CANDIDATE NUMBER

HUMAN BIOLOGY

WESTERN AUSTRALIA

TERTIARY ADMISSIONS EXAMINATION 1982

HUMAN BIOLOGY

Please place one of your Candidate Identification labels in this box

CANDIDATE NUMBER: In figures

In words

TIME ALLOWED FOR THIS PAPER:

Reading time before commencing: Ten minutes
For working of paper: Three hours

MATERIALS TO BE PROVIDED FOR THIS PAPER:

Question Paper comprising	PART I	Pages 3 - 30
	PART II	Pages 31 - 32
Essay sheets for	PART III	Pages 33 - 40
Answer sheet for	PART I	Page 42
Space for rough work		Page 41

INSTRUCTIONS TO CANDIDATES: SEE PAGE 2

FOR EXAMINER'S USE ONLY							MARKER'S NUMBER				
QUEST.	MARKS		QUEST.	MARKS		QUEST.	MARKS		QUEST.	MARKS	
41		1	57		17	62b		33	65a		49
42		2	58		18	c		34	b(i)		50
43		3	59		19	d		35	(ii)		51
44		4	60		20	e		36	c		52
45		5	61a		21	63a		37	d(i)		53
46		6	b(i)		22	b(i)		38	(ii)		54
47		7	(ii)		23	(ii)		39	66 (i)		55
48		8	(iii)		24	c		40	(ii)		56
49		9	(iv)		25	d		41	67		57
50		10	c(i)		26	e		42	68(i)		58
51		11	(ii)		27	64aA		43	(ii)		59
52		12	d		28	B		44	69(i)		60
53		13	e(i)		29	b(i)		45	(ii)		61
54		14	(ii)		30	(ii)		46	70		62
55		15	(iii)		31	(iii)		47	71		63
56		16	62a		32	(iv)		48			64

INSTRUCTIONS TO CANDIDATES:

Part I consists of 40 multiple choice questions (80 marks), 20 word-completion questions (40 marks), and 5 diagram completion questions (80 marks).

Answer ALL questions in Part I.

Part II consists of two (2) sub-sections. ONE (1) question from each sub-section should be answered. Each question MUST come from a different sub-section (20 marks each).

The Answer Sheet for questions 1 - 40 is printed on Page 42. 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 33 - 40 of the question paper.

At the end of the examination carefully check that you have placed your Candidate Identification Labels, and that you have written your candidate number in figures and words in the spaces provided on both the front and back covers of the question paper AND on the answer sheet for questions 1 - 40. FOLD your completed answer sheet BACK inside this question paper.

SEE PAGE 3

PART I

1. Every organic compound contains

   a) nitrogen
   b) carbon
   c) phosphorus
   d) calcium

2. The only possible route of a bullet passing directly through the chest of a man shot in the back, is

   a) rib → lung → kidney → heart
   b) lung → vertebra → heart → rib
   c) skin → liver → rib → lung
   d) spinal cord → heart → rib → skin

3. A.T.P. is essential to every living cell because it

   a) reacts with energy from glucose to form A.D.P.
   b) speeds up digestion of carbohydrates
   c) stores energy in a form that is instantly available
   d) stores energy released during the breakdown of A.D.P.

4. Skeletal muscle is

   a) smooth, involuntary and multinucleate
   b) smooth, voluntary and uninucleate
   c) striated, voluntary and multinucleate
   d) striated, involuntary and uninucleate

5. Bacteria cause tooth decay, due to their ability to

   a) consume the tooth's calcium phosphate
   b) attack the central nerve of the tooth
   c) produce acid which dissolves the tooth
   d) grind through enamel and dentine

6. Which one of the following is NOT a function of the liver?

   a) producing urea from unwanted amino acids
   b) regulating how much sugar is in the blood
   c) producing constituents of bile
   d) secreting enzymes for digestion

SEE PAGE 4

Questions 7, 8 and 9 refer to Figure 1 below.

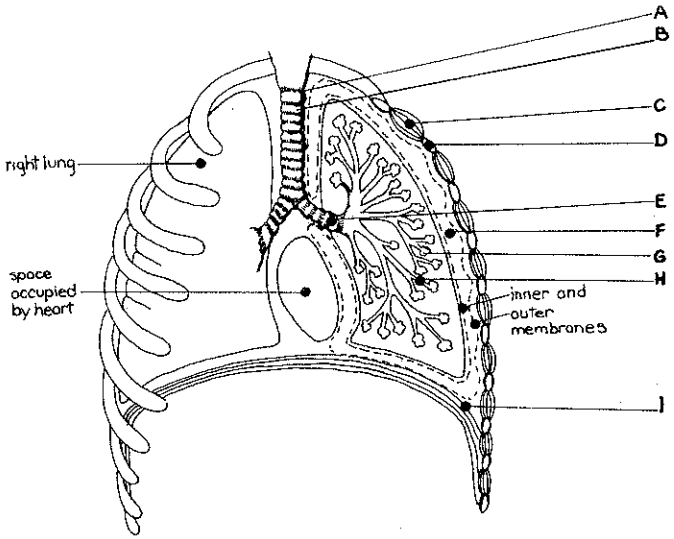

FIGURE 1.

7. Which of the following pairs of structures cause the pressure in the lungs to decrease during inspiration?

   a) A and I
   b) F and I
   c) C and F
   d) C and I

8. At which of the regions does carbon dioxide leave the blood stream?

   a) A
   b) E
   c) G
   d) H

9. The respiratory disease, pleurisy, would occur in region

   a) E
   b) F
   c) G
   d) H

SEE PAGE 5

10. Which of the following substances is found in the blood but not in the lymph?

    a) proteins
    b) red blood cells
    c) digested foods
    d) white blood cells

Questions 11 and 12 refer to Figure 2 below.

