



**education**

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Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**SENIOR CERTIFICATE EXAMINATION - 2005**

**BIOLOGY P2**

**HIGHER GRADE**

**OCTOBER/NOVEMBER 2005**

**Marks: 200**

**2 Hours**

**This question paper consists of 20 pages.**



**INSTRUCTIONS AND INFORMATION TO CANDIDATES**

Read the following carefully before answering the questions:

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answer to each question at the top of a new page.
4. Number the answers exactly as the questions are numbered.
5. Write neatly and legibly.
6. If answers are not presented according to the instructions of each question, candidates will lose marks.
7. ALL drawings should be done in pencil and labelled in ink.
8. Only draw diagrams and flow charts when requested to do so.
9. The diagrams in the question paper may not necessarily be drawn to scale.
10. The use of graph paper is NOT permitted.
11. Non-programmable calculators, protractors and compasses may be used.



**SECTION A****QUESTION 1**

1.1 Various possible answers are provided for each question. Indicate the correct answer by writing only the **letter** of your choice next to the relevant question number.

1.1.1 Podocytes in the human body are found in the ...

- A nose.
- B ear.
- C kidney.
- D spinal cord.

1.1.2 Which one of the following pairs of statements is the correct description of a stimulus and an impulse?

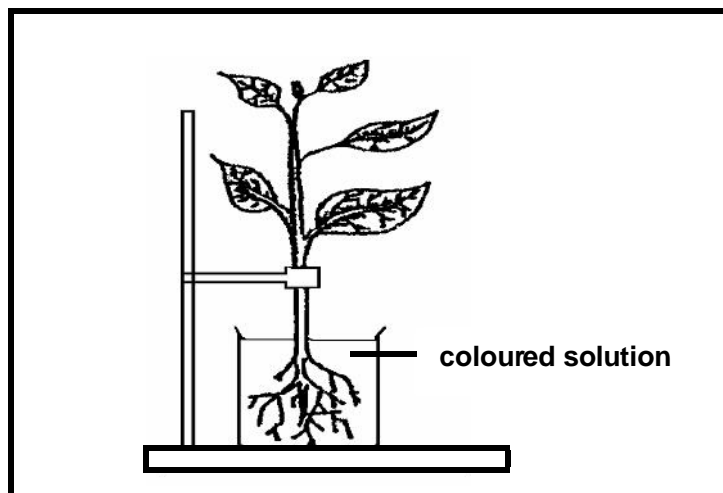
|   | STIMULUS  | IMPULSE                                  |
|---|---|--|
| A | Change in the external environment only         | Change in the internal environment only  |
| B | Change in the external and internal environment | Change in the external environment only  |
| C | Reaction of a receptor to pain                  | Reaction of an effector to touch         |
| D | Change in the internal and external environment | Information conducted along nerve fibres |

1.1.3 Which of the following methods of heat regulation are found in both ectothermic and endothermic animals?

- (i) Behaviour
  - (ii) Heat exchange
  - (iii) Colour change
- A Only (i)
  - B (i) and (ii)
  - C Only (ii)
  - D (i), (ii) and (iii)



1.1.4 Study the diagram below of the apparatus used in an investigation.



The apparatus was used to show ...

- A the suction force of transpiration.
- B water movement through the xylem.
- C osmosis in plants.
- D the influence of water on the rate of transpiration.

1.1.5 The movement of water from the root hair to the xylem of the root takes place by ...

- A osmosis and diffusion.
- B osmosis only.
- C diffusion only.
- D active transport.

1.1.6 Which of the following represents the role of thorns as modified leaves?

- (i) Protects the plant against herbivores
  - (ii) Decrease the surface area to limit transpiration
  - (iii) Increase the size of the plant to absorb more water from the air
- A (i) only
  - B (ii) only
  - C (iii) only
  - D (i) and (ii)



- 1.1.7 After which of the following activities will a person produce more concentrated urine? Assume that all conditions are the same before the various activities begin.
- A Swimming in cold water for an hour
  - B A tough hockey game in winter
  - C Taking in a large amount of cold drink
  - D An hour's study on a cool evening
- (7 x 2)      **(14)**
- 1.2 Give the correct **biological term** for each of the following descriptions. Write only the **term** next to the relevant question number.
- 1.2.1 Stretch receptors found in the muscles and joints
- 1.2.2 The tendency of liquid molecules to spontaneously rise in tubes with small diameters
- 1.2.3 The layer of waxy material covering the surfaces of leaves to limit the loss of water to the atmosphere
- 1.2.4 Loss of water as droplets through pores at the edges of some leaves
- 1.2.5 The tube that connects the urinary bladder to the exterior
- 1.2.6 Animals whose body temperature is greatly influenced by the environmental temperature
- (6)**



- 1.3 Indicate whether each of the statements in COLUMN I, applies to **A only**, **B only**, **both A and B** or **none** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the relevant question number.

