Life Sciences IEB

CLASS TEXT & STUDY GUIDE

Liesl Sterrenberg, Helena Fouché & Grace Elliott

GRADE

11

IEB

3-in-1

THE ANSWER SERIES *Your Key to Exam Success*

Grade 11 Life Sciences 3-in-1 IEB

CLASS TEXT & STUDY GUIDE

This Grade 11 Life Sciences 3-in-1 study guide breaks the IEB curriculum down into accessible chunks, allowing you to navigate your way through a challenging course. You'll gain thorough understanding of various organisms and their environment, and an overview of human influences and sustainability as you work through this comprehensive study guide.

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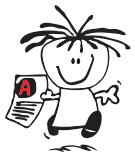
- Carefully selected, graded questions and answers per module
- 'Rapid-fire' questions for key concepts and terms
- Clear, explanatory diagrams
- Up-to-date, relevant material

This study guide enables learners of all levels to achieve their best results.



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THIS HANDBOOK & STUDY GUIDE INCLUDES

1 Notes

- Life Processes in Plants and Animals
- Life at the Molecular, Cellular and Tissue Level
- Diversity, Change and Continuity
- Environmental Studies

2 Questions and Rapid Fire Questions

3 Detailed Memos
(available in the supplement)

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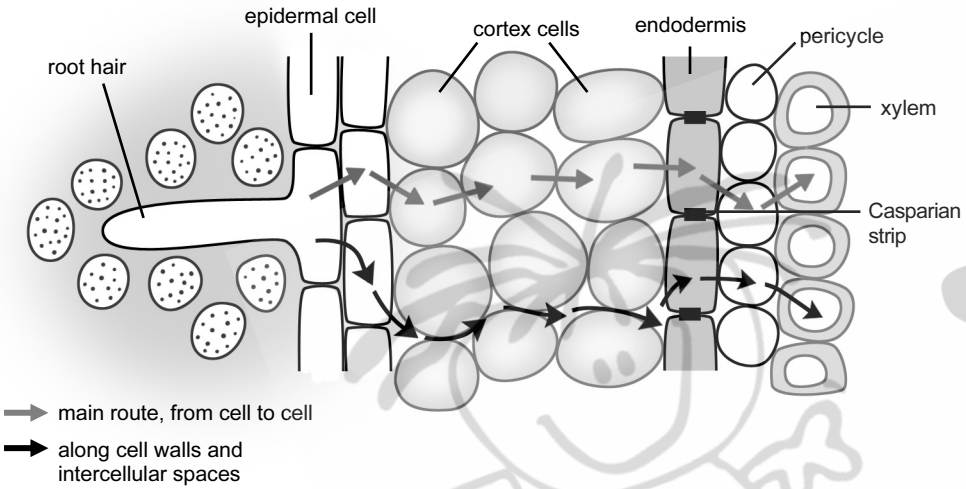
CONTENTS

- Mineral salts are absorbed **against** the concentration gradient (from a low concentration to a high concentration) because there is a higher concentration of dissolved nutrients (solutes) in the cell sap than in the soil solution.
- Therefore mineral salts are **actively** absorbed out of the soil, which means that **energy** is required for the process.

MOVEMENT OF WATER TO THE XYLEM OF THE ROOT



Movement of water from the root hair to the xylem of the root

- The water potential in the vacuole of the root hair is higher than that of the adjacent parenchyma cells in the cortex.
- Water can move via **two routes** down a concentration gradient to the xylem in the central part of the root:
  - The main route that water takes is from cell to cell by osmosis through the selectively permeable membranes of each cell - movement occurs slowly.
  - Water can move through the cell walls and intercellular air spaces between the cells by diffusion. This movement occurs faster.
- When the water reaches the endodermis containing the Casparian strips, it cannot pass through the cell walls but moves through the passage cells of the endodermis, through the pericycle to the root xylem.

Do you remember? *The Casparian strips consist of cork and are impermeable to water. Therefore, at this point the water is forced to move* ***through*** *the selectively permeable membranes and not between the cells.*

UPWARD MOVEMENT OF WATER IN THE XYLEM FROM THE ROOTS TO THE LEAVES

In Grade 10 you studied the structure of the leaf. To understand this section, you must know the internal structure of the leaf.

The root xylem joins the stem xylem, in which the water moves upwards to the leaf.

There are three forces involved in the upward transport of water in a plant:

- **Capillarity**
- **Root pressure**
- **Transpiration pull**

Capillarity (capillary action)

- This is the phenomenon where liquids will spontaneously move up tubes that have a very small bore (cross-section).
- The xylem vessels and the tracheids of the stem xylem are very narrow vessels, therefore water will spontaneously move upwards due to capillarity.
- Capillarity is a very weak force consisting of the forces of **cohesion** and **adhesion**.
- Cohesion is the force of attraction between the water molecules, and adhesion is the force of attraction between the water molecules and the walls of the xylem vessels.
- Together, cohesion and adhesion make water move up the xylem vessels in a continuous column.

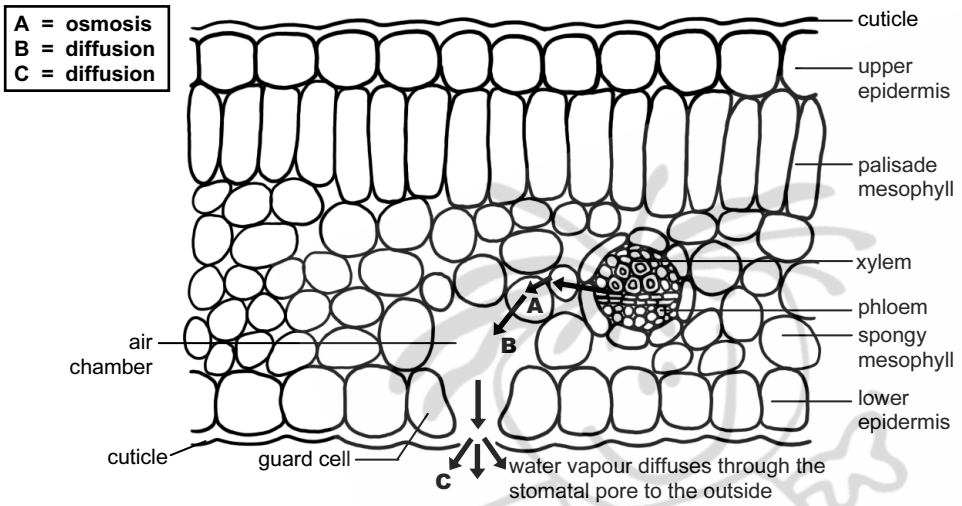
Root pressure

- This is the upward force that develops in roots due to the continuous influx of water from the soil.
- Water moves by osmosis, through the root tissue to the root xylem, where the pressure develops.
- Root pressure is not strong enough to push water high up into the stem.

Transpiration pull (suction force of transpiration)

- Transpiration pull is the main force drawing water upwards in the plant.

