KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

LIFE SCIENCES

JUNE 2024

COMMON TEST

MARKS: 150

TIME: 2½Hours

N.B This question paper consist of 17 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 the ANSWER BOOK.
3. Start the answers 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.
11. Write neatly and legibly.

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SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.9) in your ANSWER BOOK, for example 1.1.10 D.

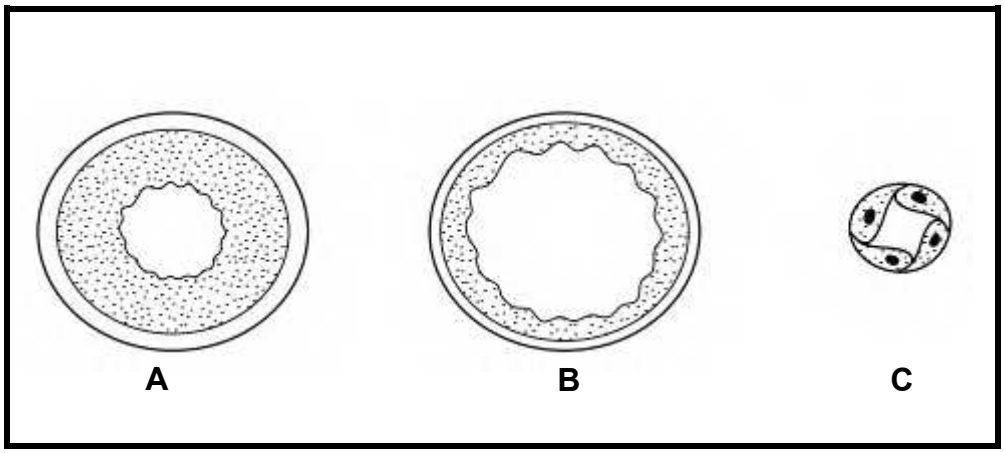
1.1.1 Calcium and phosphorus in mammals …

A forms part of nucleic acid.
B plays a role in the synthesis of proteins.
C prevents rickets.
D is involved in the formation of haemoglobin.

1.1.2 Which ONE of the following results in swelling of thyroid gland when in short supply?

A Iron
B Iodine
C Phosphorus
D Calcium

QUESTIONS 1.1.3 AND QUESTION 1.1.4 ARE BASED ON THE DIAGRAMS OF DIFFERENT BLOOD VESSELS BELOW



1.1.3 Which diagram/s or blood vessel/s connect/s arteries to veins?

A **A**
B **B**
C **C**
D **A** and **B**

1.1.4 The main functional difference between diagram **A** and diagram **B** is that…

A both Diagram **A** and **B** carry blood away from the heart.

B both Diagram **A** and **B** carry blood back to the heart.

C diagram **A** carry blood back to the heart and diagram **B** carries blood away from the heart.

D diagram **A** carry blood away from the heart and diagram **B** carry blood back to the heart.

1.1.5 Below is a list of tissues in an angiosperm root:

(i) Parenchyma cells
(ii) Endodermis
(iii) Pericycle
(iv) Xylem

Which ONE of the following is the CORRECT order of the movement of water from the root hair to vascular tissue in the angiosperm root?

A (i) → (ii) → (iv) → (iii)
B (i) → (ii) → (iii) → (iv)
C (ii) → (i) → iv) → (iii)
D (iii) → (i) → (iv) → (ii)

QUESTIONS 1.1.6 AND QUESTION 1.1.7 ARE BASED ON THE INVESTIGATION BELOW

An investigation was conducted by grade 10 learners on the effect of exercise on heartbeat.

The following procedure was followed:

(i) Learners of the same age were chosen
(ii) Venue, place and time were decided
(iii) The recording tool was also decided up on
(iv) The investigation was repeated 5 times

1.1.6 Which ONE of the following combinations forms part of the planning stage in an investigation?

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

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1.1.7 Which ONE of the following steps increased the reliability of the results?

A Learners of the same age were chosen
B Venue, time, and time were decided
C The recording tool was also decided up on
D The investigation was repeated 5 times

1.1.8 Which ONE of following organelles carries hereditary characteristics and play a role in paternity testing?

A Lysosomes
B Cell wall
C Ribosomes
D Nucleus

1.1.9 Shape of the leaves that contributes to increased rate of transpiration is…

A large and broad.
B needle shaped.
C rolled.
D small and narrower.