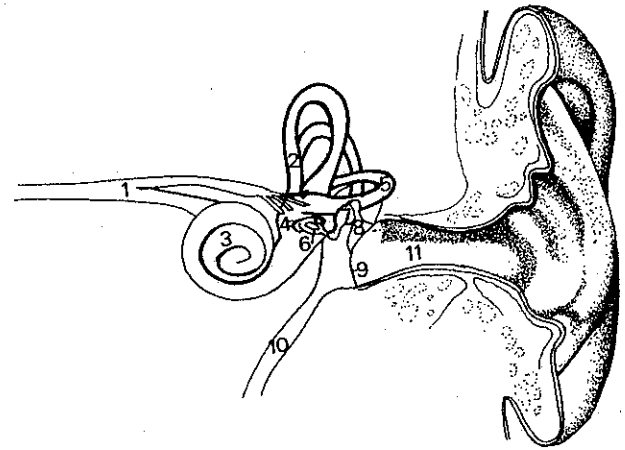

FIGURE 2.

11. In which structure do vibrations stimulate the production of nerve impulses?

    a) 1
    b) 3
    c) 5
    d) 10

12. Which structures are concerned with balance?

    a) 2 and 3
    b) 3 and 5
    c) 2 and 10
    d) 2 and 5

SEE PAGE 6

Figure 3 represents four hominid skulls. Refer to these for questions 19 and 20.

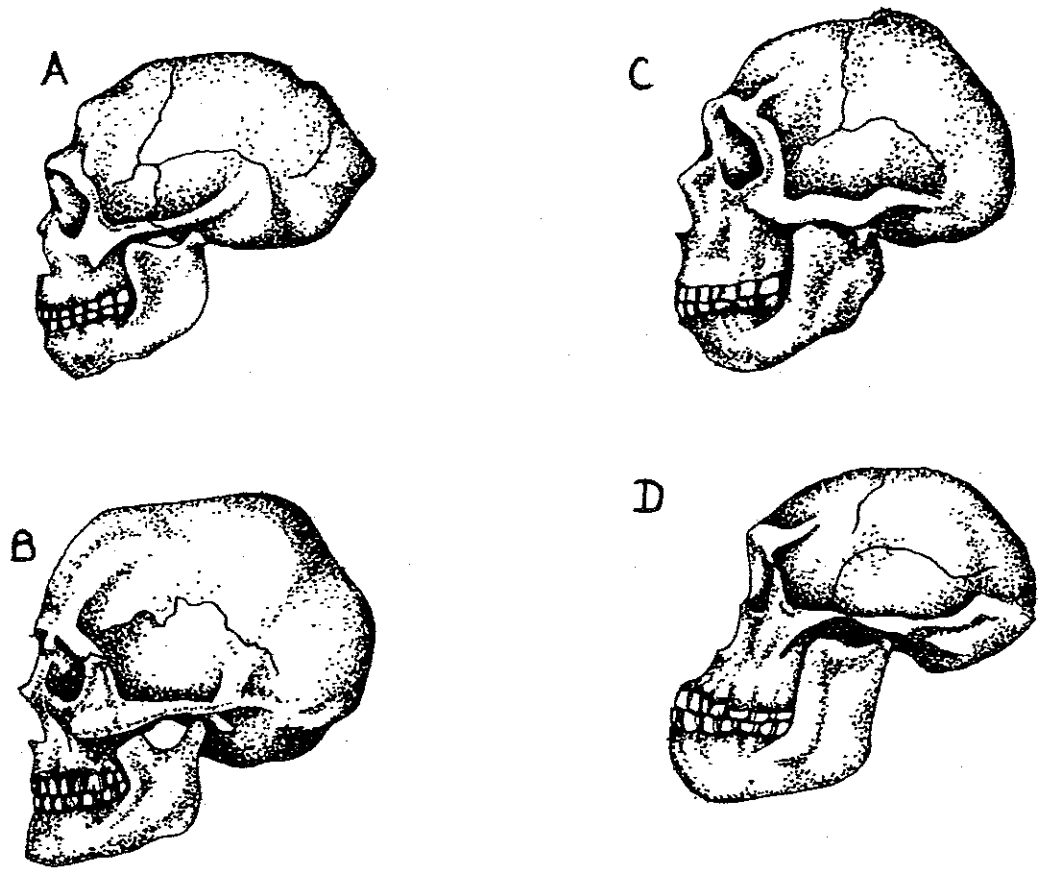

FIGURE 3.

19. In which order would you place the skulls to show an evolutionary trend towards modern man?

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

20. Skull A would represent

a) Australopithecus africanus
b) Homo erectus
c) Homo sapiens neanderthalensis
d) Homo sapiens sapiens

SEE PAGE 8

13. Which of the following pairs of events occurs during peristalsis in the oesophagus?

	STATE OF CIRCULAR MUSCLE		DIAMETER OF OESOPHAGUS
a)	contracted behind the bolus	and	wider round the bolus
b)	contracted in front of the bolus	and	wider round the bolus
c)	relaxed behind the bolus	and	narrower round the bolus
d)	relaxed in front of the bolus	and	narrower round the bolus

14. The body can be sequentially divided into units of decreasing size. From the smallest to the largest units, the correct sequence is

a) cells, organelles, tissues, organs, systems
b) organelles, cells, tissues, organs, systems
c) cells, tissues, organelles, organs, systems
d) systems, organs, organelles, tissues, cells

15. The second baby of a woman may suffer red blood cell damage, unless otherwise treated, if the mother is Rhesus

a) negative and the baby is positive
b) negative and the baby is negative
c) positive and the baby is negative
d) positive and the baby is positive

16. The Graafian follicle secretes the hormone

a) oestrogen
b) follicle stimulating hormone
c) progesterone
d) luteinizing hormone

17. In which of the following cases would there be a decrease in the volume of urine produced?

a) an intake of coffee resulting in an increase in pressure in the renal artery
b) an intake of a considerable volume of water
c) an intake of alcohol which inhibits secretion of anti-diuretic hormone
d) blood loss resulting in a fall of arterial pressure

18. Retention of heat in the body is aided by

a) vaso-dilation
b) sub-cutaneous fat
c) evaporation of sweat
d) exhalation from the lungs

SEE PAGE 7

Figure 3 represents four hominid skulls. Refer to these for questions 19 and 20.