Transpiration is the loss of water, in the form of water vapour through the aerial parts of the plant, mainly through the stomata.

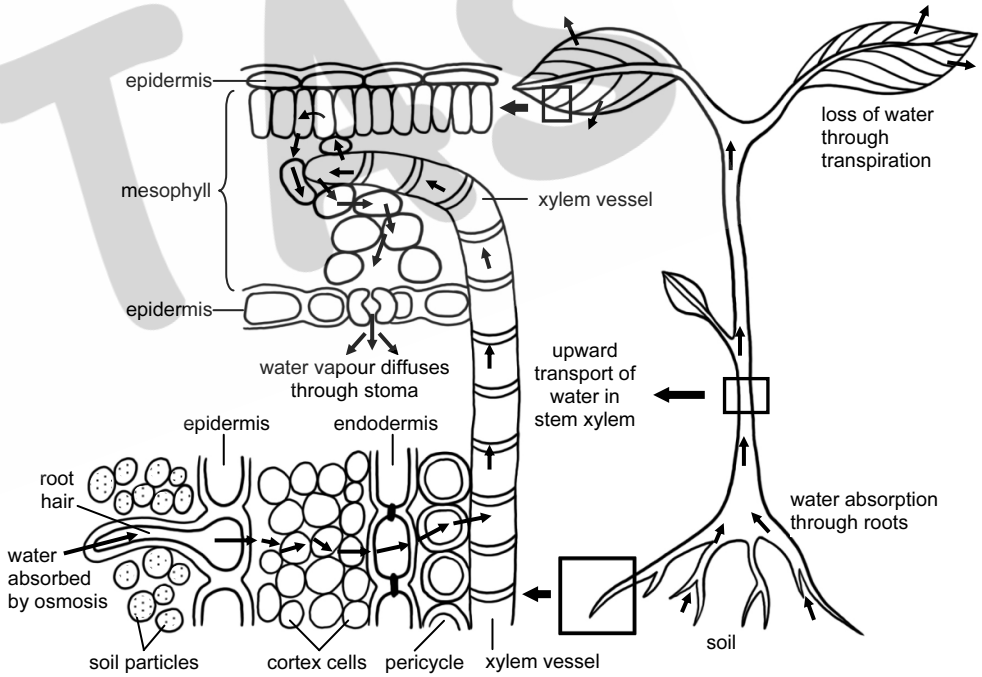


The movement of water through a leaf

- Transpiration causes water to move down a series of water potential gradients, always moving from high to low.
- The water potential in the intercellular air spaces of the mesophyll cells decreases because of the loss of water vapour through the stomata of the leaves.
- Water molecules **diffuse** from the moist cell walls of the mesophyll cells into the air spaces.
- The water potential of the mesophyll cell walls is now lower than that of the cell sap in the vacuoles of the mesophyll cells.
- The water potential gradient extends back to the leaf xylem, which joins the upper ends of the stem xylem.
- Tension builds up and a suction force develops at the top of the stem xylem, which pulls water up from the root xylem.
- Cohesion forces cause the water molecules to be drawn upwards as a continuous column.
- The column of water that is pulled upwards is known as the **transpiration stream**.

Mineral salts are pulled upwards to the leaves dissolved in the water of the transpiration stream.

- The water potential of the root xylem is lower than that of the cortex cells in the root because of the upward movement of water from the root xylem.
- A water potential gradient is created in the direction of the root xylem.
- The water potential gradient extends back to the root hairs, where the absorption of water from the soil takes place.



Absorption of water through the plant

The water that was lost through the leaves by transpiration is replaced by the absorbed water from the soil solution through the root hairs.

- Movement of the body muscles makes the blood move.
- Blood flows very slowly in an open blood system and due to the large blood-filled hemocoel.
- Blood pressure is very low so open blood systems are limited to smaller animals.

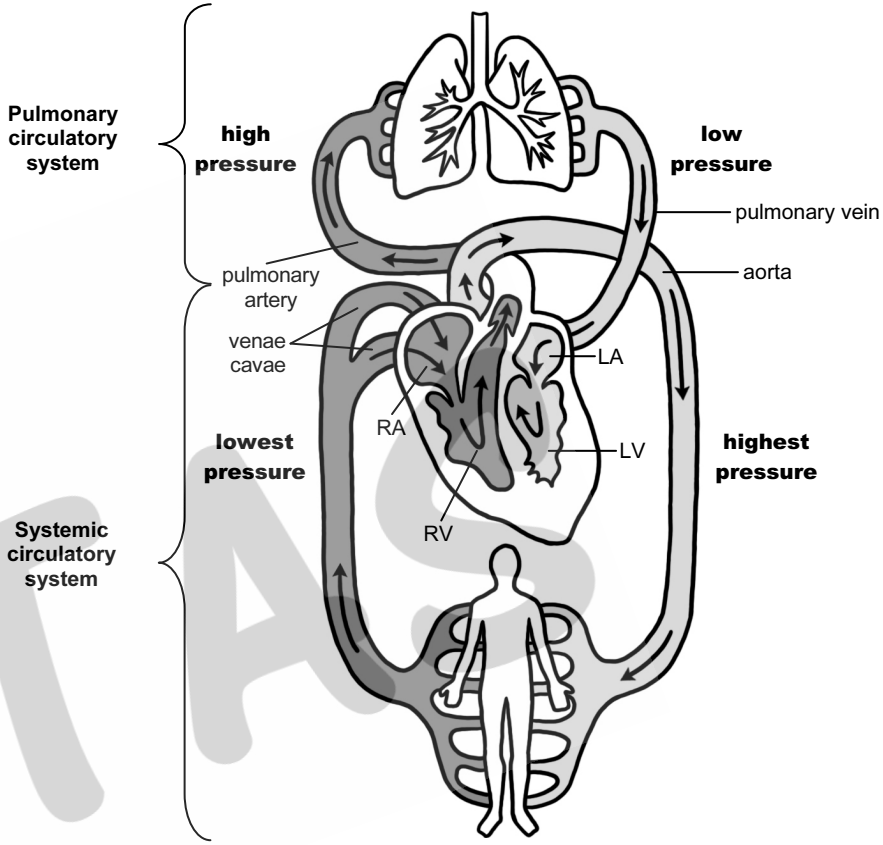
CLOSED CIRCULATORY SYSTEM

- A closed circulatory system occurs in earthworms and vertebrate animals.
- Blood is pumped from the heart into blood vessels which reach all body tissues.
- Larger blood vessels branch into capillaries which occur between the cells for the exchange of gases, nutrients and wastes.
- Blood flows back to the heart in blood vessels with valves to ensure that the blood flows in only one direction towards the heart.
- After the blood has circulated through the body, it is pumped to the lungs under high pressure to absorb oxygen.
- The high rate of oxygen-rich blood flow through the body makes it possible for birds and mammals to maintain a high level of activity.

The high blood pressure in a closed blood circulatory system makes it much more effective than an open circulatory system.

