0
Kenya	50.0	20.0
India	42.0	17.0

SEE PAGE 13

30. (continued)

In which country was the rate of population growth greatest?

a. East Germany

b. Colombia

c. Kenya

d. India

31. During severe exertion in a hot environment a man lost four litres of sweat in one hour. This would have resulted in

a. decreased plasma volume

b. decreased circulating levels of ADH (antidiuretic hormone)

c. return of body fluid balance to normal, following ingestion of 1,000 ml of water

d. increased volume of urine

32. The "pacemaker cells" of the normal heart are found in the

a. Sino-atrial (SA) node

b. Atrio-ventricular (AV) node

c. Chordae tendineae

d. Tricuspid valve

SEE PAGE 14

33. The stomach produces proteolytic enzymes and hydrochloric acid but does not digest itself because

a. stomach cells do not contain protein

b. slightly alkaline mucus protects stomach cells

c. stomach cell membranes neutralise hydrochloric acid

d. proteolytic enzymes can only break down damaged or dead cells

34. The liver cannot break down

a. glycogen

b. haemoglobin

c. aspirin (acetylsalicylic acid)

d. DDT (dichlorodiphenyltrichloroethane)

35. Substances may be excreted from the body via

a. lungs and skin

b. large intestine and liver

c. kidneys and spleen

d. nose and adrenal glands

36. Which of the following plays NO part in the removal of foreign substances from the respiratory system?

a. cilia

b. lung macrophages

c. cough reflex

d. erythrocytes

SEE PAGE 15

37. It is unwise to tip disinfectants into septic tank systems because

a. decay-bacteria may be killed

b. they inactivate the deodourising chemicals

c. algal growth is encouraged thus blocking the pipes

d. nutrients are supplied to dangerous viruses

38. Influenza vaccinations have to be repeated frequently because

a. the influenza viruses have a longer life span than other viruses

b. the antibodies produced in response to the vaccinations are not strong enough

c. genetic changes in the viruses continually produce new strains

d. the influenza viruses multiply at a very rapid rate

39. The chemical added to drinking water to kill bacteria is

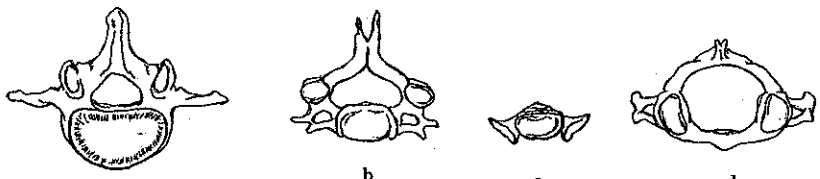
a. hydrogen fluoride

b. fluorine gas

c. liquid chlorine

d. sodium chloride

40. Which of the following diagrams shows a typical lumbar vertebra ?



a b c d

Figure 3 : Human vertebrae drawn to scale.

SEE PAGE 16

In questions 41 - 60 give the most appropriate <u>biological</u> term to match the statement. Answer the question in the spaces provided.

41. The passive process by which water moves into a cell when placed in pure water _____

42. The non-cellular component of blood _____

43. The structure in the body in which fertilisation occurs _____

44. The opening between the atria of the foetal heart which allows most of the blood to by-pass the lungs _____

45. The process of cell division which results in haploid cells _____

46. The extinct hominid species who produced Acheulian tools _____

47. Successive contractions and relaxations of the gut wall to move food along _____

48. A series of mechanical and chemical actions in order to break down large food molecules _____

49. The circular muscle that regulates the emptying of the stomach contents into the duodenum _____

50. The process by which bone forms in the body _____

SEE PAGE 17

51. A type of leucocyte involved in the production of antibodies _____

52. The word describing the relative constancy of the body's internal environment _____

53. The physical breaking down of large fat globules due to the action of bile _____

54. Contraction of the ventricles or atria _____

55. A change in the shape of the eye lens so that objects viewed at various distances can be brought into sharp focus. _____

56. The smaller air tubes of the respiratory tract that contain no cartilage _____

57. An abnormal accumulation of fluid in the body tissues _____

58. A hominid with endocranial capacity 1300-1600c.c. using Mousterian tools _____

59. The scientific name that identifies all the human races living today _____

60. The general term for a substance that is recognised as foreign by the body _____

SEE PAGE 18

61.

