Life Sciences

CLASS TEXT & STUDY GUIDE

Liesl Sterrenberg, Helena Fouché & Grace Elliott

GRADE

10

CAPS

3-in-1

THE ANSWER SERIES *Your Key to Exam Success*

Grade 10 Life Sciences 3-in-1 CAPS

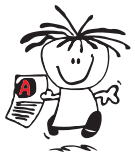
CLASS TEXT & STUDY GUIDE

This Grade 10 Life Sciences 3-in-1 study guide enables you to understand the basic concepts of the Grade 10 curriculum and creates a strong foundation for success in Grades 11 and 12. The subject material is organised into logical easy-to-understand units and sections which simplify the curriculum content.

Key Features:

- Comprehensive, learner-friendly notes per module
- 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 will stimulate your understanding of Life Sciences and, as you work through the material, boost your exam performance.



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THIS CLASS TEXT & STUDY GUIDE INCLUDES

1 Notes

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

2 Questions and Rapid Fire Questions

3 Detailed Memos

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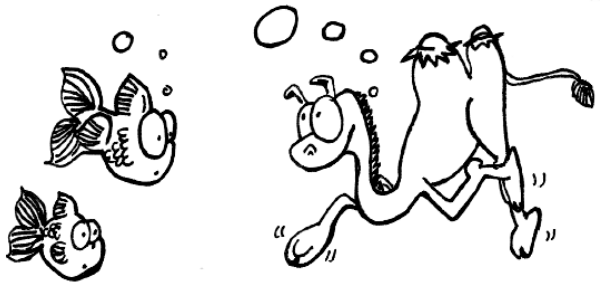
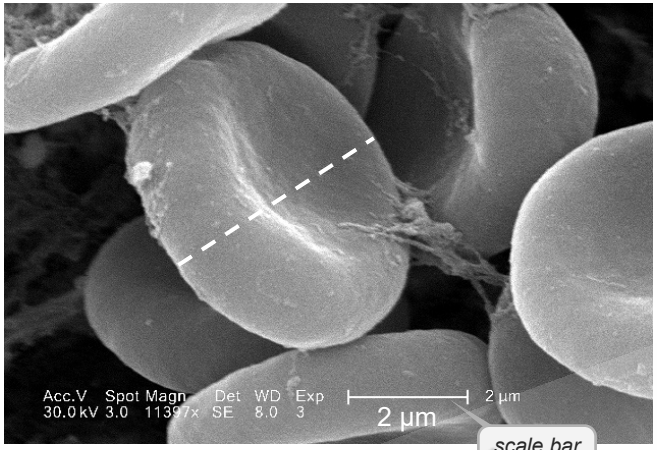




scale bar

EXAMPLE

Use the micrograph above to determine the actual size of the red blood cell.

1. Calculate magnification from the scale bar:

$$\text{magnification} = \frac{\text{image size}}{\text{actual size}} = \frac{\text{measured length of scale bar}}{\text{length on scale bar}}$$

$$= \frac{16\text{ mm}}{2\text{ µm}} = \frac{16\,000\text{ µm}}{2\text{ µm}} = 8\,000\times$$

2. Calculate actual size using magnification 8 000×:

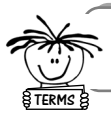
$$\text{actual size} = \frac{\text{image size}}{\text{magnification}} = \frac{32\text{ mm}}{8\,000} = \frac{32\,000\text{ µm}}{8\,000} = 4\text{ µm}$$

NOTE

Remember to convert all measurements to the same unit, e.g. µm.

Calculating the ACTUAL SIZE of an object from the microscope image using the FIELD OF VIEW diameter

The **size of a specimen** can also be determined by measuring the diameter of the microscope's **field of view**.



field of view: *the diameter of the circular area that is visible when you look through the eyepiece*

- Place a transparent plastic ruler with mm scale (or a microscope slide with ruler markings) on top of the microscope stage.
- Use the lowest magnification and focus the image of the ruler.
- Count the number of visible intervals of the ruler across the field of view.

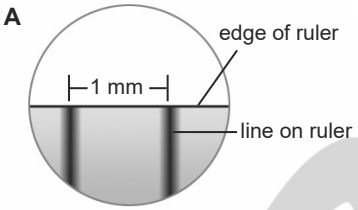
NOTE

Remember that each interval is actually 1 mm.

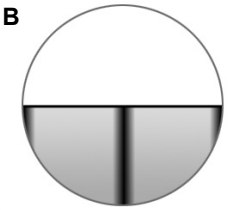
- Multiply the number of intervals by 1 000 to convert the diameter of the field of view from mm to µm (micrometres).

NOTE

At higher magnifications, the field of view decreases in size.



At a 40× magnification, the ruler lines are visible. Shift a line to the edge of the field of view to measure the field of view accurately (see image B).



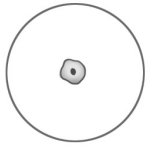
With the line against the edge, it is easier to determine the field of view:
2 mm × 1 000 = 2 000 µm

1 mm = 1 000 µm

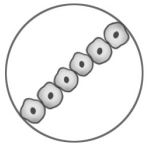
- To determine the diameter of a specimen in the field of view:
  1. estimate how many specimens of the same size can fit across the diameter of the field of view.
  2. calculate one specimen as a fraction of the total and multiply by the diameter of the field of view.

EXAMPLE

Determine the size of the cell in a field of view measured at 3 000 µm.



1 specimen in field of view with a diameter of 3 000 µm

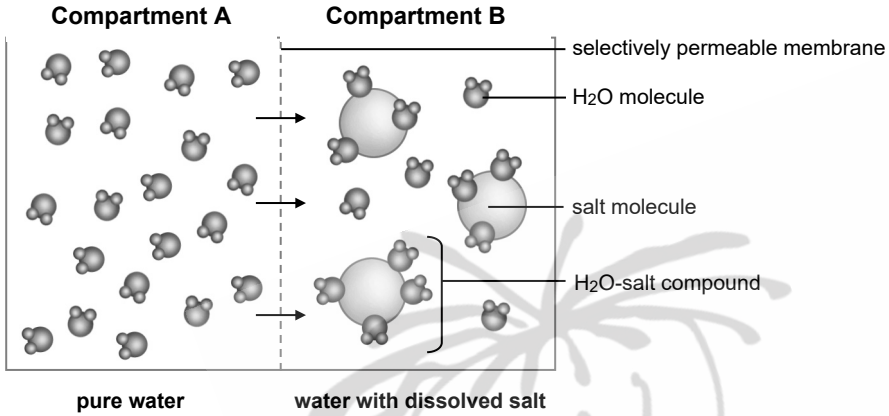


estimated 6 specimens fit into the field of view

1. estimated 6 specimens fit in field of view (diameter 3 000 µm)
2. ∴ estimated size of 1 specimen $= \frac{1}{6}$ of 3 000 µm = 50 µm

Look at the following diagram, where:

- compartment A is filled with pure water (H_2O),
- compartment B is filled with a salt solution; and
- compartments A and B are separated by means of a selectively permeable membrane.