HUMAN CIRCULATORY SYSTEM

- The blood circulatory system in humans consists of three main components:
  - the **heart**, which is the pumping organ
  - the **blood vessels**, which are tubes in which the blood flows
  - the **blood**, which is the fluid that acts as a transport medium in the blood vessels
- Humans have a closed blood circulatory system, where blood is limited to the blood vessels.
- The high rate of oxygen-rich blood flow through the body makes it possible to maintain a high level of activity.
- Humans have a **double circulatory system**. Two main circulatory systems can be distinguished:
  - **Pulmonary circulatory system**
  - **Systemic circulatory system**



The double circulatory system

PULMONARY CIRCULATORY SYSTEM

- Blood flows from the heart, to the lungs and back.
- Deoxygenated blood leaves the **right ventricle** through the **pulmonary artery** and flows to the **lungs**.
- The blood absorbs oxygen from the lungs, via diffusion, and releases carbon dioxide.
- Oxygenated blood flows back to the left atrium via the **pulmonary veins**.

Do you still remember? *Deoxygenated blood has a high concentration of CO_2 and a low concentration of O_2. Oxygenated blood has a high concentration of O_2 and a low concentration of CO_2.*

Resting pulse rate in relation to fitness

Pulse? It is the regular contraction and relaxation of an artery, caused by the heart pumping blood through the body. It can be felt where an artery lies close to the surface, e.g. in your wrist or carotid (neck) arteries.

Pulse rate? Number of heart beats per minute.

How is your pulse rate measured?

- Turn the palm of your hand upwards.
- Place your index and middle finger of your other hand on your wrist.
- Press your fingers lightly against the bone. You should feel a beat: this is your pulse.
- Count the number of beats for 10 seconds and multiply the number by 6. This gives you the number of heartbeats/minute (pulse rate).

The significance of resting pulse rate in relation to fitness may be summed up as follows:
The fitter a person, the lower their pulse rate (as low as 40 - 60 beats/minute). When a person exercises regularly, the cardiac muscle becomes stronger and more blood can be pumped with each heartbeat. Therefore, a fit person's heart beats fewer times per minute to pump the required amount of blood. An unfit person's heart must work harder (more beats per minute) to pump the same amount of blood. The heart rate speeds up during exercise to supply the necessary oxygen and nutrients to the active muscle cells. It gradually slows down after exercise to the resting pulse rate. The faster the pulse rate returns to normal, the higher the fitness level.

BLOOD GROUPS

Erythrocytes (red blood cells) carry specific proteins called **antigens** on their surface. Two types of antigens are distinguished, i.e. **antigen A** and **antigen B**.

Antigen? *A substance that is recognised by the body as foreign and stimulates the immune system to produce antibodies.*

Human blood is classified according to a system known as the **ABO system**, based on the presence or absence of antigen A and B on the red blood cells.

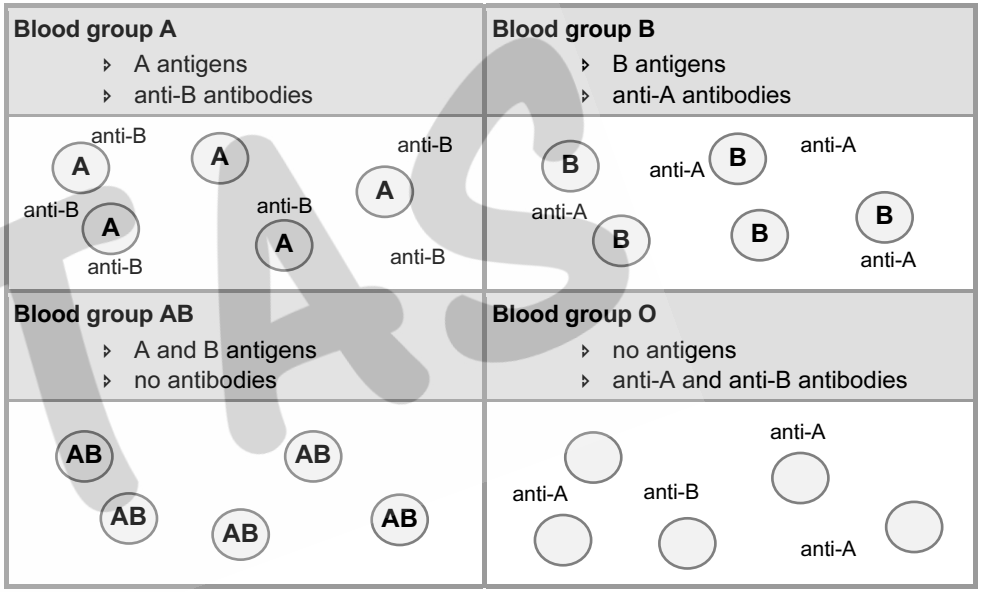
There are **four blood groups:**

- **blood group A** - has A antigens on the red blood cells
- **blood group B** - has B antigens on the red blood cells
- **blood group AB** - has both A and B antigens on the red blood cells
- **blood group O** - has no antigens on the red blood cells

Antibodies against antigen A and B occur in the blood plasma, i.e. **anti-A** and **anti-B** antibodies. If a person has a specific antigen on their red blood cells, they will not have the corresponding antibody that attacks that antigen.

Example: A person with blood group A has A antigens on the red blood cells and anti-B antibodies. They cannot have anti-A antibodies in their blood plasma, as they would attack their own antigens.

The diagram below illustrates the antigens and antibodies that occur in each blood group.



BLOOD TRANSFUSIONS

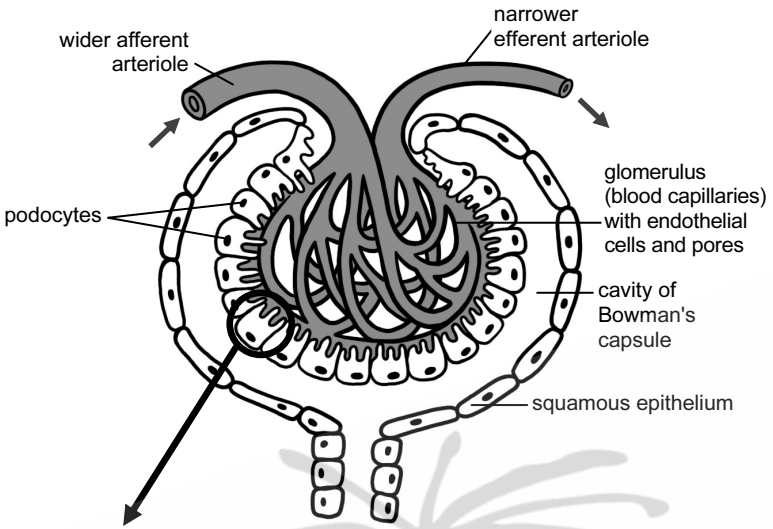
A blood transfusion from a **donor** with the same blood group as the **recipient** is completely safe.

