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Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

LIFE SCIENCES

MARKS: **150**

TIME: **2½ hours**

This question paper consists of 16 pages.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in your ANSWER BOOK.
3. Start the answer to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Do ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You may use a non-programmable calculator, protractor and a compass where necessary.
11. Write neatly and legibly.

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SECTION A

QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 An inorganic constituent of protoplasm is….

A Cholesterol
B Starch
C Water
D Haemoglobin

1.1.2 The organelle where proteins are manufactured is ..

A Chloroplast
B Ribosome
C Centrosome
D Vacuole

1.1.3 The following elements are found in the organic compounds

(i) Hydrogen
(ii) Nitrogen
(iii) Oxygen
(iv) Carbon

Which of the above element/s is not found in carbohydrates?

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

1.1.4 The movement of molecules from a region of high concentration to a region of low concentration until equilibrium is reached.is:

A Translocation
B Diffusion
C Osmosis
D Transpiration.

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1.1.5 Which ONE of the following is part of the axial skeleton?

A Arms
B Legs
C Hip bone
D Sternum

1.1.6 During which phase of mitosis do chromosomes begin to attach to the spindle fibres?

A Telophase
B Metaphase
C Anaphase
D Prophase

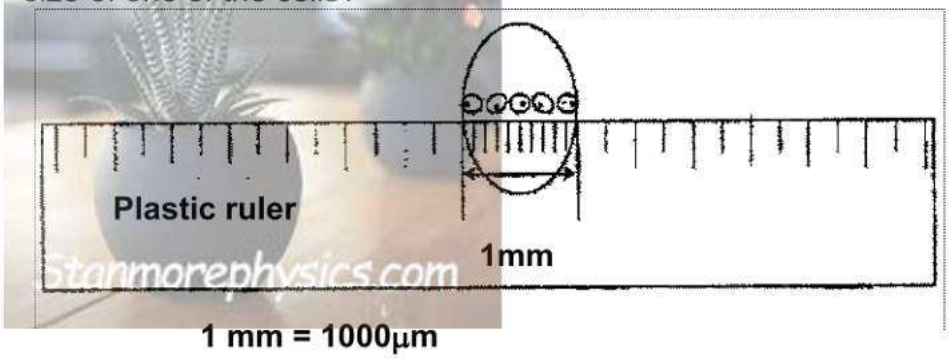
1.1.7 Which ONE of the following is classified as an animal tissue?

A Stomach
B Heart
C Blood
D Kidney

1.1.8 Mitochondrion is an organelle that ..

A is the site of cellular respiration.
B absorbs radiant energy from the sun during photosynthesis
C controls all vital activities of the cell
D controls the substances entering the cell.

1.1.9 A grade 10 learner placed a clear plastic ruler across the centre of the view of a compound light microscope as shown below. A row of cells was seen under a low-power magnification. What is the actual size of one of the cells?



A 100 µm
B 10 µm
C 2000 µm
D 200 µm

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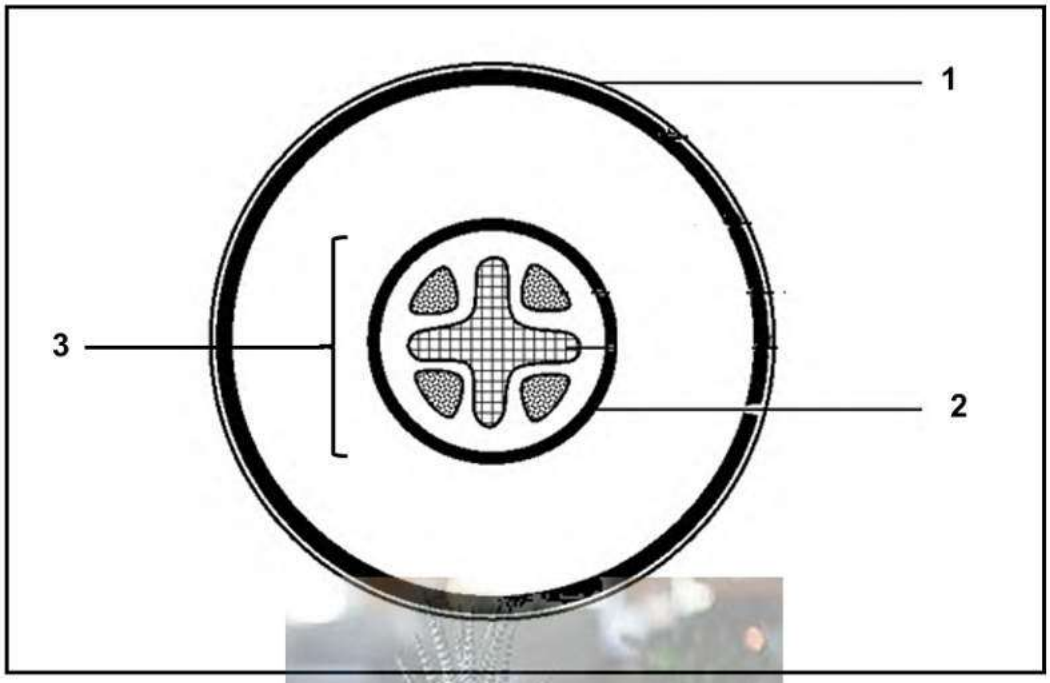
1.1.10 The diagram below represents a transverse section through a plant root.



Which ONE of the following combinations are correct labels for parts labelled **1**, **2** and **3**?

	1	2	3
A	Xylem	Epidermis	Endodermis
B	Epdermis	Endodermis	Stele
C	Pericycle	Endodermis	Epidermis
D	Vascular tissue	Pith	Pericycle

(10 x 2) **(20)**

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1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.10) in the ANSWER BOOK.