- Many of the water molecules in compartment B are bound to salt molecules.
- Most of the 'free' water molecules are therefore in compartment A.
- Compartment A has a greater **ability** to release water molecules to compartment B because it has the most free water molecules.

TERMS

water potential (Ψ): *the ability of a solution to release water OR a measure of the potential of water to move*

Therefore: Compartment A has a **higher water potential (Ψ)** than B.

NOTE

*Pure water has the **highest water potential**. It has the **greatest** ability to release water molecules to another solution because pure water has a large number of 'free' molecules.*

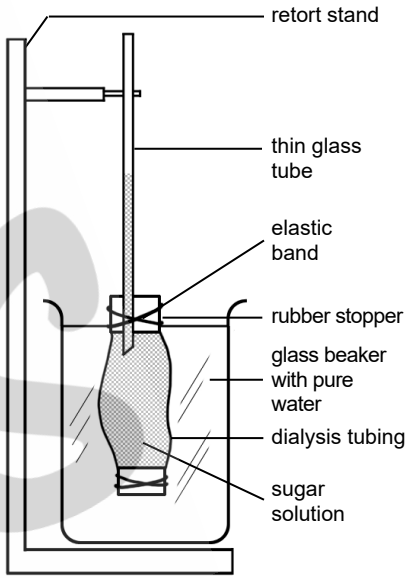
- Water molecules will move from A (a high Ψ) to B (a low Ψ) through the selectively permeable membrane.
- This movement will continue until there are an equal number of free water molecules on either side of the membrane.
- Equilibrium has now been reached.

PRACTICAL INVESTIGATION

Demonstration of Osmosis

Requirements

- 8 cm dialysis tubing
- thin glass tube
- 2 rubber stoppers
- 2 elastic bands
- glass beaker
- pure water
- sugar solution
- retort stand



Method

1. Wet the dialysis tube thoroughly.
2. Seal the one end of the tube with a rubber stopper and an elastic band.
3. Seal the other end with a rubber stopper in which a small hole has been drilled. Force the end of the glass tube into the stopper. Wind an elastic band firmly around the stopper (see diagram for positioning).
4. Fill the dialysis tubing and glass tube with sugar solution.
5. Fill the glass beaker with pure water and fix the glass tube tightly in a vertical position so that the dialysis tube lies under the water.

Result

The level of the sugar solution in the glass tube will rise.

Conclusion

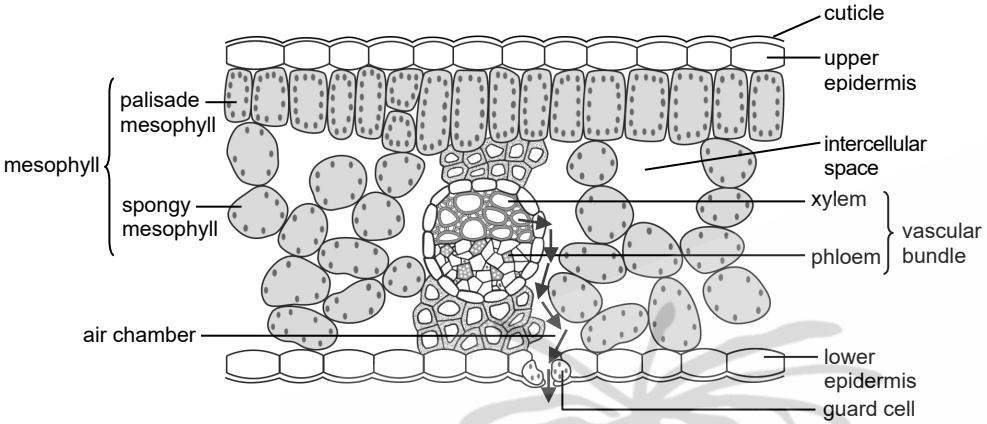
The Ψ of pure water is higher than that of the sugar solution. Water molecules therefore move from an area of high Ψ to an area of low Ψ. Water molecules move out of the glass beaker, through the dialysis tube and into the sugar solution. The level of the sugar solution rises.
∴ Osmosis has occurred.

NOTE

The dialysis tube is selectively permeable and allows water molecules to pass through, but not the larger sugar molecules.

Internal structure of a leaf

The diagram below shows a cross-section of a dicotyledonous leaf to illustrate the various tissues that make up the leaf.



Cross-section through a dicotyledonous leaf

Three main sections are apparent on the diagram:

- **Epidermis** (upper and lower)
- **Mesophyll**
- **Vascular bundles/veins**

Epidermis

- The upper and lower surfaces of the leaf are covered by an epidermal layer.
- The epidermis protects the underlying tissues.
- Regular epidermal cells do not contain chloroplasts and are **transparent** in order to allow light through to the underlying tissues for photosynthesis.
- A waxy, transparent **cuticle** covers the epidermis, reducing excessive moisture loss while still allowing sunlight through for photosynthesis.
- The lower epidermal cells contain **stomata**. The guard cells of a stoma are responsible for the opening and closing of the stomatal pore. Stomata are responsible for **gaseous exchange** into and out of the leaf during:
  - **photosynthesis** - CO_2 in and O_2 out by diffusion
  - **respiration** - O_2 in and CO_2 out by diffusion
  - **transpiration** - water vapour out by diffusion

NOTE

See p. 43 for more detail on a stoma.

REMEMBER

***Diffusion** is the movement of particles from a high concentration to a low concentration until equilibrium is reached.*

Mesophyll

Two types of mesophyll cells, i.e. **palisade** and **spongy mesophyll cells**, fill the space between the upper and lower epidermis.

Palisade mesophyll cells

- These are elongated, thin-walled parenchyma cells situated just under the upper epidermis.
- The cells contain large numbers of chloroplasts, thus enabling them to absorb the maximum amount of sunlight for photosynthesis.

NOTE

The palisade mesophyll cells are the primary photosynthesising cells of the leaf.

- The cells are arranged longitudinally and packed tightly against one another, without intercellular spaces. This ensures that the largest possible surface area is exposed to sunlight for photosynthesis.
- The cell walls are very thin for easy diffusion of gases (CO_2 and O_2) into and out of the cells during photosynthesis and cellular respiration.

Spongy mesophyll cells

- This is the lower mesophyll layer.
- The cells are round parenchyma cells, loosely packed in an irregular manner.
- They contain large intercellular spaces that are connected to air chambers behind the stomata for efficient gaseous exchange.
- These cells contain chloroplasts for photosynthesis, but fewer than the palisade mesophyll cells.