*The **donor** is the person that gives the blood and the **recipient** is the person who receives the blood transfusion.*

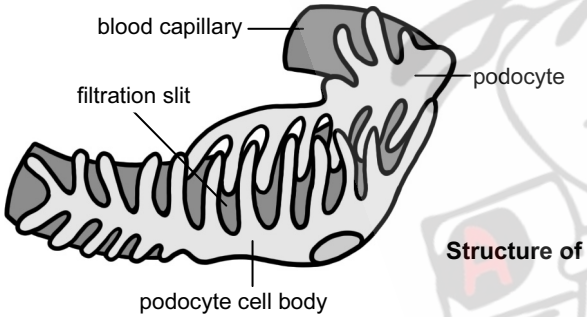
If clotting occurs when two different blood groups are mixed, the two blood groups are considered **incompatible**.

*Another name for clot formation is **agglutination**.*

The antibodies of the blood of the one blood group react to the corresponding antigens on the red blood cells of the blood of the other blood group.



Malpighian body



Structure of a podocyte

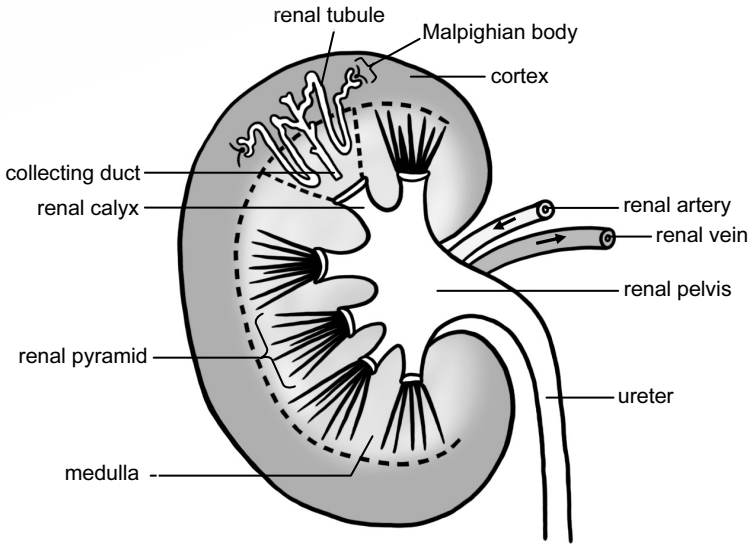
- The inner wall of the **Bowman's capsule** consists of specialised cells, the **podocytes**.
- The podocytes are cells with projections between which small openings, the **filtration slits**, occur.
- The cavity between the inner and outer wall of the Bowman's capsule is known as the **cavity of the Bowman's capsule**.

> ***NB**: The blood in the glomerulus is separated from the cavity of the Bowman's capsule by a thin endothelial cell layer with pores and the podocyte layer with filtration slits.*

Renal tubule

- The renal tubule is a long convoluted tubule that is situated partially in the cortex and partially in the medulla.
- The tube consists of three parts: the **proximal convoluted tubule**, the **loop of Henle** and the **distal convoluted tubule**.
- The **proximal convoluted tubule** follows directly after the Bowman's capsule and is situated in the cortex.
- The renal tubule is at its widest in this part and is lined with a single layer of cuboidal epithelium.
- The **loop of Henle** consists of a descending limb, which extends down into the medulla and forms a hairpin loop, and an ascending limb which extends up into the cortex.
- The loop of Henle is situated in the medulla.
- The **distal convoluted tubule** is situated in the cortex and, just like the proximal convoluted tubule, it is lined with a single layer of cuboidal epithelium.
- The distal convoluted tubule opens into a **collecting duct** together with a number of distal convoluted tubules from other nephrons.
- A few collecting ducts converge and form the **ducts of Bellini**.
- The ducts of Bellini are the tubes forming the pyramids that open into the renal calyx of the renal pelvis.

> *The following diagram shows the macro- and microscopic structures of the kidney. The position of the nephrons is clearly visible.*



Position of nephrons in the kidney

BLOOD SUPPLY OF THE KIDNEY

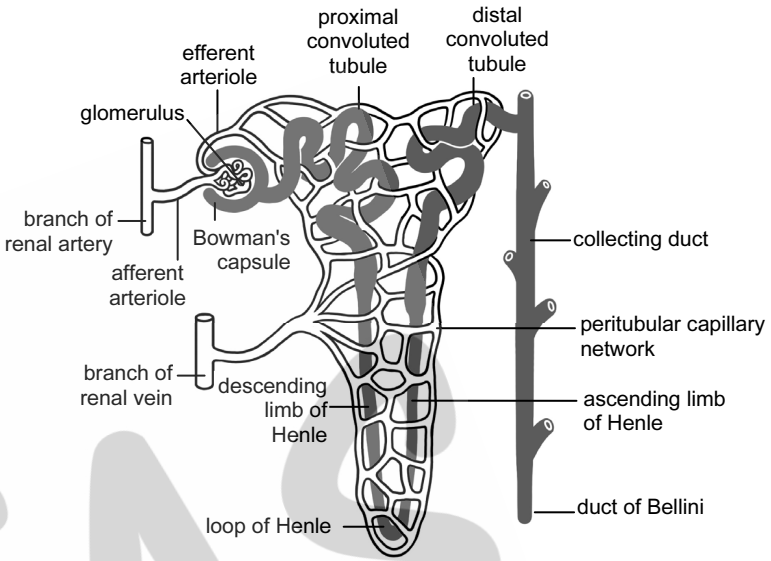
- Each kidney is supplied with blood from a **renal artery**.
- The renal artery is a branch of the aorta, which carries oxygenated blood rich in metabolic waste products to the kidney.
- The renal artery enters the kidney at the **hilum**.
- The artery branches into smaller arteries which extend between the pyramids in the direction of the cortex.
- They branch further until they form the smallest branches in the cortex called afferent arterioles.
- One afferent arteriole extends to each Bowman's capsule.
- The **afferent arteriole** divides to form a capillary network, the **glomerulus**, which fits inside the cup-shaped hollow of the Bowman's capsule.
- The blood capillaries then merge and form an **efferent arteriole**, which transports blood away from the Bowman's capsule.

The afferent arteriole is much wider than the efferent arteriole. This maintains a high pressure in the blood of the glomerulus.

- The efferent arteriole branches again and forms a second network of blood vessels, the **peritubular capillary network**, which surrounds the renal tubule.

Peritubular? *peri = around the outside*
tubule = small tub
The peritubular capillary network is situated around the outside of the renal tubules.

- The peritubular capillaries combine to form venules and larger veins that eventually form the **renal vein**. The renal vein takes deoxygenated blood, minus waste products, from the kidney to the heart via the inferior vena cava.