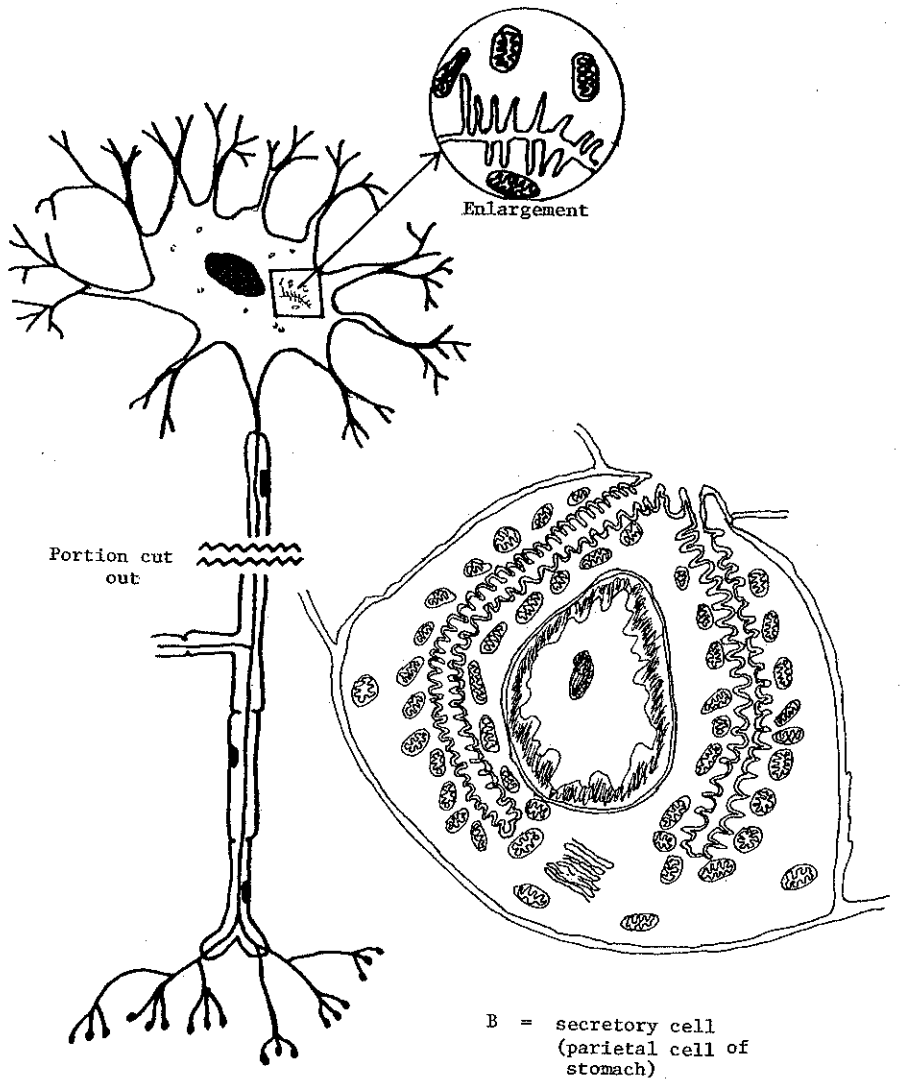


Figure 4.

SEE PAGE 19

61. (Continued)

Figure 4 depicts two (2) cells, a nerve cell (A) and a secretory cell (B)

(a) List three (3) structures these cells have in common and explain their function. (3 marks)

(b) Explain three (3) ways in which these cells differ. (3 marks)

(c) Explain one (1) way in which cell A is suited to its function. (2 marks)

SEE PAGE 20

Question 62 refers mainly to the diagram of the ear shown in Figure 5 below:

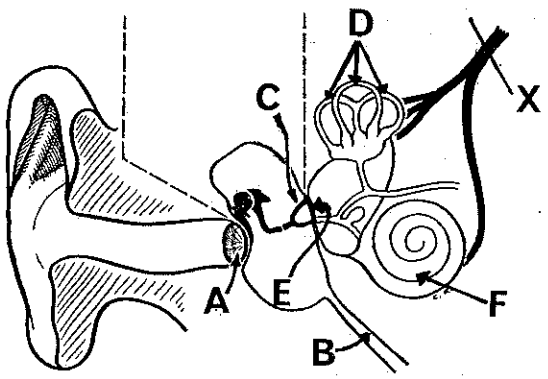


FIGURE 5 The ear and its various parts.

62 (a) Give the name of the structures labelled :

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

(3 marks)

SEE PAGE 21

62 (b) What is the function of A? _____

_____

(1 mark)

(c) "Burst ear drums" often result when people with head colds travel by air.