Vascular bundles/veins

- The veins consist of **xylem** and **phloem** that are continuous with the xylem and phloem of the root and stem.
- Water that is absorbed from the soil and transported via the root and stem xylem to the leaf xylem moves by **osmosis** until it reaches the mesophyll cells, where it is used for photosynthesis.

REMEMBER

***Osmosis** is the movement of water molecules from a high water potential to a low water potential, through a selectively permeable membrane, until equilibrium is reached.*

- The phloem transports organic nutrients, which are manufactured in the leaf during photosynthesis, to other parts of the plant.

SUMMARY

Structural Adaptations of Leaves for Photosynthesis

- **Flat leaf blade** (lamina) - provides a large external surface to absorb as much sunlight as possible.
- **Thin leaf blade** (lamina) - allows gaseous exchange to occur relatively easily by diffusion.
- **Cuticle** is **impermeable to water** and is **transparent** - prevents moisture loss and allows sunlight through to the mesophyll cells.
- **Epidermal cells are transparent** - allow sunlight through to the mesophyll cells.
- The lower epidermis has **many stomata** - ensures that maximum gaseous exchange takes place (CO_2, O_2 and water vapour) and less water loss due to less exposure to light.
- The **palisade mesophyll cells**:
  - are directly below the upper epidermis and **arranged longitudinally** with **no intercellular spaces** - largest possible surface exposed to sunlight
  - contain **large numbers of chloroplasts** - to absorb the maximum possible amount of sunlight
  - have **thin cell walls** - to facilitate osmosis and the diffusion of gases into and out of the cells
- The **spongy mesophyll cells**:
  - contain **large intercellular spaces** - to facilitate efficient gaseous exchange
  - contain **chloroplasts** - to absorb sunlight
  - have **thin cell walls** - to facilitate osmosis and the diffusion of CO_2 and O_2 into and out of the cells
- The **vascular bundles**:
  - contain **xylem** - to transport water and dissolved mineral salts to the mesophyll cells
  - contain **phloem** - to transport produced organic nutrients to other parts of the plant

UNIT 1

QUESTIONS

QUESTION 1

1.1 Define each of the following terms:

1.1.1 atom 1.1.2 molecule

1.1.3 element 1.1.4 compound

1.2 Explain the structure of water with reference to the terms defined in 1.1.

QUESTION 2

Name the SEVEN basic characteristics of life that a living organism displays.

QUESTION 3

Distinguish between:

3.1 cell 3.2 tissue 3.3 organ

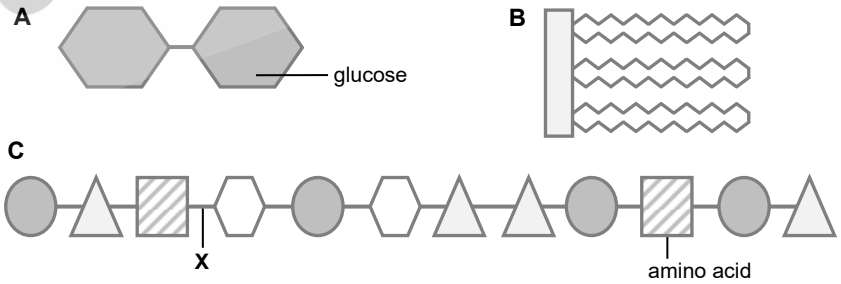
QUESTION 4

Define the following terms and give two examples of each:

4.1 inorganic compounds 4.2 organic compounds

QUESTION 5

Study the following diagrams and answer the questions that follow.



5.1 Identify the type of organic compound represented by A, B and C, respectively.

5.2 Name the monomers of compound B.

5.3 Identify the type of bond indicated by X.

QUESTION 6

6.1 Tabulate the similarities and differences in composition between carbohydrates, lipids and proteins.

6.2 Write a paragraph explaining the differences between the different types of lipids, including cholesterol.

QUESTIONS

QUESTION 1

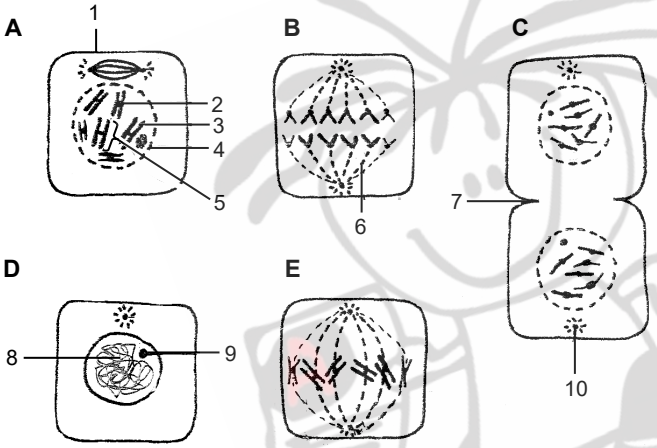
1.1 Give THREE reasons why mitosis is of biological importance.

1.2 Distinguish between *somatic cells* and *sex cells*.

1.3 Name the TWO main phases of the cell cycle.

QUESTION 2

Study the following representation of a division process and answer the questions that follow.

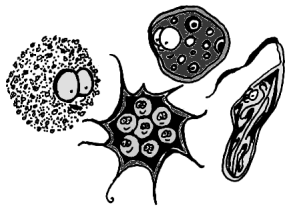


2.1 Identify the phases labelled A to E and state a visible reason to motivate your choice.

2.2 By making use of the letters only, arrange the phases into the correct sequence.

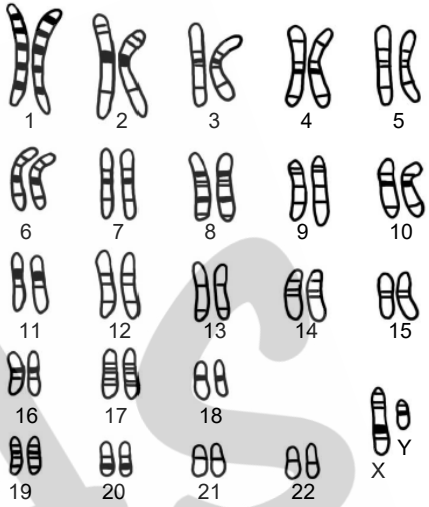
2.3 Identify the parts numbered 1 to 10.

2.4 Write down the number of chromosomes in a daughter cell produced during the nuclear division shown above.



QUESTION 3

Study the following representation of a set of chromosomes in a human cell.