1.2.1 A carbohydrate disaccharide consisting of two sugar units

1.2.2 The monomers of proteins

1.2.3 The structure that holds two chromatids together

1.2.4 A substance that speeds up the rate of chemical reactions in the cells of living organisms

1.2.5 A polysaccharide which is a component of cell walls in plants

1.2.6 A factor that is manipulated in an investigation

1.2.7 Bones that surround and protect the brain

1.2.8 The neuron that carries impulses from the sense organs to the central nervous system.

1.2.9 Green pigment found in plants.

1.2.10 Minerals that are needed in small quantities by living organisms.

(10 x 1) **(10)**

1.3 Indicate whether each of the descriptions 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 question number (1.3.1 to 1.3.4) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	Found in a dicotyledonous root.	A: B:	Starch grains Xylem
1.3.2	Test for proteins	A: B:	Fehling's A and Fehling's B Biuret test.
1.3.3	Connects muscles to bones	A: B:	Ligament Tendon
1.3.4	Site of photosynthesis	A: B:	Ribosomes Lysosomes

(4 x 2) **(8)**

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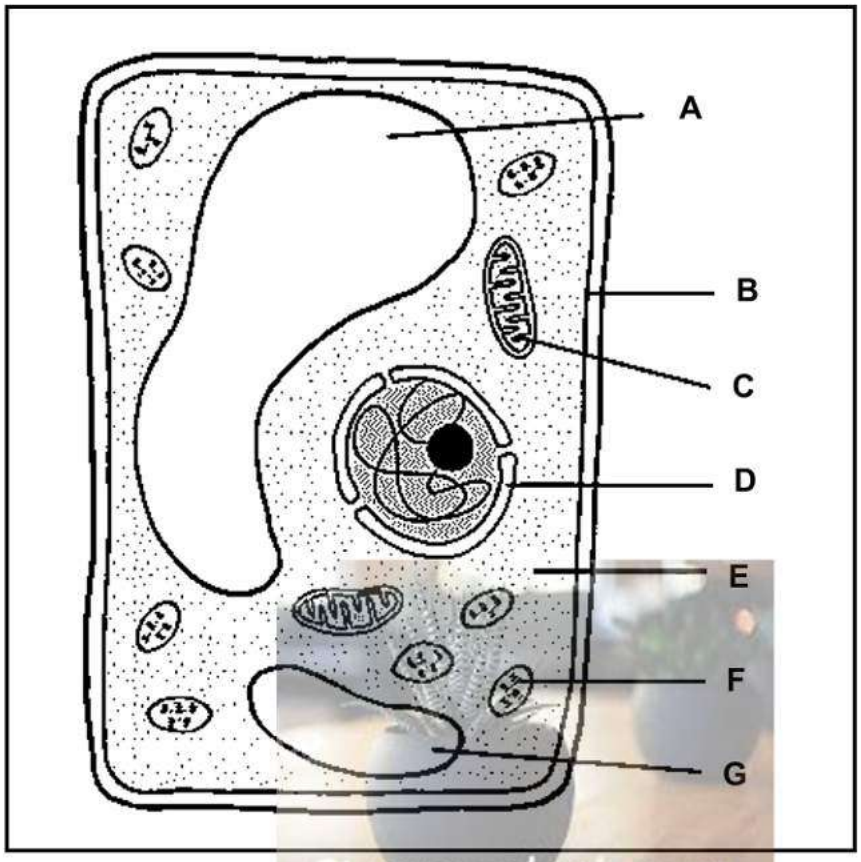
1.4 The diagram below shows the structure of a cell.



1.4.1 State whether this cell is a plant or animal cell. (1)

1.4.2 Give TWO visible reasons for your answer to QUESTION 1.4.1 (2)

1.4.3 Provide labels for letters **B, C,** and **E** (3)

1.4.4 Give a function of each of the following:

(a) Organelle **F** (1)

(b) Chromatin network in part **D** (1)

1.4.5 Explain what would happen to the above cell if it were to be put in a solution with a high concentration of salt. (4)
(12)

TOTAL SECTION A: 50

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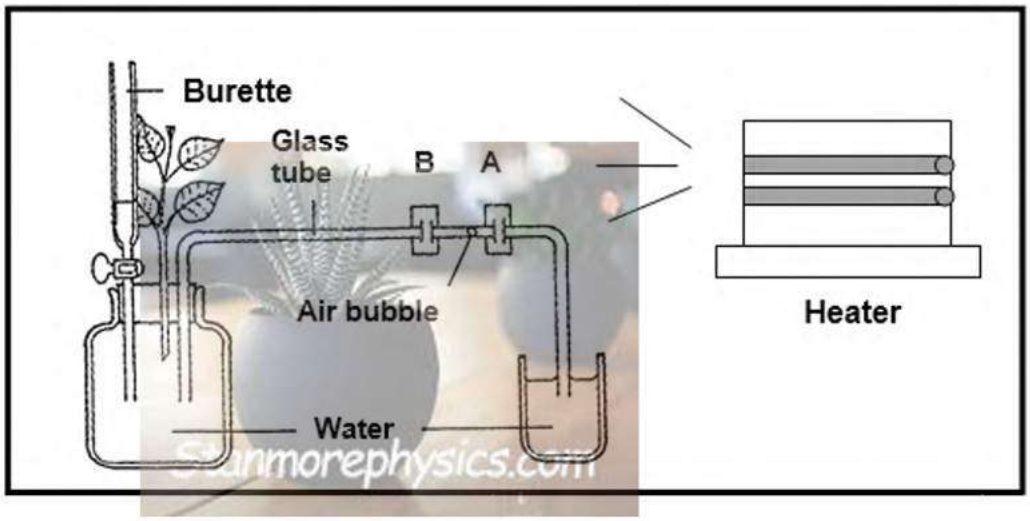
SECTION B