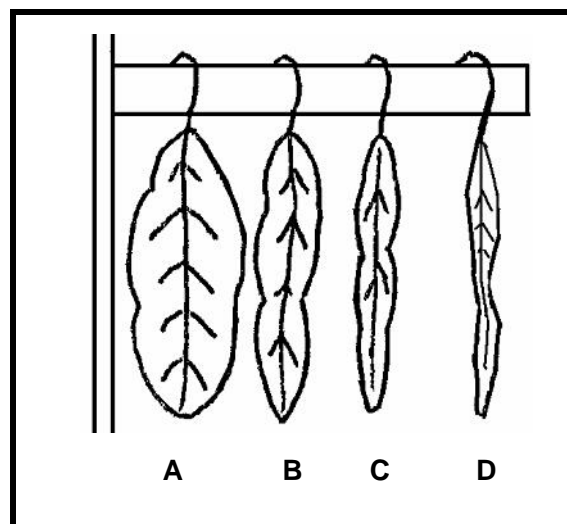
|       | COLUMN I  | COLUMN II                                |
|-------|---|--|
| 1.3.1 | Involved in the removal of urea from the bodies of mammals  | A Liver<br>B Skin                        |
| 1.3.2 | Regulation of the amount of water lost in urine   | A Bowman's capsule<br>B Glomerulus       |
| 1.3.3 | May influence the direction in which water molecules move through a differentially permeable membrane | A Water potential<br>B Osmotic potential |
| 1.3.4 | Will develop as a result of water entering the vacuole  | A Turgor pressure<br>B Root pressure     |
| 1.3.5 | Capable of detecting stimuli from the external environment  | A Receptors<br>B Sense organs            |

(5 x 2) (10)

- 1.4 Four fresh leaves of equal size from the same mesophytic plant were treated as follows:

- Leaf 1: Both surfaces covered with petroleum jelly
- Leaf 2: Only upper surface covered with petroleum jelly
- Leaf 3: Only lower surface covered with petroleum jelly
- Leaf 4: NOT treated with petroleum jelly

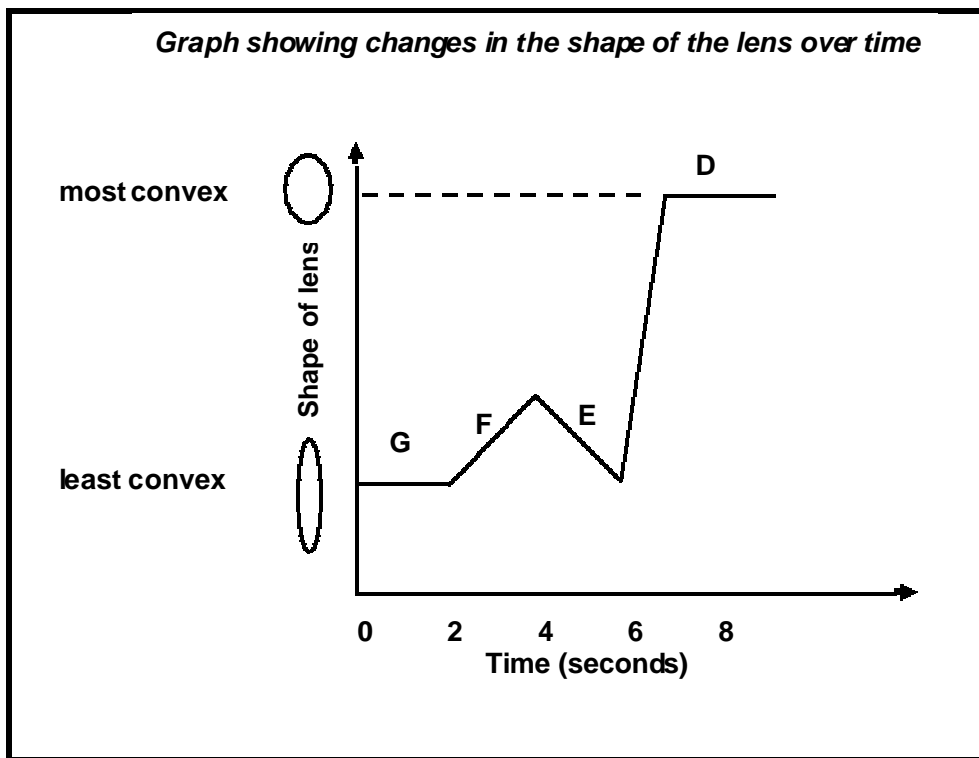
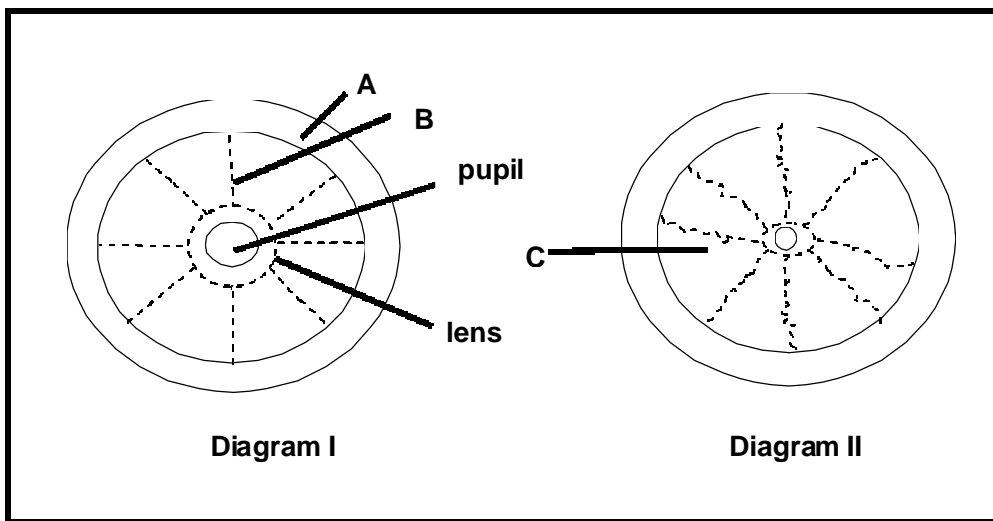
The following diagram shows the result after a few hours.



