

# education

Department of Education  
REPUBLIC OF SOUTH AFRICA

## SENIOR CERTIFICATE EXAMINATION – 2006

**BIOLOGY PAPER 2**

**HIGHER GRADE**

**OCTOBER/NOVEMBER 2006**

**306-1/2E**

**BIOLOGY HG: Paper 2**



**MARKS: 200**

**TIME: 2 hours**

**This question paper consists of 17 pages.**



**INSTRUCTIONS AND INFORMATION**

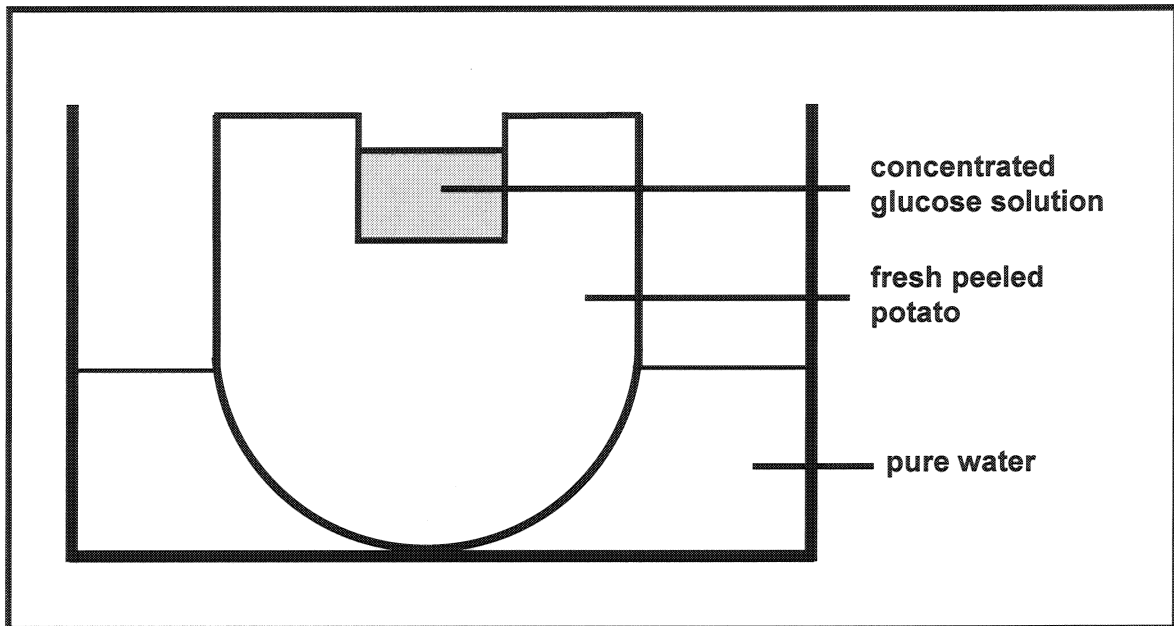
Read the following carefully before answering the questions:

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 Which ONE of the following will result in a person excreting more urine than normal?
- A Low blood pressure due to too little tissue fluid
  - B High re-absorption of water from the proximal convoluted tubule
  - C Low ADH concentration in the blood
  - D Excessive salt intake
- 1.1.2 The hormone aldosterone ...
- A is secreted by the adrenal gland.
  - B regulates calcium metabolism.
  - C prevents high blood pressure.
  - D has no influence on the sodium pump.
- 1.1.3 The autonomic nervous system controls ...
- A the skeletal muscles.
  - B the senses.
  - C the contraction of involuntary muscles.
  - D reflexes.
- 1.1.4 Which of the following statements about the human eye are correct?
- (i) The cornea bends light rays
  - (ii) The choroid contains many blood vessels
  - (iii) The sclera is the innermost layer of the eye
  - (iv) The blind spot is found on the retina
- A (ii), (iii) and (iv)
  - B (i), (ii) and (iv)
  - C (i), (ii) and (iii)
  - D (ii) and (iii)

1.1.5 Study the diagram below and answer the question that follows:



Which of the following will occur after a few days?

- A The level of the pure water will increase, while the level of the glucose solution will decrease
- B The mass of the potato will increase, while the level of the glucose solution will also increase
- C The level of the pure water will increase, while the level of the glucose solution will also increase
- D The mass of the potato will decrease, while the level of the glucose solution will increase

1.1.6 A stomatal pore opens as a direct result of the guard cells ...

- A absorbing water by osmosis.
- B having walls of uniform thickness.
- C using their available water during photosynthesis.
- D using their available sugar for cellular respiration.

1.1.7 The two hormones that directly affect the growth of a child are ...

- A adrenalin and TSH.
- B TSH and thyroxin.
- C thyroxin and STH/GH.
- D adrenalin and STH/GH.

1.1.8 Which of the following are CORRECT regarding the secretion from endocrine glands? The secretions ...

- (i) reach their target cells through the blood.
- (ii) reach their target cells through ducts.
- (iii) are known as hormones.
- (iv) never reach any target cells.