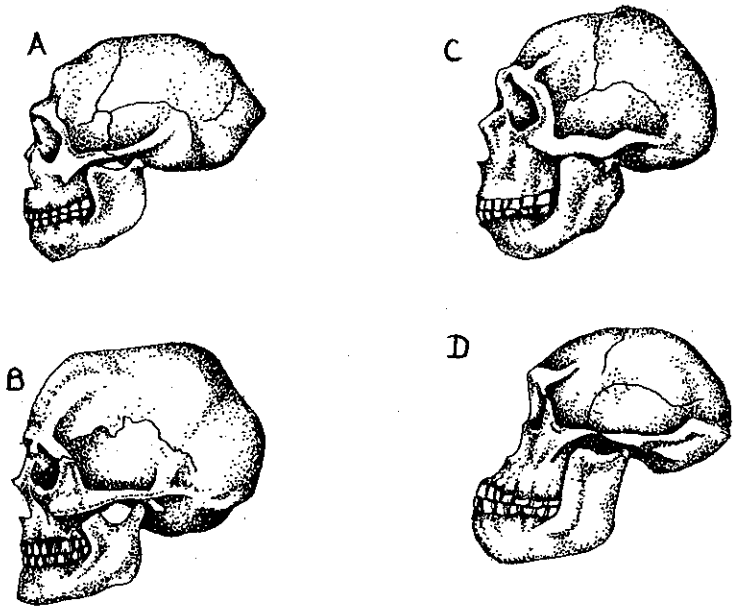

FIGURE 3.

19. In which order would you place the skulls to show an evolutionary trend towards modern man?

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

20. Skull A would represent

a) Australopithecus africanus
b) Homo erectus
c) Homo sapiens neanderthalensis
d) Homo sapiens sapiens

SEE PAGE 8

21. Of the following Primates, those most adapted to an arboreal way of life are the

a) chimpanzees
b) gorillas
c) gibbons
d) baboons

22. A person of blood type AB can donate blood to individuals with blood type

a) A and B
b) AB only
c) A, B and AB
d) AB, A, B, O

23. Complex food molecules are broken down chemically by a process called hydrolysis. This breakdown is characterized by

a) dissolving the complex food molecule in water
b) the removal of water molecules from the complex food molecule
c) the addition of hydrogen ions to the complex food molecule
d) the addition of water molecules to the complex food molecule

24. In passing from the stomach to the duodenum, food must pass through the

a) pyloric sphincter
b) oesophagus
c) common bile duct
d) cardiac sphincter

25. If a change in a particular characteristic occurs, it can only be passed on to individuals in the next generation if it is

a) a lethal trait
b) a mutation in any body cell
c) an acquired characteristic
d) a mutation in a gamete

26. Which of the following is NOT true of meiosis?

a) It occurs only in reproductive organs
b) Homologous chromosomes line up in pairs
c) Each daughter cell is identical to the parent cell
d) Chromatids are drawn to opposite poles

SEE PAGE 9

27. If monozygous twins were reared in very different environments, it is likely that they will

a) be of different sexes
b) have different D.N.A. composition
c) have different genotypes
d) have different phenotypes

28. A boy sat down on a chair and a sewing needle which was protruding from the arm of the chair pierced his hand. He rapidly jerked his arm upward. Which of the pathways of nerve "messages" shown in Figure 4 below is involved in this action?

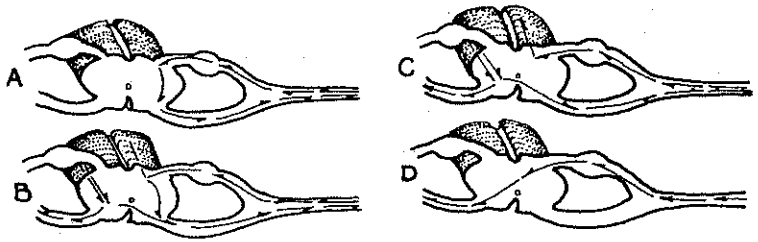

FIGURE 4.

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

SEE PAGE 10

29. Which of the following symptoms would a person with a degenerative disease of the cerebellum be most likely to show?

a) loss of peripheral vision
b) reduced motor co-ordination
c) difficulty hearing high pitched sounds
d) loss of long term memory

30. Some vitamins produce harmful effects if taken in excess. In which of the following pairs do both vitamins fit into the above category?

a) Vitamin A and Vitamin C
b) Vitamin A and Vitamin D
c) Vitamin B and Vitamin C
d) Vitamin B and Vitamin D

Questions 31 and 32 refer to the following information, and to the graph shown in Figure 5. The stroke volume of the heart is the volume of blood pumped by one ventricle at each beat. The graph shows the average heart rate for boys and girls at rest measured at different ages.

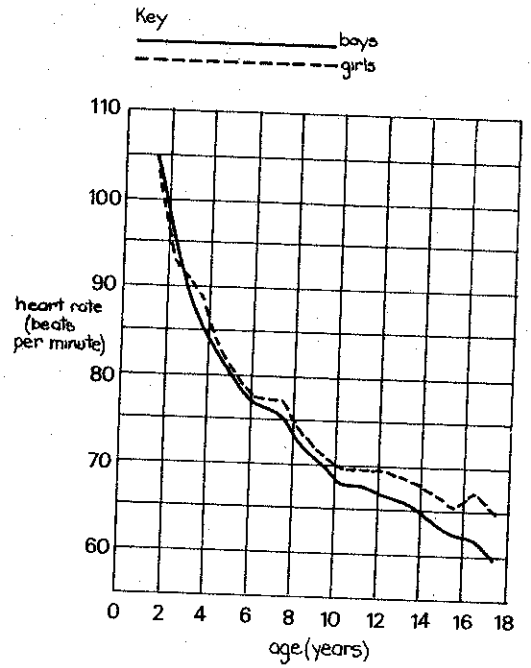

FIGURE 5

SEE PAGE 11

31. At which one of the following ages is the average resting heart rate higher for boys than for girls?

a) 2 years
b) 4 years
c) 6 years
d) 16 years

32. If boys of fourteen have an average stroke volume of 75 cm^3, the volume of blood pumped into the aorta each minute will be closest to

a) 140 cm^3
b) 1500 cm^3
c) 4875 cm^3
d) 7500 cm^3

SEE PAGE 12

Questions 33 and 34 refer to the following information and to Figures 6 and 7. An adult human body contains about 5 litres of blood which is pumped through blood vessels by the heart.