- 1.4.1 Give the aim of this investigation. (2)
- 1.4.2 What is the function of the petroleum jelly in this investigation? (1)
- 1.4.3 Give ONE reason for each of the following:
- (i) Using fresh leaves (2)
  - (ii) Using leaves of the same size (2)
  - (iii) Using leaves of the same plant (2)
- 1.4.4 Which leaf ( A, B, C, or D) was NOT treated with petroleum jelly? (1)
- 1.4.5 Explain your answer in QUESTION 1.4.4. (2)
- (12)**



1.5 Study Diagrams I and II that illustrate the lens and parts of one layer of the human eye, as well as the graph below and answer the questions that follow.



1.5.1 Identify parts A and B.

(2)

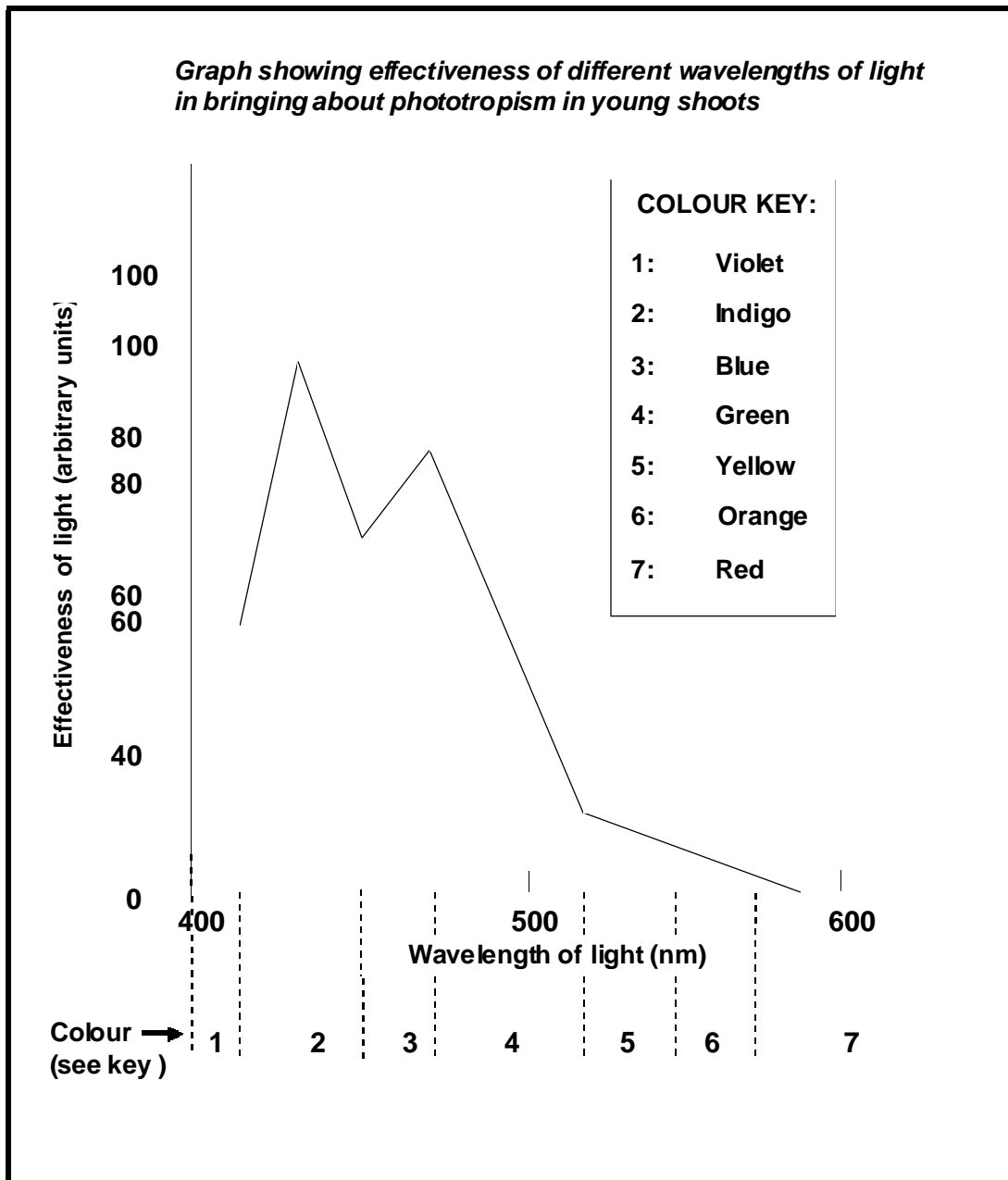




- 1.5.2 Which Diagram (I or II) shows part of the eye
- (i) where the ciliary muscles are contracted. (1)
  - (ii) under dim light conditions. (1)
- 1.5.3 Explain your answer in QUESTION 1.5.2(i). (2)
- 1.5.4 Which letter on the graph indicates each of the following:
- (i) The eye looking at a nearby stationary object (1)
  - (ii) The eye looking at an object moving towards the viewer (1)
- 1.5.5 Explain the significance of the elastic nature of the lens. (2)
- (10)**



1.6 Study the following graph and answer the questions that follow.



- 1.6.1 What will your observation be if a young shoot was exposed to a wavelength of light of 650 nm from one side for a few days? (1)
- 1.6.2 Explain your answer in QUESTION 1.6.1. (2)
- 1.6.3 Comment on the effectiveness of indigo light on phototropism in young shoots? (2)



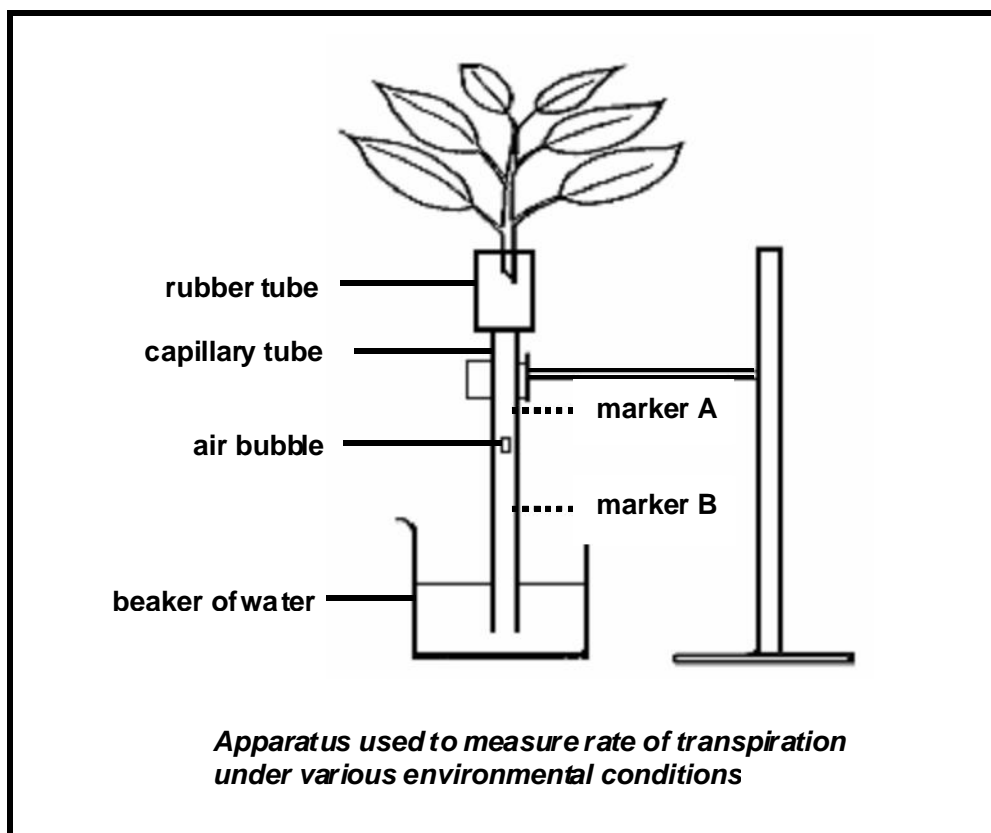
- 1.6.4 Give the name of the plant growth substance that is responsible for phototropism in plants. (1)
- 1.6.5 Explain ONE advantage of phototropism for a plant. (2)  
(8)

**TOTAL QUESTION 1: 60**  
**TOTAL SECTION A: 60**

## SECTION B

### QUESTION 2

- 2.1 Study the following diagram and answer the questions that follow.