(2x9) **(18)**

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 1.2.9) in your ANSWER BOOK

1.2.1 Separating wall preventing the mixing of oxygenated and deoxygenated blood

1.2.2 Part of the microscope that regulates light intensity

1.2.3 The blood vessel that transport oxygenated blood from the left ventricle to all parts of the body

1.2.4 Site of protein synthesis

1.2.5 The blood vessel that carry oxygenated blood from the lungs to the left atrium

1.2.6 The structure that allows the flow of blood in one direction only

1.2.7 Part of the microscope that supports the stage and is used to carry the microscope

1.2.8 The pressure that develops as a results of the movement of water into the root by osmosis

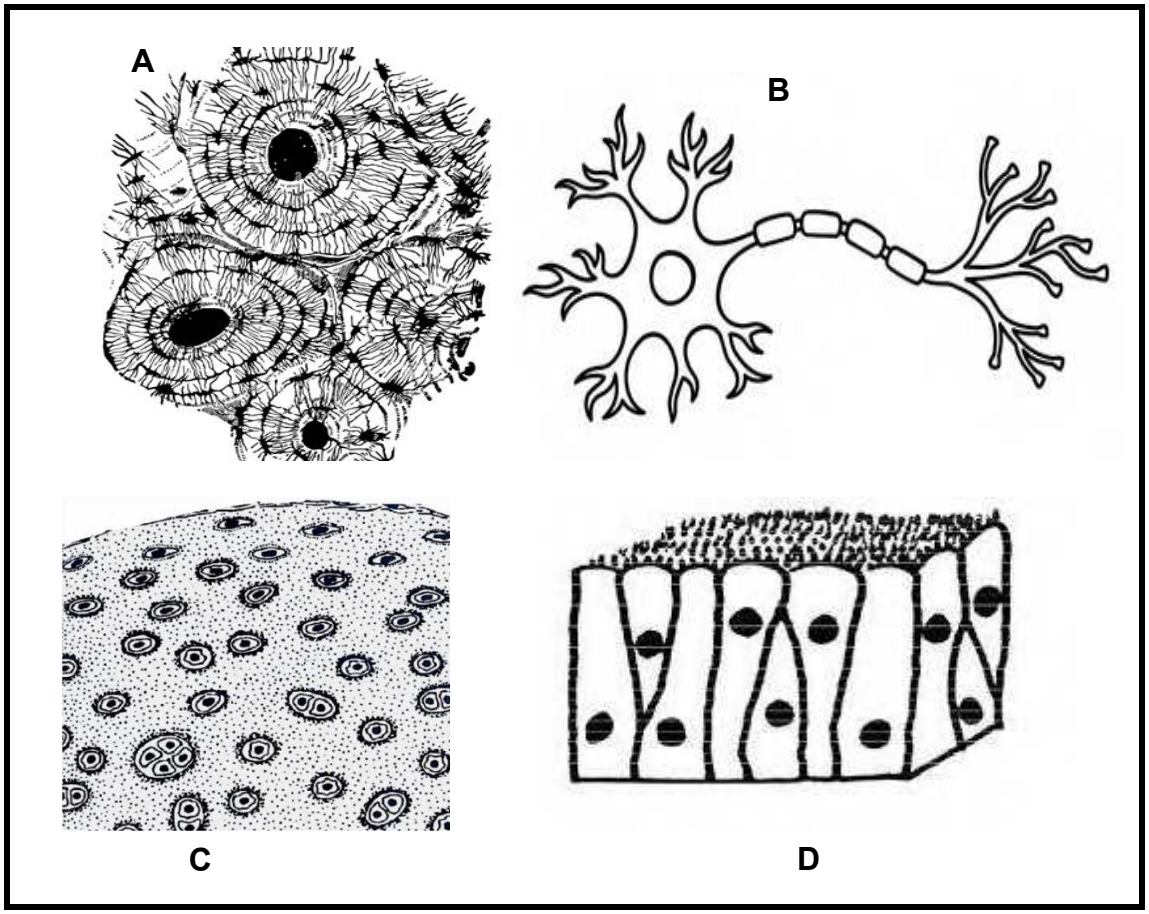
1.2.9 The transport of molecules across membranes against a concentration gradient, which therefore requires energy 1x9 **(9)**

1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the question number (1.3.1 to 1.3.4) in the ANSWER BOOK.

COLUMN I	COLUMNII
1.3.1 Mammalian tissue/s	A: Muscle B: Blood
1.3.2 Prevents water loss in plants	A: Waxy cuticle B: Xylem
1.3.3 Affects rate of transpiration	A: Humidity B: Light intensity
1.3.4 Selectively permeable membrane	A: Cell wall B: Nucleoplasm