3.1 How many chromosomes are found in each human cell?

3.2 Why is the chromosome number in a specific species always an even number?

3.3 Which two chemical compounds make up a chromosome?

3.4 Give the name of the two individual strands of each chromosome.

3.5 Name the structure that joins the two strands mentioned in Question 3.4.

3.6 Name the segment of DNA on a chromosome that controls a hereditary characteristic.

3.7 Name the process that produces an identical copy of DNA during Interphase.

QUESTION 4

Make a neat, labelled drawing of each of the following phases using the labels provided in the box below:

cell membrane	spindle fibres	cytoplasm	chromosome
nuclear membrane	chromatid	nucleoplasm	centromere
nucleolus	centriole/pole	(unreplicated) daughter chromosome	

QUESTION 25

25.1 Sensitivity to temperature.

25.2 The blood spot on tablecloth 1 has been partially removed, while the spot on 3 has not been removed at all.

25.3 In tablecloth 1 the enzyme was inactive due to a low and less optimal temperature. In tablecloth 3, the enzyme denatured due to high temperatures, no digestion of blood took place, therefore the spot was not removed.

25.4.1 2 - 37ºC 25.4.2 3 - 65ºC

25.5 protease - the enzyme acts on the plasma proteins (e.g. albumin and fibrinogen) present in blood

QUESTION 26

26.1 water and oxygen

26.2 An enzyme is a biological catalyst that accelerates a chemical reaction.

26.3 The poisonous substance is converted into harmless substances as soon as possible, which prevents poisoning of body tissues.

26.4 The enzyme lowers the activation energy that is needed for the reaction to take place.

26.5 No, the enzyme stays unchanged and can be used over and over.

26.6 The formation of bubbles/oxygen.

26.7 In test tube C. 37ºC is the human's body temperature as well as the optimum temperature where catalase works best.

26.8 No bubbles were formed in test tube A; hydrogen peroxide was not broken down. Catalase is inactive at a low temperature such as 2ºC and could not perform its function.
No bubbles were formed in test tube B; hydrogen peroxide was not broken down. Catalase denatured at a high temperature such as 90ºC (loses its shape and function) and could not perform its function.

26.9 Catalase functions optimally at body temperature (37ºC).

26.10.1 the amount of bubbles/oxygen formed

26.10.2 the temperature of the water bath

26.10.3 the same amount of chicken liver; all chicken liver must be in the same condition e.g. mashed; the same amount of hydrogen peroxide.

26.11 There will be no reaction. The enzyme would denature if the chicken liver were boiled at a high temperature.

QUESTION 27

It is an animal cell

27.1 glycogen

27.2 hydrolysis 27.3 cell membrane

27.4 Carnivores eat meat, which contains no starch.

QUESTION 28

28.1 nucleic acids

28.2.1 **DNA** is found in the nucleoplasm of the nucleus where it forms part of the chromatin network or chromosomes (during cell division).

RNA is found in the nucleolus and nucleoplasm of the nucleus, as well as in the cytoplasm where it forms part of the ribosomes.

28.2.2 **DNA** carries the hereditary characteristics and controls the structure and function of the cell.

RNA plays a role in protein synthesis in that it arranges the amino acids in a particular sequence according to the instructions provided by DNA.

QUESTION 29

29.1 Cereal and cereal products:
$33\% \times 18 = 5{,}95 \approx 6$

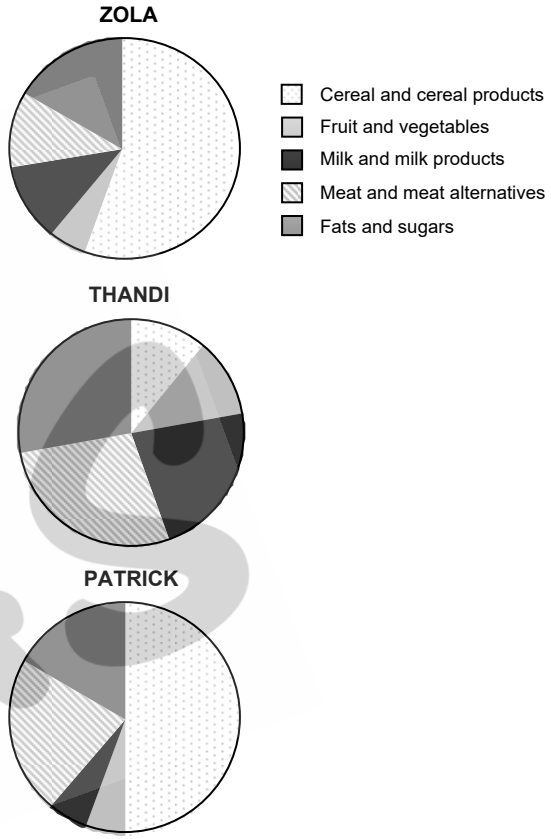
Fruit and vegetables:
$33\% \times 18 = 5{,}94 \approx 6$

Milk and milk products:
$15\% \times 18 = 2{,}7 \approx 3$

Meat and meat alternatives:
$12\% \times 18 = 2{,}16 \approx 2$

Fats and sugars:
$8\% \times 18 = 1{,}44 \approx 1$

29.2.1



29.2.2 Patrick. He eats too little fruits and vegetables as well as milk and milk products, which are rich in vitamins.

29.2.3 Thandi. She eats too much animal products / proteins, which are rich in saturated fats; and too few vegetables, fruits and carbohydrates.

29.2.4 Zola will suffer from obesity. She eats too many carbohydrates (bread, rice, etc.) and too few fruits and vegetables. She also eats too many portions of food that are high in fat and/or sugar and contains many kilojoules.

29.2.5 Zola must eat fewer carbohydrates (bread, rice, etc.) and more fruit and vegetables. She must also drastically reduce the foods that are high in fat and/or sugar.

29.3 water

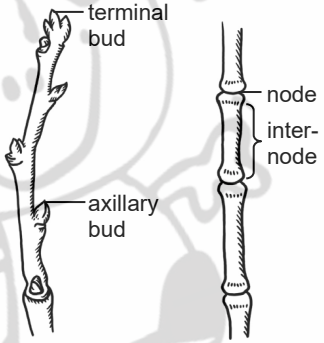
DICOTYLEDONOUS STEM

Main functions

- It bears the leaves in a favourable position for the absorption of light for photosynthesis.
- It bears the flowers in a favourable position for pollination.
- It bears fruits in a favourable position for the distribution of seeds.
- It transports water and mineral salts from the roots to the rest of the plant.
- It transports organic substances from the leaves to the rest of the plant.
- It stores reserve nutrients and water.

External structure

- Externally, the stem consists of **nodes** and **internodes**.
- The node is where the leaves, flowers and side branches develop.
- The internode is the region between two nodes.
- The **terminal bud** occurs at the tip of the stem.
- The terminal bud consists of meristematic tissue which continuously divides and forms new cells and results in primary growth (increase in length) of the plant.
- **Axillary buds** occur in the space (axil) between the stem and a leaf stalk (petiole) and develop into lateral branches or flowers.