- A (iii) and (iv)
- B (i) and (iii)
- C (ii) and (iii)
- D (i), (iii) and (iv)

(8 x 2) (16)

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 The movement of liquid molecules along a concentration gradient through a differentially permeable membrane

1.2.2 The movement of blood plasma minus proteins from the glomerulus into the Bowman's capsule

1.2.3 The interaction between two endocrine glands such that one gland controls the secretion of the other

1.2.4 The process in the formation of urine that occurs in the proximal convoluted tubule

1.2.5 The concave side of the kidney where nerves, blood vessels and urinary tubes enter and exit the kidney

1.2.6 Plants that survive in habitats with a low water supply

1.2.7 Openings on the margins of some leaves through which water is lost as droplets

1.2.8 The integrated functioning of the different organs, systems and their activities in the human body

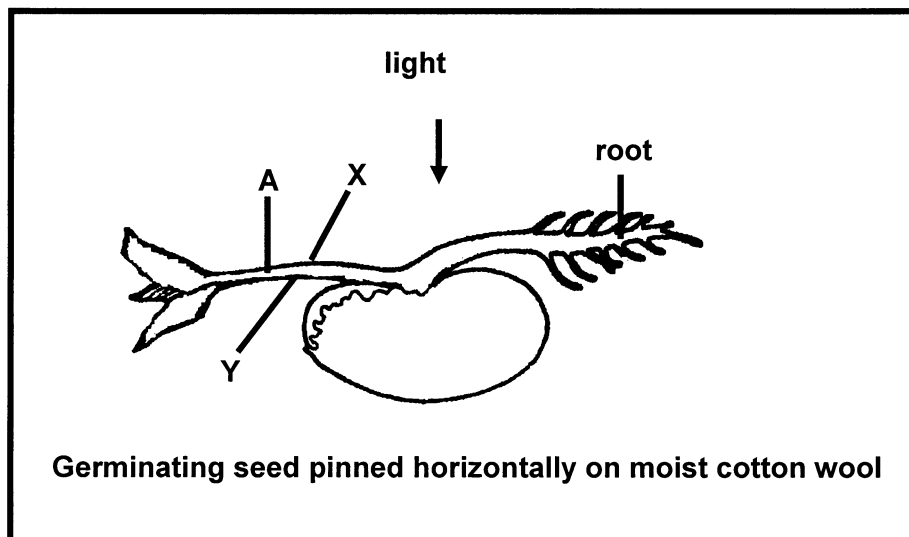
1.2.9 Modified chloroplast-containing epidermal cells in the leaves (9)

- 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	Part of the autonomic nervous system	A	Sympathetic nerves
		B	Cerebrum
1.3.2	Inhibits cell division in stems and roots	A	Auxin
		B	Absciscic acid
1.3.3	Breaks the dormancy of seeds and buds	A	Gibberellins
		B	Ethylene
1.3.4	Plant grows rapidly upwards, while growth of the side branches closest to the tip is slowed down	A	Apical dominance
		B	Phototropism
1.3.5	Ions that are reabsorbed when the blood tends to become too alkaline	A	Ammonium ions
		B	Hydrogen ions
1.3.6	Turgid	A	Cell volume increases because of increased vacuole size
		B	Result of endosmosis

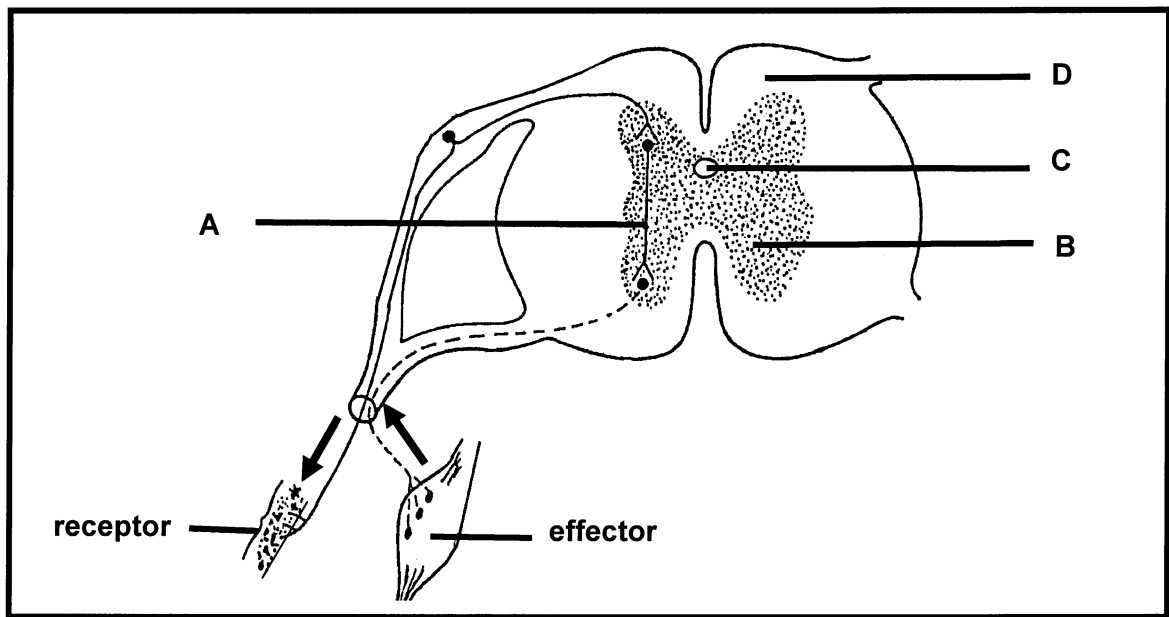
(6 x 2) (12)

- 1.4 Study the drawing below and answer the questions that follow. After a few days part A starts growing upwards.



