education

Department:
Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION - 2007

BIOLOGY P2

HIGHER GRADE

FEBRUARY/MARCH 2007

306-1/2

BIOLOGY HG: Paper 2

MARKS: 200

TIME: 2 hours

306 1 2E HG

This question paper consists of 18 pages.

X05

GAUTENG

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 for 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 A plant cell does not need to use energy obtained from cellular respiration in …

A diffusion.
B active transport.
C metabolism.
D growth and development.

1.1.2 An animal with a short loop of Henlé possibly lives in …

A soil.
B a forest.
C a river.
D a desert.

1.1.3 A reflex action …

A requires the immediate involvement of the brain.
B is a fast, voluntary action.
C is a slow, involuntary action.
D is a fast, involuntary action.

1.1.4 Proprioceptors are responsible for the detection of …

A heat.
B coldness.
C muscle tension.
D bitter taste.

1.1.5 The water potential in a cell is high when the …

A cell wall pressure is low.
B solute concentration is very low.
C solute concentration is very high.
D cell is plasmolysed.

1.1.6 A plant is growing in soil where the concentration of a certain nutrient is 50 parts per million. This nutrient is found at a concentration of 200 parts per million in the root tissues of the plant. The nutrient is taken up rapidly. The mechanism by which this nutrient is entering the plant tissues is probably ...

A diffusion.
B cohesion.
C active transport.
D osmosis.

1.1.7 In the leaves of a plant that grows in a dry environment, you would expect to find …

A stomata on the upper surface only.
B approximately an equal number of stomata on both surfaces.
C more stomata on the upper than the lower surface.
D more stomata on the lower than the upper surface.

(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 A colourless body fluid derived from the tissue fluid which is returned to the circulatory system

1.2.2 The pressure in plant cells due to the liquid content of the vacuole

1.2.3 The maintenance of a constant internal environment by the co-ordinated functioning of various organs in the human body

1.2.4 The membranes enclosing and protecting the central nervous system

1.2.5 The loss of water vapour from the aerial parts of plants

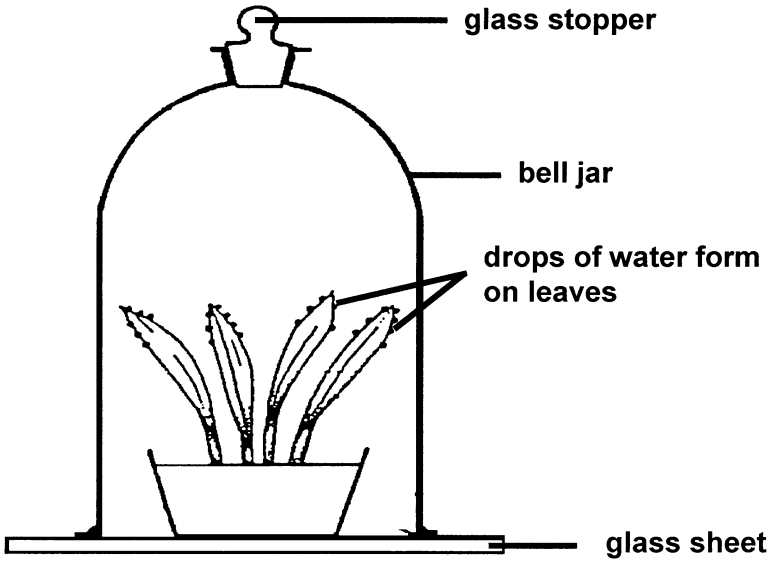
1.2.6 The disease indicated by the presence of glucose in the urine **(6)**

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	Synaptically linked with a neuron	A Receptor B Effector
1.3.2	Site of olfactory receptors in the human body	A Ear B Eye
1.3.3	Assists in excretion	A Liver B Kidney
1.3.4	Function of the nephron	A Excretion B Osmoregulation
1.3.5	Transports urine to the bladder	A Urethra B Ureter