Name the structure affected by the head cold thereby producing the burst ear drum.

_____

(1 mark)

(d) How would the structure you referred to in question (c) above, normally function to reduce the chance of a burst ear drum?

_____

_____

(1 mark)

(e) Name the structure in which the special receptors for sound are located.

_____

(1 mark)

(f) If a cut were made through the nerve at point X which sense or senses would be impaired?

_____

(1 mark)

(g) Which structure or structures are likely to be damaged by regular exposure to very loud music?

_____

(1 mark)

SEE PAGE 22.

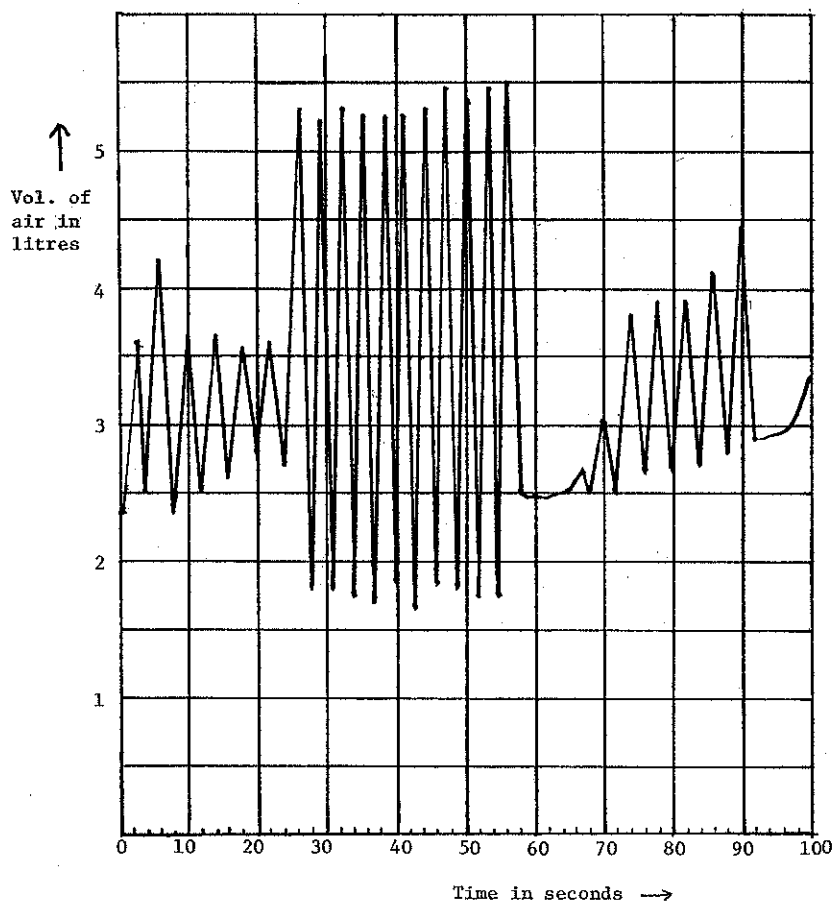


Figure 6 : Spirogram of subject's breathing pattern.

SEE PAGE 23

63. (Continued)

A subject's breathing pattern under different circumstances was investigated in the following way.

The subject was allowed an initial period of normal breathing following by a short period of hyperventilation (voluntary deep breathing). The results obtained are shown in the spirogram on the opposite page. The spirogram was produced by markings made over a moving piece of graph paper (a kymograph) by a pen attached to an instrument (a spirometer) which measured the volume of air breathed by the subject.

(a) Estimate the subject's normal breathing rate (in breaths per minute).

(1 mark)

(b) What are the differences in breathing pattern between normal breathing and hyperventilation?

(2 marks)

(c) The changes in breathing pattern were involuntary for the first 30 seconds after hyperventilation. What changes in alveolar air and pulmonary blood could have produced this change in breathing pattern?

(4 marks)

(d) Estimate the subject's approximate vital capacity from the spirogram.

(1 mark)

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64.