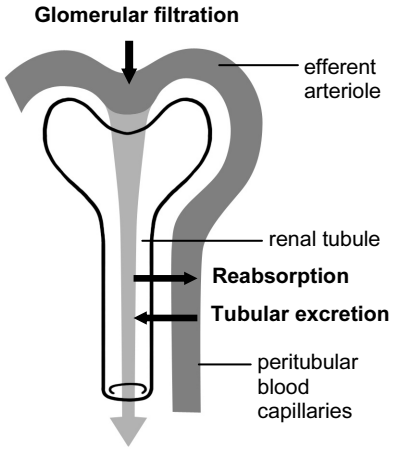


The efferent arteriole has a capillary network on both sides: the glomerulus on the one side and the peritubular capillaries on the other side. This system is known as a portal system. A portal system consists of a blood vessel with capillary vessels on both sides.

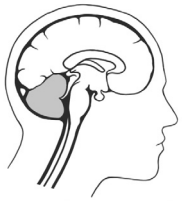
FUNCTIONING OF THE KIDNEY

The functioning of the kidney can be divided into three main processes:

- **Glomerular filtration**
- **Tubular reabsorption**
- **Tubular excretion**



Cerebellum



- The cerebellum is situated behind and below the cerebrum.
- It consists of two hemispheres, connected to each other by a worm-like mass of nerve tissue, the **vermis**.
- The surface of the cerebellum also has grooves but more shallow and parallel than those of the cerebrum.
- The grey matter is situated on the outside of the white matter.
- The white matter is uniquely arranged like a branched tree, hence the term '*arbor vitae*'.

'Arbor vitae' is the Latin term for 'Tree of Life'.

Functions of the cerebellum

- It **coordinates and controls all voluntary actions** to make smooth and precise movement possible.
- It **controls the muscle tone** (tension in the muscles) to maintain balance and posture.

The cerebellum ensures the precision and timing of complex muscle movements. Research has shown that professional musicians and sportsmen have an enlarged cerebellum as they spend many hours practising and fine-tuning a particular skill.

Medulla oblongata

- The medulla oblongata is an extension of the spinal cord and has the same structure.
- It differs from the rest of the brain, because the grey matter is on the inside and the white matter on the outside.
- The grey matter is arranged in an **H**-shape.

Motor fibres from the cerebrum cross over in the medulla oblongata, i.e. the left cerebral hemisphere controls effectors on the right side of the body while the right hemisphere controls the left side.

Functions of the medulla oblongata

- It transmits nerve impulses between the spinal cord and the brain.
- It **controls autonomic functions**, including the following:
  - rate and depth of breathing
  - heartbeat
  - vasomotor activity, i.e. vasoconstriction and vasodilation (widening and narrowing of blood vessels)
  - peristalsis and vomiting

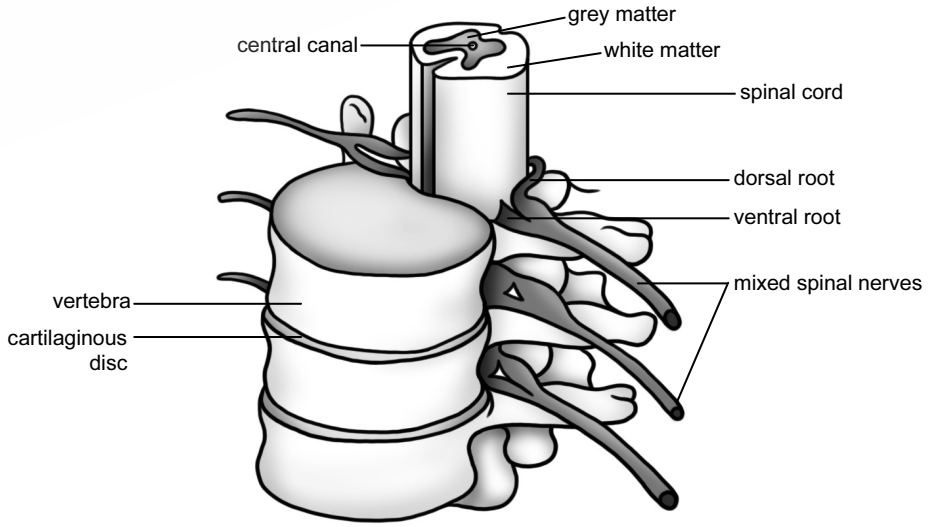
Less vital reflexes, such as coughing, sneezing, hiccupping and eye blinking, are also controlled by the medulla oblongata.

There are many other functions of the brain that are not covered in your syllabus. Vital processes like the control of blood pressure, water balance, hunger, thirst, sleep, the driving forces of reproduction and self-defence, for example, are performed by the hypothalamus.

Spinal cord

- The spinal cord extends from the medulla oblongata and through the spinal canal of the vertebral column to the lumbar region.

You have already learnt that the spinal cord is protected and enclosed by the three cerebral meninges (membranes), the vertebral column and cerebrospinal fluid.



The vertebral column showing the position of the spinal cord and spinal nerves

Significance of the reflex action

- The reflex action is rapid to protect the hand from further injury.
- It prevents overload of the higher centres of the brain.

Practical Investigation: Reaction times of different learners to a stimulus *- enrichment*

Please note the curriculum requires you to:

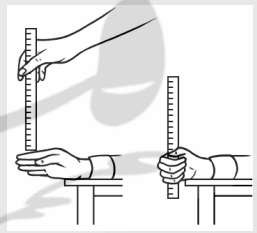
- design an investigation similar to this one
- formulate a hypothesis
- state your method
- record results in tables and graphs
- draw conclusions
- identify fixed, independent and dependent variables
- discuss inaccuracies and errors in design
- apply the average reaction time to calculate safe following distances

Hypothesis

- Your hypothesis is a prediction/statement that may be tested to show the relationship between the independent and dependent variables.
- Example: Reaction times with a sound stimulus are slower than reaction times with a visual stimulus.

Requirements

- ruler
- calculator
- table/desk
- results table



Method

- Your partner holds the ruler at the top and prepares to drop it without warning.
- Rest your hand on a table below with your fingers lined up at the zero (bottom) of the ruler **without touching the ruler**.
- When the ruler drops, you catch it between your thumb and fingers **without following the ruler**.
- Read off the position of the thumb on the ruler.
- Repeat the steps until you have 10 readings and record your results in a table.
- Use the conversion chart or the formula provided to determine the reaction time for each result.
- Calculate the **average distance** (in cm) and determine the **average reaction time** (in milliseconds) of the 10 attempts.
- Repeat the steps to test **your partner's reactions** in catching the ruler.

Table to show the approximate reaction times calculated from the distance a ruler falls

Approximate distance ruler falls (cm)	Reaction time (ms)
5	100
10	140
15	175
20	200
25	225
30	245

Formula to calculate reaction time:

$t = \sqrt{2d/g} \times 1\,000$

t = time in seconds

d = distance in cm

g = acceleration of gravity ($980\ cm/s^2$)

- Repeat the investigation using a **sound stimulus** (blindfolded) to signal the dropping of the ruler.
- Record your results in a table and illustrate the data in a graph.