QUESTION 2

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



2.1.1 What is the name of the apparatus illustrated above? (1)

2.1.2 State the aim of the above experiment. 1)

2.1.3 How can the air bubble be moved from **B** to **A**? (3)

2.1.4 Explain what would happen when the underside of each leaf was covered with Vaseline. (3)

2.1.5 List FOUR precautionary measures that should be taken to make the results of the experiment more reliable. (4)
(10)

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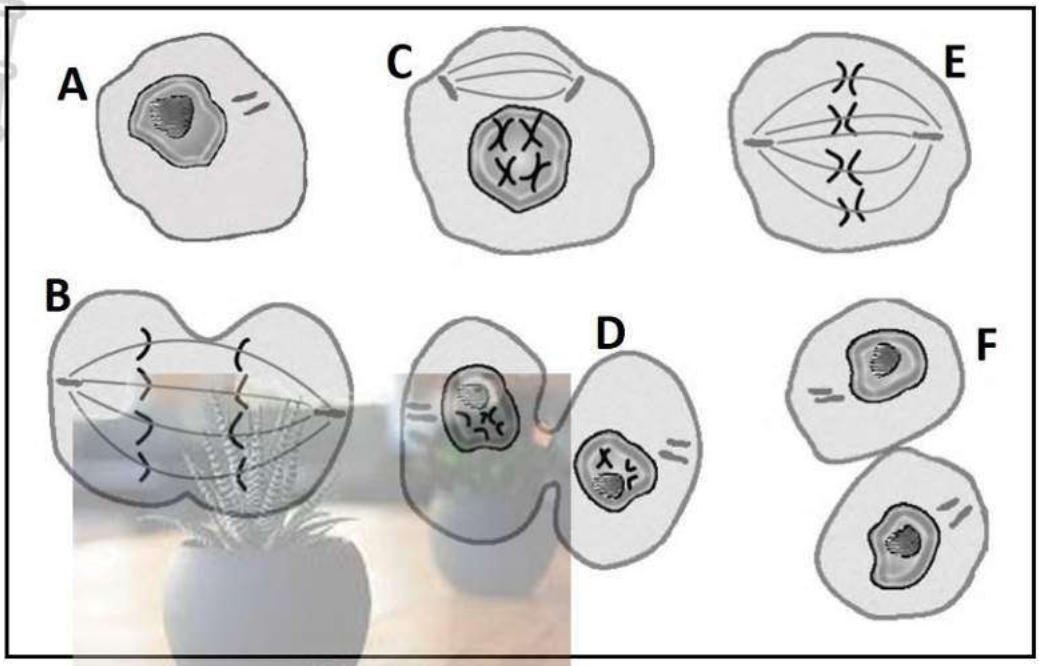
2.2 The diagrams below show the different phases of mitosis.



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2.2.1 Name the phase that is represented by diagram **F.** (1)

2.2.2 Describe TWO observable events that take place in Diagram **E** (2)

2.2.3 Using the letters, **A** to **F**, arrange all the phases in the correct sequence. (2)

2.2.4 (a) During which phase does DNA replication take place? (1)

(b) Describe how telophase in plant cells differs from that in animal cells (2)

2.2.5 How many chromosomes will each of the daughter cells in the diagram contain at the end of mitosis . (1)

2.2.6 State THREE reasons why mitosis is of biological importance to living organisms. (3) **(12)**

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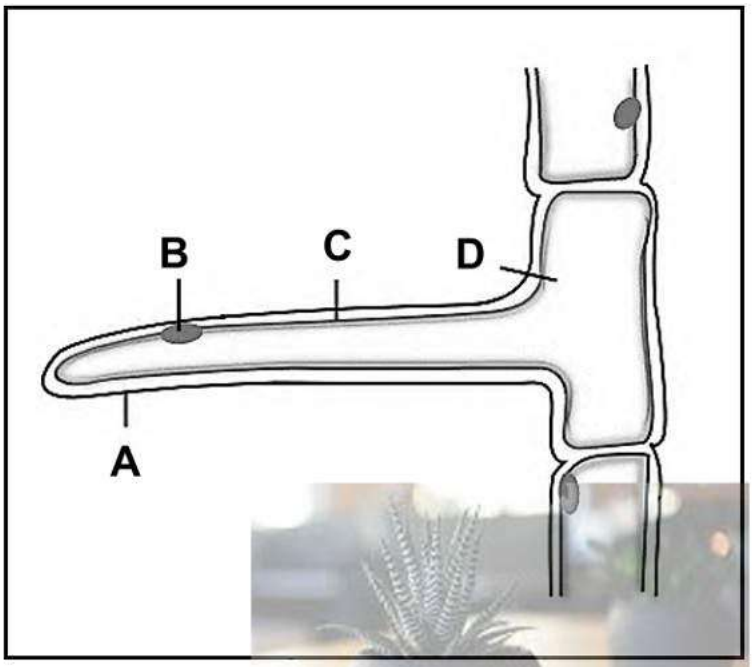
2.3 The diagram below part of the root showing a fully grown root hair.



2.3.1 State the part of the root where the root hair is found (1)

2.3.2 Identify the parts labelled **B** and **D**. (2)

2.3.3 Explain TWO ways in which the root hair cell is structurally suitable to perform its function. (4)

2.3.4 Explain ONE difference related to permeability of parts **A** and **C.** (4)

2.3.5 Name THREE forces that are responsible for the upward movement of water from the roots to the leaves (3)
(14)

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2.4 Read the extract below.

Leukemia and Bone Marrow Transplant

Leukemia, is a type of cancer which affects blood cells. This disease (as well as many other) is caused by abnormal stem cells in the bone marrow producing defective or immature blood cells. These abnormal stem cells are usually treated by chemotherapy. Unfortunately, the large doses of chemotherapy required also destroy healthy bone marrow. A bone marrow transplant is necessary to replace the diseased and damaged bone marrow.