- 2.1.1 How would you move the air bubble in the direction of B? (1)
- 2.1.2 (i) Name ONE instrument not shown in the diagram, that is needed when carrying out this investigation. (1)
- (ii) Give ONE reason why the apparatus named in QUESTION 2.1.2 (i) is necessary. (2)



- 2.1.3 Explain TWO ways in which the reliability of the results of the investigation can be improved when using the apparatus in the diagram. (4)
- 2.1.4 (i) Would the rate of transpiration increase or decrease if the rate of photosynthesis increases in the guard cells of the leaves? (1)  
(ii) Explain your answer in QUESTION 2.1.4 (i). (3)  
**(12)**
- 2.2 An experiment was carried out to investigate the influence of temperature on the rate of transpiration. The data collected is shown in the following table. Study the table and answer the questions that follow.

**NOTE:** The vapour pressure in this investigation is an indication of the amount of water molecules in the form of a gas.

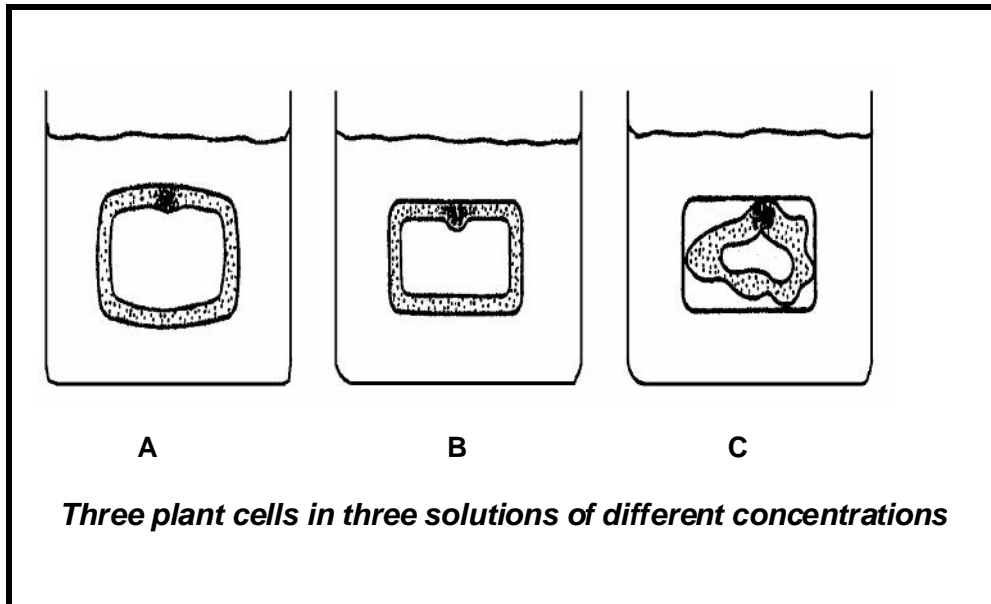
| Temperature (°C) | Vapour pressure inside leaf (mm Hg) | Air vapour pressure (mm Hg) |
|------------------|-------------------------------------|-----------------------------|
| 10               | 9                                   | 8,77                        |
| 20               | 18                                  | 8,77                        |
| 30               | 32                                  | 8,77                        |
| 40               | 38                                  | 8,77                        |

- 2.2.1 Calculate the difference in vapour pressure between the inside of the leaf and the air at 30 °C. (2)
- 2.2.2 At which temperature, shown on the table, will the rate of transpiration be the lowest? (2)
- 2.2.3 Explain your answer in QUESTION 2.2.2. (2)
- 2.2.4 Use the data on the table to draw a line graph which shows the relationship between temperature and vapour pressure inside the leaf. (11)  
**(17)**



2.3 Study the following diagram and answer the questions that follow.

**NOTE:** The cells were from the same part of one plant and were of equal size before they were used.



- 2.3.1 Which solution (A, B, or C) has the highest water potential? (1)
- 2.3.2 Explain your answer in QUESTION 2.3.1. (2)
- 2.3.3 Describe the events that lead to the appearance of the cell in C. (3)
- (6)**