(5 x 2) **(10)**

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



Apparatus used to demonstrate a process taking place in a plant

1.4.1 Name the process that is being investigated. (1)

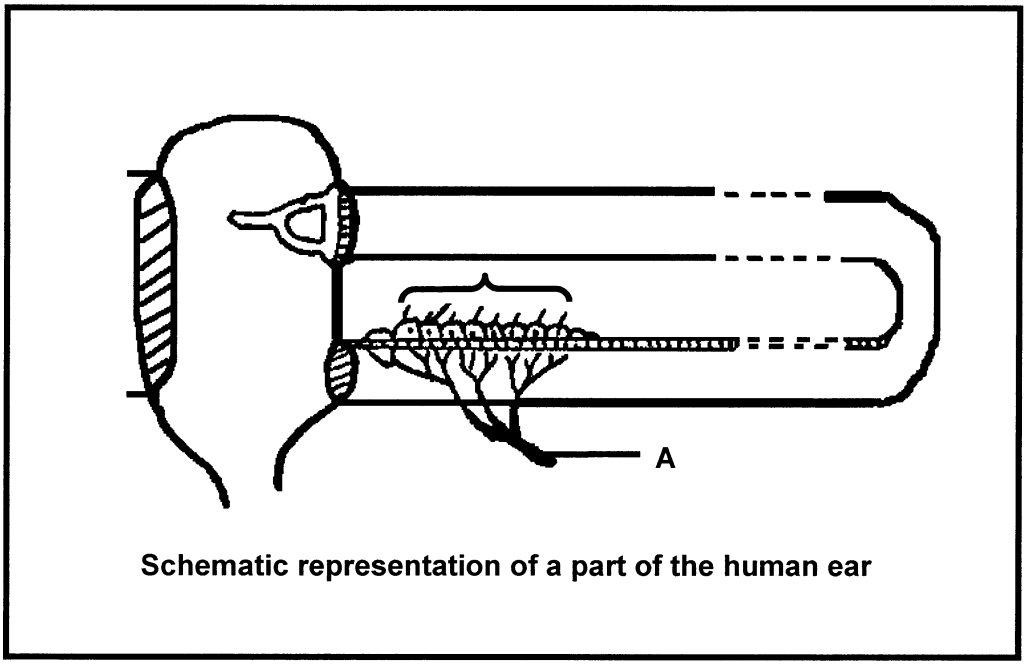
1.4.2 State TWO conditions that favour the process named in QUESTION 1.4.1. (2)

1.4.3 Explain TWO precautions that must be considered when setting up the above investigation. (4)

1.4.4 Explain what would happen if the hydathodes did not function during the conditions mentioned in QUESTION 1.4.2. (3)

