

TERTIARY ADMISSIONS EXAMINATION, 1984

# 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: Ten minutes  
For working of paper: Three hours

## MATERIAL REQUIRED/RECOMMENDED FOR THIS PAPER

### TO BE PROVIDED BY THE SUPERVISOR

This Question/Answer Booklet comprising PART I Page 3 - 33  
PART II Pages 34 - 37  
Essay sheets for PART II Pages 38 - 46  
Space for rough work Page 47  
Separate Multiple Choice Answer Sheet

### TO BE PROVIDED BY THE CANDIDATE

#### Standard Items

Pens, pencils, eraser, ruler

#### Special Items

A 'B' or '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.

## INSTRUCTIONS TO CANDIDATES

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INSTRUCTIONS TO CANDIDATES

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HUMAN BIOLOGY

PART I

consists of 40 multiple choice questions (80 marks),  
20 word-completion questions (40 marks), and 6 diagram  
completion questions (80 marks).

Answer ALL questions in PART I.

Questions 1 - 40 should be answered on the Separate Multiple Choice Answer Sheet. USE A 'B' OR '2B' PENCIL. DO NOT USE A BALL POINT OR INK PEN.

Questions 41 - 66 should be answered in the spaces provided in the Question/Answer Booklet.

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 essays for PART II should be written on Pages 38 - 46 of the question paper.

At the end of the examination carefully check that you have placed your Candidate Identification Label, and that you have written your candidate number in figures and words in the spaces provided on the front cover of this Question/Answer Booklet.

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HUMAN BIOLOGY

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PART I

Mark your answers to Questions 1 - 40 on the Separate Multiple Choice Answer Sheet, using a 'B' or '2B' pencil.

1. Which of the lists below is the correct order of size from smallest to largest?

- a) bacterium, ovum, virus, water molecule
- b) ovum, water molecule, bacterium, virus
- c) water molecule, virus, bacterium, ovum
- d) bacterium, virus, ovum, water molecule

2. Which of the cellular organelles below would synthesize growth hormone in the cells of the pituitary gland?

- a) ribosomes
- b) vacuoles
- c) mitochondria
- d) centrioles

3. Physiological saline solution is used for dilution of blood samples in a medical laboratory. If distilled water was used

- a) the blood cells would shrink in size
- b) the activity of the mitochondria in the cells would be stimulated and they would use up all of the oxygen supply
- c) the blood cells would swell and burst
- d) the activity of the mitochondria in the cells would be inhibited and they would die

4. The following is a list of processes which occur in a cell:

- 1. active transport
- 2. catabolism
- 3. respiration
- 4. osmosis
- 5. anabolism
- 6. diffusion
- 7. pinocytosis

Which processes listed above move material into or out of the cell?

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

SEE PAGE 4

Questions 5 and 6 refer to Figure 1 below.

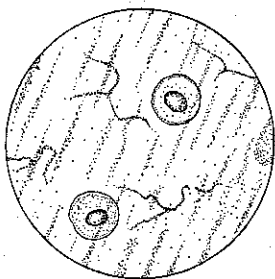


FIGURE 1. Microscopic View of a Tissue.

5. The function of the tissue shown in the figure above is most likely to be

- a) conduction of impulses
- b) support and joining
- c) protection and secretion
- d) contraction when stimulated

6. In the figure above, if the diameter of the field of view is 0.5mm, then the diameter of one of the cells shown is approximately

- a) 25  $\mu\text{m}$
- b) 100  $\mu\text{m}$
- c) 250  $\mu\text{m}$
- d) 1000  $\mu\text{m}$

7. If we observe that small molecules can diffuse through cell membranes at a greater rate than large molecules AND that a molecule of size greater than 0.8nm in diameter can only diffuse very slowly into cells, then which of the graphs in Figure 2 below best represents these observations?

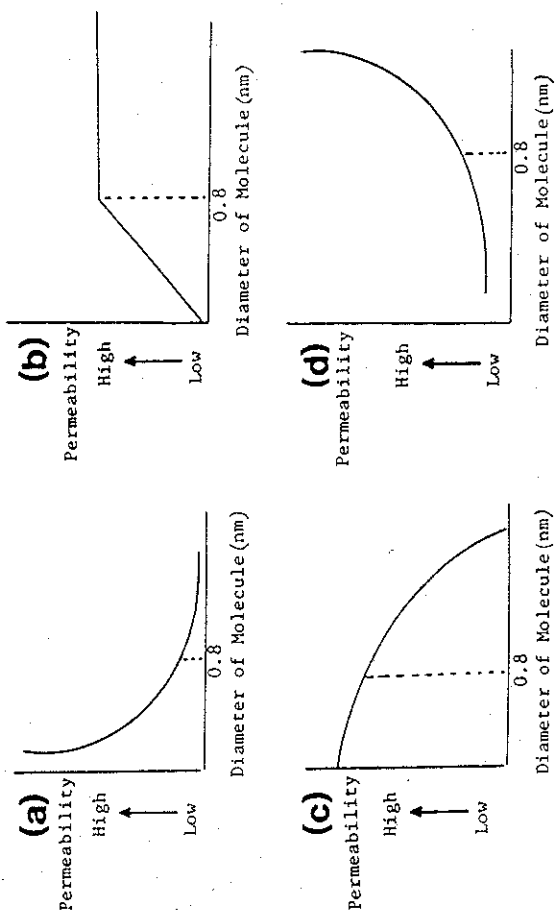


FIGURE 2. Graphs Showing Rates of Diffusion

8. Patients who have had their gall bladder removed

- a) should eat small amounts of carbohydrate at a time
- b) should eat small amounts of protein at a time
- c) should eat small amounts of lipid at a time
- d) need not change their diet at all