(2x4) **(8)**

1.4 The diagrams below represent animal tissues.



1.4.1 Give the LETTER and NAME of the tissue/ cells that:

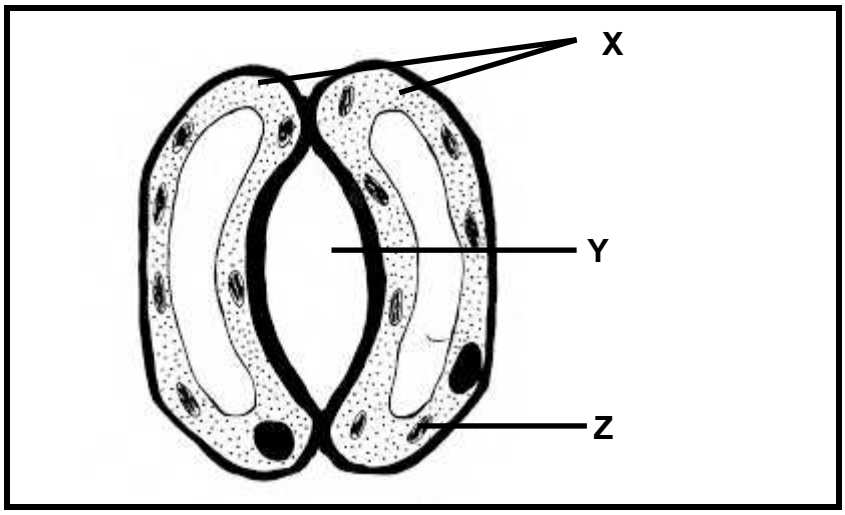
(a) Contains microscopic hair-like projections lining nasal cavities and trachea (2)

(b) Carries impulses from the central nervous system to the effectors (muscles or gland) (2)

(c) Forms bones making up the skeleton of mammals (2)

(d) Prevents damage between bones in joints (2)
(8)

1.5 The diagram below shows a surface view of a part of epidermal tissue in a leaf.



1.5.1 Identify part:

(a) **X** (1)

(b) **Y** (1)

(c) **Z** (1)

1.5.2 Name TWO processes in a plant in which this part of leaf is involved. (2)

1.5.3 Explain ONE way in which the epidermal tissue of a leaf is suited for maximum absorption of light. (2)

(7)

TOTAL QUESTION 1 [50]
TOTAL SECTION A [50]

SECTION B

QUESTION 2

2.1 The table below shows the nutritional information printed on a cereal box.

Nutrients present in cereal	35 g of cereal contain:
Proteins	4 g
Carbohydrates	15 g
Fat	0.5 g
Iron	8 g
Vitamin B_1	2 g
Fibre (roughage)	5.5 g

2.1.1 Name the nutrient that makes up the largest part of the 35g cereal in the table. (1)

2.1.2 Name the building blocks of nutrient named in QESTION 2.1.1 (1)

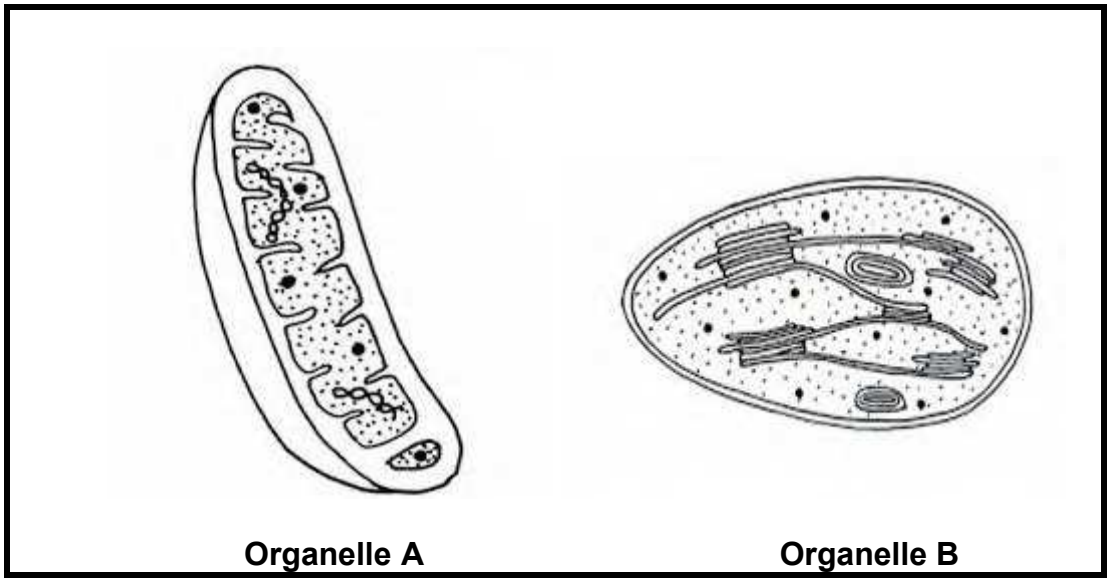
2.1.3 List TWO functions of protein in the human body. (2)