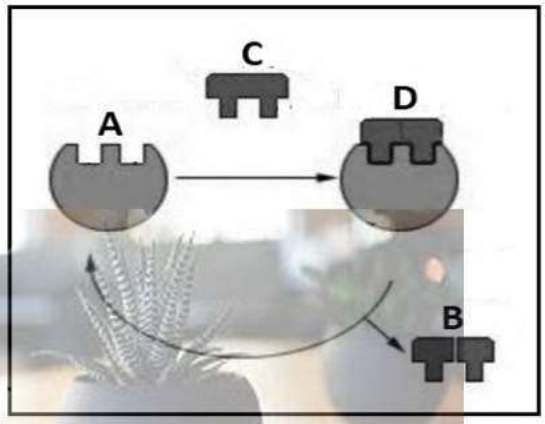
2.4.1 What is cancer? (2)

2.4.2 Describe how is leukemia caused. (1)

2.4.3 Why is bone marrow transplant necessary? (1)

2.4.4 State TWO other ways of treating cancer that are not mentioned in the extract. (2)
(6)

2.5 Study the diagram below and answer questions that follow.



2.5.1 What does the above diagram represent? (1)

2.5.2 Identify the structures labelled **B** and **D** respectively (2)

2.5.3 The arrows in the diagrams show that structure **A** retains the same shape throughout the process.

Explain this statement. (1)

2.5.4 Explain what happens to structure **A** when it is exposed to temperatures above the optimum temperature (2)
(8)
[50]

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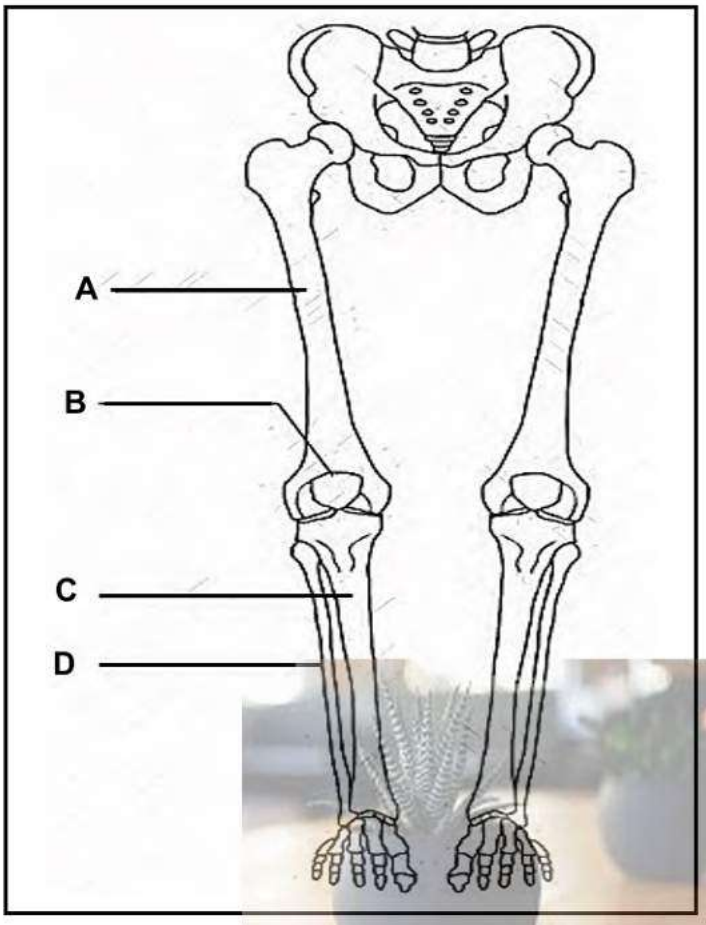
QUESTION 3

3.1 The diagram below shows part of a human skeleton



3.1.1 Identify the parts labelled **A**, **B** and **D** (3)

3.1.2 To which of the two main sections of the skeleton do these bones belong? (1)

3.1.3 Draw a well-labelled diagram of the part labelled **A.** (5)

3.1.4 Apart from protection, list any other TWO functions of a human skeleton. (2)
(11)

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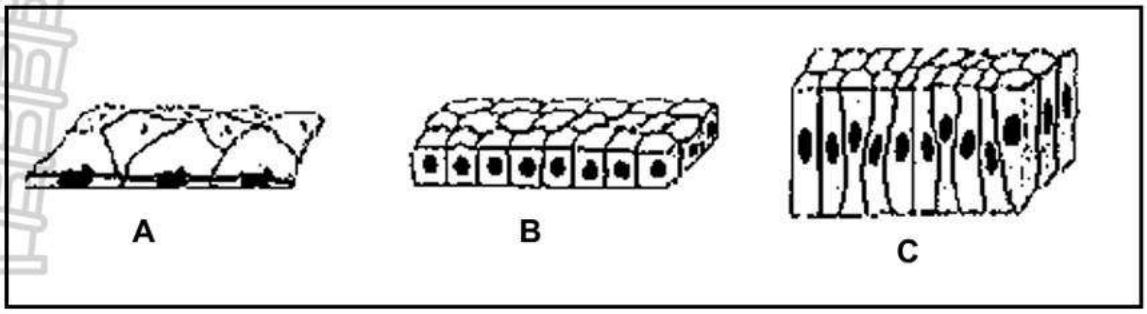
3.2 The diagram below shows different animal tissues.