9. The region common to both the digestive and the respiratory systems is the

- a) oesophagus
- b) larynx
- c) trachea
- d) pharynx

SEE PAGE 5

SEE PAGE 6

10. The bulk of faeces is greater with an increased intake of
- meat because it is rich in proteins
  - dairy products because they are rich in lipids
  - fruit because it is rich in vitamins and minerals
  - vegetables because they are rich in complex carbohydrates
11. Which two minerals are required in the diet to prevent the formation of weak, "chalky" teeth?
- sodium and calcium
  - potassium and phosphorous
  - phosphorous and calcium
  - sodium and potassium
12. Which of the following foods would be chemically digested to the greatest extent in the stomach?
- a slice of bread
  - an apple
  - a carrot
  - an egg
13. During expiration
- the intercostal muscles contract to move the diaphragm downwards
  - air moves from the alveoli, through the bronchi, then the bronchioles and trachea to the outside
  - the air pressure in the lungs is greater than atmospheric pressure outside of the body
  - the pleura expand to enlarge the pleural cavity and allow air to move out
14. Although the heart beats intermittently, the blood pressure in the arteries does not drop to zero between beats of the heart and the blood is kept in continuous motion.
- Which of the following best explains these observations?
- The left and right ventricles contract alternately.
  - Blood is held in reserve in the lymphatic system and supplements blood flow when required.
  - The blood changes in volume with the pressure changes produced by periodic contractions.
  - The walls of the arteries are elastic.

SEE PAGE 7

15. Which of the following blood hormone concentrations would NOT fall after the removal of the pituitary gland in a male?
- thyroxine
  - adrenalin
  - testosterone
  - antidiuretic hormone
16. In a situation of stress, which of the following symptoms would NOT be due to stimulation of the sympathetic branch of the autonomic nervous system?
- rapid heart rate
  - cold clammy hands
  - flushed face
  - rapid respiration rate
17. A Western Australian newspaper in February 1984 reported:
- "A clinical trial will begin in Perth soon to determine the effectiveness of very high frequency (VHF) microwave therapy - popularly called the Tronado - in the treatment of cancer. The trial, extending over two years, will be a study of patients with various types of lymphoma - cancer of the lymph glands. During that time it is expected that 56 patients will come into the trial. Half of them will be treated with conventional radiotherapy and the other half with radiotherapy and VHF microwave therapy. Whether they receive the VHF microwave therapy will be determined by the opening of a sealed envelope when they first attend for treatment."
- In the trial described above, the independent (experimental) variable is
- radiotherapy
  - VHF microwave therapy
  - the development of lymphoma
  - a combination of radiotherapy and VHF microwave therapy

SEE PAGE 8

18. Which of the following statements about the male reproductive system is INCORRECT?

- Sperm are produced in the seminiferous tubules.
- The prostate and bulbo-urethral (Cowper's) glands add fluid to the semen.
- Although semen usually contains between 50 and 100 million sperm per millilitre, only one sperm fertilizes an ovum.
- Fertility is not affected by the number of sperm per millilitre of semen.

19. Which of the following statements about the curves in Figure 3 showing development of various organ systems is INCORRECT?

- Curve A represents the growth of the immune system.
- Curve B represents the growth of the brain and head.
- Curve C represents the growth of the whole body.
- Curve D represents the growth of the reproductive organs.

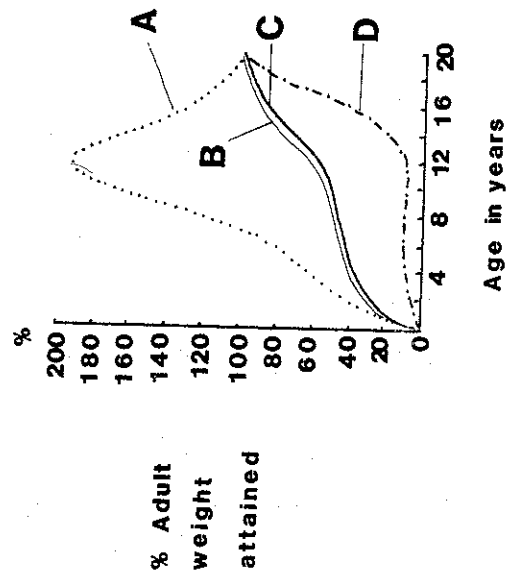


FIGURE 3. Growth of Human Organ Systems

SEE PAGE 9

Questions 20 and 21 refer to Table 1.

TABLE 1.

Period	Birth		1		20		40		60	
	male	female	male	female	male	female	male	female	male	female
1901-11	55.2	58.8	60.0	62.9	44.7	47.5	28.6	31.5	14.4	16.2
1920-22	59.2	63.3	62.7	66.0	47.0	50.0	30.1	33.1	15.1	17.2
1946-48	66.1	70.6	67.3	71.5	49.6	53.5	31.2	34.9	15.4	18.1
1960-62	67.9	74.2	68.8	74.5	50.4	56.2	31.8	37.0	15.6	19.5
1970-72	67.8	74.5	68.3	74.7	50.2	56.4	31.6	37.2	15.4	19.7

20. During which period could a 60 year old male expect to live longest?

- 1920-1922
- 1946-1948
- 1960-1962
- 1970-1972

21. The life expectancy at birth rose by about 12 years between the 1901-1911 period and the 1970-1972 period, but the life expectancy at 60 years rose by only one year.

Which of the following combinations of statements best explains these observations?

- Infant mortality fell markedly during this time.
  - The mortality due to infectious diseases in children fell markedly during this time.
  - Improved treatment of chronic diseases of old age had only a small effect on prolonging the lifespan of people over 60 years of age.
  - The population increased markedly during this time.
- (i) and (ii) best explain the observations.
  - (ii) and (iii) best explain the observations.
  - (i), (ii) and (iii) best explain the observations.
  - All explain the observations.

SEE PAGE 10

Questions 22, 23 and 24 are based on the pedigree shown in Figure 4 below in which individuals with a common bone disease are indicated by shading.