The blood is pumped under pressure from the heart via the arteries and eventually returns to the heart via the veins. The following diagram simplifies the pattern of blood circulation. The arrows show the direction of blood flow.

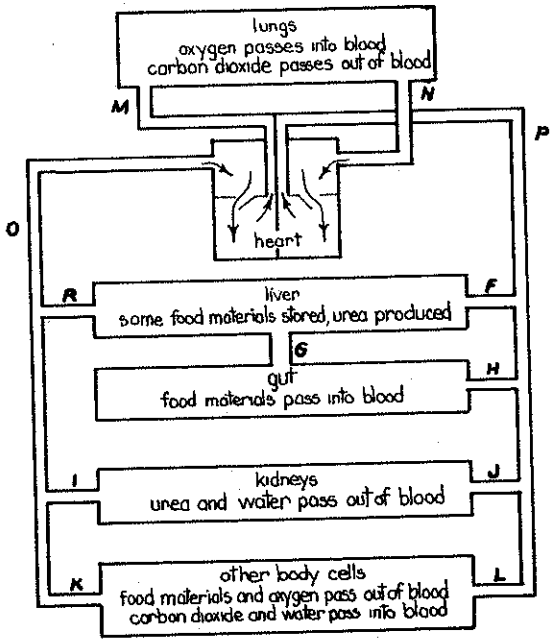

FIGURE 6.

SEE PAGE 13

33. In which of the following diagrams in Figure 7. do the arrows show the correct direction of blood flow?

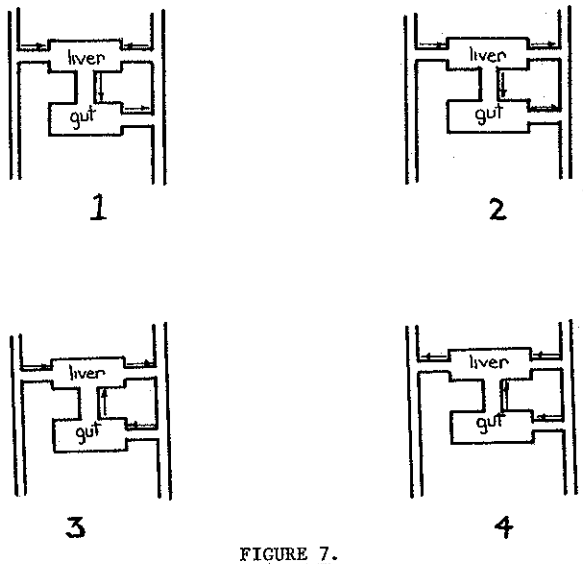

FIGURE 7.

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

34. In which of the following blood vessels would the lowest concentration of urea be found?

a) I
b) J
c) K
d) R

SEE PAGE 14

Questions 35 and 36 refer to the following information and to Figure 8 below. In the human female, body temperature is closely linked to the menstrual cycle. The day after an egg is released from the ovary a woman's body temperature rises by about 0.5°C and remains at this level until the beginning of menstruation. Menstruation begins about 14 days after an egg is released and lasts about 4 days. The cycle repeats itself about every 28 days.

Figure 8 is a graph of a woman's body temperature measured daily over a number of consecutive days.

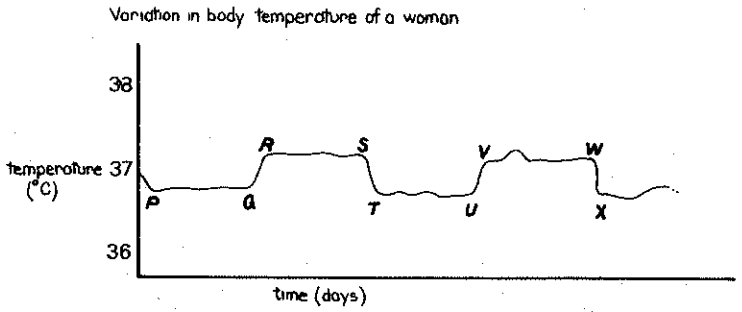

FIGURE 8.

35. The graph from Q to T covers a time span of about

a) 4 days
b) 14 days
c) 28 days
d) 56 days

36. The woman whose temperature is graphed probably began menstruating on days represented by points

a) P and T
b) Q and U
c) R and V
d) Q and T

SEE PAGE 15

37. A young man breathed into a spirometer and produced a trace of his pulmonary volumes as shown in Figure 9. below.

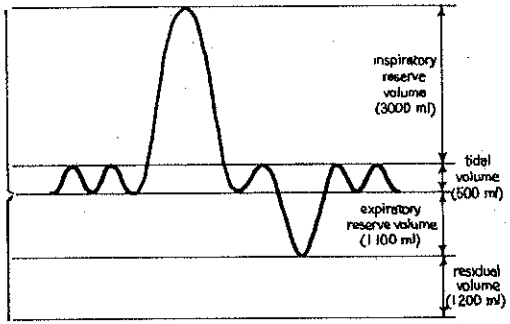

FIGURE 9.