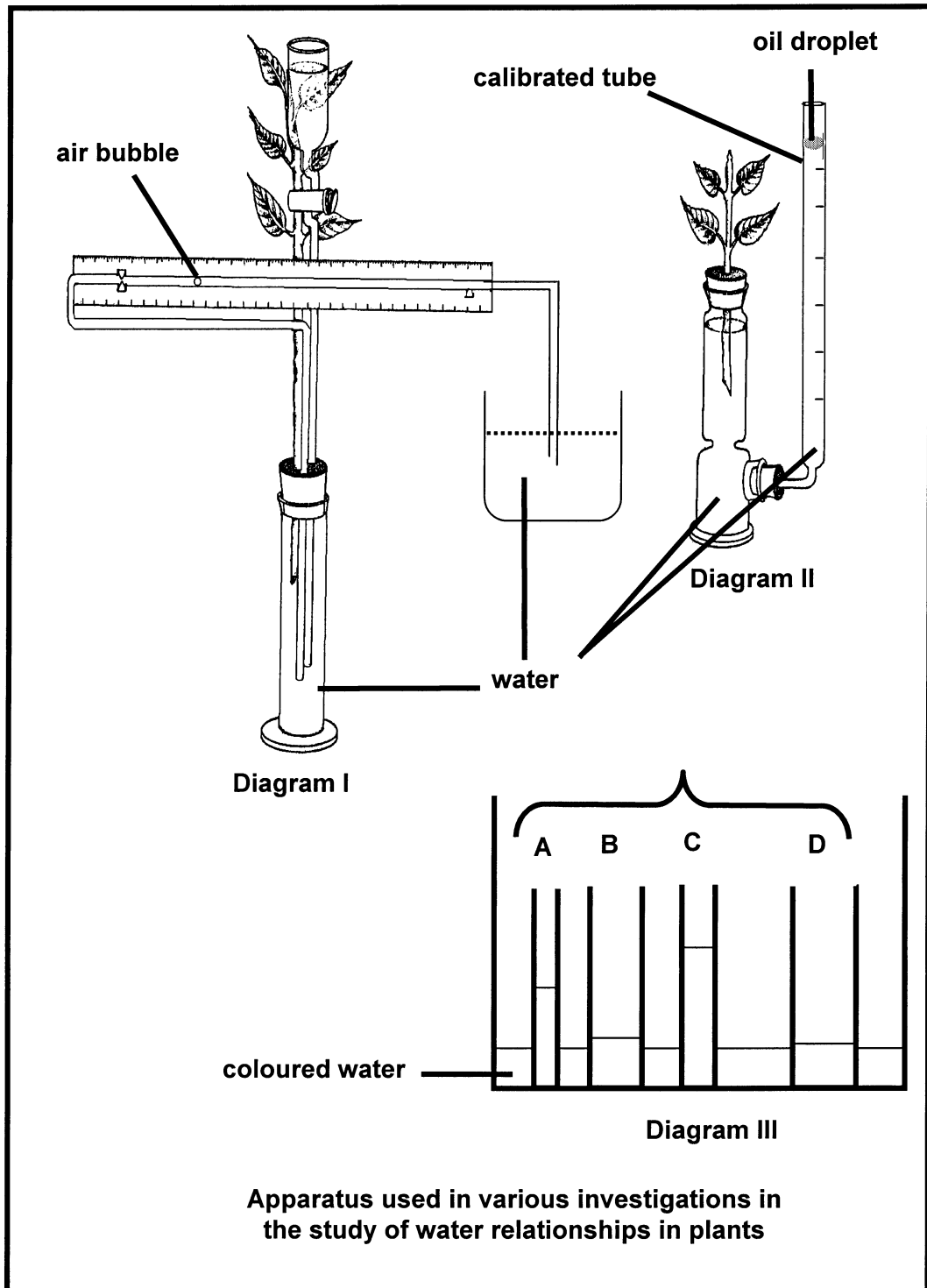
- 1.4.1 Which hormone is responsible for this phenomenon? (1)
- 1.4.2 On which side (X or Y) will the concentration of this hormone be greater? (1)
- 1.4.3 Give a possible reason for the higher concentration of the hormone named in QUESTION 1.4.2. (2)
- (4)

1.5 Study the diagram below and answer the questions that follow:



- 1.5.1 Supply a caption for the diagram. (1)
- 1.5.2 Give the **letter** of the part that:
- (a) Is continuous with the ventricles of the brain (1)
  - (b) Has the same colour as the cerebral cortex of the brain (1)
- 1.5.3 There is ONE mistake in the diagram. Identify and explain the mistake. (3)
- (6)**

1.6 Study the following diagrams and answer the questions that follow:



- 1.6.1 State the aim of the investigation relating to Diagram I. (2)
- 1.6.2 What result would you expect in Diagram II after some time? (1)
- 1.6.3 Explain why the illustration shown in Diagram III is an incorrect representation of the expected results. (2)