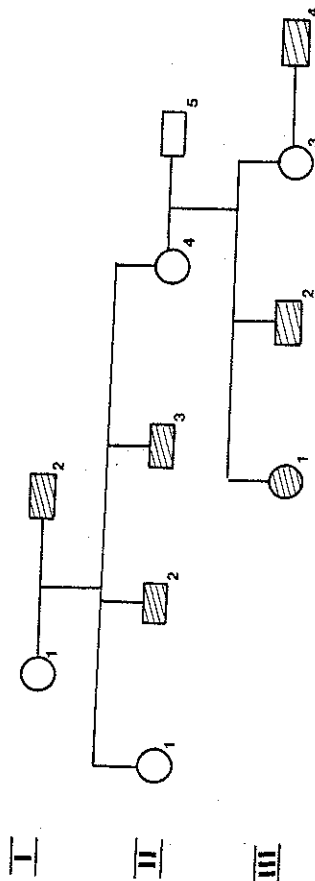


FIGURE 4. Pedigree

22. The bone disease is inherited as

- autosomal recessive
- autosomal dominant
- sex (X) linked recessive
- sex (X) linked dominant

23. The genotype of female II.4 is

- homozygous recessive
- homozygous dominant
- heterozygous
- heterozygous or homozygous dominant

24. Female II.1 is pregnant to a heterozygous male not shown on the pedigree. What is the probability that this baby will be affected with the disease?

- 0.0
- 0.25
- 0.5
- 0.75

25. Mary has black hair like her father but her mother has red hair. Mary is pregnant to Bill who has red hair. What is the probability that the baby will have red hair? Assume hair colour is determined by a pair of genes at one locus.

- 0.0
- 0.25
- 0.5
- 1.00

26. The theory of natural selection suggests that:

- in each generation, all the individuals well adapted to their environment live longer and produce more offspring than the less well adapted individuals
- the deaths of individuals occur at random with respect to the physical environment
- the deaths of individuals occur at random with respect to their genotype
- the survival and reproductive success of individuals depend upon the extent to which they are genetically adapted to their environment

27. The australopithecine dentition is characterized by small incisors and canines, and huge molars and pre-molars. This dental pattern suggests that:

- the diet consisted of meat
- hands were used rather than teeth as defense weapons
- large quantities of food were eaten
- tough vegetable food sources formed a large proportion of the diet

28. Which of the following tool cultures is the most ancient?

- Neolithic
- Aurignacian
- Oldowan
- Acheulian

29. Which of the following organs is NOT part of the immune system?

- bone marrow
- tonsils
- thyroid gland
- thymus gland

30. Which of the following is NOT an adaptation for gas exchange at high altitudes?

- a) an increased number of red blood cells
- b) an increased number of white blood cells
- c) an increased vital capacity
- d) an increased concentration of haemoglobin

31. The potassium-argon technique of dating fossilized material is most suitable for samples

- a) that are between 30,000 and 50,000 years old
- b) trapped in layers of volcanic ash
- c) found in limestone caves
- d) rich in carbon

32. Which of the following is NOT consistent with the graph in Figure 5 below?

- a) Individuals at the equator on average are heavier than those living at the poles.
- b) Individuals at the equator have a large body surface area per unit volume.
- c) Individuals at the equator have a body shape that facilitates heat loss.
- d) Environmental temperature is an agent of natural selection influencing body shape.

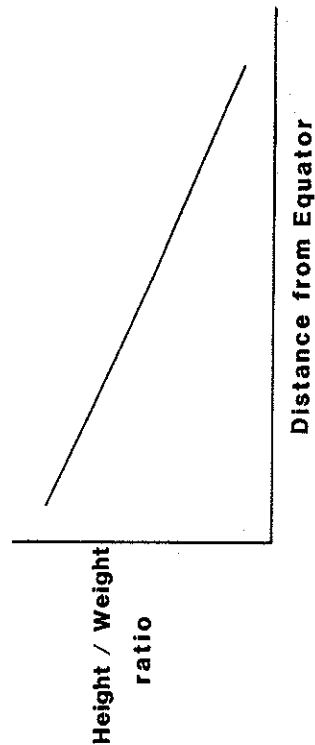


FIGURE 5. Graph Showing Variations in Body Shape

SEE PAGE 13

33. A scientist developed a technique which involved making rubber casts of the inside of fossilized crania to estimate brain size. The scientist managed to obtain one intact cranium of each of the following species -

- Homo sapiens sapiens,
- Homo sapiens neanderthalensis,
- Homo habilis,
- Australopithecus africanus,
- Australopithecus afarensis,
- Homo erectus.

Which of the following predictions is most likely to be supported by measurements made on these crania?

- a) The Homo sapiens sapiens brain will be larger than the Homo sapiens neanderthalensis brain.
- b) The Australopithecus afarensis brain will be larger than the Australopithecus africanus brain.
- c) The Homo erectus brain will be larger than the Australopithecus africanus brain.
- d) The Australopithecus africanus brain will be larger than the Homo habilis brain.

34. Which of the following statements about the development of the fertilized ovum is INCORRECT?

- a) Fertilization produces a zygote which contains 46 chromosomes.
- b) The fertilized ovum undergoes several mitotic divisions as it progresses down the uterine tube to become a morula.
- c) The morula develops a cavity and becomes a blastocyst.
- d) The blastocyst implants in the endometrium two weeks after fertilization.