Which of the following volumes corresponds to his vital capacity?

a) 2800 ml
b) 3500 ml
c) 4600 ml
d) 5800 ml

SEE PAGE 16

38. The human skeleton

i) Is made of bone which metabolizes very slowly and has a poor blood supply.
ii) Acts as a framework for the attachment of muscle and as a system of levers.
iii) Encloses certain delicate organs thus providing a degree of protection from physical damage.
iv) Is strengthened by the addition of a chemical compound called keratin, particularly at the joints.

Choose the correct alternative

a) (ii) only is correct
b) (i), (ii) and (iii) only are correct
c) (ii) and (iii) only are correct
d) (i), (ii), (iii) and (iv) are correct

39. The white matter of the spinal cord

a) consists mainly of nerve cell bodies
b) contains tracts to and from the brain
c) is surrounded by the grey matter
d) contains the dorsal root ganglia

40. Simple goitre is caused by a dietary deficiency of which of the following ions?

a) iodide
b) iron
c) calcium
d) sodium

SEE PAGE 17

In questions 41-60 give the most appropriate term to match the statement. Answer the questions in the spaces provided.

41. A plane dividing the body into right and left portions. _____

42. The volume of air entering and leaving the body with each breath during quiet respiration. _____

43. Abnormal loss of blood from the blood vessels either internally or externally. _____

44. The shaft or cylindrical part of a long bone. _____

45. A collective term for energy requiring reactions which result in the synthesis of cellular components. _____

46. Hairlike projections found on some columnar epithelia, which are capable of moving small particles along the cell surface. _____

47. The final stage of mitosis in which a new nuclear membrane appears and the parent cell divides into two halves. _____

48. The endocrine gland attached to the superior surface of the kidney. _____

49. A tail which is able to grasp objects like a fifth limb. _____

50. To break down food using chemical and mechanical means. _____

51. The relaxation phase of the cardiac cycle, when the atria and ventricles fill with blood. _____

52. The region of communication between two neurons. _____

53. A collective name for drugs which reduce anxiety. _____

54. An individual who has two identical alleles at a given locus. _____

SEE PAGE 18

55. A fold in the skin of the eyelid that produces the 'almond' shaped eyes found primarily in Oriental and American Indian populations. _____

56. The blood vessel in the foetal circulatory system which allows blood to pass from the pulmonary artery to the aorta, so by-passing the lungs. _____

57. The superfamily to which humans belong. _____

58. The cell organelle containing digestive enzymes for use within the cell. _____

59. The principal storage form of carbohydrate in liver and muscle tissue. _____

60. The period between contracting an infectious disease and the appearance of symptoms of the disease. _____

SEE PAGE 19

61.

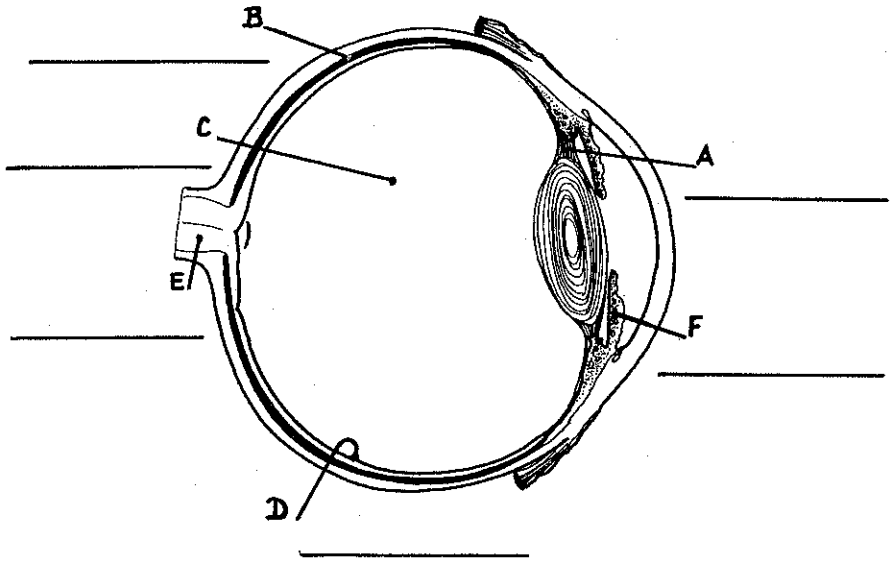

FIGURE 10.

Diagram Of The Human Eye Seen In Horizontal Section.

a) Label the parts of the eye in the spaces provided on Figure 10. (6 marks)

b) Give the functions of the following structures in Figure 10.

i) B _____

ii) C _____

iii) D _____

iv) F _____

(4 marks)

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61. (continued)

c) A person suffering from an eye defect is prescribed with concave lenses to correct for the defect.

i) From what defect is the person suffering? _____

ii) Use the following diagrams A & B to show how the lens corrects for the defect, by sketching the light rays and the image produced.

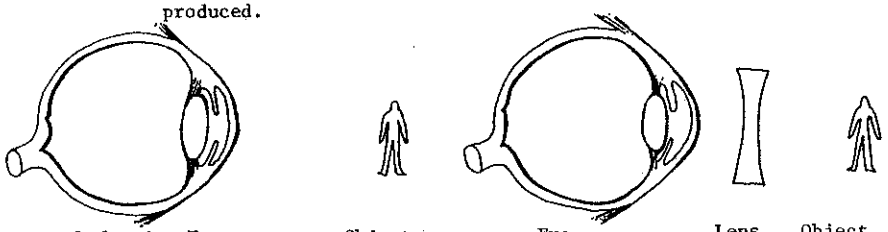

Diagram A. Diagram B.

(3 marks)

d) Colour blindness is a hereditary condition in which degrees of deficiency in colour perception may occur.
Which receptors in the light sensitive part of the eye would be affected by this condition? _____

(1 mark)

e) The Pedigree Chart in Figure 11. shows the inheritance of red-green colour blindness, a common form of the condition mentioned in part (d). Red-green colour blindness is an X-linked condition.

i) Is the gene for red-green colour blindness dominant or recessive? _____

Give one conclusive reason for your answer.