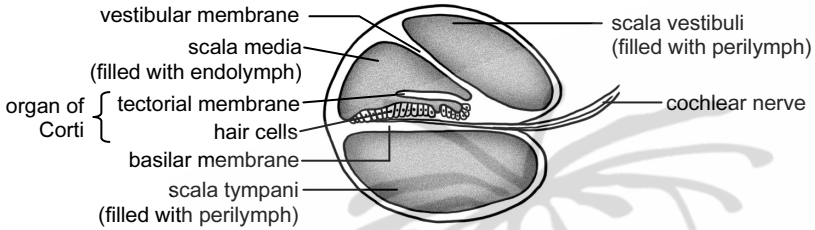
Results

Table to show results of reaction times of a visual vs a sound stimulus

Attempt	Visual stimulus		Sound stimulus	
	Distance (cm)	Reaction time (ms)	Distance (cm)	Reaction time (ms)
1	19,5	199	16	181
2	17	186	15	175
3	18,5	194	13	163
4	16	181	14	169
5	15,5	178	16	181
6	16,5	184	12,5	160
7	14	169	13,5	166
8	17,5	189	12	156
9	13,5	166	14	169
10	14	169	13,5	166
Ave.	16,2	181,5	14,0	168,5

- The two outer canals, filled with perilymph, join at the tip of the cochlear tube, at an opening called the **helicotrema**.
- The scala media is separated from the scala vestibuli by the **vestibular membrane** (also known as the Reissner's membrane), while the scala media is separated from the scala tympani by the **basilar membrane**.

The vestibular membrane forms the 'roof' of the scala media, and the basilar membrane the 'floor'.



Transverse section through the cochlea

- There are **hair cells** on the basilar membrane, the tips of which are embedded in an immovable, stiff membrane, the **tectorial membrane**.
- This membrane stretches over the hair cells.
- The tectorial membrane and hair cells form the **organ of Corti**.
- The organ of Corti is thus a specialised structure containing the hearing receptors.

Function of the organ of Corti

- The hair cells detect mechanical stimuli (vibrations) and convert them into nerve impulses.

From the hair cells the nerve impulses are conducted along nerve fibres that form the **cochlear nerve**. The cochlear and vestibular nerves merge to form the **auditory nerve**.

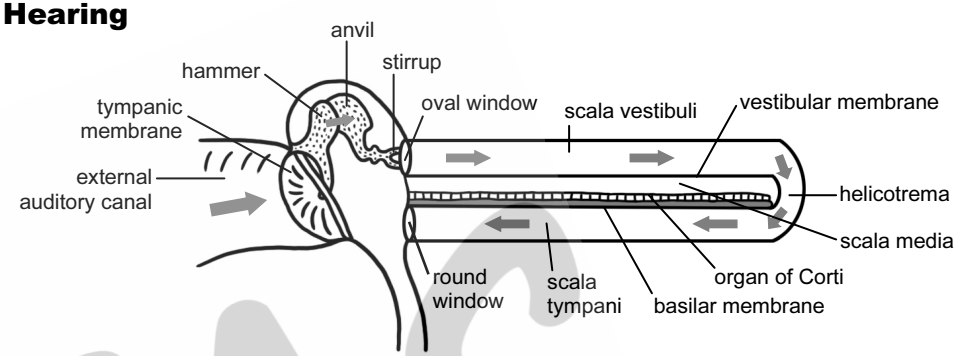
Functions of the auditory nerve

- Conducts nerve impulses to the cerebral cortex where the sensation of hearing is produced.
- Conducts nerve impulses to the cerebellum where balance is coordinated.

Functioning of the ear

- The ear is responsible for hearing and balance.

Hearing



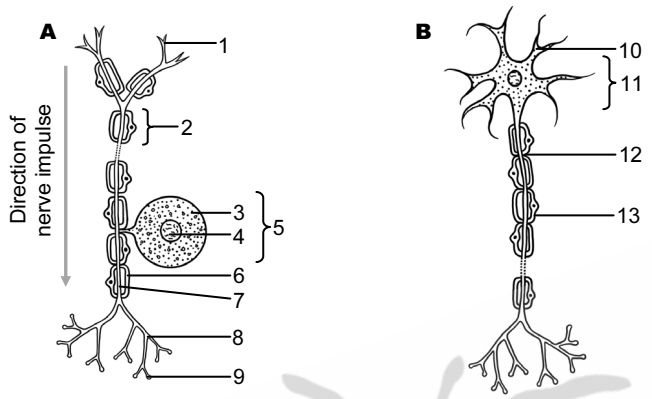
Path of a sound stimulus

- Sound waves are received by the **pinna** and directed into the **external auditory opening**.
- The **external auditory canal** transmits the sound waves to the **tympanic membrane** (eardrum).
- The tympanic membrane vibrates and transmits the vibrations to the **ossicles** (malleus, incus, stapes) in the middle ear.
- The ossicles amplify the vibrations and transmit them via the middle ear to the membrane of the **oval window**.
- The oval window vibrates and causes pressure waves in the **perilymph** of the **scala vestibuli**.
- The waves travel along the scala vestibuli and cause the **vestibular membrane** to vibrate.
- This produces waves in the **endolymph** of the **scala media**, causing the **basilar membrane** to vibrate.
- These vibrations cause mechanical stimulation of the **hair cells** embedded in the **tectorial membrane** (organ of Corti) as they are pulled and bent which then generates nerve impulses.
- Nerve impulses are conducted along the **cochlear nerve** and finally the **auditory nerve** to the **cerebral cortex** of the brain, where the sensation of hearing is produced.

Pressure waves in the perilymph of the scala tympani are finally absorbed by the membrane of the round window.

QUESTION 3

Study the drawings of neurons below and answer the following questions.



3.1 Identify the neurons labelled A and B respectively, based on:

3.1.1 their function

3.1.2 the number of outgrowths/nerve fibres projecting from the cell body

3.2 Which neuron, A or B, is referred to as an *efferent neuron*? Give a reason for your answer.

3.3 Identify the parts numbered 1 to 13.

3.4 List the functions of each of the following numbered parts:

3.4.1 2 3.4.2 6

3.4.3 12 3.4.4 13

3.5 Define the concept *synapse*.

3.6 What is the purpose of a neurotransmitter in the synaptic vesicles?

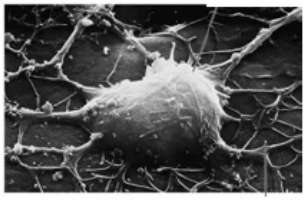
3.7 Choose the correct sequence in brackets: A nerve impulse always runs from (dendrite → cell body → axon / axon → cell body → dendrite)

3.8 What ensures that the impulse can only move in one direction?

3.9 Explain the importance of a synapse.

QUESTION 4

Study the accompanying micrograph of a neuron and answer the following questions.

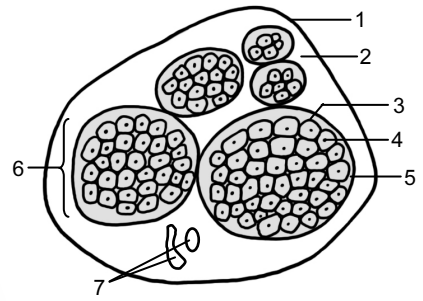


4.1 Identify the neuron, based on the number of outgrowths.

4.2 Make a neat, labelled drawing to show the structure of this neuron.

QUESTION 5

Study the diagram provided of a nerve and answer the following questions.