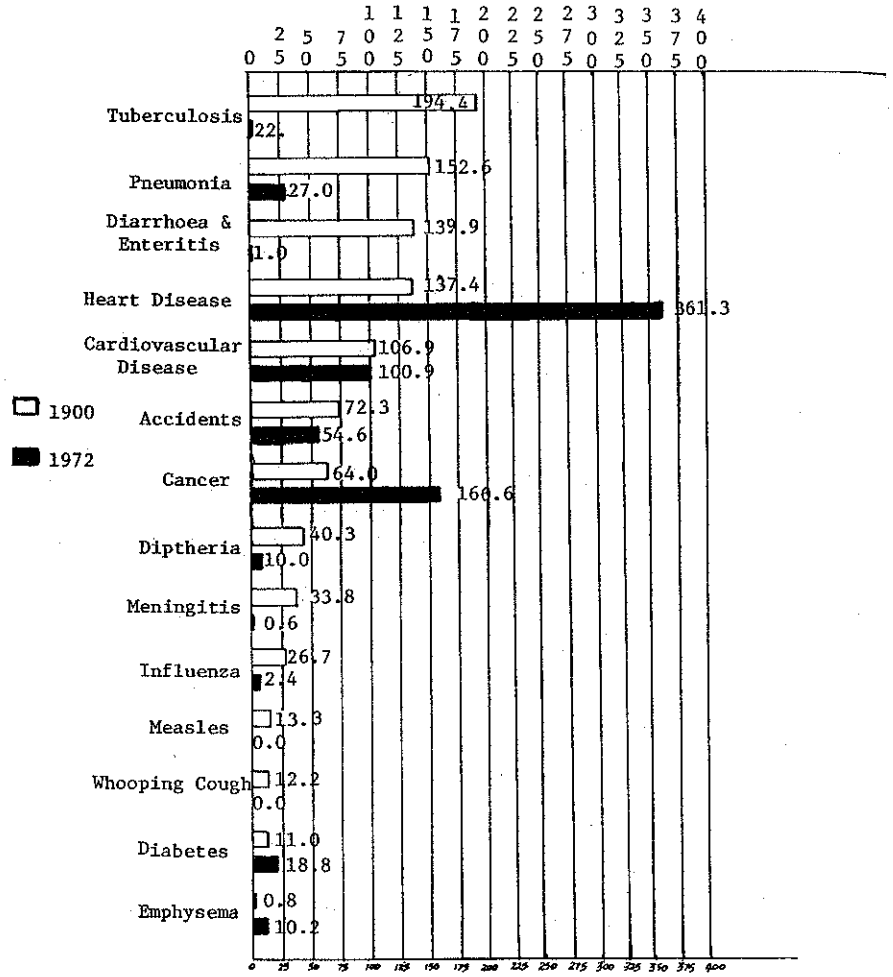

Figure 7 : Death rates from selective causes in the United States, 1900 and 1972. (Deaths per 100,000 population.)

SEE PAGE 25.

Question 64 refers in part to the information given in the histogram (Fig. 7) on opposite page.

64. (a) As can be seen from Fig. 7 tuberculosis has decreased dramatically as a cause of death between 1900 and 1972. Give two (2) reasons for this.

_____

_____

_____

(2 marks)

(b) For which disease has the greatest percentage increase in death rate occurred?

_____

(2 marks)

(c) What two (2) environmental factors may have contributed to the rise in death rates due to emphysema?

_____

_____

(2 marks)

(d) For which of the diseases shown in the histogram can Western Australian school-children obtain immunisation/vaccination?

_____

(1 mark)

SEE PAGE 26.

65.