1.4.5 Draw a labelled diagram of an apparatus that could be used to demonstrate root pressure. (7)
(17)

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

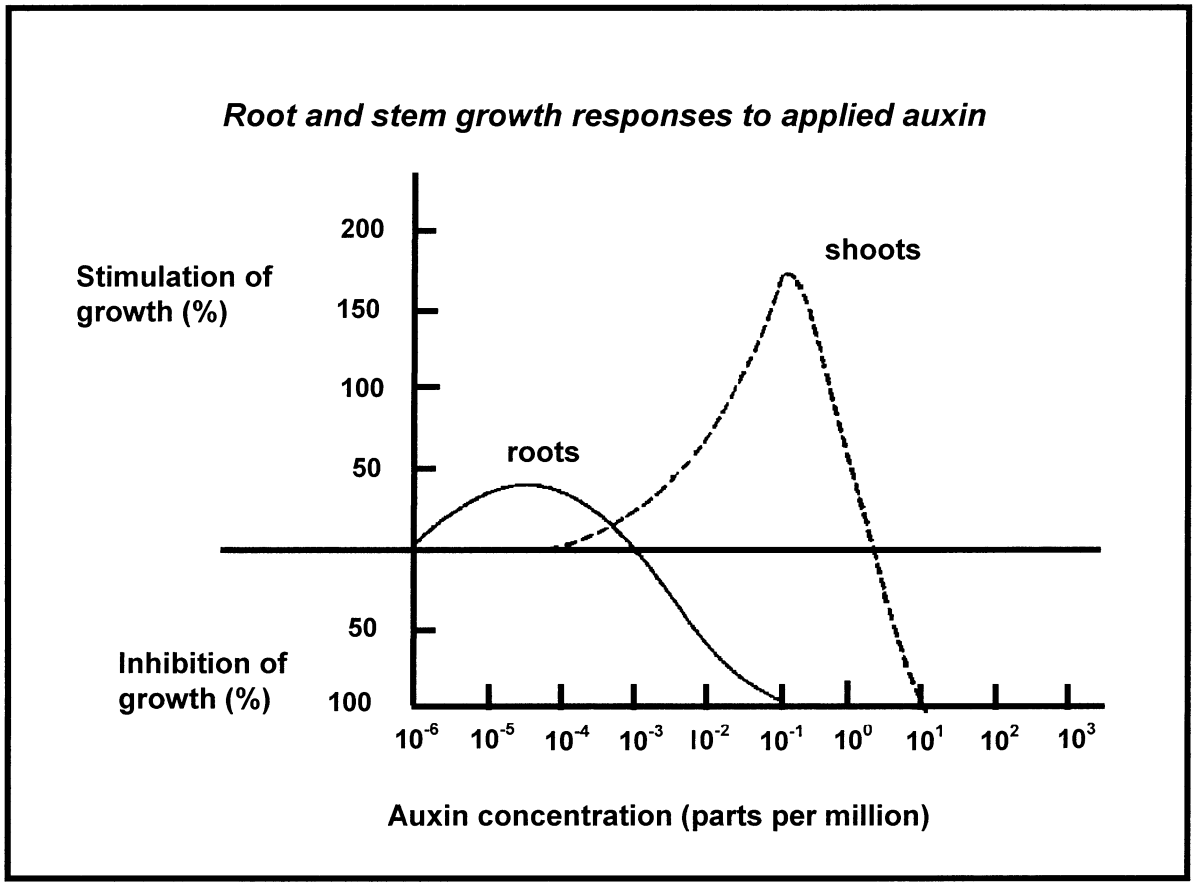


Schematic representation of a part of the human ear

1.5.1 Explain how having a severe cold could affect a person who dives to great depths. (3)

1.5.2 Explain how the process of hearing may be affected if part A is damaged. (2)
(5)

1.6 The graph below shows the growth response of roots and shoots to auxins applied at different concentrations.



1.6.1 At what concentration of auxins do shoots show the most growth? (2)

1.6.2 At what concentration of auxins does growth begin to be inhibited in roots? (2)

1.6.3 Name TWO places in plants where auxins are produced. (2)

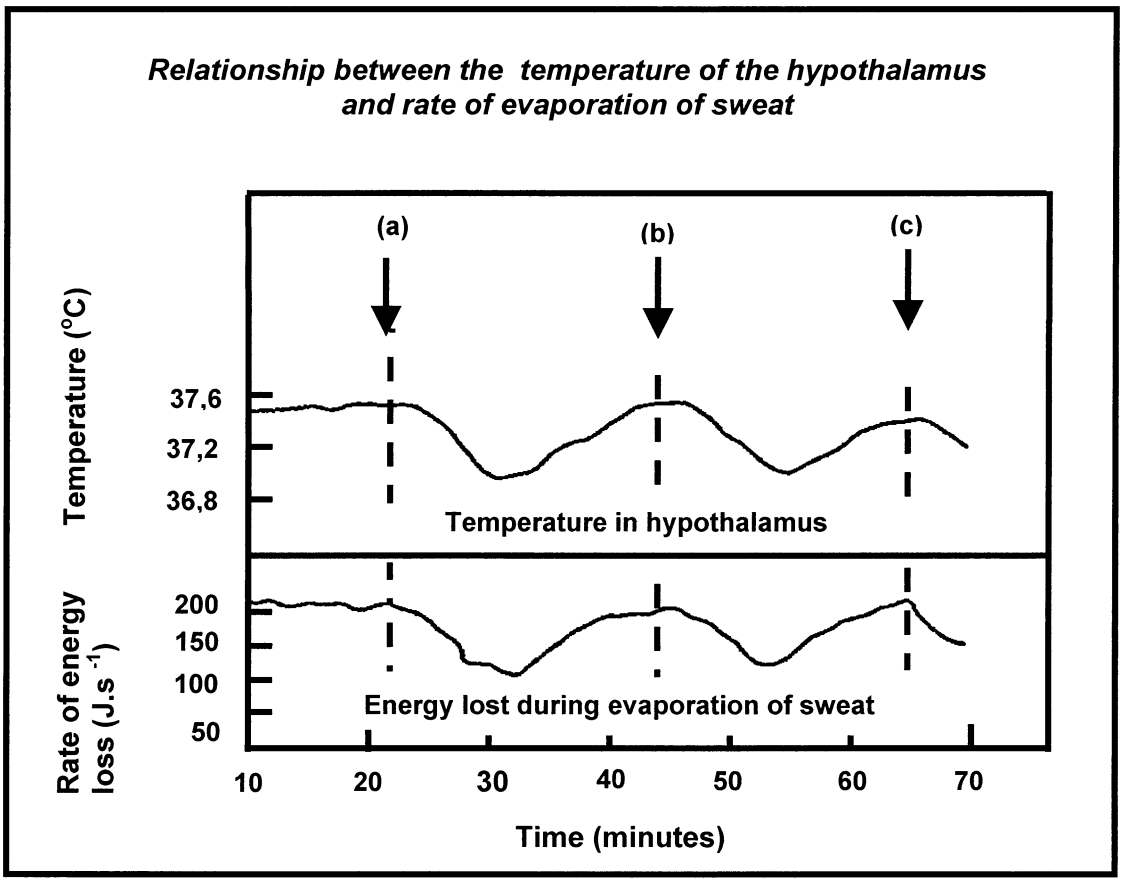
1.6.4 Explain the role of auxins in apical dominance. (2)
(8)

TOTAL QUESTION 1: 60
TOTAL SECTION A: 60

SECTION B

QUESTION 2

2.1 Temperature is one of the factors in the tissue fluid that must remain more or less constant. The graph below shows the relationship between the temperature of the hypothalamus and the rate at which energy is lost as sweat evaporates when a person is placed in a warm room (39 °C). The person drank iced water at points (a), (b) and (c).