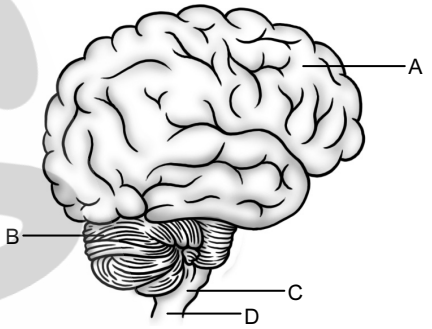


5.1 Identify the parts numbered 1 to 7.

5.2 Describe the structure of a nerve with reference to the drawing.

QUESTION 6

Study the drawing of a part of the human nervous system below and answer the following questions.



6.1 Identify the parts labelled A to D respectively.

6.2 What is this part of the nervous system called?

6.3 List the functions of the various parts labelled:

6.3.1 A 6.3.2 B

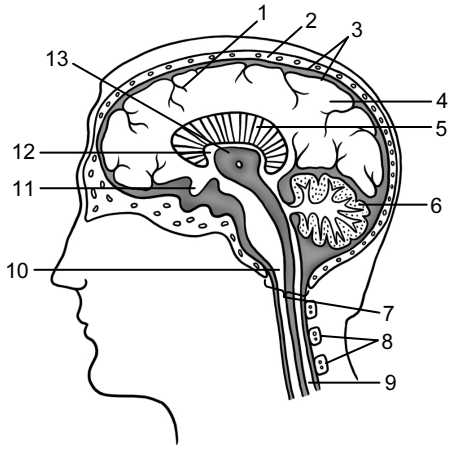
6.3.3 C 6.3.4 D

6.4 Name THREE ways in which the brain is protected.

6.5 Name and describe the three cerebral membranes/meninges that surround the brain.

QUESTION 7

Study the drawing below of a section through a part of the human central nervous system and answer the questions that follow.

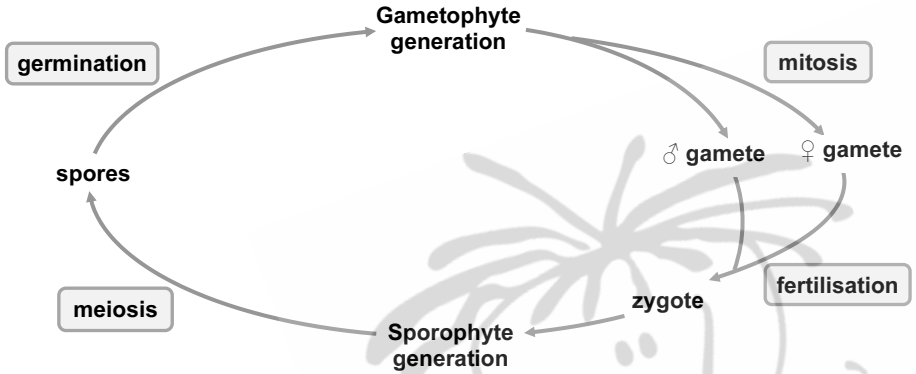


Alteration of generations

During the life cycles of each of the four plant groups two definitive generations occur, i.e.:

- **Gametophyte generation**, which is sexual, and produces **gametes**
- **Sporophyte generation**, which is asexual, and produces **spores**

These two generations alternate in that the one generation gives rise to the other. This phenomenon is known as **alternation of generations**.

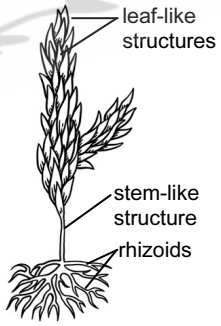


BRYOPHYTES (MOSSES)

- Bryophytes include three groups, namely:
  - mosses
  - liverworts
  - hornworts

Mosses are the first plants that are thought to have lived on land 400 million years ago.

- Mosses grow in cool, moist, shady environments.
- The **gametophyte generation** is the **dominant** generation and is represented by the adult moss plant.
- The plant body is known as a **thallus**, because it does not have true roots, stems and leaves.
- Instead it has **leaf-like structures, stem-like structures** and **rhizoids**.
- The rhizoids anchor the moss plant firmly in the soil and absorb water and mineral salts.
- **Vascular tissue** (xylem and phloem) are **absent**.

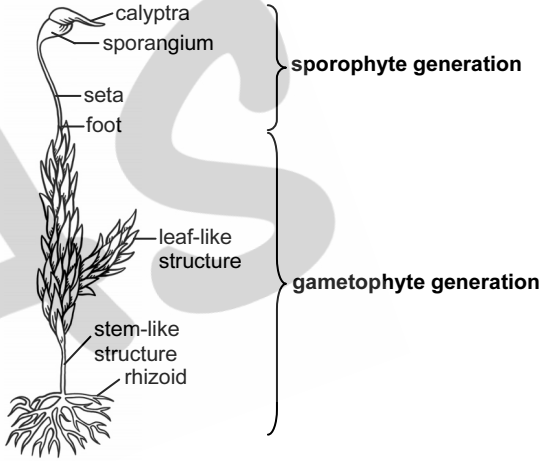


Adult moss plant - gametophyte

- Gametes (ova and sperm) are produced in male and female sex organs of the gametophyte.

Remember: *The gametophyte generation produces gametes for sexual reproduction.*

- In sexual reproduction, the sperm **requires water** to move to the ovum for fertilisation to occur.
- After fertilisation has occurred a zygote is formed which is the beginning of the **sporophyte generation**.



- The sporophyte develops on the gametophyte and it is dependent on it.
- The sporophyte consists of a **foot** part which is anchored in the gametophyte, and a **seta** which bears a capsule known as the **sporangium**.

A sporangium is a structure that produces and stores spores.

- The sporangium is covered with a cap, the **calyptra**.
- The **spores** form in the sporangium.
- The sporangium eventually dries out and releases the spores.

Remember: *The sporophyte generation produces spores for asexual reproduction.*

- The spores are dispersed by the wind and germinate in damp soil.
- A new plant, representing the **gametophyte generation**, develops.

Note that moss plants do not produce seeds and fruit.