_____

_____

_____

SEE PAGE 21

61. (continued)

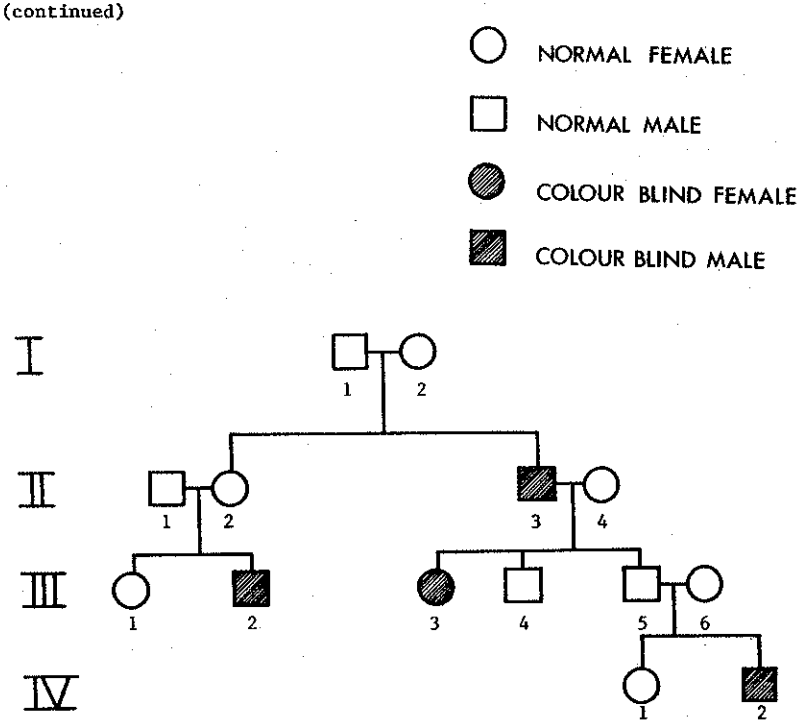

FIGURE 11.
Pedigree Chart.

ii) What are the genotypes of the following individuals shown in Figure 11?

$\overline{\text{I}}$ 2 _____

$\overline{\text{III}}$ 2 _____

$\overline{\text{III}}$ 4 _____

Indicate, in the space below, the meaning of the symbols you are using.

_____ _____

iii) Female $\overline{\text{IV}}$ 1 is pregnant. The father of the child has normal vision. What is the probability that the child will be a red-green colour blind son? _____

(4 marks)

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62.

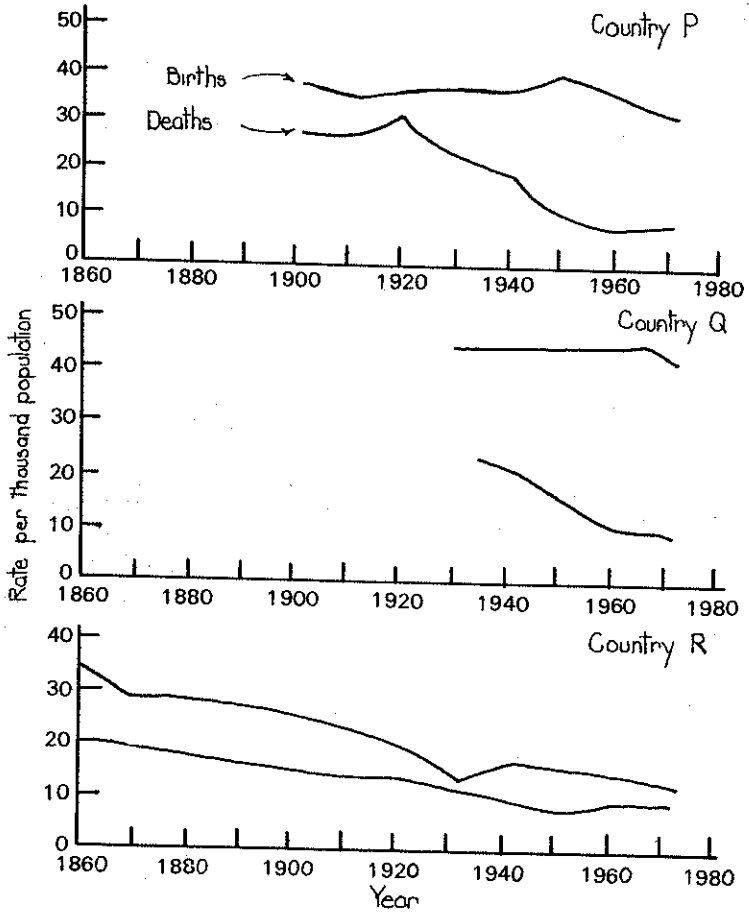

FIGURE 12.

Graphs of birth and death rates of three different countries P, Q and R. In each of these graphs the upper line shows birth rate and the lower line shows death rate.

SEE PAGE 23

62. (continued)

a) Which country had the highest birth rate in 1950? _____

(2 marks)

b) During which period was there an increase in birth rate in country R? _____

(2 marks)

c) In which country was zero population growth nearest to being achieved in 1970? _____

(2 marks)

d) What was the rate of natural increase in population in 1970 in each of the following countries? Country P _____

Country Q _____

(4 marks)

e) From countries P, Q and R give an example typical of a developing country. _____

(1 mark)

What factors in this country have contributed to the trends in the birth and death rates shown in the graph?

_____

_____

_____

_____

(4 marks)

SEE PAGE 24

63.