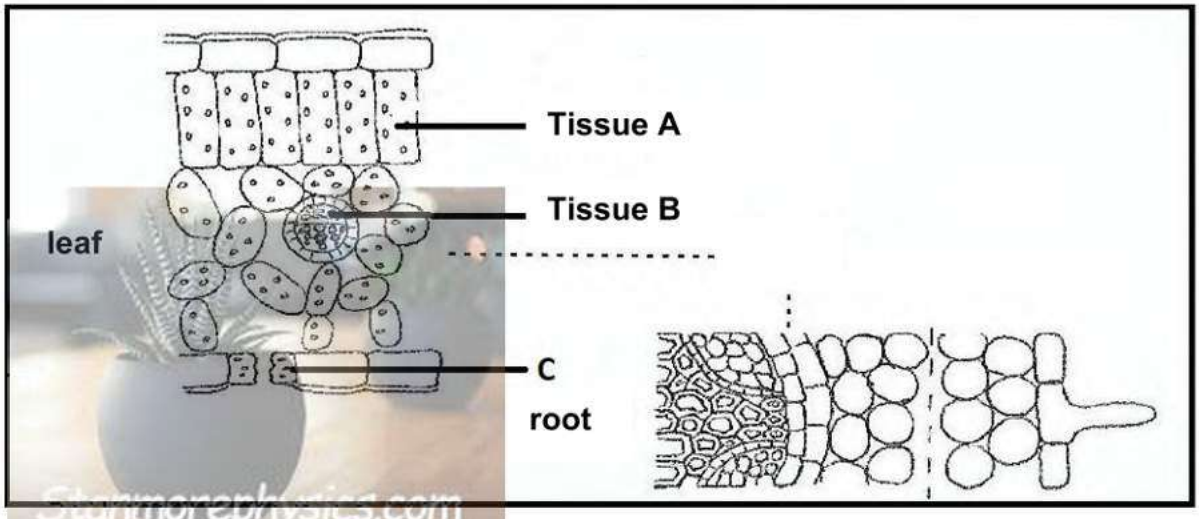


3.2.1 Identify the tissues labelled **A** and **C** (2)

3.2.2 State the difference in function between tissue **A** and **C.** (2)

3.2.3 Explain the consequences of damage to tissue **B**. (2)
(6)

3.3 The diagrams below show cross sections through a dicot leaf and a root.



3.3.1 Name the tissue that transports manufactured organic food from the leaf to the other parts of the plant. (1)

3.3.2 Identify the tissues labelled **A** and **B**. (2)

3.3.3 State ONE structural difference between the cell labelled **C** and the cell attached to it. (2)

3.3.4 Name the function of the cell labelled **C** (1)

3.3.5 Explain TWO visible structural adaptations that assist the plant In the prevention of water loss. (4)
(10)

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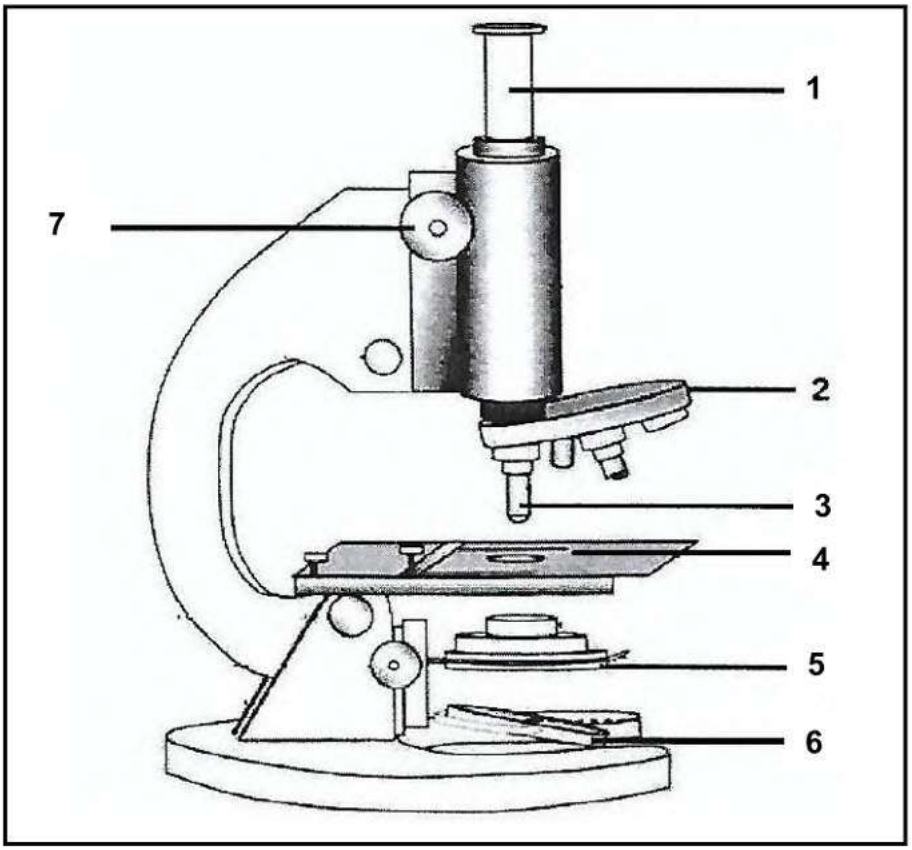
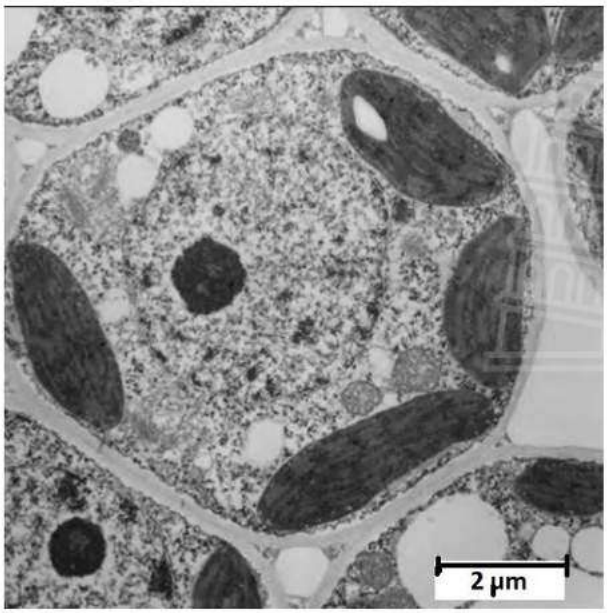
3.4 The diagram below shows a light microscope.