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- 1.6.4 Describe a method by which the apparatus in Diagram II can be used to determine the amount of water lost by the plant through transpiration. (4)
- 1.6.5 Explain why a sharp knife must be used when cutting the leafy twigs used in Diagram I and Diagram II. (2)
- 1.6.6 Explain how high air humidity will influence the rate of movement of the air bubble in Diagram I. (2)
- (13)

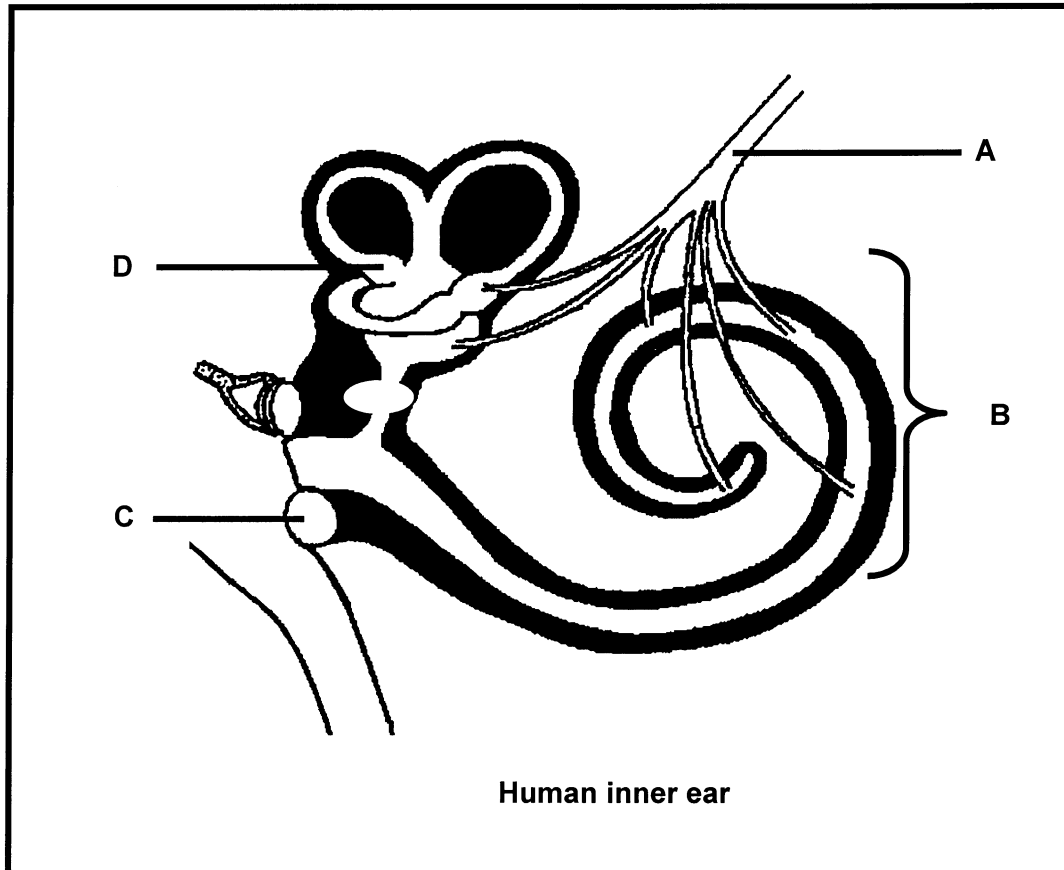
**TOTAL QUESTION 1: 60**  
**TOTAL SECTION A: 60**