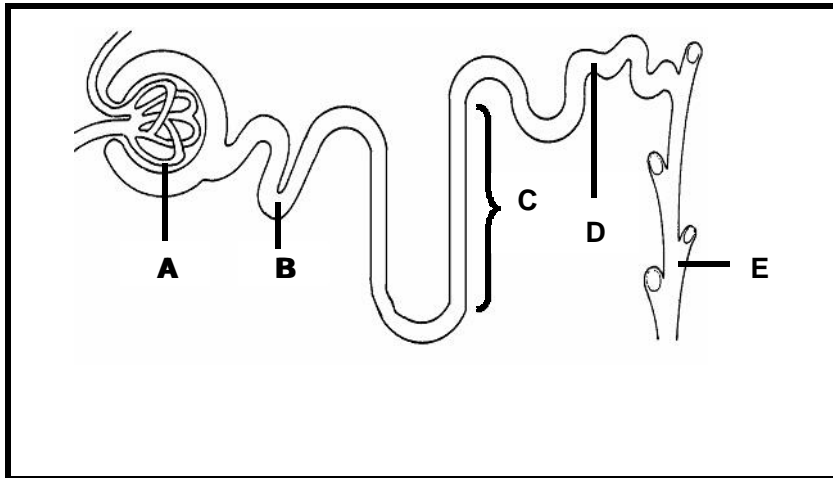
**TOTAL QUESTION 2: 35**

### QUESTION 3

- 3.1 Answer the following questions on the human kidney.
- 3.1.1 Make a labelled drawing of a longitudinal section of the human kidney to show its internal structure. (8)
- 3.1.2 Apart from the removal of waste substances from the body, give THREE other functions of the kidney. (3)
- (11)**



3.2 Study the following diagram and table and answer the questions that follow.



*Table showing some substances moving through different parts of the structure in the diagram above*

| Substance | Amount moving through A daily | Amount moving through E daily | Amount reabsorbed daily |
|-----------|-------------------------------|-------------------------------|-------------------------|
| Water     | 180 litres                    | ?                             | 178,5 litres            |
| Glucose   | 180 g                         | ?                             | 180 g                   |
| Urea      | 60 g                          | 35 g                          | ?                       |

- 3.2.1 Give the biological name of the structure represented by the diagram. (1)
- 3.2.2 Identify parts C, D, and E. (3)
- 3.2.3 Name the physical process that takes place at B. (1)
- 3.2.4 Explain THREE ways in which the cells in part B are structurally suited for the process named in QUESTION 3.2.3. (6)



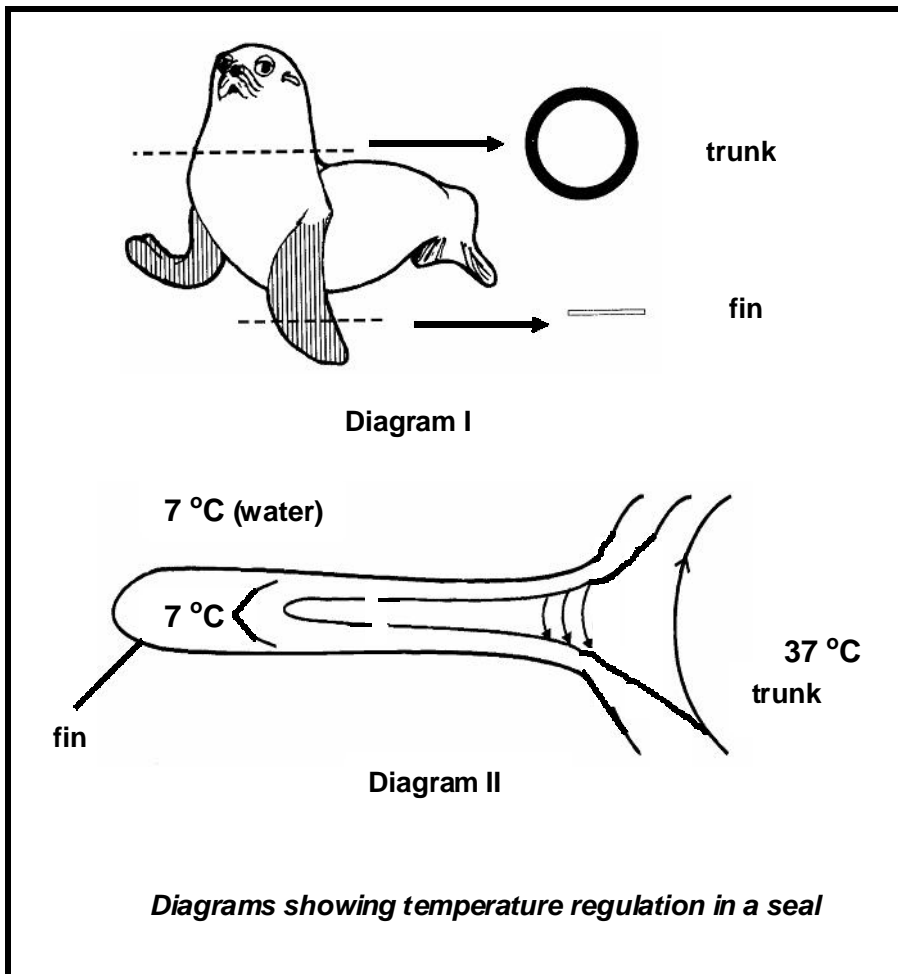
- 3.2.5 Refer to the table and state how much
- (i) water is lost in the urine. (2)
  - (ii) urea (in grams) will be re-absorbed in a normal healthy person. (1)
- 3.2.6 Would you expect to find any proteins in part E of a healthy person? (1)
- 3.2.7 How would you explain the following:
- (i) The presence of proteins in D (2)
  - (ii) The absence of glucose in C (2)
- 3.2.8 Explain why it is better for a mammal living in the sea to have a shorter renal tubule. (5)
- (24)**