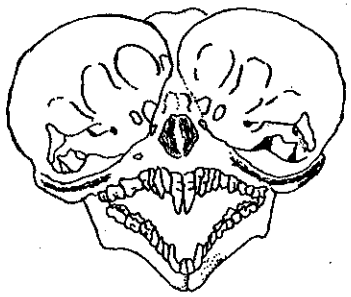

Figure 8 Enlargement of Tarsier skull

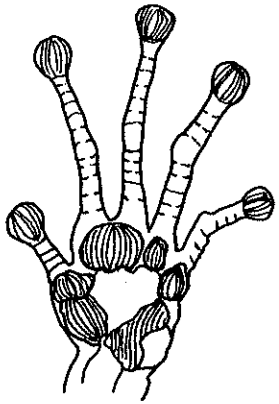

Figure 9 Enlargement of Tarsier hand

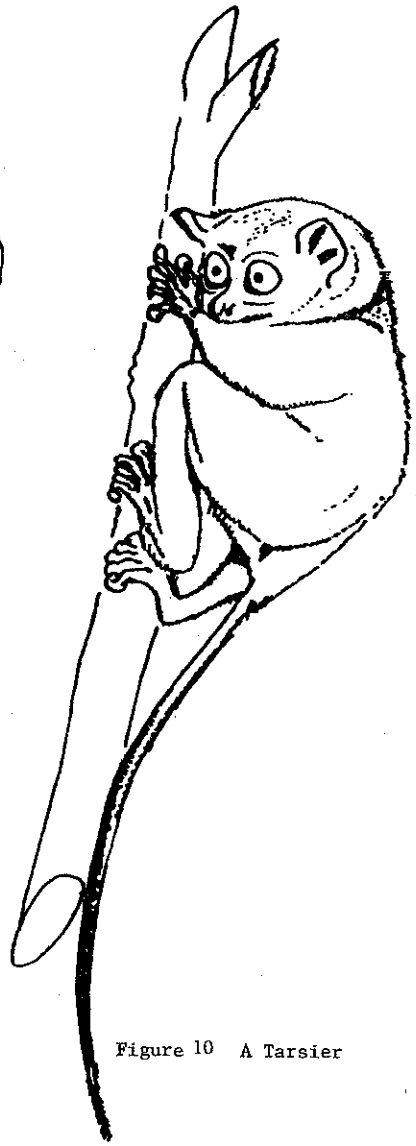

Figure 10 A Tarsier

SEE PAGE 27

65. (Continued)

Tarsiers are primates, living in the rain-forests of the Philippines. They are nocturnal and arboreal. They can leap 2 metres at a time, catching flying insects on which they feed in mid-leap and land safely on another branch. They have acute vision, though the retina contains only rods and no cones.

(a) From figures 8 and 10 which is the most striking feature of the Tarsier eye? (1 mark)

_____

(b) How will this feature contribute to the acute vision of the Tarsier? (1 mark)

_____

_____

(c) How is the fact that the retina of the Tarsier contains only rods and no cones related to its way of life? (2 marks)

_____

_____

(d) Describe one (1) feature of the hand which could be an adaptation to the Tarsier's way of life. (1 mark)

_____

(e) The Tarsier is classified as a prosimian, while monkeys, apes and humans are anthropoids. On this basis which would you expect to be more alike?

monkeys and humans

or

Tarsiers and monkeys?

Explain your answer. (3 marks)

_____

_____

_____

_____

SEE PAGE 28

PART II

Essay Section

THIS SECTION IS DIVIDED INTO THREE (3) SUB-SECTIONS. ATTEMPT TWO (2) QUESTIONS WHICH MUST COME FROM DIFFERENT SUB-SECTIONS. E.G. QUESTION 2 (SUB-SECTION I) AND QUESTION 3 (SUB-SECTION II).

SUB-SECTION I

1. "The body does not just consist of a number of different organ systems which operate independently of each other; these systems are interdependent."

   Discuss this statement with reference to water balance in the body.

   (10 marks)

2. (a) Outline the structural differences between arteries, veins and capillaries. Discuss how the structure of each is suited to its function.

   (6 marks)

   (b) Discuss changes in blood flow during a "fight-or-flight" emergency (e.g. when faced by a mad dog).

   (4 marks)

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SUB-SECTION II

3. Discuss TWO (2) of the following :

   The possible biological consequences of exposure to :

   (a) asbestos dust (5 marks)

   (b) ionising radiation (5 marks)

   (c) ultra-violet light (5 marks)

   (d) cigarette smoke (5 marks)

4. Imagine you are a member of a team of physical anthropologists investigating human origins in East Africa. You discover a reasonably complete skeleton which appears to be either hominid or pongid. Dating by the potassium-argon method indicates an age approximately 3.5 million years.

   Describe features of the following structures which would help you identify the fossil as either hominid or pongid.

   (a) skull (including mandible) (5 marks)

   (b) pelvis (3 marks)

   (c) foot. (2 marks)

SUB-SECTION III

5. Outline four (4) different methods of birth control which are available, discussing

   (a) the mechanisms by which they work or are thought to work

   (6 marks)

   (b) the effectiveness of these methods, (2 marks)

   (c) cultural factors preventing the widespread use of these methods in different countries. (2 marks)

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SUB-SECTION III (continued)

6. 1979 has been declared "The Year of the Child". Principle 4 of the Declaration of the Rights of the Child (U.N. Assembly, November 1959) states that "The child who is physically, mentally or socially handicapped shall be given the special treatment, education and care required by his particular condition."

Discuss the services provided in your community to assist physically handicapped children.

(10 marks)

END OF PAPER