## SECTION B

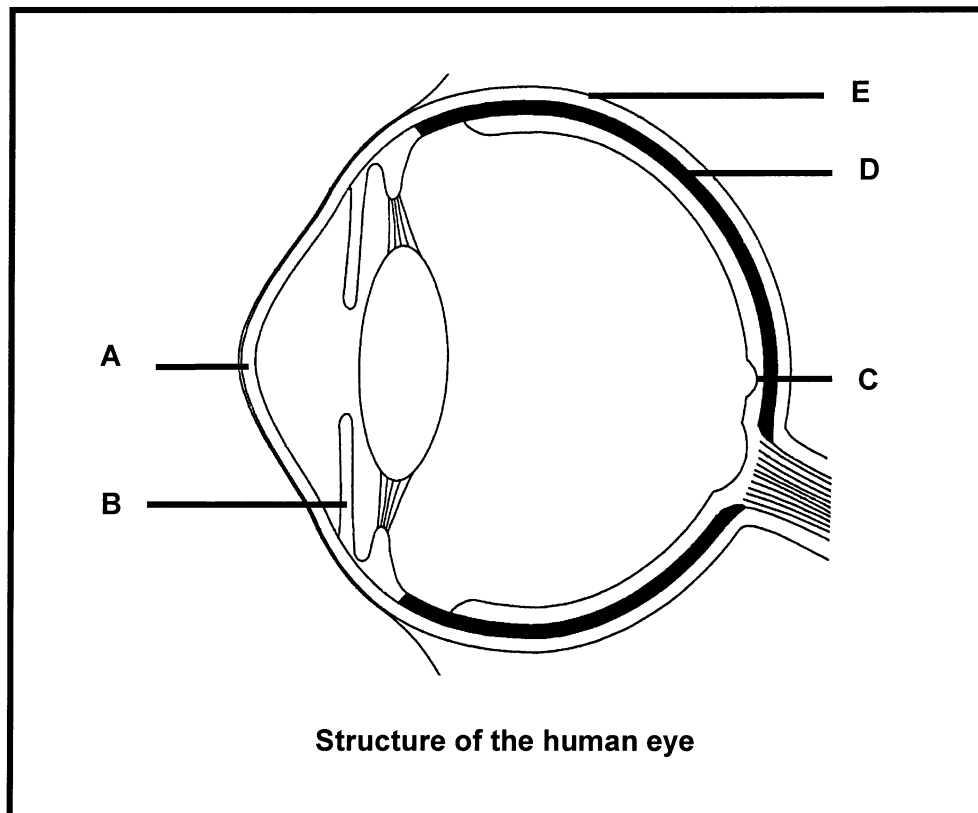
## QUESTION 2

2.1 Study the diagram below and answer the questions that follow:



- 2.1.1 Write only the **letter** of the part responsible for the following:
- |     |  |     |
|-----|--|-----|
| (a) | Converting sound stimuli to nerve impulses   | (1) |
| (b) | Passing vibrations from the inner ear back to the middle ear to prevent sound reflection | (1) |
| (c) | Detecting changes in the direction of the head   | (1) |
- 2.1.2 A canon is a type of gun that makes a very loud noise when fired. Explain why a person should open his/her mouth when firing a shot from a canon. (3)
- 2.1.3 What causes the slight deafness when there is a sudden change in atmospheric pressure? (2)
- 2.1.4 Explain TWO ways in which the auditory canal is adapted for its function. (4)
- (12)**

2.2 Study the diagram below and answer the questions that follow:



2.2.1 Write the **letter** of the part:

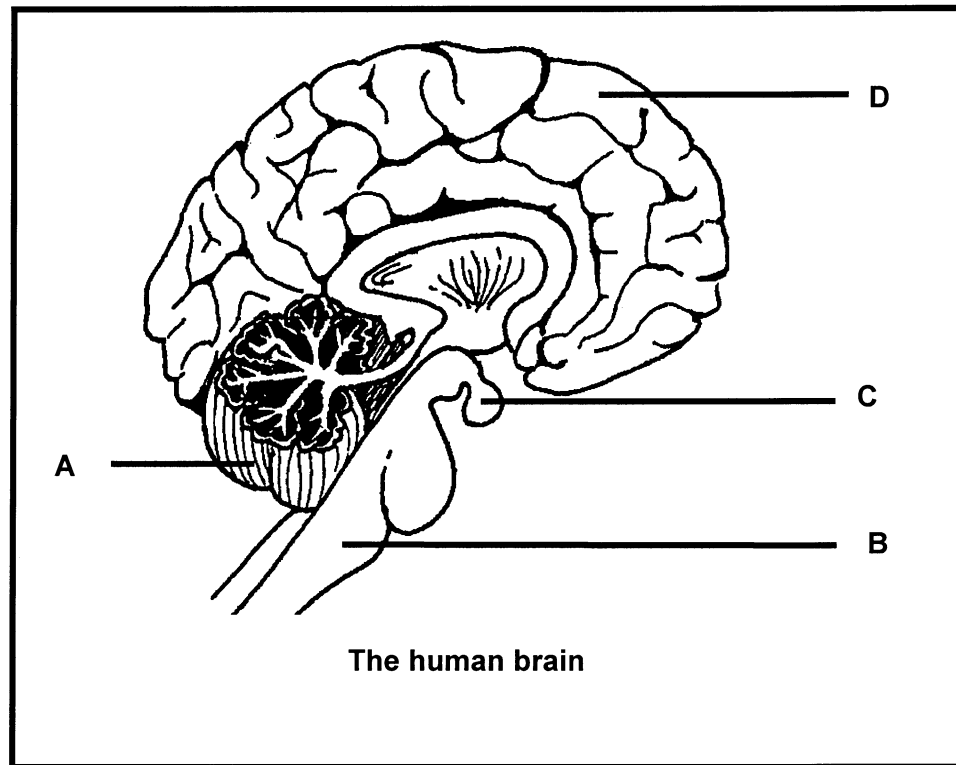
- |     |  |     |
|-----|--|-----|
| (a) | At which the clearest image is formed                    | (1) |
| (b) | That is responsible for the greatest refraction of light | (1) |
| (c) | That is responsible for the nutrition of the eye         | (1) |