**TOTAL QUESTION 3: 35**



**QUESTION 4**

4.1 Study the following diagrams and answer the questions that follow.

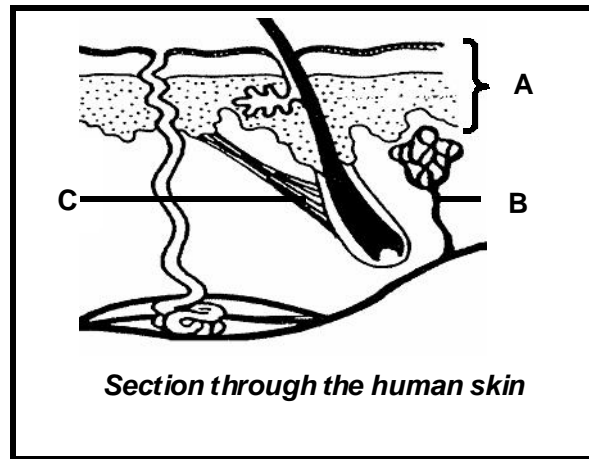


- 4.1.1 Refer to Diagram I and provide TWO explanations why a seal will lose more heat through its fins than through its trunk. (4)
- 4.1.2 Refer to Diagram II and deduce why the seal can be described as an endothermic animal. (3)
- 4.1.3 Explain the significance of the process illustrated in Diagram II for an animal. (3)

**(10)**



4.2 Study the following diagram and answer the questions that follow.



- 4.2.1 Identify parts A and C. (2)
- 4.2.2 What change will part B undergo if the environmental temperature suddenly rises? (1)
- 4.2.3 Explain the advantage of the change named in QUESTION 4.2.2 for a person. (4)
- 4.2.4 (i) Give the name of the hormone that will have the opposite effect on part B to that which a rise in the environmental temperature has. (1)
- (ii) Under what conditions will the hormone named in QUESTION 4.2.4 (i) be secreted? (1)
- (iii) Explain the significance of the effect on part B of the hormone named in QUESTION 4.2.4 (i). (5)
- (iv) What effect will the hormone named in QUESTION 4.2.4 (i) have on the activity of the thyroid gland? (1)
- (v) Explain your answer in QUESTION 4.2.4 (iv). (2)
- (17)**



4.3 Read the following passage and answer the questions that follow.

**Anabolic Steroid Use**

*Anabolic steroids are essentially the male sex hormone testosterone and similar substances produced in laboratories. The latter were developed in the 1930s to prevent the atrophy (withering or degeneration) of muscle tissue in patients.*

*Steroids were first used for non-medical reasons in World War II, when German doctors gave them to soldiers. The Soviet Union began dispensing steroids to athletes, and when the results were observed, it was recommended that the U.S. weightlifting team use them.*

*There is great concern because these drugs are now being more widely used to increase muscle size. When some of the dangerous side effects (aggression, stunted growth in teenagers by prematurely halting the lengthening of bones, increased risk of heart disease and liver cancer to name a few ) became known, the Olympic Committee added anabolic steroids to its list of banned substances. Often the side effects of steroids can be understood in view of the fact that testosterone is the male sex hormone that maintains the secondary sex characteristics of males, such as the development of the testes and penis , the deep voice and a beard. Psychiatrists feel that the impact of the mental effects of steroids is only now being realized.*

**Adapted from: *BIOLOGY*, Third Edition, Sylvia S. Mader**

4.3.1 Name

- (i) a hormone that has the same effect on muscle tissue as steroids. (1)
- (ii) the endocrine gland that secretes the hormone named in QUESTION 4.3.1 (i). (1)

4.3.2 Explain why steroids were

- (i) given to German soldiers in World War II. (1)
- (ii) used by the U.S. weightlifting team. (1)
- (iii) added to the Olympic Committee's list of banned substances. (1)



4.3.3 State THREE side effects that may be caused by anabolic steroids in women.

(3)  
(8)