35. The following four statements are about events occurring during different phases of the cardiac cycle:

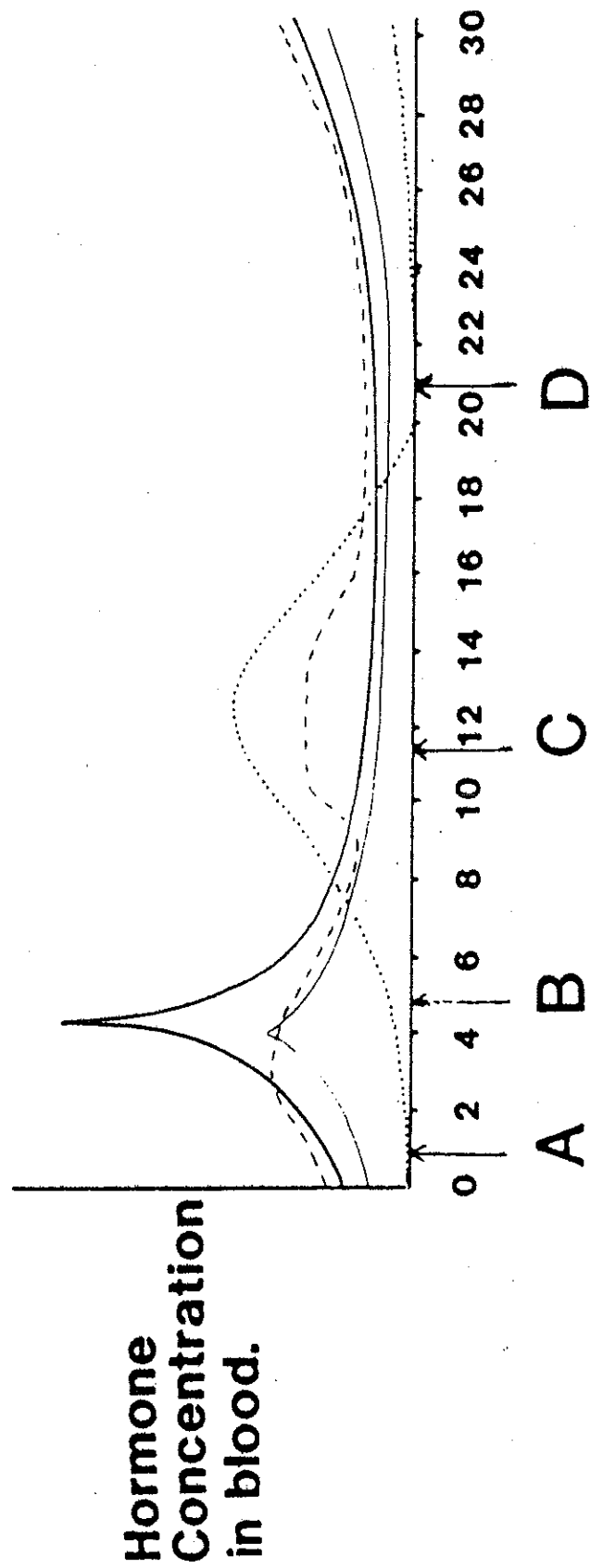
- i) Atrial systole is the phase of active contraction of the atria.
- ii) Ventricular diastole is the period during which filling of the ventricles occurs.
- iii) Blood enters the right atrium from the pulmonary veins during atrial diastole.
- iv) Blood enters the aorta and the pulmonary arteries during ventricular systole.

Which group of the above statements is correct?

- a) (i) and (ii) only are correct.
- b) (i), (ii) and (iv) only are correct.
- c) (ii), (iii) and (iv) only are correct.
- d) All are correct.

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- Follicle Stimulating Hormone (F.S.H.)
- Luteinizing Hormone (L.H.)
- ..... Progesterone
- Estrogen



Time in days



Question 36 refers to Figure 6.

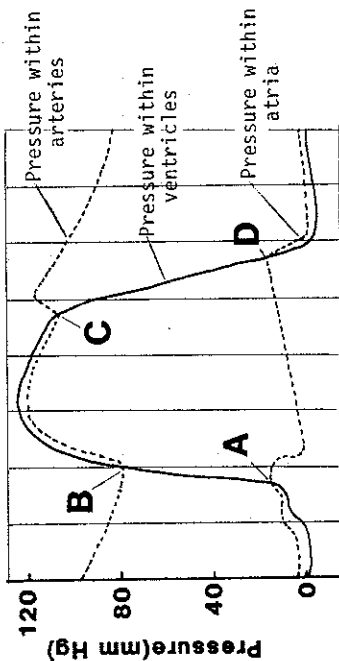
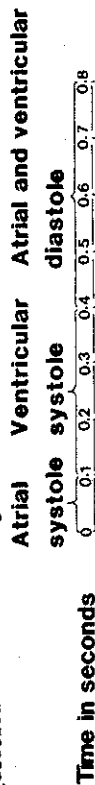


FIGURE 6. Pressure Changes in Various Components of the Circulatory System during the Cardiac Cycle

36. Use the information in Figure 6 to determine which of the following statements about the opening and closing of valves in the heart is correct.

- The atrioventricular valves open at C and close at D.
- The atrioventricular valves close at A and open at D.
- The semilunar valves open at B and close at D.
- The semilunar valves open at A and close at C.

37 Which of the following advances has NOT helped to reduce the incidence of viral infections?

- improved sanitation
- introduction of immunization programs
- introduction of antibiotics
- compulsory notification of some severe infectious diseases

38. Which of the following statements is INCORRECT?

- Vitamin D
- is present in the rays of ultraviolet light from the sun
  - can be produced by a chemical reaction involving cholesterol
  - can be manufactured by the skin
  - is present in some foods such as liver

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Questions 39 and 40 refer to Figure 7

Artificial insemination is to be used to enable a woman to conceive. Her blood hormone levels are monitored and the results shown in Figure 7.

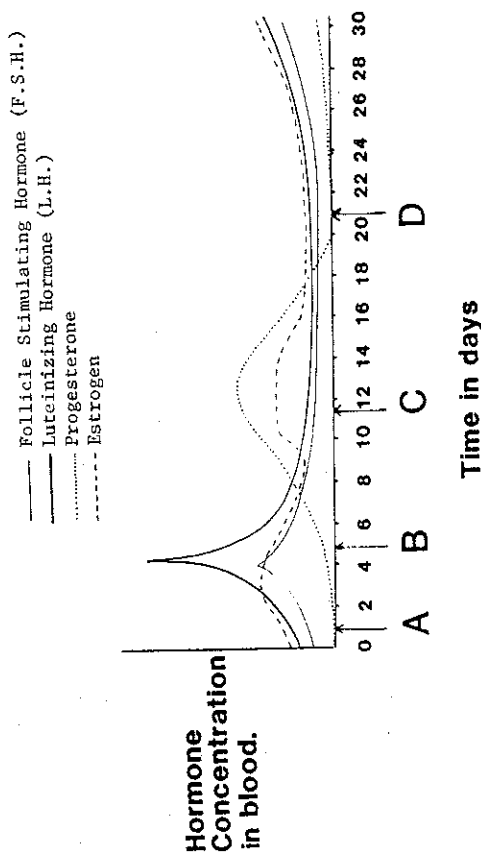


FIGURE 7. Blood Hormone Levels.