2.2.2 State the function of part A. (2)

2.2.3 Explain how part B functions in dim light. (3)  
(8)

2.3 Explain why a person whose ciliary muscles do not function properly should wear glasses. (4)

2.4 Study the diagram below and answer the questions that follow:

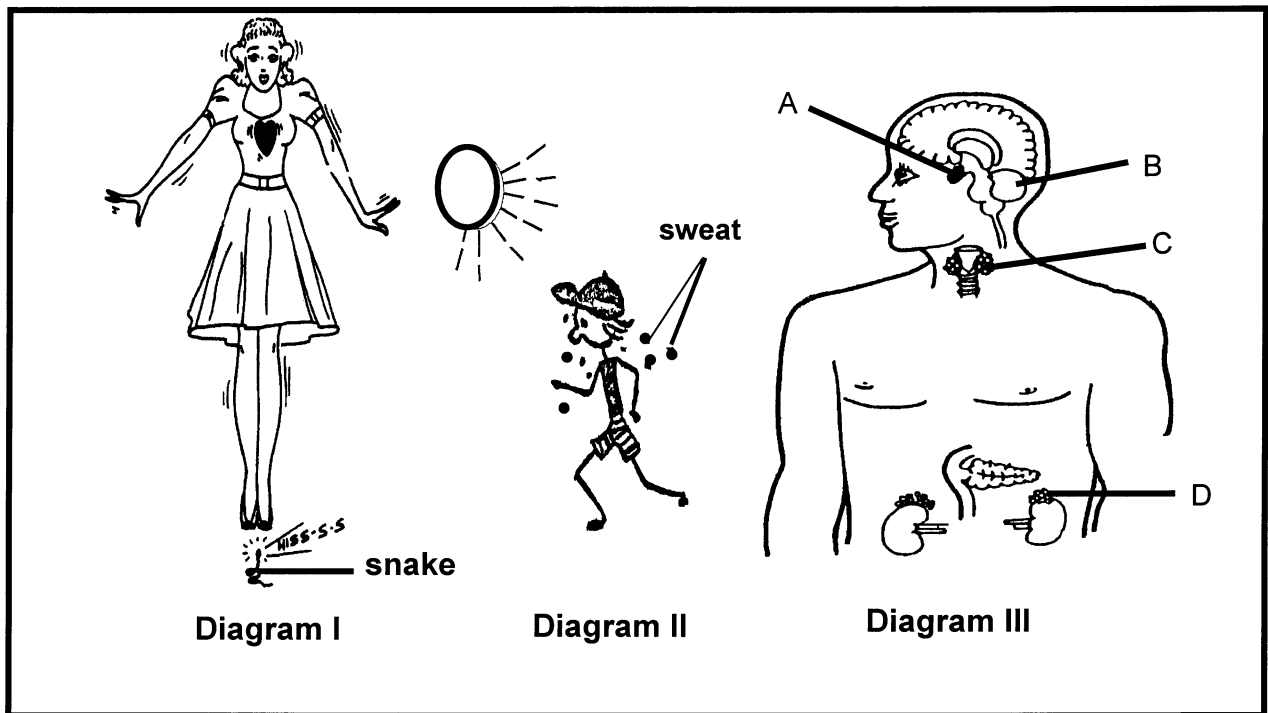


- 2.4.1 Write the **letter** and **name** of the part that:
- |     |   |     |
|-----|---|-----|
| (a) | Controls peristalsis                            | (2) |
| (b) | Maintains balance and muscle tone               | (2) |
| (c) | Controls the permeability of the kidney tubules | (2) |
- 2.4.2 State THREE functions of the liquid found in the ventricles of the brain. (3)
- 2.4.3 Explain why neurons are not in direct physical contact with one another. (2)
- (11)**