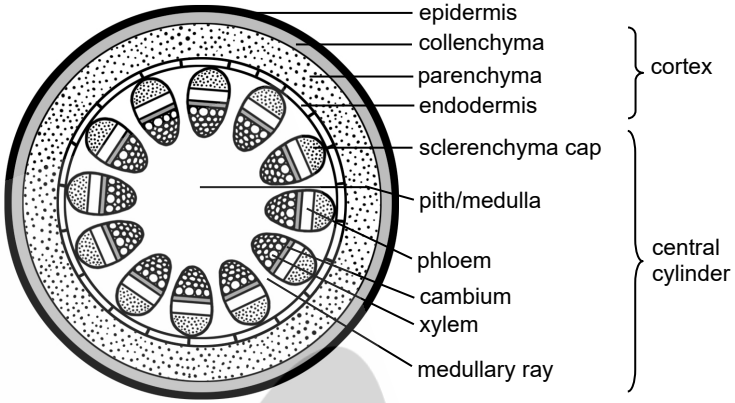


Dicotyledonous stems

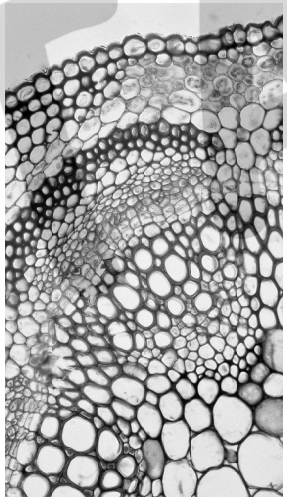
Internal structure

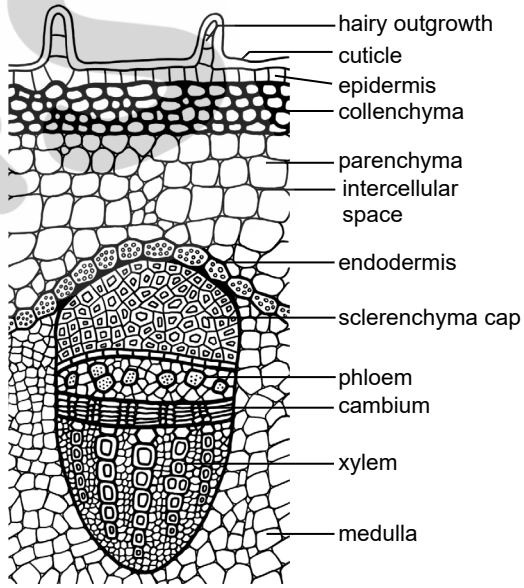
Three regions can be distinguished in the cross-section of a young dicotyledonous stem:

- **Epidermis**
- **Cortex**
- **Central cylinder**



Cross-section through a young dicotyledonous stem


Photomicrograph of a cross-section through a vascular bundle in a dicotyledonous stem



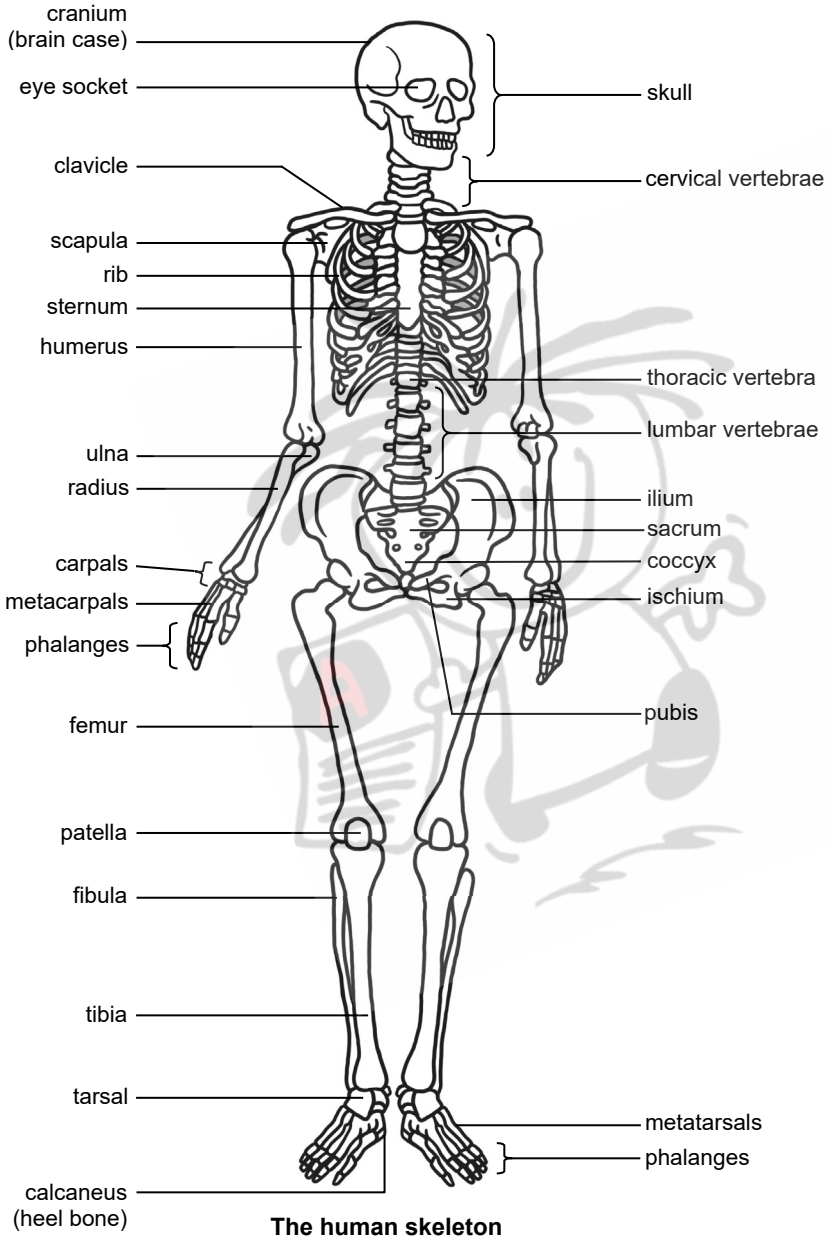
Cross-section through a part of a young dicotyledonous stem

Epidermis

- The epidermis forms the outer layer of the stem.
- It consists of a single layer of thin-walled, brick-shaped cells.
- Some epidermal cells are modified to form stomata.
- The outer walls of the epidermis are covered with a waterproof cuticle.
- Multicellular, hairy outgrowths may occur.

NOTE

You are expected to know the names of all the bones in the human body and be able to identify them on a sketch.



The human skeleton

AXIAL SKELETON

The axial skeleton forms the central axis that keeps the body upright. All the other parts of the endoskeleton are attached to it. It protects the brain, sense organs, spinal cord, heart and lungs.