2.1.1 Name FOUR factors other than temperature that should remain more or less constant in the tissue fluid in a healthy person. (4)

2.1.2 Explain why the temperature in the hypothalamus and the rate of evaporation of sweat stayed more or less the same for the first 20 minutes. (3)

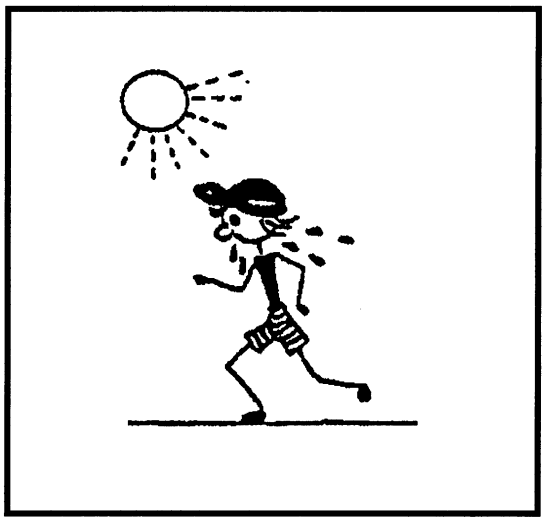
2.1.3 Describe the relationship between the temperature of the hypothalamus and the rate of sweat production. (2)

2.1.4 State ONE conclusion that can be made from the relationship referred to in QUESTION 2.1.3 regarding the control of sweat production. (2)
(11)

2.2 Organisms use various mechanisms to control their body temperature.

2.2.1 The fins of fish are richly supplied with blood capillaries and have a large surface area. These features allow for excessive loss of heat from the body if not properly regulated. Explain how fish prevent excessive heat loss from their bodies. (4)

2.2.2 The diagram below represents a mechanism used by a human to ensure that the body temperature remains constant.



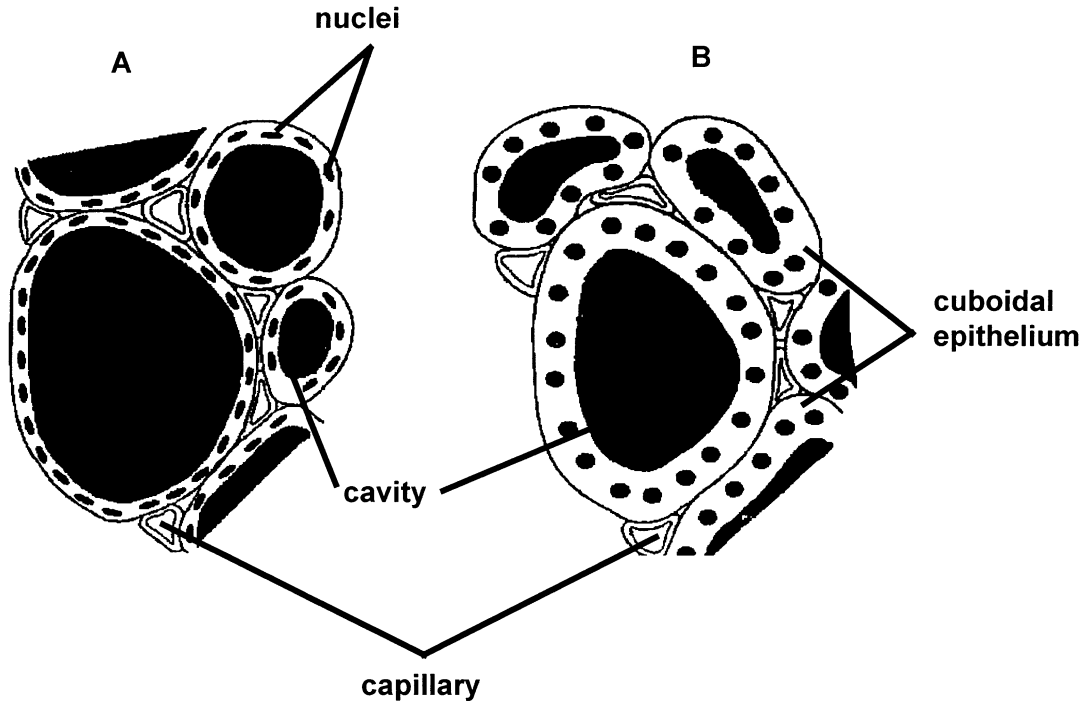
(a) What effect will the mechanism represented in the diagram have on the body of a human? (1)
(b) Explain your answer to QUESTION 2.2.2. (a). (3)
(8)

2.3 During a cricket match a batsman hits a ball hard while balancing his body perfectly on one leg.

Explain how the batsman manages a co-ordinated movement while balancing on one leg. **(8)**

2.4 A sample of tissue was taken from the thyroid gland of a sick cat (A) and a section through it was viewed under a microscope. This was compared with a similar section from a healthy cat (B).