39. At which time would insertion of semen be most likely to result in conception?

- A
- B
- C
- D

40. Which one of the following statements is CORRECT?

Between B and C

- The cervical mucous is sticky and the corpus luteum is present in the ovary.
- The cervical mucous is watery and the endometrium is at its maximum thickness.
- The corpus luteum is degenerating in the ovary and the endometrium is increasing in thickness.
- The primary follicle is developing in the ovary and the endometrium is at its maximum thickness.

SEE PAGE 16

In questions 41-60 give the most appropriate term to match the statement. Answer the questions in the spaces provided. Each question is worth 2 marks. A 1/2 mark will be deducted for each term spelt incorrectly.

41. The chromosomal make-up of an organism, analysed according to the size of the chromosomes and the position of their centromeres. \_\_\_\_\_
42. The term describing skulls which are long and narrow in shape. \_\_\_\_\_
43. The evolutionary force due to random events that results in changes in gene frequency from generation to generation and is a function of population size. \_\_\_\_\_
44. The chemical compound which transmits genetic information from one generation to another in humans. \_\_\_\_\_
45. The category of amino acids which cannot be synthesized by the human body. \_\_\_\_\_
46. The principal ionic form in which carbon dioxide is transported in the blood. \_\_\_\_\_
47. The body of air moved in and out with each breath during normal breathing. \_\_\_\_\_
48. The group of three membranes covering the brain and spinal cord. \_\_\_\_\_
49. A region of communication between two neurons. \_\_\_\_\_
50. The period of life at which the reproductive organs become functional. \_\_\_\_\_

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51. Loss of appetite. \_\_\_\_\_
52. The milk containing maternal antibodies which is secreted at the commencement of lactation. \_\_\_\_\_
53. Large molecules that are foreign to the body and trigger an immune response. \_\_\_\_\_
54. The hormone produced by the pituitary gland which stimulates uterine muscle to contract. \_\_\_\_\_
55. The instrument used to measure blood pressure. \_\_\_\_\_
56. The oily secretion produced by glands in the skin. \_\_\_\_\_
57. Arm over arm suspensory locomotion, typical of gibbons and siamangs. \_\_\_\_\_
58. That part of the skeleton which consists of limbs and limb girdles. \_\_\_\_\_
59. An organic catalyst that can change the rates of chemical reactions in the body, without being consumed in the reaction. \_\_\_\_\_
60. The reproductive technique used to fertilize human ova outside the body. \_\_\_\_\_

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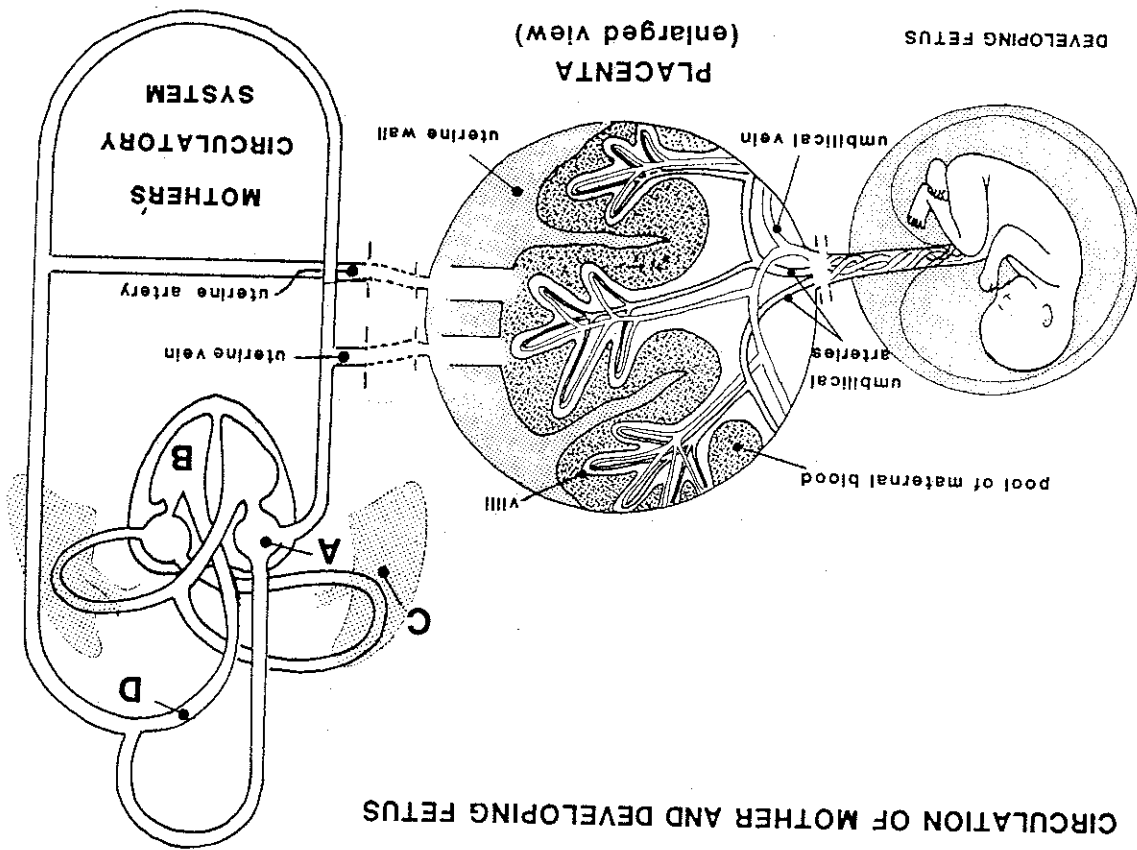


Figure 8.