The axial skeleton consists of:

- **Skull**
- **Vertebral column**
- **Rib cage**

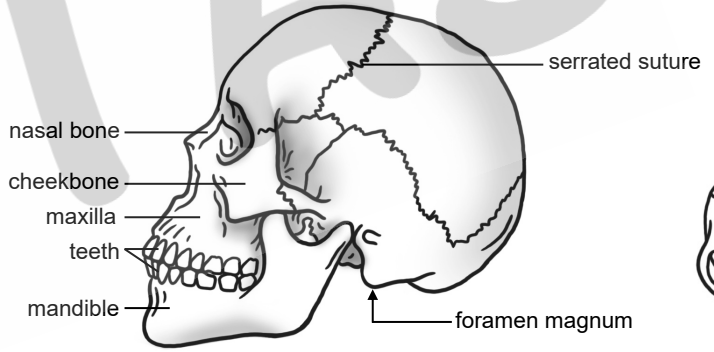
REMEMBER

*The **vertebral column** and the **spinal cord** are distinctly different. The spinal cord is made of nervous tissue that connects the brain to the body. It is surrounded and protected by the vertebral column which is made of bone and supports the weight of the body.*

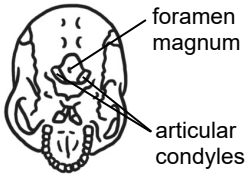
Skull

NOTE

You don't need to know the names of the bones making up the skull.



Lateral view of the skull



Ventral view of the skull

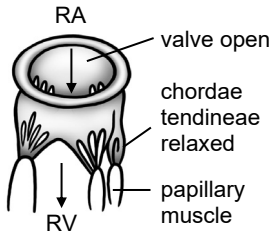
- The skull consists of two groups of bones, namely the bones of the **cranium** and the **facial bones**.
- The **cranium** consists of **eight** flat bones that are immovably joined to each other with serrated sutures.
- The cranium is large and rounded in humans to house a large brain.
- There is a large opening at the base of the skull, the **foramen magnum**, for the spinal cord to pass through.
- On either side of the foramen magnum is a raised oval, bony swelling called an **articular condyle** which articulates with the **first cervical vertebra (atlas)**.

articulate: *to move at (around) a joint*

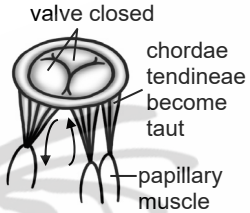
TERMS

Atrio-ventricular (AV) valves

Tricuspid valve



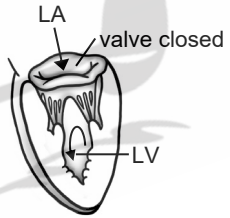
- The tricuspid valve is an **atrio-ventricular valve** as it is situated between the right atrium and the right ventricle.
- This valve consists of three flaps (tri = three).
- The flaps are attached to the inner walls of the right ventricle by inelastic tendons, the **chordae tendineae** or **heart tendons**.
- The chordae tendineae are attached to small protrusions, the **papillary muscles**, on the inside wall of the right ventricle.
- When the right atrium contracts, the flaps of the valve are pushed open and the blood flows through to the right ventricle.
- When the right ventricle contracts, the blood pushes the valve flaps up and closes the atrio-ventricular valve.



Functioning of the tricuspid valve

- The papillary muscles contract and this pulls the chordae tendineae tight and prevents the flaps from being pushed too far back into the right atrium.
- The tricuspid valve is now closed and blood cannot flow back from the right ventricle into the right atrium.

Bicuspid (mitral) valve



Functioning of the biscuspid valve

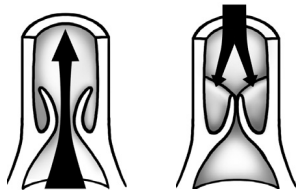
- The bicuspid valve is also an **atrio-ventricular valve** as it is situated in the opening between the left atrium and the left ventricle.
- This valve consists of two flaps (bi = two), which are attached to the papillary muscles in the inner wall of the left ventricle by the chordae tendineae or heart tendons.
- The functioning of this valve corresponds to that of the tricuspid valve; it prevents backflow of blood into the left atrium when the left ventricle contracts.

NOTE

*The **'lub-dub'** sound that is audible in a heartbeat, is the closing of the atrio-ventricular ('lub') and semilunar valves ('dub').*

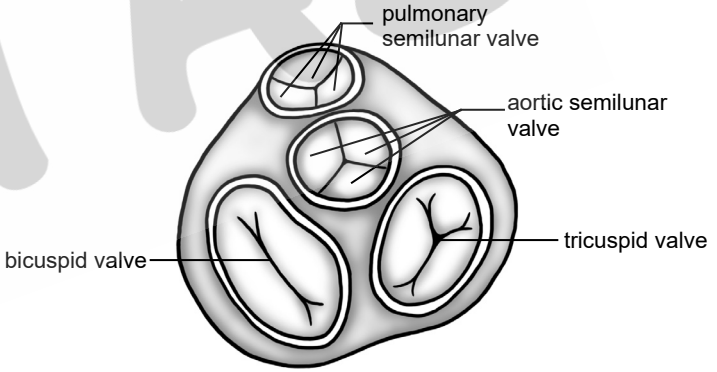
Semilunar valves

- Semilunar valves occur at the base of the aorta and pulmonary artery, where these blood vessels leave the ventricles.
- The semilunar valves occur on the inside of the blood vessels and look like half-moon shaped membrane sacks, with their free ends pointing away from the ventricles.



Functioning of a semilunar valve

- When the ventricles contract, the blood pushes the flaps flat against the artery walls and the valves are open.
- When the ventricles relax, the blood flows back and pools behind the valve flaps. Blood fills the sacks, which then push against each other and close the valves.
- This prevents the blood flowing back into the ventricles.



Cross-section through the heart to show the different cardiac valves

SUMMARY

Blood flow through the heart

- Deoxygenated blood enters the RA through the superior and inferior venae cavae, flows through the tricuspid valve to the RV, and is then pumped through the pulmonary arteries to the lungs.
- Oxygenated blood enters the LA through the pulmonary veins, flows through the bicuspid valve to the LV, and is then pumped through the aorta to the rest of the body.

QUESTION 3

When referring to the cardiac cycle, the terms 'systole' and 'diastole' are used.

3.1 What is meant by...

3.1.1 *systole*; and

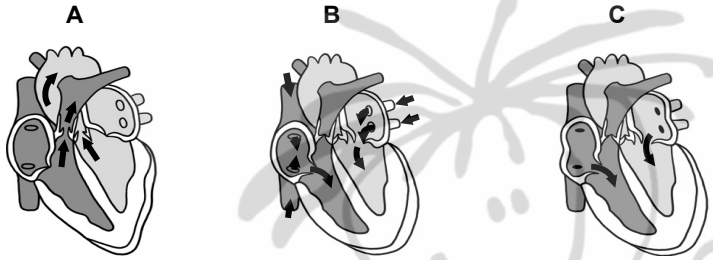
3.1.2 *diastole*?