3.4.1 Label the parts numbered **1** and **7**. (2)

3.4.2 What is the function of the part labelled **4**? (1)

3.4.3 Calculate the size of a plant cell from the micrograph given below.



(4)
(7)

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3.5 Eight grade 10 learners investigated the effect of a salt solution on the size (turgidity) of onion rings.

The procedure was as follows:

- 100 onion rings of the same size from the same type of plant were cut out from onion bulbs.
- The onion rings were all put on a weighing scale at 08h30 and it was found that they all weighed 8 grams each.
- The learners divided the onion bulbs into two groups of 50.
- One group that was labelled Group **A** was placed in one large beaker that was full of water.
- At the same time the other Group labelled group **B** was placed in another large beaker of the same size that contained a mixture of salt and water (a salt solution).
- All the onion rings were removed from the beakers at 14h30 and put on a weighing scale again. Their mass was measured and recorded and they were then returned to the water and the salt solution as in the beginning.
- Two of the learners who stay in the school hostel were requested to do the same and to record two more readings and record them at 21h30 and 04h30.
- The last reading was recorded by all the learners at 08h30.

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The table below shows the result of the investigation.

Observation time.	**At the start 08h30**	**14h30**	**21h30**	**04h30**	**08h30**
Group A mass in grams.	8	20	24	24	24
Group B mass in grams.	8	17	15	7	2

3.5.1 Identify the independent variable in this investigation. (1)

3.5.2 List TWO fixed/ controlled variables in this investigation. (2)

3.5.3 State ONE way in which reliability was ensured in this investigation (1)

3.5.4 Calculate the percentage decrease between 21h30 and 08h30 for Group **B** (3)

3.5.5 State the conclusion for this investigation. (2)
(9)

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3.6 The table below shows the percentage of incidence of high cholesterol level of in different population groups in the Eastern Cape.

Population group	Percentage of individuals with high cholesterol levels
A	30 %
B	65 %
C	10 %
D	25 %

3.6.1 Draw a bar graph based on the data in the table above (6)

3.6.2 According to the table, which population (**A, B, C** or **D**) is the least affected by high cholesterol? (1)

(7)

[50]

TOTAL SECTION B: 100

GRAND TOTAL: 150

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GRADE 10

05 JUNE 2023

LIFE SCIENCES MARKING GUIDELINES

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MARKS: 150

These marking guidelines consist of 11 pages..

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PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks is reached and put a wavy line and 'max' in the right-hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark the first three irrespective of whether all or some are correct/ incorrect

3. **If whole process is given when only a part of it is required**
   Read all and credit the relevant part.

4. **If comparisons are asked for but descriptions are given**
   Accept if the differences/similarities are clear.

5. **If tabulation is required but paragraphs are given**
   Candidates will lose marks for not tabulating.

6. **If diagrams are given with annotations when descriptions are required**
   Candidates will lose marks.

7. **If flow charts are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where sequence and links are correct, credit. Where sequence and links are incorrect, do not credit. If sequence and links become correct again, resume credit.

9. **Non-recognised abbreviations**
   Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of the answer if correct.

10. **Wrong numbering**
    If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable.

11. **If language used changes the intended meaning**
    Do not accept.

12. **Spelling errors**
    If recognisable, accept the answer, provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names are given in terminology**
    Accept, provided it was accepted at the national memo discussion meeting.

14. **If only the letter is asked for but only the name is given (and vice versa)**
    Do not credit.

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15 **If units are not given in measurements**
Candidates will lose marks. Marking guidelines will allocate marks for units separately.

16 **Be sensitive to the sense of an answer, which may be stated in a different way.**

17 **Caption**
All illustrations (diagrams, graphs, tables, etc.) must have a caption.

18 **Code-switching of official languages (terms and concepts)**
A single word or two that appear(s) in any official language other than the learners' assessment language used to the greatest extent in his/her answers should be credited if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages.

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SECTION A

QUESTION 1

1.1	1.1.1	1.1.1 C✓✓ 1.1.2 B✓✓ 1.1.3 A✓✓ 1.1.4 B✓✓ 1.1.5 D✓✓ 1.1.6 B✓✓ 1.1.7 C✓✓ 1.1.8 A✓✓ 1.1.9 D✓✓ 1.1.10 B✓✓	(10 X 2)	(20)
1.2	1.2.1	Iodine✓		
	1.2.2	Amino acids✓		
	1.2.3	Centromere✓		
	1.2.4	Enzyme✓		
	1.2.5	Cellulose✓		
	1.2.6	Independent✓ variable		
	1.2.7	Cranium✓/ skull		
	1.2.8	Sensory✓neuron		
	1.2.9	Chlorophyll✓		
	1.2.10	Micronutrient✓	(10 x 1)	**(10)**
1.3	1.3.1	Both A and B ✓✓		
	1.3.2	1.3.2 B only✓✓		
	1.3.3	1.3.3 B only✓✓		
	1.3.4	1.3.4 None✓✓	(4 x 2)	**(8)**

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1.4 1.4.1 Plant cell✓ (1)

1.4.2 - Presence of cell wall✓
- Presence of chloroplast✓
- Large vacuole✓
- Regular shape✓ Any (2)

(Mark first TWO only)

1.4.3 B- Cell membrane✓
C- Mitochondrion✓
E- Cytoplasm✓ (3)

1.4.4 (a) - Site for photosynthesis✓
- Chlorophyll traps radiant energy from the sun and uses it to produce for during photosynthesis✓ Any (1)

(Mark first ONE only)

(b) Contains the information/genes that plays a role in heredity✓ (1)