Study the drawings of parts of these sections below and answer the questions that follow:



The thyroid gland with numerous blood capillaries

2.4.1 Give ONE symptom (not visible in diagrams) that might be associated with a thyroid gland that is not functioning correctly. (1)

2.4.2 Describe TWO ways visible in the diagram, in which the sick cat differed from the healthy cat. (2)

2.4.3 Explain why there should be many capillaries in the thyroid tissue. (3)

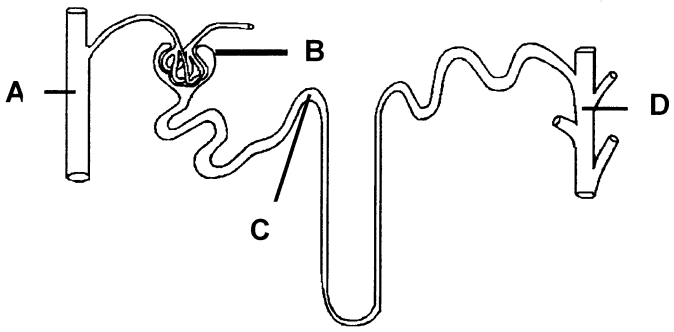
2.4.4 The investigator thought that cat A might be sick as a result of a lack of iodine in its diet. Why is this element needed for the normal functioning of the thyroid gland? (2)
(8)

TOTAL QUESTION 2: 35

QUESTION 3

3.1 Define the terms *excretion* and *secretion.* **(4)**

3.2 Study the diagram of a nephron and the table below, which shows the various amounts of substances present, filtered and reabsorbed in the human kidney over a period of 24 hours:



A nephron and its associated structures

Substance	Amount in plasma	Amount filtered	Amount reabsorbed	Amount passed out in urine
Water (mℓ)	180 000	180 000	178 000	?
Urea (g)	53	53	28	25
Sodium (g)	540	540	537	3
Creatinine (g)	1,4	1,4	0	1,4
Glucose (g)	180	180	180	0

3.2.1 Identify regions C and D. (2)

3.2.2 Calculate the amount of water that is excreted from the kidney in 24 hours. (2)

3.2.3 Which region (A, B, C or D) contains plasma? (1)

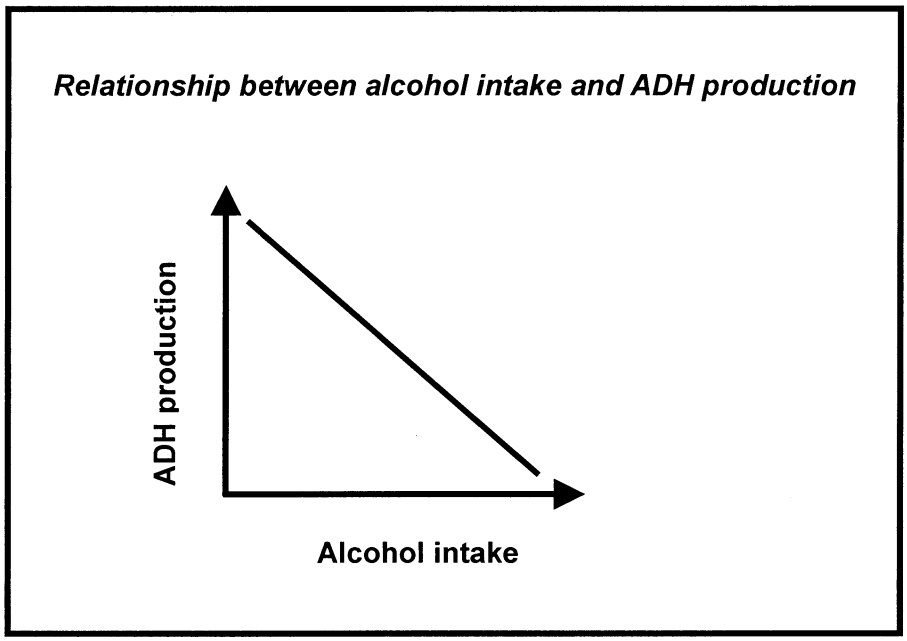
3.2.4 Explain why:

(a) Glucose appears in the filtrate (2)
(b) No glucose appears in the urine (2)

3.2.5 Explain THREE structural adaptations of part B that makes the process of filtration possible. (6)

3.2.6 Explain how the composition of urine represented in the table above might be altered, if the cells of region C were subjected to extreme cooling. (5)
(20)

3.3 Using the graph below, explain why alcohol increases the daily urine output of a healthy person: **(4)**



3.4 A person with kidney failure may undergo a kidney transplant or use a dialysis machine. A dialysis machine is an artificial kidney.