3.2 Name and explain the different stages of the cardiac cycle.

3.3 How long does one cardiac cycle normally last?

3.4 How many cardiac cycles occur during one minute?

3.5 A representation of the cardiac cycle is illustrated below.



Write down the letters of the diagram(s) that can be associated with the:

3.5.1 ventricular systole

3.5.2 atrial systole

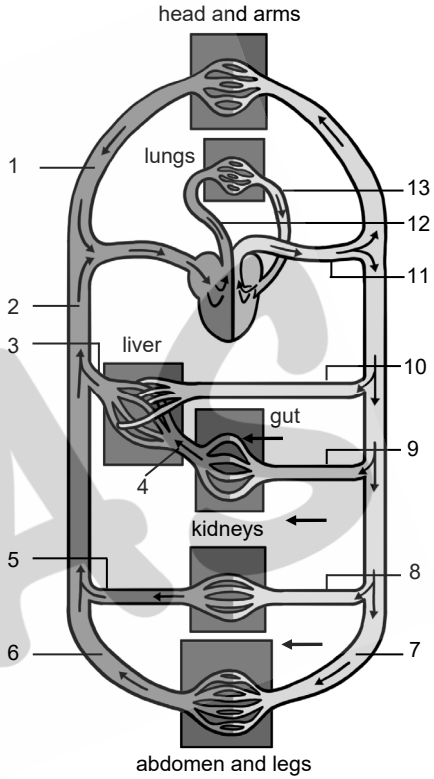
3.5.3 general diastole

3.6 The table below summarises the main blood vessels (numbered 1 to 5) to and from the heart, the valves and their functions. Complete the table.

	Name	Name of valve present (if any)	Type of blood	Source of blood	Destination of blood
1	vena cava inferior				
2	vena cava superior				
3	aorta				
4	pulmonary artery				
5	pulmonary vein				

QUESTION 4

The double circulatory system of the human is illustrated below.



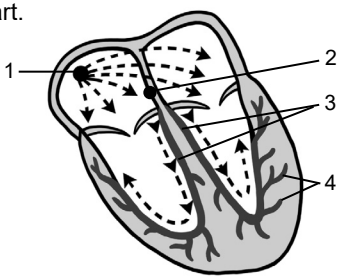
4.1 Why is the human circulatory system known as a double system?

4.2 Identify the blood vessels that are numbered 1 to 13.

4.3 Distinguish between the two main circulatory systems indicated on the diagram above, by naming them and referring to their functions.

QUESTION 5

The diagram below shows the conducting tissue in the heart.



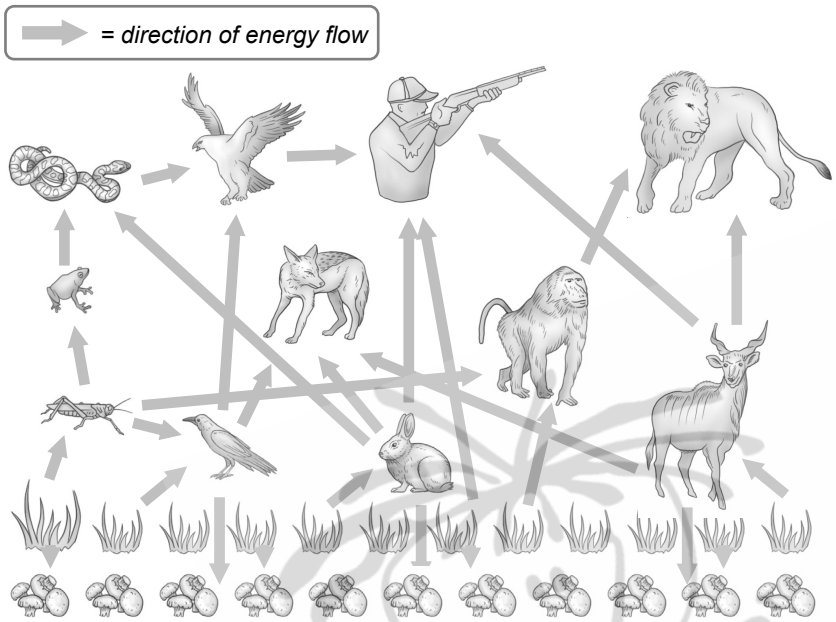
5.1 Which characteristic of the heart muscle ensures that it contracts and relaxes without any external stimuli?

5.2 The sound of one heartbeat is heard as a 'lub-dub' sound. What causes the:

5.2.1 'lub' sound 5.2.2 'dub' sound

5.3 Identify the conducting tissues numbered 1 to 4 in the representation provided.

- A food chain never occurs in isolation, but is usually linked to other food chains to form a **food web**.



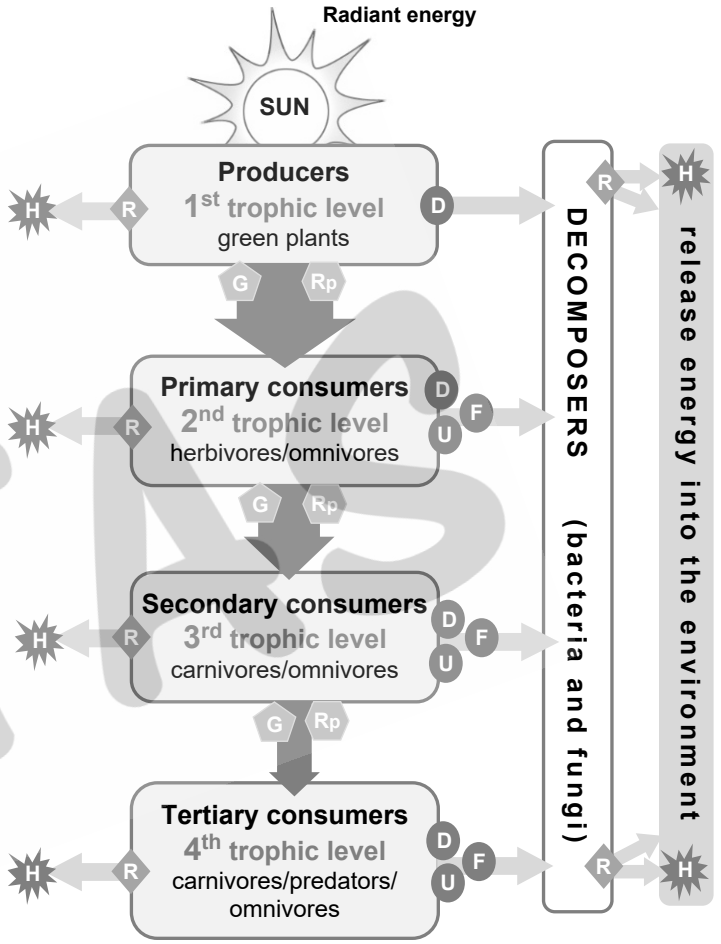
Food web showing the interaction of food chains and the flow of energy