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a) Name the following structures indicated on Figure 8.

- Chamber A \_\_\_\_\_  
 Chamber B \_\_\_\_\_  
 Organ C \_\_\_\_\_  
 Blood Vessel D \_\_\_\_\_ (4 marks)

b) By placing arrows on the diagram of the mother's heart in Figure 8, indicate the direction of blood flow through each of the 4 chambers. (2 marks)

c) The fetal circulatory system contains the structures ductus arteriosus and foramen ovale which are not present in the mother's circulatory system. Explain where these structures are located and the function of each.

- Ductus arteriosus \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Foramen ovale \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ (4 marks)

d) Consider the enlarged view of the placenta at the centre of Figure 8. Using the labels provided, describe the pathway by which a molecule of oxygen would be transported from the mother's circulatory system to the developing fetus.

- \_\_\_\_\_ (3 marks)  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

SEE PAGE 20

61. (continued)

- e) Explain why an active transport system is NOT required to move oxygen molecules across the placenta from the mother to the developing fetus.

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(2 marks)

62.

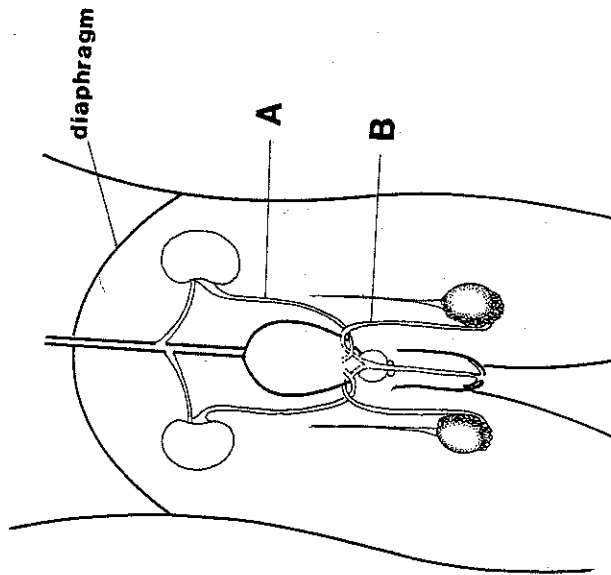


Figure 9. Organs of the Male Urinogenital System

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62. (continued)

- a) Name the structures labelled A and B. What is transported by each structure?

Structure A \_\_\_\_\_ transports \_\_\_\_\_

Structure B \_\_\_\_\_ transports \_\_\_\_\_ (4 marks)

- b) The testis develops in the abdominal cavity then descends into the scrotal sac. Why is it necessary for the testes to descend into the scrotum?

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(2 marks)

- c) Vasectomy is an operation used to sterilize men. Explain what structures are operated on and how the technique prevents conception.

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(2 marks)

- d) Why is castration an unsuitable procedure for male sterilization?

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(2 marks)

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62. (continued)

Each kidney contains many nephrons which are responsible for regulating the composition of the blood. Samples of fluid were taken from regions A, B and C as indicated in Figure 10 below.

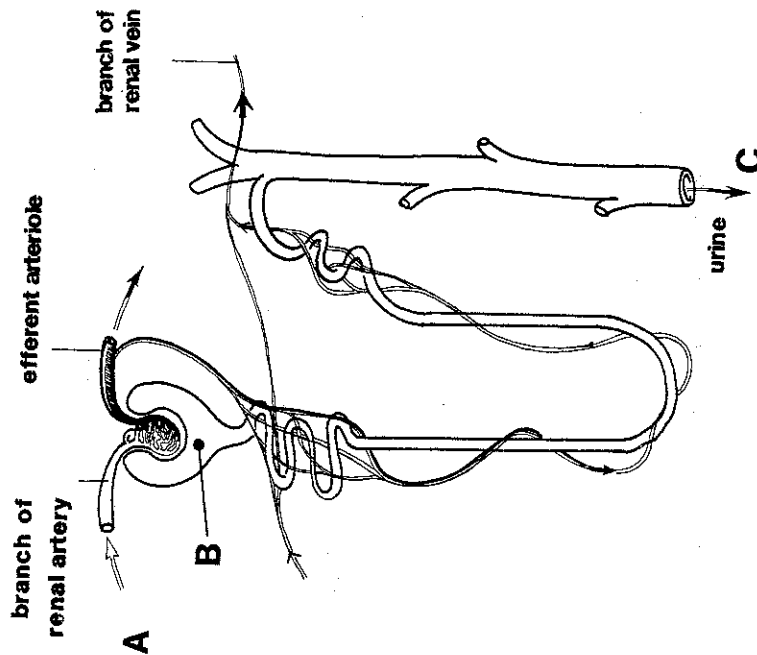


FIGURE 10. Diagram of the Nephron

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62. (continued)

The composition of the three samples is indicated in Table 2. The concentrations of various substances are shown in g/100 ml.

TABLE 2. Composition of Fluid in Parts of the Kidney

	A Blood plasma	B Filtrate	C Urine
Urea	0.03	0.03	2.00
Glucose	0.10	0.10	0.00
Proteins	8.00	0.00	0.00

e) Why is the concentration of urea higher in urine than in the filtrate?

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(2 marks)

f) Explain the processes which result in the glucose concentrations in Table 2.

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(2 marks)

g) Explain the process which results in the protein concentrations shown in Table 2.

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(2 marks)

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63.