1.4.5 - Water would move out of the cell✓ which is a region of high concentration of water
- to the surrounding salt solution which is a region of low concentration✓
- High amounts of water will be lost from the vacuolar sap✓
- This would reduce the size of the vacuole✓
- The cytoplasm moves away from the cell wall✓
- The cell will become flaccid✓ Any (4)

(12)

TOTAL SECTION A: 50

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SECTION B

QUESTION 2

2.1 2.1.1 Potometer✓ (1)

2.1.2 To determine the effect of temperature on the rate of transpiration✓✓ (2)

2.1.3 - Opening the tap✓ in the burette
- to allow water more water into the jar✓ (2)

2.1.4 - The stomata would be clogged/blocked✓
- There would be water loss✓
- Transpiration would stop✓ (3)

2.1.5 - Cut the shoot from a plant under water✓
- to prevent air from entering the xylem✓
- Make sure the apparatus is airtight, using vaseline to seal any gaps✓ If air enters the apparatus the readings will be affected✓
- Dry the leaves of the shoot✓ Any moisture present on the leaves will affect the rate of transpiration✓
- Cut the shoot at a slant ✓ to increase surface area✓
- Use the apparatus under the same environmental conditions✓
- to ensure validity✓ of the results Any (1 x2) (2)

(Mark first ONE only)

(10)

2.2.1 Telophase✓ (1)

2.2.2 - Chromosomes line up the equator✓
- attached by the centromere to the spindle fibres ✓ (2)

2.2.3 A, C, E, B, D, F✓✓ (2)

2.2.4 (a) Interphase✓ (1)

(b) - in plants the spindle fibres form from centrioles✓ whereas in animals there are no centrioles✓ so the spindle fibres form from cytoplasm
- in plants a cell plate forms to separate the two new daughter cells✓ whereas in animals an invagination occurs that separates the two new daughter cells.✓ Any (1 x 2) (2)

2.2.5 Four✓/ 4 (1)

2.2.6 - For growth✓
- To replace damaged or worn- out cells✓
- Reproduction in unicellular organisms ✓ (3)

(12)

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2.3.1 Epidermis✓ (1)

2.3.2 B- Nucleus✓
D- Cytoplasm✓ (2)

2.3.3 - Finger-like projections✓
increase surface area for absorption of water✓
- Thin, cell wall, without cuticle✓
to absorb water from the soil✓
- Large vacuole with low water concentration in cell sap✓
for absorption of more water✓ (Any 2 x 2) (4)

2.3.4 Part **A**/the cell wall of a root hair is freely permeable✓
and allows both salt and water to pass through✓ whereas
Part **C**/the cell membrane of a root hair is semi-permeable
and does not allow large dissolved salt molecules to pass through✓ (4)
(Mark first ONE only)

2.3.5 Root pressure✓
Transpiration pull✓
Capillarity✓ (3)
(14)

2.4 2.4.1 - A disease✓
- caused by abnormal and uncontrolled cell division✓ in the body (2)

2.4.2 It is caused by abnormal stem cells in the bone marrow producing defective/immature blood cells✓ (1)

2.4.3 To replace the diseased and damaged bone marrow✓ (1)

2.4.4 Radiotherapy✓
Surgery✓ (2)
(6)

2.5 2.5.1 It represents the reaction between an enzyme and its substrate✓ (1)

2.5.2 **B** – product✓
D - enzyme-substrate complex✓ (2)

2.5.3 - the enzyme✓/ A remains the same
- promotes the chemical change✓
- without being used up✓ in a reaction (3)

2.5.4 - structure A/ enzyme become denatured✓/ shape is altered
- reaction rate slows down or stops altogether✓ (2)
(8)
[50]

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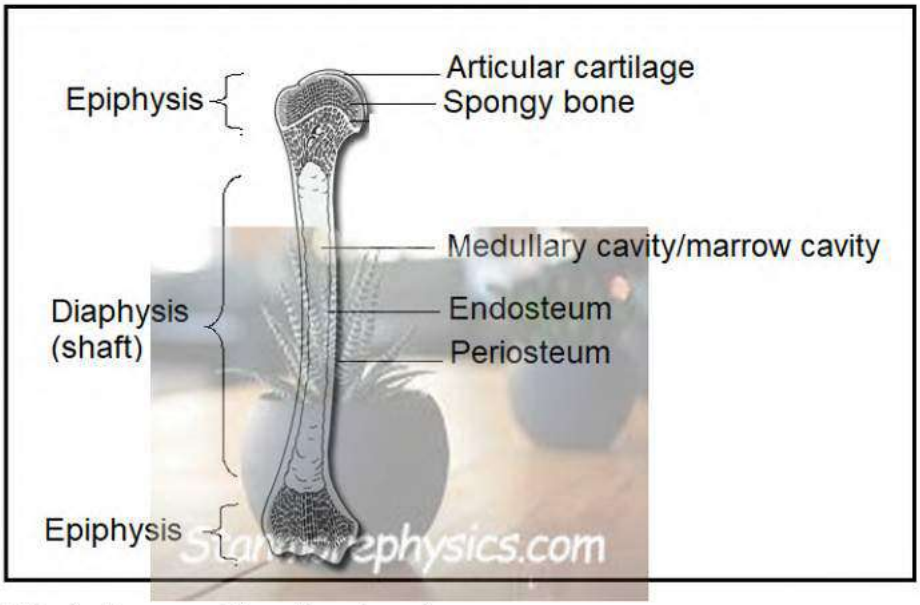
QUESTION 3

3.1 3.1.1 B- Femur✓
C- Patella ✓
D- Fibula✓ (3)

3.1.2 Appendicular✓ (1)

3.1.3 **Structure of a long**



Criteria for marking the drawing:
Caption (**C**) ✓
Drawing (**D**) ✓
Any 3 correct labels **(L)** ✓✓✓ (5)

3.1.4 - Support✓
- Movement✓/ locomotion
- Mineral storage✓
- Hearing✓
- Production of blood corpuscles and blood cells✓ Any (2)