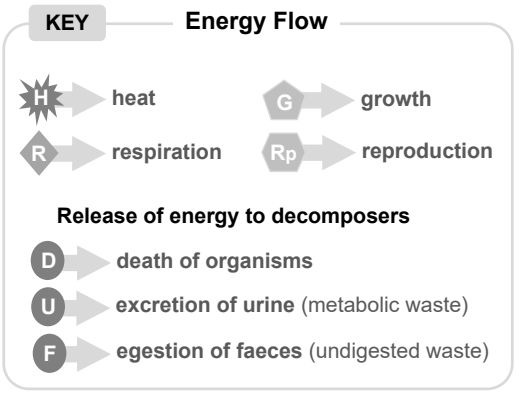
TROPHIC LEVELS

Living organisms occur at different feeding levels, known as **trophic levels**, of the ecosystem:

- **Producers** (green plants) that produce their own food through photosynthesis form the **first trophic level** and have the greatest amount of energy.
- **Primary consumers** (herbivores) form the **second trophic level**.
- **Secondary consumers** (carnivores) form the **third trophic level**.
- **Tertiary consumers** that consist of carnivores feeding on other carnivores form the **fourth trophic level**.
- **Omnivores** may be part of the second, third or fourth trophic levels, depending on their food.
- **Decomposers** (bacteria and fungi) may be part of any of the trophic levels, as they break down all living organisms and release heat energy into the environment.
- Energy is used by the organisms at each trophic level for **growth** (metabolism) and **reproduction**. This energy is available to the next trophic level (consumers). Energy **released** via **movement**, **heat**, **respiration**, **urine** and **faeces** is not available for the next trophic level, but ultimately released into the environment as heat.

Flow of energy and the relationship between different trophic levels





NOTE

Only about 10% of the energy moves from one trophic level to the next. If the producer received 10 000 kJ from the sun, the tertiary consumer will ultimately only receive 10 kJ.

QUESTION 8

Case study: Coelacanth - 'the living fossil'

We call all life forms that have hardly changed for millions of years 'living fossils'.

In December 1938 a very strange fish was caught in a trawl net off East London in the Eastern Cape. The fish weighed 50 kg and was 1,5 m long with big blue shiny scales. The fish was taken to the East London museum where it was identified as a coelacanth. The scientists were amazed, as this primitive type of fish was known only from fossils found in rocks between 70 and 350 million years old. Scientists thought that it had become extinct.

The search for another specimen continued and one was found 14 years later. In the meantime, the inhabitants of the Comoros in the Indian Ocean already knew the coelacanth as it had been caught in their nets. Coelacanths live 200 meters below the surface of the ocean.

Scientists now know there are 2 extant species of coelacanth - the West Indian Ocean coelacanth (Latimeria chalumnae) and Indonesian coelacanth (Latimeria menadoensis). Live specimens studied in a lab showed that this fish does not lay its eggs, but allows them to hatch internally, and so it gives birth to live young.

8.1 Why is the coelacanth regarded as a 'living fossil' and not just a 'fossil'?

8.2 The coelacanth is also regarded as a transitional species. What does this mean?

8.3 What features of the coelacanth make it a transitional species?

8.4 Differentiate between the terms 'extinct' and 'extant'.

8.5 Why do you think the coelacanth was only 'discovered' in 1938 in South Africa, when it was clearly well-known by the Comoros inhabitants?

8.6 Explain the value of fossil tourism to South Africa, particularly with reference to the coelacanth.

QUESTION 9

9.1 Define the term *fossil*.

9.2 Name TWO reasons why fossils are useful.

9.3 9.3.1 Define the term *fossil record*.

9.3.2 Give THREE reasons why fossil records are incomplete.

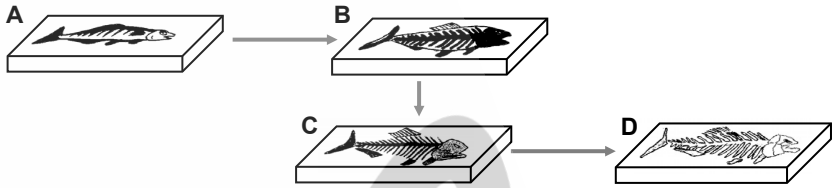
9.4 Define *fossilisation*.

9.5 Explain why an organism will fossilise better if...

9.5.1 it is rapidly buried after death.

9.5.2 the body has a hard skeleton.

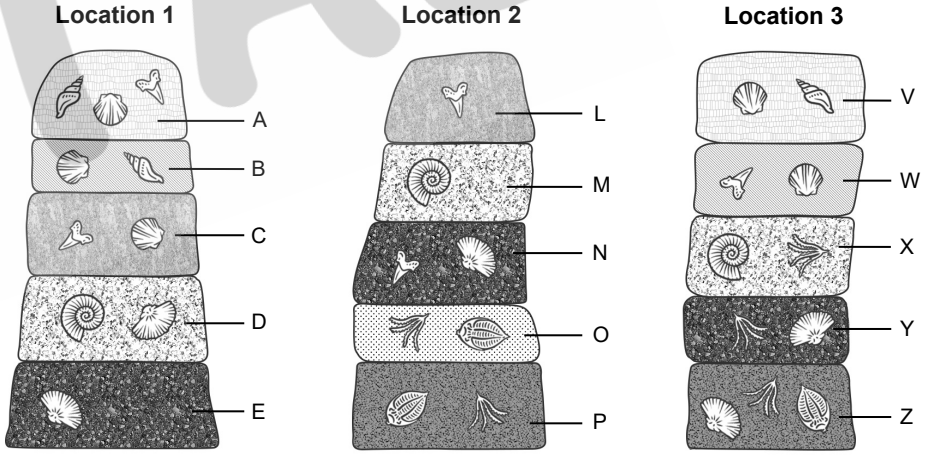
9.6 Fully describe the process of fossilisation of the aquatic animal below, with reference to the sketches A to D.



9.7 Name FOUR different types of fossils.

QUESTION 10

Rock profiles from three different locations 1, 2 and 3 showing different rock layers labelled **A** - **E**, **L** - **P** and **V** - **Z**.



10.1 Identify THREE rock layers that correlate.

10.2 Explain how you determined which layers correlated with each other.

10.3 Explain why correlating rock layers may not be in the same position in the rock strata.

10.4 Explain why some sedimentary rocks may have no fossils present.