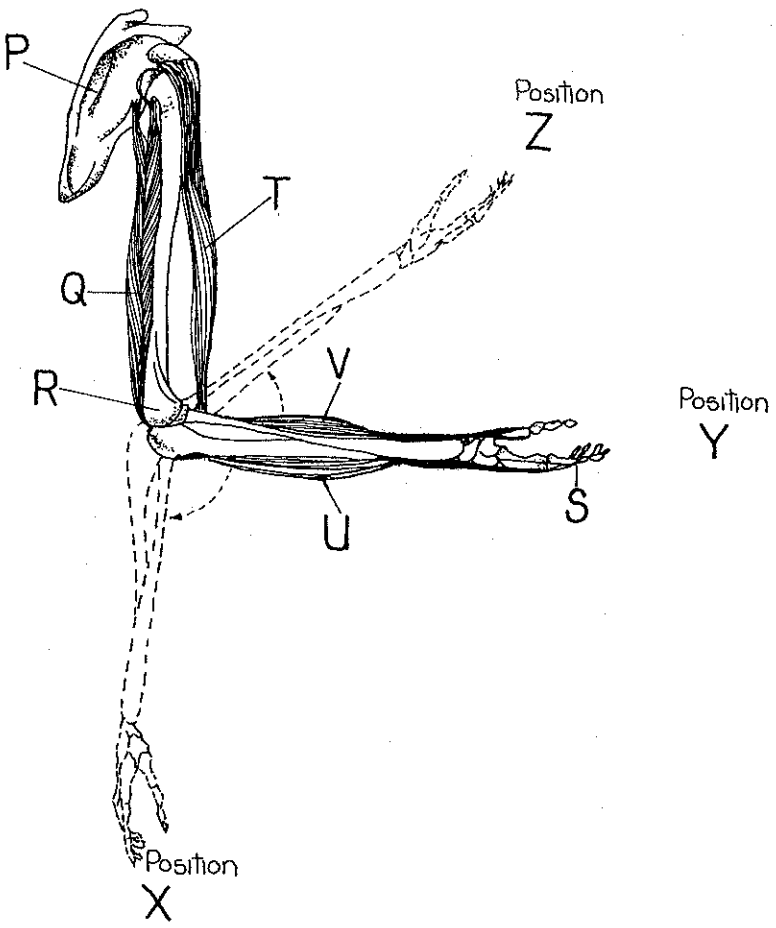

FIGURE 13.

Three Positions Of The Human Upper Limb

SEE PAGE 25

63. (continued)

a) Label the parts P and Q shown in Figure 13.

P _____ Q _____ (4 marks)

b) What type of joint exists between

i) bone R and the ulna _____

ii) bone P and bone R _____ (4 marks)

c) If the forearm moves from position Y to position Z, which letter in Figure 13 represents the muscle which is contracting to enable this movement? _____ (1 mark)

d) What type of movement is occuring when the forearm moves from postion Y to position X? _____ (2 marks)

e) The muscles of the arm can become fatigued after prolonged vigorous exercise. Explain why this occurs

_____

_____

_____

_____

_____

(4 marks)

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64.

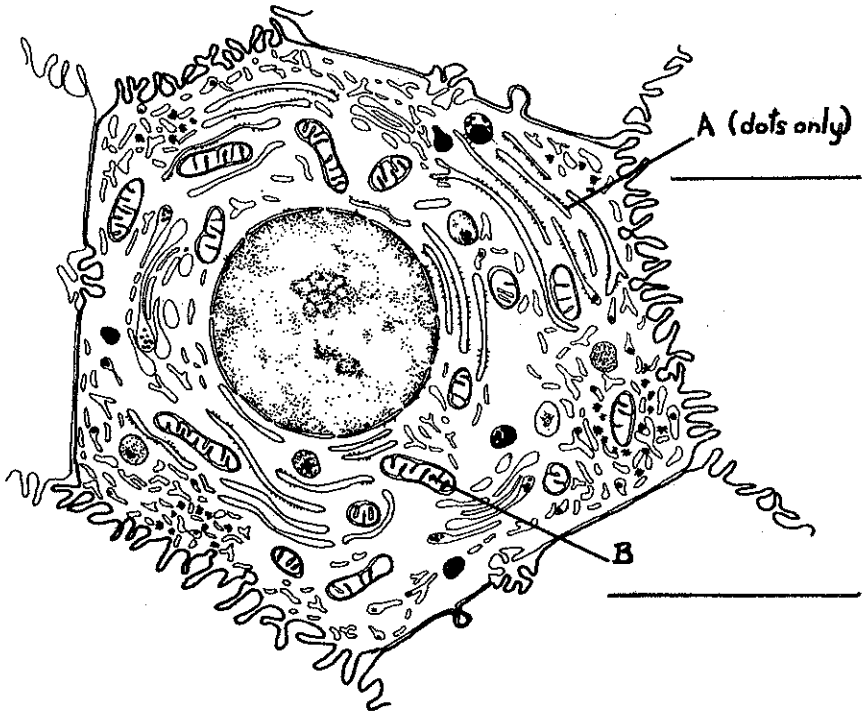

FIGURE 14.

Diagram Of Section Through A Liver Cell.

SEE PAGE 27

64. (continued)

a) Label the cell organelles indicated as A and B in the spaces provided on Figure 14.

What is the major function of each of these organelles?

A _____

B _____

(4 marks)

b) List FOUR ways in which substances can cross the cell membrane and explain how each occurs.

i) _____

ii) _____

iii) _____

iv) _____

(12 marks)

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65. a) Label the structures in the spaces provided in Figure 15. below.