3.4.1 Explain why heart failure often results in kidney failure. (3)

3.4.2 Explain:

(a) ONE advantage and (2)
(b) ONE disadvantage of a kidney transplant compared to the use of a dialysis machine for a person with kidney failure (2)
(7)

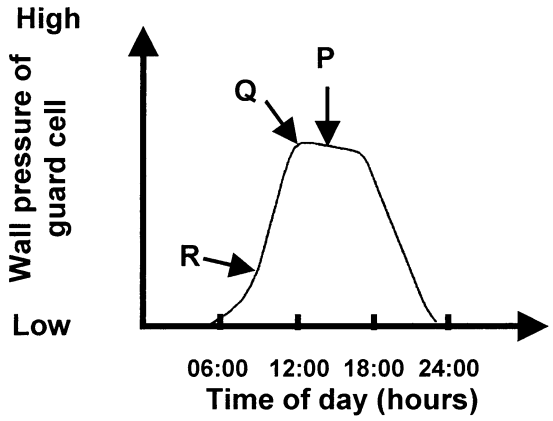
TOTAL QUESTION 3: 35

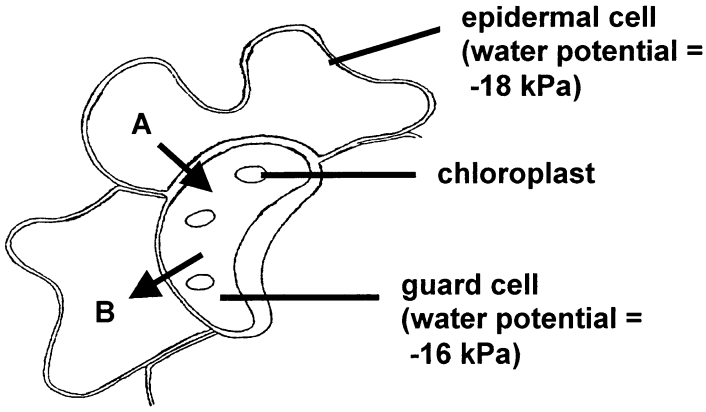
QUESTION 4

4.1 The opening and closing of stomatal pores is caused by changes in turgor pressure of the guard cells and their adjacent epidermal cells.

The graph below shows the behaviour of the stomata of a particular dicotyledonous leaf over a 24-hour period. The diagram shows a guard cell with its associated epidermal cells from the same plant.

The behaviour of stomata of a particular dicotyledonous leaf over a 24-hour period





A guard cell and adjacent epidermal cells

4.1.1 At what time of the day would the stomata open the widest? (1)

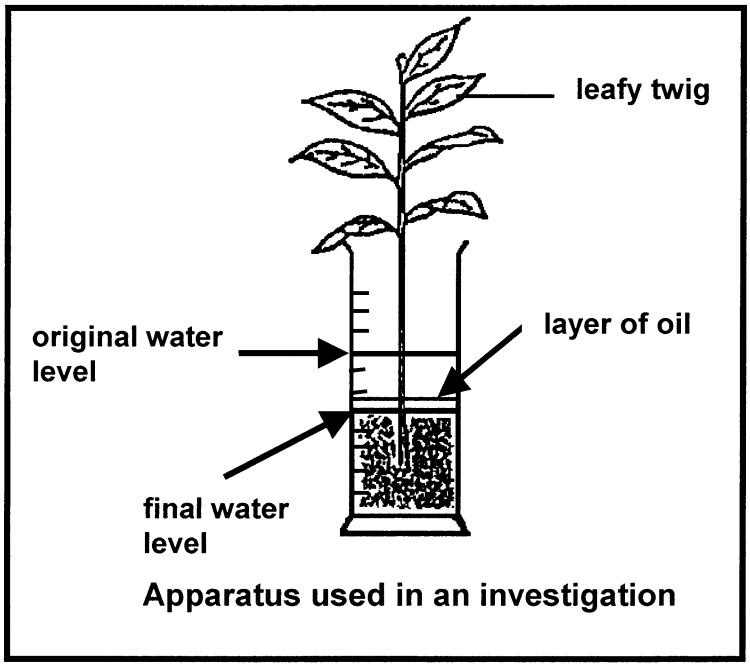
4.1.2 Explain your answer to QUESTION 4.1.1. (2)

4.1.3 Explain why it is harmful for this plant to open its stomata between Q and P when the environmental temperature is high. (3)

4.1.4 In which direction (A or B) will the water flow in the conditions illustrated in the diagram above? (1)

4.1.5 Explain TWO ways in which the guard cell is structurally suited to perform the function of stomatal opening and closing. (4)
(11)

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



Apparatus used in an investigation

The diagram shows one of four measuring cylinders (A, B, C and D) that were set up for an investigation.