(Mark first TWO only) **(11)**

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3.2 3.2.1 **A** – Squamous epithelium✓
C - Columnar epithelium✓ (2)

3.2.2 Tissue A
- protects underlying tissues✓
- allows certain substances to pass through✓ Any 1

Tissue C
- supports other cell types✓
- secretion of mucus✓
- absorption of food, water and minerals✓ Any 1 (2)

3.2.3 Tissue B/Cuboidal tissue is damaged:
- useful substances will not be secreted ✓
- the functioning of cells in the body will be affected✓ (2)
(6)

3.3 3.3.1 Phloem✓ (1)

3.3.2 A – Palisade mesophyll✓
B – Xylem✓ (2)

3.3.3 - Guard cells are bean shaped✓
epidermal cells have fixed shapes✓
- Guard cells have thick inner walls✓,
epidermal cells have thin walls✓
- Guard cells have chloroplasts✓
epidermal cells have no chloroplasts✓ Any (1 x 2) (2)

Mark first ONE only)

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3.3.4 Guard cells are responsible for the opening and closing of stomata✓ (1)

3.3.5 - The presence of a waxy cuticle layer✓
does not allow water to pass through it easily, this prevent water loss✓.
- Guard cells on the ventral side✓/underside
allow stomata to open and close to prevent more water from being released✓ Any (2 x 2) (4)
(10)

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3.4 3.4.1 1- Eye Piece✓
3 – (High Power) objective lens✓ (2)

3.4.2 Stage -Responsible for the placement of slide for examination✓
OR
Stage clips – Hold the slide in place✓ Any (1)

3.4.3 Actual size = $\frac{\text{Measured length of the cell X length of the scale in micrometers}}{\text{Measured length of eh scale in mm}}$✓

$= \frac{6.3cm \ X \ 2\mu m}{1.5 \text{ cm}}$ ✓✓OR $= \frac{63 \ mm \ X \ 2\mu m}{15 \text{ mm}}$ ✓✓

$= 8.4 \ \mu m$✓ $= 8.4 \ \mu m$✓

(4)
(7)

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3.5 3.5.1 Salt solution✓ (1)

3.5.2 Same:
- type of plant✓
- size of onion rings✓
- weighing scale used✓
- beaker size✓
- number of onion rings in each group✓ Any (2)

(Mark first TWO only)

3.5.3 100✓ onion rings were used

3.5.4 15-2/15 ✓X 100✓ **OR** 15-2=13
= 86.67%✓ 13/15✓X100✓
=86.67%✓ (3)

3.5.5 The higher the concentration of salt in a solution, the smaller the size of the onion rings✓✓ (2)
(9)

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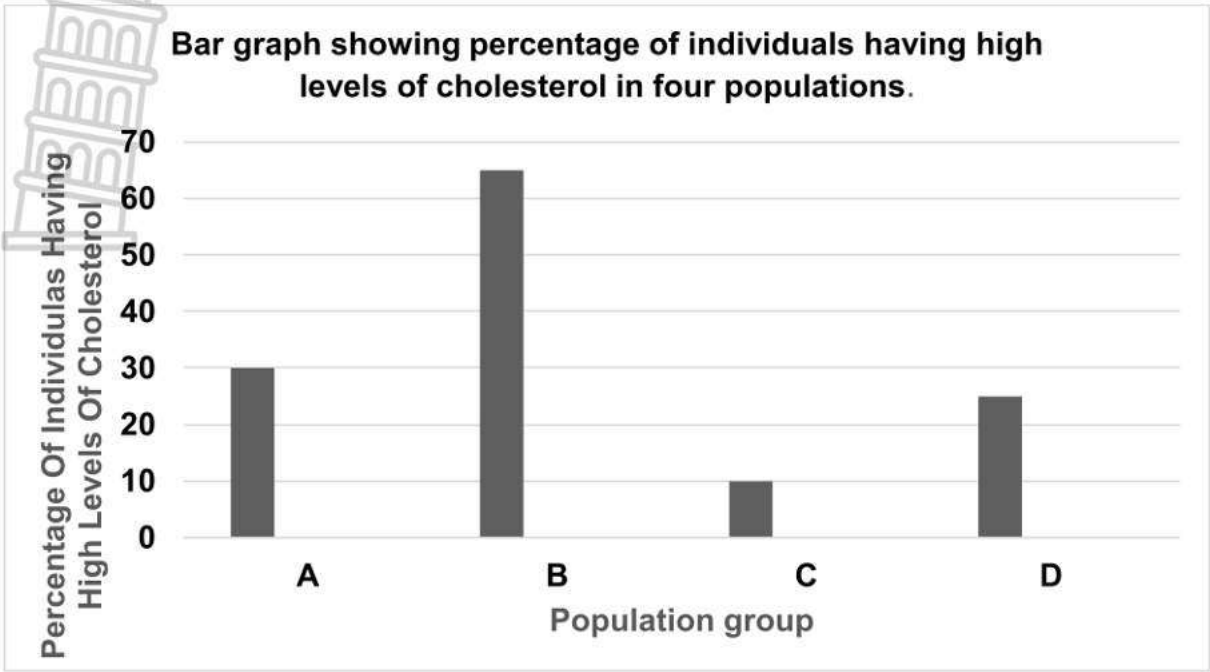
3.6.1 (6)



Criteria for marking the graph

Criteria	Mark allocation
Bar graph is drawn **(T)**	1
Captionof the graph includes both variables **(C)**	1
Correct labels on X-axis and Y-axis **(L)**	1
Correct scale for Y-axis Equal spaces between bars and equal width of bars for X-axis **(S)**	1
Plotting **(P)** 1-3 co-ordinates plotted correctly All 4 co-ordinates plotted correctly	 1 2

(6)

3.6.2 Population C✓ (1)

(7)

[50]

TOTAL SECTION B: 100

GRAND TOTAL: 150

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