Comparative table of the relationship between the mode of living and body plan of 6 phyla

Phylum	Mode of life	Symmetry and cephalisation	Number of tissue layers	Presence/ absence of coelom and blood system	Type of body cavity	Presence/ absence of through gut/ complete gut
Porifera	▸ aquatic (sea water) ▸ sessile	▸ asymmetrical ▸ no cephalisation	▸ cellular (consist of loose cells)	▸ acoelomate ▸ no blood system	▸ spongocoel	▸ none
Cnidaria	▸ aquatic (fresh and sea water) ▸ sessile and free-living	▸ radially symmetrical ▸ no cephalisation	▸ two layers (diploblastic)	▸ acoelomate ▸ no blood system	▸ coelenteron	▸ absent ▸ only one opening
Platyhel-minthes	▸ aquatic ▸ free-living and parasitic	▸ bilaterally symmetrical ▸ cephalisation	▸ three layers (triploblastic)	▸ acoelomate ▸ no blood system	▸ none	▸ absent ▸ only one opening
Annelida	▸ aquatic (fresh and sea water) ▸ terrestrial (moist environments) ▸ free-living	▸ bilaterally symmetrical ▸ cephalisation	▸ three layers (triploblastic)	▸ coelomate ▸ closed blood system	▸ coelom	▸ present ▸ two openings
Arthropoda	▸ occur everywhere - aquatic (fresh and sea water) terrestrial, underground, in the air ▸ free-living	▸ bilaterally symmetrical ▸ cephalisation	▸ three layers (triploblastic)	▸ coelomate ▸ open blood system	▸ coelom (haem-ocoel)	▸ present ▸ two openings
Chordata	▸ occur everwhere, terrestrial, in the air, aquatic (fresh and sea water) ▸ free-living	▸ bilaterally symmetrical ▸ cephalisation	▸ three layers (triploblastic)	▸ coelomate ▸ closed blood system	▸ coelom	▸ present ▸ two openings

Parasitic worm in South Africa - Bilharzia parasite

- The bilharzia parasite *(Schistosoma)* is a parasitic flatworm.
- One part of the parasite's life cycle is completed in humans and the other part in a specific freshwater snail.
- The **human** is regarded as the **primary host** and the **freshwater snail** as the **intermediate host**.
- Two species, i.e. *Schistosoma haematobium*, affecting the kidneys of humans, and *Schistosoma mansoni*, affecting the intestines of humans, occur in South Africa.

When a person is infected by the bilharzia parasite, we say the person has the disease ***bilharzia****, or* ***schistosomiasis****.*

- Bilharzia is a common occurrence in areas with poor sanitation and hundreds of millions of people are infected across the world.
- People are infected by walking, swimming or playing in contaminated water, or by drinking it.
- The largest number of infections in South Africa occur in children who become infected by swimming or playing in contaminated, slow-flowing rivers or dams.
- It has a significant impact on productivity as workers and students are unable to perform daily tasks.

Life cycle

- When humans come into contact with contaminated water (swimming, walking, playing or drinking), the parasitic larvae, known as **cercariae**, penetrate the skin or enter the body through the mucous membranes of the mouth and throat.
- The cercariae have forked tails and move quickly through the water.
- As the larvae enter the human body, the tails are discarded and the larvae bore into the surface blood vessels of the skin.
- The larvae end up in the blood stream and move to the liver where they develop into adult flatworms.
- After mating the worms move to blood vessels of the bladder (*S. haematobium*) or the intestinal canal (*S. mansoni*), where the females lay many eggs.
- Each egg has a sharp spine with which it penetrates the vascular walls.
- The eggs land in the bladder or intestinal canal from where they are released in the urine or faeces.

QUESTION 7

Deforestation is the destruction of forests through the removal of trees in large numbers. The table below shows statistics related to deforestation in different regions over a period of 10 years.

Region	Total land area (ha)	Total forest cover (hectare)	Forest cover (%)	Deforestation rate (%)
Africa	2 978 394	649 866	**X**	0,8
Asia	3 084 746	547 793	17,8	0,1
North and Central America	2 136 966	549 304	25,7	0,1
Oceania and Australia	849 096	197 623	23,3	0,2

7.1 Which region had the highest rate of deforestation in the 10-year period?

7.2 Calculate the forest cover (%) of Africa as indicated by **X**. Show ALL calculations and round off your answer to one decimal place.

7.3 Give any TWO reasons for deforestation.

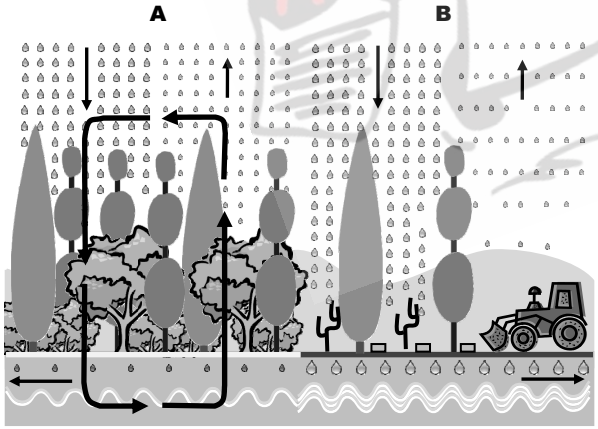
7.4 Describe how deforestation leads to soil erosion and soil degradation.

7.5 Name another FOUR consequences of deforestation for the ecosystem.

7.6 Explain THREE possible actions to reduce deforestation.

QUESTION 8

Study the following diagrams labelled A and B below and answer the questions that follow.



8.1 What human activity is illustrated in diagram B?

8.2 What is illustrated in diagram A?

8.3 Describe the role that trees play in diagram A.

8.4 The activity shown in diagram B also has a negative effect in terms of global warming. Describe the role of trees in this regard.

8.5 Name THREE consequences of the activity shown in diagram B, apart from the two effects already discussed.

QUESTION 9

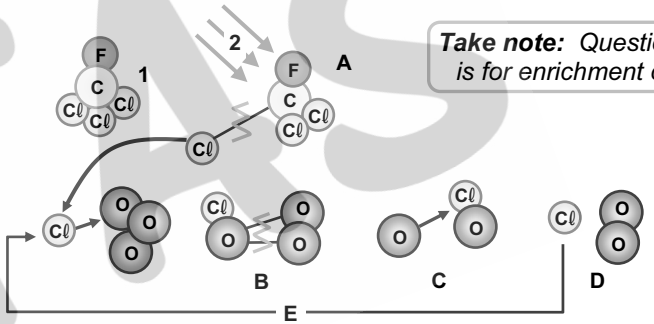
9.1 Define the term *ozone*.

9.2 Where is the ozone layer found?

9.3 What is the difference between stratospheric and surface ozone?

9.4 What is the role of stratospheric ozone in the atmosphere?

9.5 Study the illustration below and answer the questions that follow.



Take note: *Question 9.5 is for enrichment only.*

9.5.1 Ozone depleting substances (ODSs) are stable, non-toxic and environmentally friendly, but pose a danger to us. Identify the ODS numbered 1.

9.5.2 For what purpose were the ODSs in Question 9.5.1 widely used before?

9.5.3 Identify the rays numbered 2.

9.5.4 Identify the layer of the atmosphere in which this process occurs.

9.5.5 Explain the process of ozone depletion by using A to E in the above representation.

9.6 Name FOUR consequences of ozone depletion.

QUESTION 10 - *enrichment*

The Gariep Dam is the largest reservoir in South Africa and is built on the Orange River.

10.1 How do we define a *dam*?

10.2 List FOUR reasons for building a dam.