(6 marks)

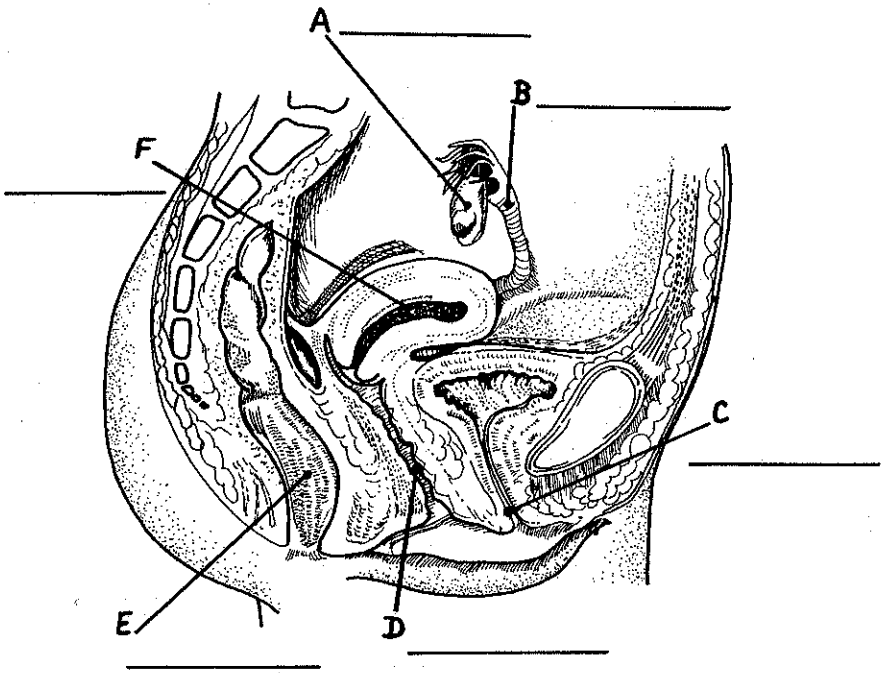

FIGURE 15.

Diagram Of The Female Pelvic Region Seen In Sagittal Section.

SEE PAGE 29

65. (continued)

b) Figure 16 below, shows the structure of a developing embryo at various stages after fertilization.

i) How long after fertilization has occurred would each of these stages be reached?

two cell stage _____

blastocyst _____

ii) Name the part of the female reproductive system in which each of these structures would normally be found.

two cell stage _____

blastocyst _____

(4 marks)

FIGURE 16.

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65. (continued)

c) Label the structures in the spaces provided on Figure 17 below.

What is the function of the fluid in region Z? _____

_____

Provide two reasons why structure Y is necessary for the survival of the foëtus.

_____

_____

(3 marks)

d) At this stage of pregnancy (approximately 16 weeks) it is possible to obtain a sample of foetal cells, determine their karyotype (chromosomal constitution) and thus diagnose some congenital abnormalities.

i) From where in Figure 17 would foetal cells be obtained?

_____

ii) What would be the chromosome constitution of

a normal male _____

a Down's Syndrome female _____

(3 marks)

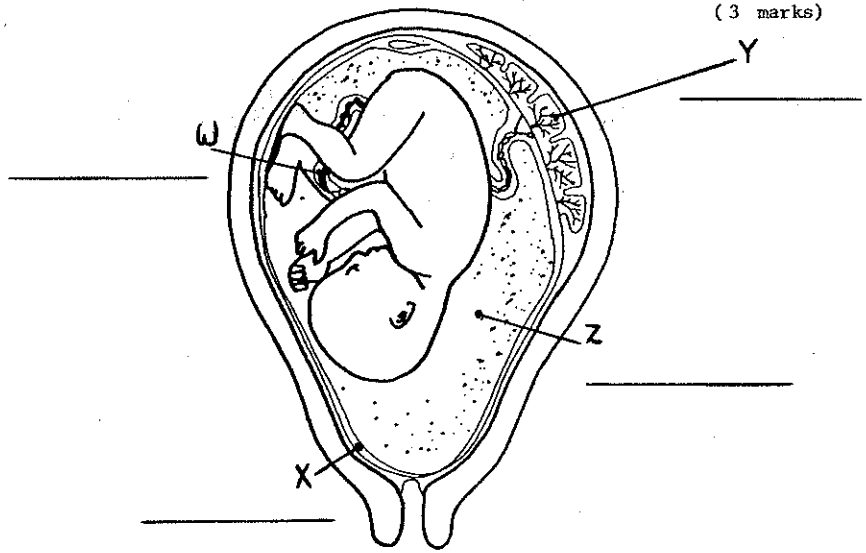

FIGURE 17.

Represents A Sixteen Week Foetus In The Uterus

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PART II

Essay Section.

THIS SECTION IS DIVIDED INTO TWO (2) SUB-SECTIONS. ATTEMPT ONE (1) QUESTION FROM EACH SUB-SECTION. ILLUSTRATE YOUR ANSWERS WITH DIAGRAMS, WHERE APPROPRIATE.

SUB-SECTION I

66. The body's defence processes against invading micro-organisms may be divided into two types

a) non-specific processes.

b) specific processes called the IMMUNE RESPONSE.

i) Discuss the non-specific processes with reference to the defense barriers on the skin and in the respiratory and digestive systems. (8 marks)

ii) Discuss the immune response using a communicable disease to illustrate your answer. (12 marks)

67. Both the nervous system and the endocrine system serve as means of communication within the body. Describe the DIFFERENCES between these two systems, including both structural and functional aspects.

(20 marks)

68. In a normal healthy individual, approximately 1000 ml of blood enters the kidney via the renal artery each minute. In the same time period about 1 ml of urine is produced (depending on conditions) and 999 ml of blood leaves the kidney via the renal vein. The production of urine from blood takes place in the nephron.

i) Describe the structure of a nephron and its associated blood vessels. (8 marks)

ii) Blood and urine differ markedly in composition. Describe the major differences and explain how the processes occurring in the nephron result in such changes. (12 marks)

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SUB-SECTION II

69. The biological effects of senescence (ageing) on the human body are widespread.

i) Discuss the changes which occur in six of the body's systems.

(12 marks)

ii) Discuss the social problems with which the aged in our society must cope.

(8 marks)

70. The tribal Australian Aboriginal was able to survive for thousands of years in harsh conditions. Discuss the physical characteristics and cultural factors that may have made this possible.

(20 marks)

71. The human being and the lemur are both living members of the order Primates. Discuss the characteristics of Primates explaining why the human being and the lemur are included in this order.

(20 marks)

END OF PAPER