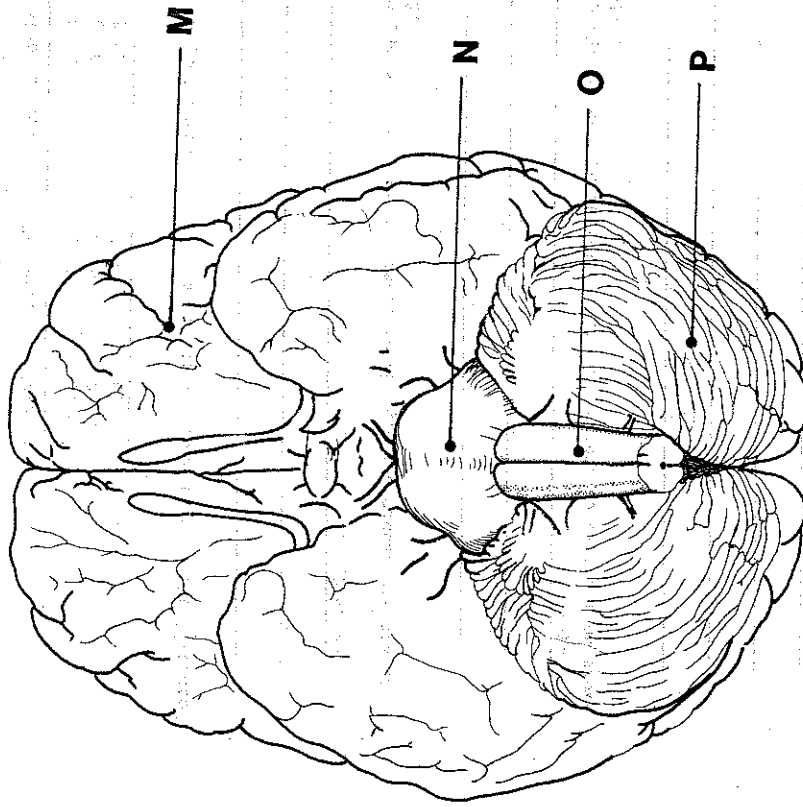


FIGURE 11. Diagram of Inferior View of a Human Brain.

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63.

- a) Identify the structures on Figure 11, labelled

M

N

(2 marks)

- b) Describe the symptoms of a person who had suffered substantial damage to structure P shown in Figure 11.

(1 mark)

- c) What are two functions of structure O shown in Figure 11?

(2 marks)

- d) Perhaps the most significant trend in primate evolution involves changes in the structure and function of the brain. List three differences between a prosimian brain and that of Homo sapiens and explain the significance of each.

(6 marks)

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63. (continued)

63. (continued)

f) Explain why astronauts in space have difficulty distinguishing the "top" and "bottom" of the space capsule if they are blindfolded.

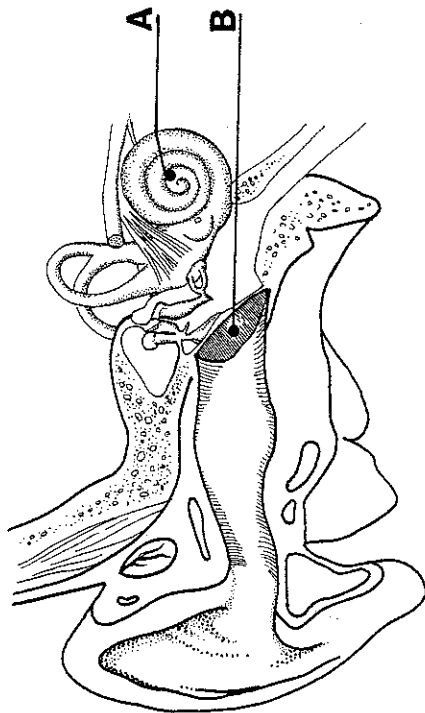


FIGURE 12. Diagram of the Ear

e) Identify the parts of the ear labelled A and B in Figure 12 and explain the function of each.

A	
Function	
B	
Function	
(4 marks)	

64.

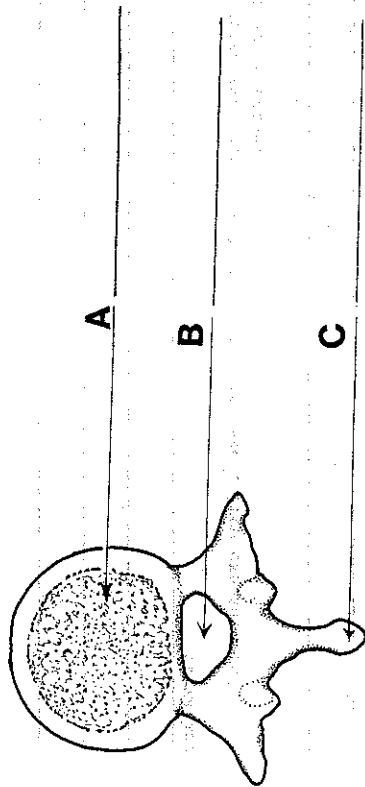


Figure 13. Superior View of a Lumbar Vertebra.

- Write the names of structures A, B and C in the places provided on Figure 13 above. (3 marks)
- Explain the functions of structures

A \_\_\_\_\_

B \_\_\_\_\_

\_\_\_\_\_ (2 marks)

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64. (continued)

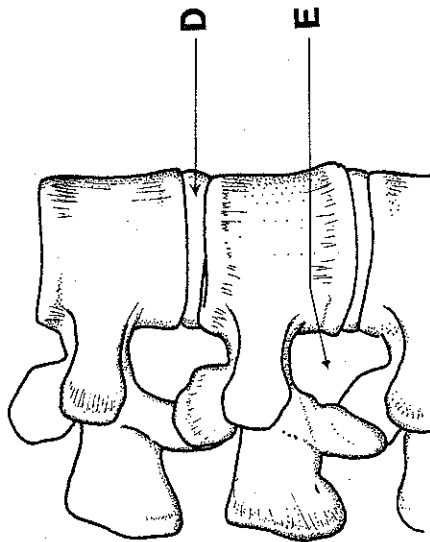


Figure 14. Lateral View of Lumbar Vertebrae.

- Name structure D and explain its function.