**TOTAL QUESTION 2: 35**

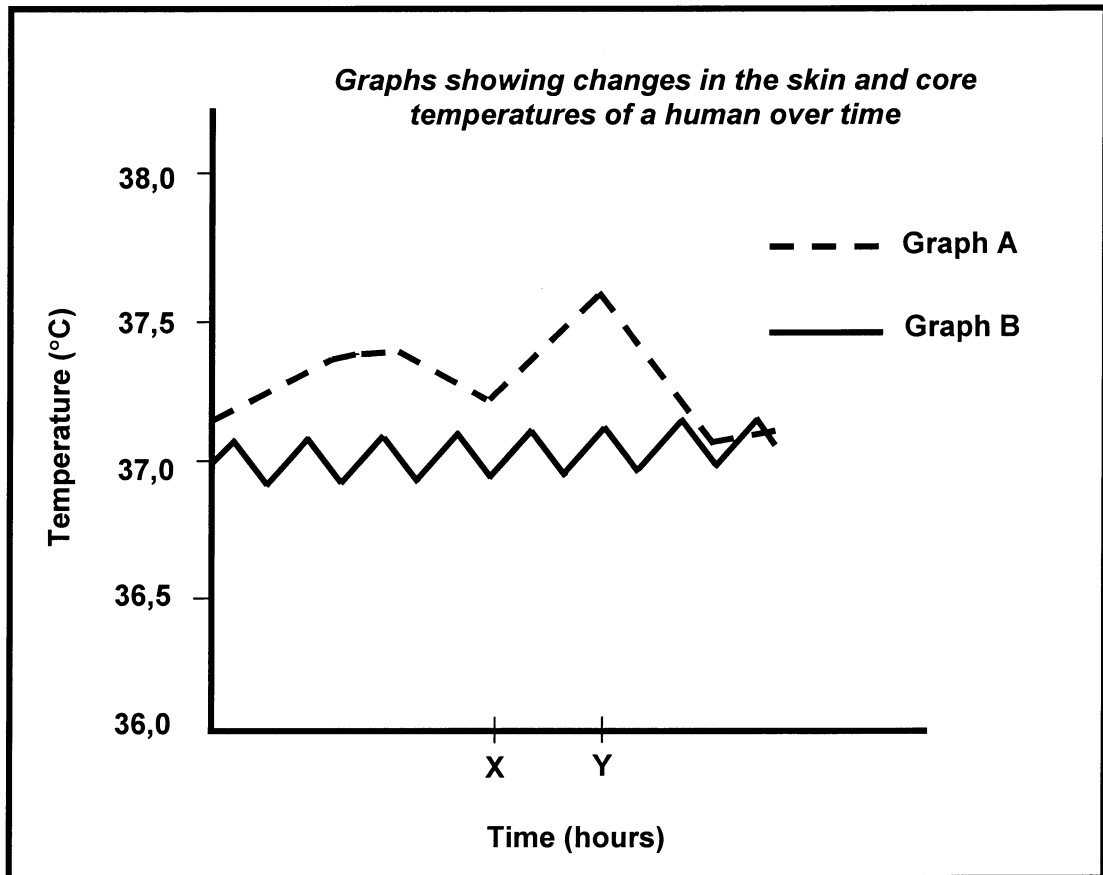
**QUESTION 3**

3.1 Study the following diagrams and answer the questions that follow:



- 3.1.1 How will the diameter of the skin capillaries of the person in Diagram I compare with those of the person in Diagram II? (1)
- 3.1.2 Choose the **letter** of the gland in Diagram III that can be associated with the condition of the skin capillaries in the person in Diagram I. (1)
- 3.1.3 Explain your answer in QUESTION 3.1.2 by referring to the changes that occur in the diameter of the skin capillaries in the person in Diagram I. (7)
- 3.1.4 Give the **letter** of the gland in Diagram III that will be affected first if the metabolic rate of the person in Diagram II needs to be lowered at the end of the race. (1)
- 3.1.5 Explain the role played by the gland named in QUESTION 3.1.4 in lowering the metabolic rate. (4)  
**(14)**
- 3.2 In relation to body temperature regulation, explain why:
- 3.2.1 Small mammals such as mice are continually consuming food (3)
- 3.2.2 Some reptiles become darker in cold weather (3)  
**(6)**

- 3.3 Study the following graphs showing changes in the skin and core temperature of a human over time. Core temperature is the temperature deep inside the body.



- 3.3.1 Which graph (A or B) is a possible representation of the skin temperature? (1)
- 3.3.2 Explain your answer in QUESTION 3.3.1. (3)
- 3.3.3 What deduction can you make from the shape of graph B? (2)
- 3.3.4 State THREE body temperature related changes that might be taking place in the skin between periods X and Y. (3)
- 3.3.5 What deduction would you make if graph A dropped to a value of 36,2 °C at the end? (3)
- (12)**
- 3.4 Explain the advantage of having a higher hydrostatic pressure in the arteriole end of the capillaries that surround cells in the tissues in comparison to the lower hydrostatic pressure in the venule end of the capillaries. (3)

**TOTAL QUESTION 3: 35**

**QUESTION 4**

- 4.1 The table below represents the composition of liquids in the different parts of the human kidney. The volume of liquid passing through each part of the kidney in an hour is also included as the total flow per hour. The quantities of the various substances are expressed as grams per litre liquid. Study the table below and answer the questions that follow:

Component	Plasma in afferent arteriole	Glomerular filtrate	Urine
Urea	0,03	0,03	2,0
Glucose	0,20	0,20	0
Amino acids	0,06	0,06	0
Large proteins	8,00	0	0
Salts	0,72	0,72	1,5
Total flow per hour	14,0 ℓ	2,8 ℓ	0,05 ℓ

- 4.1.1 Draw bar graphs on the same system of axis to compare the glomerular filtrate and the urine in terms of urea, salts and the total flow per hour. (9)
- 4.1.2 Calculate the amount of urine lost by the body per day. Show ALL calculations. (3)
- 4.1.3 Explain why urine is produced even when a person is dehydrated. (3)
- 4.1.4 Describe ONE advantage of using urine samples to determine the health of a patient's body. (2)
- 4.1.5 Explain how the composition of urine represented in the table will change if a person has a meal rich in proteins. (3)
- (20)**
- 4.2 Answer the following questions on the human kidney:
- 4.2.1 Explain THREE structural adaptations of the loop of Henlé for its function. (6)
- 4.2.2 Describe the changes that take place in the body when there is a shortage of water in the body. (7)
- 4.2.3 Name TWO excretory organs in the human body other than the kidneys. (2)
- (15)**