**TOTAL QUESTION 4: 35**  
**TOTAL SECTION B: 105**

**SECTION C**

**QUESTION 5**

5.1 Study the following diagrams and table and answer the questions that follow.

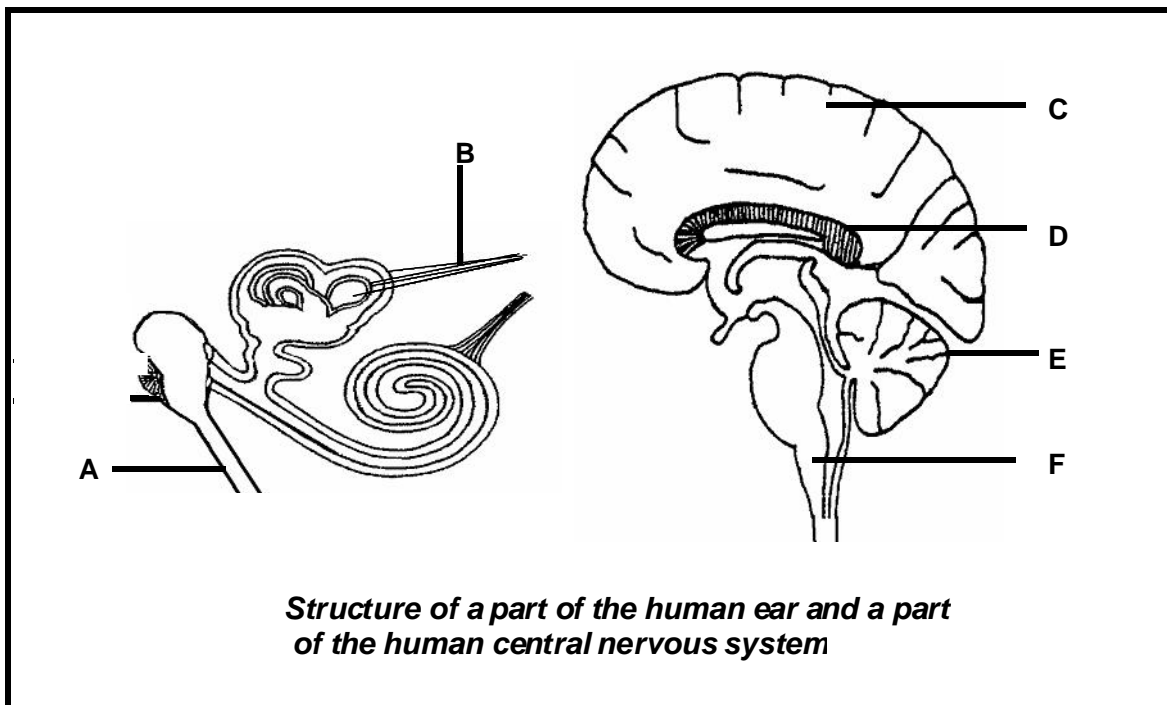


Table indicating how much of the human brain's sensory area is allocated to certain body parts, depending on the number of sensory receptors on the part

| Body part | Sensory area allocated to body part (arbitrary units) |
|-----------|---|
| Upper arm | 20  |
| Tongue    | 100   |
| Hand      | 60  |
| Leg       | 40  |



|       |   |                |
|-------|---|----------------|
| 5.1.1 | Identify parts A and D.   | (2)            |
| 5.1.2 | After <b>only</b> the sensitive <b>coverings</b> of the brain were injected to make them insensitive, part C of a <b>normal</b> person was pierced with a sharp object, but the person did NOT experience any pain. |                |
|       | (i) Give a possible explanation for the person not experiencing a pain sensation.   | (3)            |
|       | (ii) Explain a possible disadvantage if a body part is pierced with a sharp object, but the person does not experience any pain.  | (2)            |
| 5.1.3 | (i) Give the <b>letter</b> of the part that will interpret impulses conducted along part B.   | (1)            |
|       | (ii) Explain your answer in QUESTION 5.1.3 (i).   | (2)            |
| 5.1.4 | Explain why damage to part F may lead to immediate death.   | (2)            |
| 5.1.5 | Give a possible explanation for the high representation of the tongue in the sensory area of the brain compared to the leg.   | (2)            |
| 5.1.6 | (i) With which body part shown in the table, will the abdomen most probably have the same size area representation in the sensory part of the brain?  | (1)            |
|       | (ii) Explain your answer in QUESTION 5.1.6 (i).   | (2)            |
|       |   | <b>(17)</b>    |
| 5.2   | A person hears a car moving out of control and crashing into another vehicle. Describe the events that will lead to the person hearing the crash.   |                |
|       |   | Content: (15)  |
|       |   | Synthesis: (3) |
|       |   | <b>(18)</b>    |
|       | <b>TOTAL QUESTION 5:</b>  | <b>35</b>      |
|       | <b>TOTAL SECTION C:</b>   | <b>35</b>      |
|       | <b>GRAND TOTAL:</b>   | <b>200</b>     |

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