\_\_\_\_\_ (2 marks)

- Name the structure that emerges laterally from the vertebral column through space E and explain its function.

\_\_\_\_\_ (2 marks)

SEE PAGE 30





65.(continued)

- b) Would a prediction of the breathing rate at 4% carbon dioxide be likely to be more or less accurate than a prediction of breathing rate at 7% carbon dioxide? Explain.

(2 marks)

In a second experiment where a subject breathed in and out of a large plastic bag it was possible to record the percentage of carbon dioxide in the air in the bag and the alveoli of the lungs, and the rate and depth of breathing of the subject. This data was recorded during normal breathing and after one minute of breathing in and out of the bag (i.e. rebreathing expired air).

TABLE 4. Results of Rebreathing Expired Air

	Normal breathing	After rebreathing 1 min
% CO <sub>2</sub> in bag	0.004	1.52
Depth of breathing	673 ml	794 ml
Rate of breathing	14 breaths/min	15 breaths/min
% CO <sub>2</sub> in alveoli	5.6	5.55

- c) Given the data above, how would you calculate the volume of air breathed by the subject in one minute, during normal breathing?

(2 marks)

- d) Why is the increased concentration of carbon dioxide in inspired air NOT paralleled by a similar increase in the alveolar air?

(2 marks)

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65.(continued)

The scientist who conducted the second experiment (breathing in and out of the bag) was attempting to test the hypothesis:

Breathing rate and depth increases in response to an increased concentration of carbon dioxide in inspired air.

- e) What is the major weakness in the design of this experiment?

(2 marks)

- f) Design an experiment, to test the above hypothesis, that overcomes the weakness of the previous experiment. Assume you have access to cylinders of gas of any composition you require, and suitable breathing apparatus is available.

(3 marks)

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## PART II

THIS SECTION IS DIVIDED INTO TWO (2) SUB-SECTIONS. ATTEMPT ONE (1) QUESTION FROM EACH SUB-SECTION.

ILLUSTRATE YOUR ANSWERS WITH DIAGRAMS, WHERE APPROPRIATE.

UP TO TWO MARKS MAY BE DEDUCTED FOR POORLY STRUCTURED ESSAYS. (e.g. ANSWERS IN POINT FORM OR DIAGRAMS NOT EXPLAINED IN THE TEXT OF THE ESSAY)

DO NOT WRITE YOUR ANSWER IN PENCIL.

## Sub-Section I

66.

Humans begin life as a single fertilized egg cell and the processes of cell growth, division and specialization continue throughout life, although the rate is greatly reduced by the time the individual reaches adulthood.

a) Mitosis and meiosis are two different types of cell division. Describe the differences between them in terms of processes (without referring to specific phase names), function and location. (8 marks)

b) Once new cells have been formed by cell division, they become specialized. Illustrate specialization within the human body, with particular reference to red blood cells and skeletal muscle cells. (6 marks)

c) Cancer occurs when the normal checks on cell division fail to operate and large numbers of abnormal despecialized cells are produced. Examination of statistics on the incidence of cancer in Australia reveals that the percentage of deaths from cancer doubled between 1923 and 1975. Analyze and discuss possible causes of this pattern of deaths from cancer in Australia. (6 marks).

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## Sub-Section I (Continued)

67.

a) Briefly outline the pathways and processes by which carbohydrates are digested and absorbed into the bloodstream. (7 marks).

b) Explain the role of the pancreas and liver in regulating the amount of glucose present in the bloodstream throughout the day. (7 marks)

c) A patient with diabetes mellitus has difficulty maintaining a homeostasis of blood glucose levels. Analyze the reasons for the symptoms which appear when there is a very high or very low concentration of glucose in blood and explain how this disease can be treated. (6 marks)

68.

In the absence of homeostatic mechanisms prolonged strenuous exercise would produce a number of marked changes in the internal environment. Name of the variables (factors) which would be affected are listed below. (See a, b and c).

Explain how prolonged strenuous exercise would tend to change each of these factors, and describe how the body's homeostatic mechanisms operate to maintain them within narrow limits during periods of strenuous exercise.

- a) Body temperature (6 marks)
- b) Carbon dioxide concentration of plasma (6 marks)
- c) Water content of body (8 marks)

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## Sub-Section II

69. a) The recommended programme in Australia for protection against whooping cough is immunization at 3, 4, 5 and 12 months. Describe the immune response in relation to an infection by whooping cough bacteria and then explain why the introduction of the immunization program dramatically decreased the incidence of whooping cough in Australia. (7 marks)
- b) The Public Health Department of W.A. has been concerned at a renewed upturn in the number of cases of whooping cough in young children in the last few years. If you were responsible for developing a public education program to help reverse this trend, outline the main points you would need to make and the avenues you would choose to educate the public on this matter. Give reasons for your choices. (7 marks)

- c) i) The body's immune response which makes immunization possible can also be a disadvantage in certain circumstances such as organ transplantation. Explain how the immune response is a problem during organ transplantation and outline how this problem may or may not be overcome. (3 marks)

- ii) Once the problem of the immune response is solved, what legal and ethical issues might arise from a widespread practice of organ transplantation? (3 marks)

70. a) Describe the daily cultural patterns in the life of Homo erectus, together with the evidence on which your description is based. (6 marks)

- b) Outline the main factors which contributed to the development of the agricultural revolution which occurred in the Middle East 10,000 years ago. (8 marks)

- c) The rate of cultural evolution has far exceeded the rate of biological evolution in the species Homo sapiens. Discuss this statement, using examples up to the present day. (6 marks)

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## Sub-Section II (Continued)

71. a) Differences between present day populations of Homo sapiens can be considered by using the concepts of race and clines. Give a biological definition of each of these concepts then outline the advantages and disadvantages you see in each of these approaches to the study of human kind. (7 marks)
- b) How do differences between human races arise? Discuss three examples to illustrate your answer. (9 marks)
- c) How do you think cultural and technological factors could influence the development and maintenance of human racial differences? (4 marks)

END OF PAPER