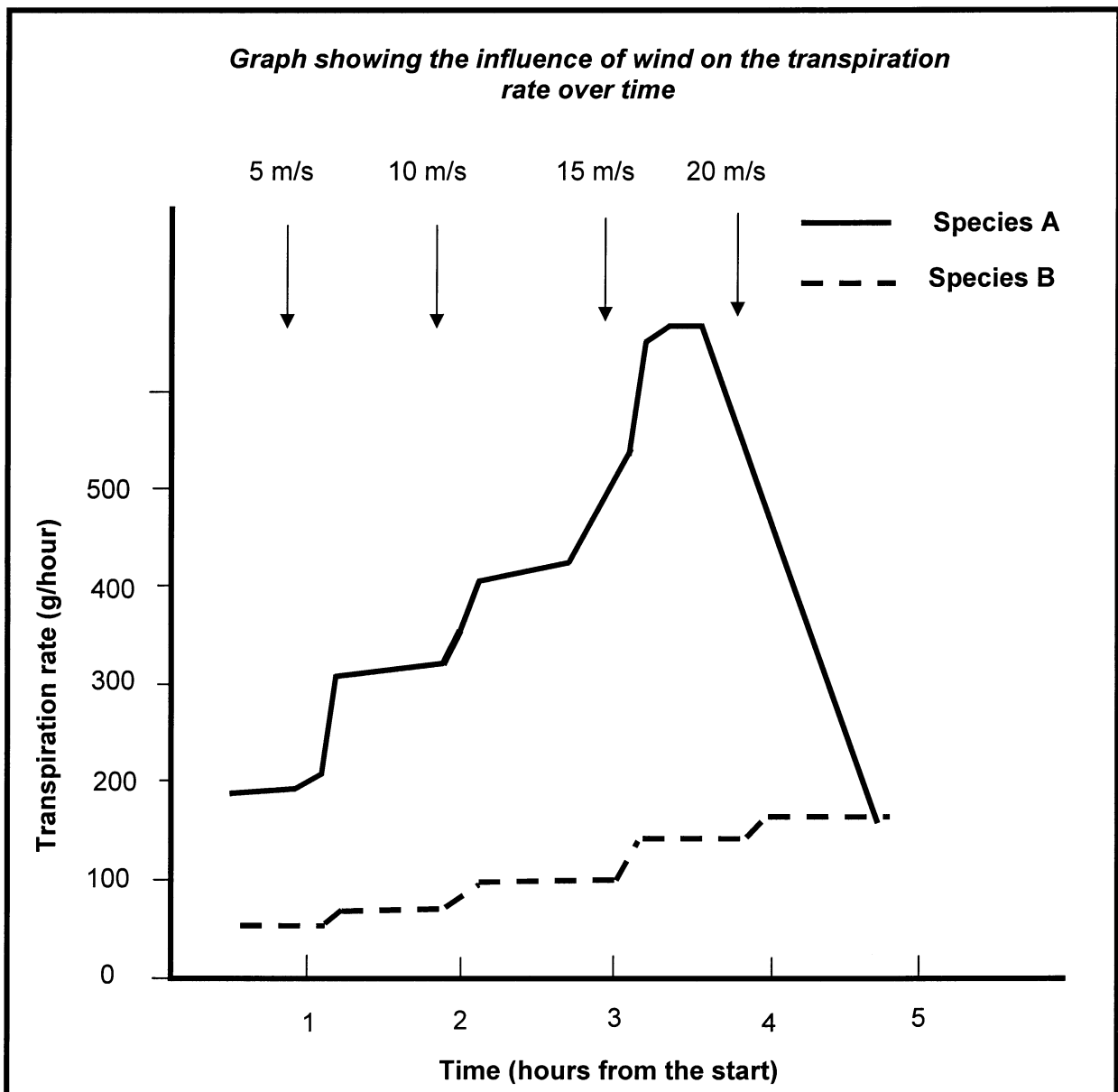
**TOTAL QUESTION 4: 35**  
**TOTAL SECTION B: 105**



**SECTION C**

**QUESTION 5**

5.1 Two different species of potted flowering plants (A and B) were put in a special wind tunnel so that wind of known speed could be applied to them. They were first put in still air and the rate of transpiration was measured at 15 minute intervals for one hour. After one hour the wind speed was changed to 5 m/s and the transpiration rate was again measured four times in one hour. The averages of the readings for each wind speed were plotted on the graph. This was repeated at wind speeds of 10 m/s, 15 m/s and 20 m/s. Study the graph below that shows the results of the experiment and answer the questions that follow:



5.1.1 During which hour was the transpiration rate the highest in species B? (1)





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- 5.1.2 What is the relationship between the wind speed and the transpiration rate for the first three hours of the investigation? (2)
- 5.1.3 Explain how the wind influences the rate of transpiration as described in QUESTION 5.1.2. (3)
- 5.1.4 Which species (A or B) is better suited to a windy habitat? (1)
- 5.1.5 Give a reason for your answer in QUESTION 5.1.4. (2)
- 5.1.6 Explain why the rate of transpiration for species A decreases after 3 hours and 45 minutes. (4)
- 5.1.7 Explain why four temperature readings, and not only one, are taken during the one hour intervals. (2)
- 5.1.8 List TWO external factors that should be kept constant in an investigation such as this. (2)
- (17)**
- 5.2 The root hair is structurally suited for its function. Explain this statement in the light of the process by which the root hair absorbs water from the soil. Describe how the absorbed water is then transported to the xylem of the root.

NOTE: NO marks will be allocated for answers in the form of diagrams or flow charts.

**Content:** (15)  
**Synthesis:** (3)  
**(18)**

**TOTAL QUESTION 5: 35**  
**TOTAL SECTION C: 35**

**GRAND TOTAL: 200**