Each measuring cylinder contained a leafy twig and 60 mℓ of water covered with a layer of oil. The four cylinders were left in the laboratory, but each was treated as follows:

CYLINDER A: Leafy twig covered with a plastic bag that was wet on the inside and placed in the shade
CYLINDER B: Placed in the shade
CYLINDER C: Placed in wind and sunlight
CYLINDER D: Placed in sunlight

Two hours later, the water levels in the four cylinders were measured and the following readings were obtained:

45 mℓ, 40 mℓ, 38 mℓ, 35 mℓ

4.2.1 What is the purpose of this investigation? (2)

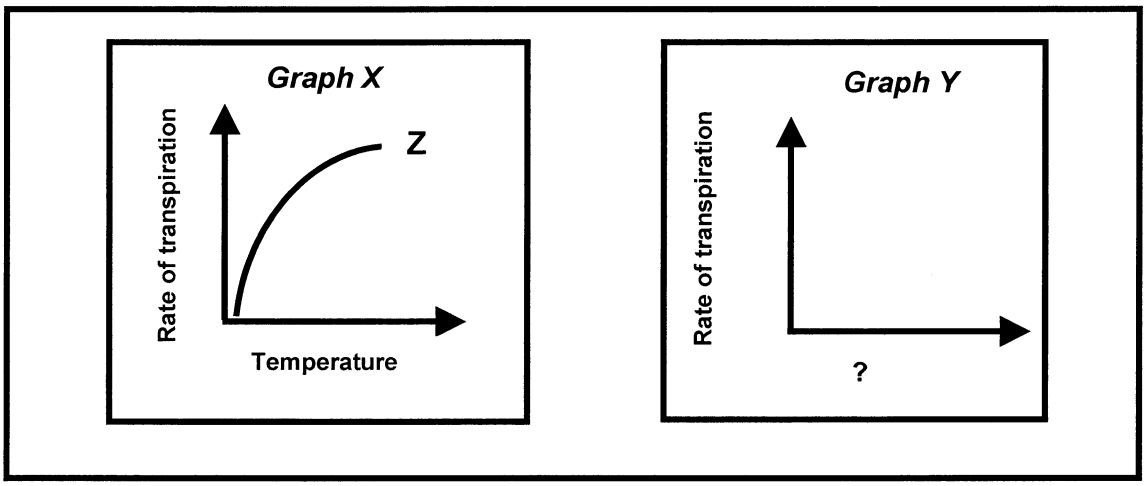
4.2.2 Explain ONE way in which the investigation could be improved upon to produce valid results. (2)

4.2.3 Select the reading (45 mℓ, 40 mℓ, 38 mℓ or 35 mℓ) that applies to each of the following cylinders:

(a) A (1)
(b) B (1)
(c) C (1)
(d) D (1)

4.2.4 Explain what is likely to happen to the rate of transpiration if the stomata of this twig were covered with hairs. (2)

4.2.5 Graph X below shows the effect of temperature on the rate of transpiration. At point Z on the graph, the plant is covered with a plastic bag.



(a) Copy the blank graph Y into your answer book.
Draw in the curve of the results you would expect with the introduction of the new environmental factor. (2)

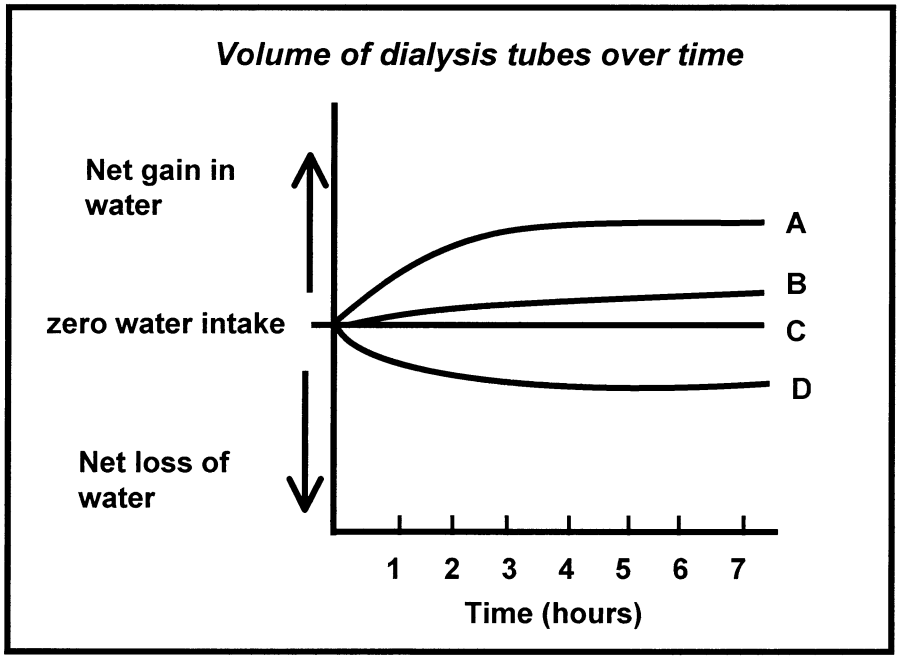
(b) Fill in the environmental condition involved along the blank axis of Graph Y. (1)

(c) Explain why you would expect such results as drawn in the graph for QUESTION 4.2.5(a). (3)
(16)

4.3 Four pieces of semi-permeable tubes were each filled with a 15% salt solution. Each piece was then sealed at both ends and immersed in one of four different solutions as follows:

10% salt solution
15% salt solution
35% salt solution
Distilled water

The graph below shows the volume of the semi-permeable tubes after a few hours:



4.3.1 Which biological process is being investigated in the experiment? (1)

4.3.2 Identify the letter (A, B, C or D) that refers to the semi-permeable tube immersed in each of the following:

(a) 15% salt solution (1)
(b) Distilled water (1)

4.3.3 Explain your answer to QUESTION 4.3.2(b). (2)
(5)

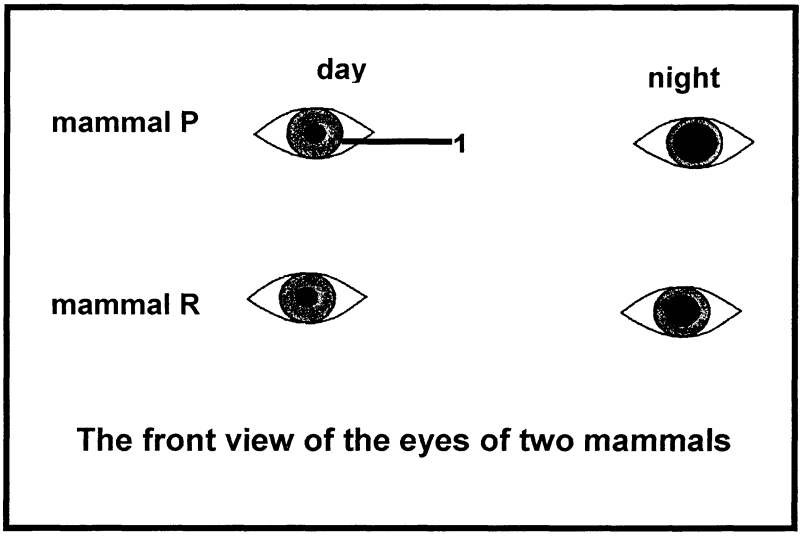
4.4 State THREE ways in which the xylem of a stem is structurally suited to its role in conducting water. **(3)**

TOTAL QUESTION 4: 35
TOTAL SECTION B: 105

SECTION C

QUESTION 5

5.1 The diagrams below show the front view of the eyes of two mammals (P and R), during the day and at night. One of the mammals hunts and feeds at night, while the other is active during the day.



The front view of the eyes of two mammals

5.1.1 Which mammal (P or R) is likely to be more active at night? (1)

5.1.2 Explain your answer to QUESTION 5.1.1. (2)

5.1.3 Explain double innervation by referring to the part numbered 1. (4)

5.1.4 Some animals which are active at night have eyes which are not specially suited to night vision.
Explain TWO other adaptations which these animals might have to assist them when hunting for food or to provide protection. (4)

5.1.5 Read the paragraph below and answer questions that follow:

Glaucoma is a condition characterised by increased fluid pressure inside the eyeball. The increased pressure closes off blood vessels that supply the retina, making the retina appear paler and causing starvation and death of the retinal cells. This condition causes a sufferer to not be able to see parts of an image that fall outside the yellow spot. Although it is a chronic disease and the damage to the eye cannot be cured, the disease can be controlled. Initially eye drops are used for this purpose, but if this proves ineffective, surgery may be necessary.

Adapted from: *HUMAN PHYSIOLOGY* - Foundations and Frontiers, D Moffett; B Moffett & C Schauf

(a) How is the posterior cavity of the eye affected by glaucoma? (1)

(b) If untreated, what will happen to a glaucoma sufferer? (2)

(c) Would a patient suffering from glaucoma be able to see a car approaching from a side street? (1)

(d) Explain your answer to QUESTION 5.1.5 (c). (2)
(17)

5.2 A person with normal vision who has been looking at a distant tree then looks at an object in his/her hand. For a split second, this object appears blurred before becoming clear. Explain why this happens and how the adjustment is brought about.

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

GAUTENG DEPARTMENT OF EDUCATION
GAUTENGSE DEPARTEMENT VAN ONDERWYS

SENIOR CERTIFICATE EXAMINATION: FEBRUARY / MARCH 2007
SENIORSERTIFIKAAT-EKSAMEN: FEBRUARIE / MAART 2007

SUBJECT CODE / VAKKODE	:	**306-1/2**
SUBJECT / VAK	:	**BIOLOGY / BIOLOGIE**
GRADE / GRAAD	:	**HG**
PAPER / VRAESTEL	:	**2**
DATE OF EXAMINATION	:	**5 MARCH / MAART 2007**
DATUM VAN EKSAMEN		
TIME / TYD	:	**9:00 – 11:00**

AANDAG: HOOFTOESIGHOUER

Verander asseblief die volgende op die Afrikaanse weergawe van die vraestel.

Bl. 4

Vraag 1.2.5

Vervang **lugdele** met **bogrondse dele**