2.1.4 Name an inorganic nutrient in this cereal. (1)

2.1.5 Draw a pie chart to represent the data in the table. (6)
(11)

2.2 Describe how enzyme work using a lock and key model. **(5)**

2.3 The diagrams below represent two organelles found in cells.



2.3.1 Name the fluid/gel-like material found inside organelle:

(a) **A** (1)

(b) **B** (1)

2.3.2 Name the part in organelle **B** in which the pigment responsible for the absorption of light is found. (1)

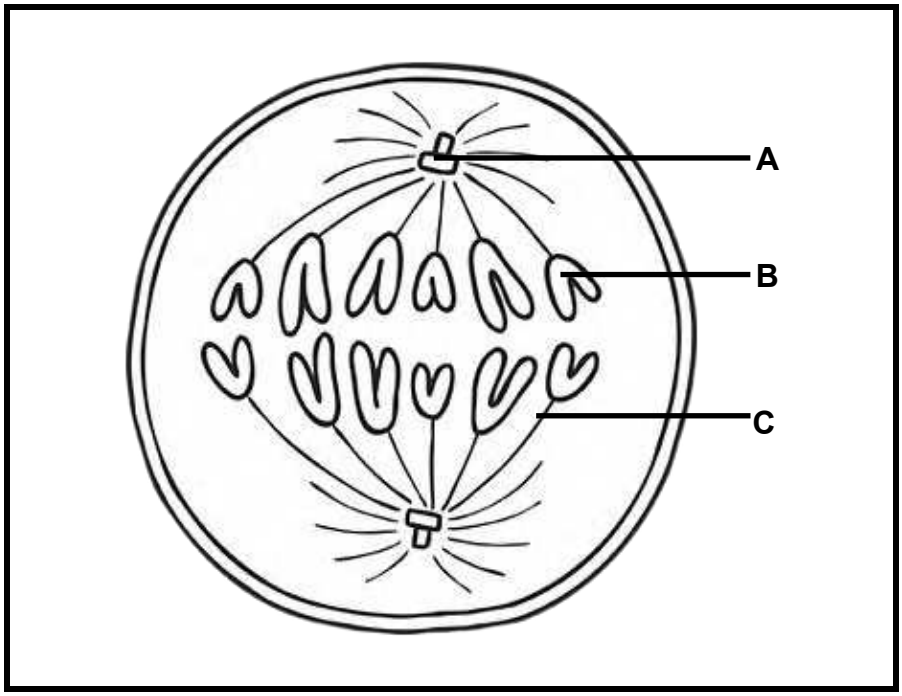
2.3.3 Explain why a muscle cell would generally need more of organelle **A.** (2)

2.3.4 Tabulate TWO differences between organelle **A** and organelle **B** with regard to **location** and **function.** (5)

2.3.5 Calculate the actual size of the micrograph of organelle **B** in micrometres if the measured size of the image using a ruler is 86mm and the electron microscopic magnification is 4000x. (3)

(13)

2.4 The diagram below shows a phase in mitosis.



2.4.1 Identify:

(a) The phase represented above. (1)

(b) Part **B** (1)

(c) The LETTER only of the part that forms spindle fibres. (1)

2.4.2 Name the disease caused by an abnormal and uncontrollable division of cells in a part of a body. (1)

2.4.3 State how many chromosomes will be present at the end of this cell division. (1)

2.4.4 Explain the effect on mitosis if part **C** fails to perform its function during cell division. (2)

2.4.5 Draw a diagram to represent the phase of mitosis that occurs before the one shown above (4)
(11)

2.5 Read the extract below.

One of the most important functions of parenchyma cells is that of healing and repair. Parenchyma cells are unique in their *meristematic* nature. This means that the cells are *pluripotent*, having the ability to divide into a number of different cells. This plays an important role in how a plant can heal itself after a wound. While it may seem silly to think that a tree heals, the process is not much different to healing in a human body.

Parenchyma cells, once exposed to the outside when a wound occurs, are stimulated to start dividing. The cells divide towards the wound, differentiating into the different cell types which are needed, such as bark and epidermis. The parenchyma cells on the inside of the wound remain undifferentiated, and provide a source of meristematic cells in case the plant is attacked again. This process is responsible for healing in plants, from giant trees to a blade of grass.

2.5.1 Define the term *meristematic* tissue. (2)

2.5.2 From the extract above:

(a) Give TWO functions of parenchyma cells. (2)

(b) Explain why the parenchyma cells on the inside of the wound would remain undifferentiated. (2)

2.5.3 State TWO functions of parenchyma cells other than the one's from the extract. (2)

2.5.4 Name TWO types of cells mentioned in the extract that parenchyma cells would differentiate into. (2)
(10)

TOTAL QUESTION 2 [50]

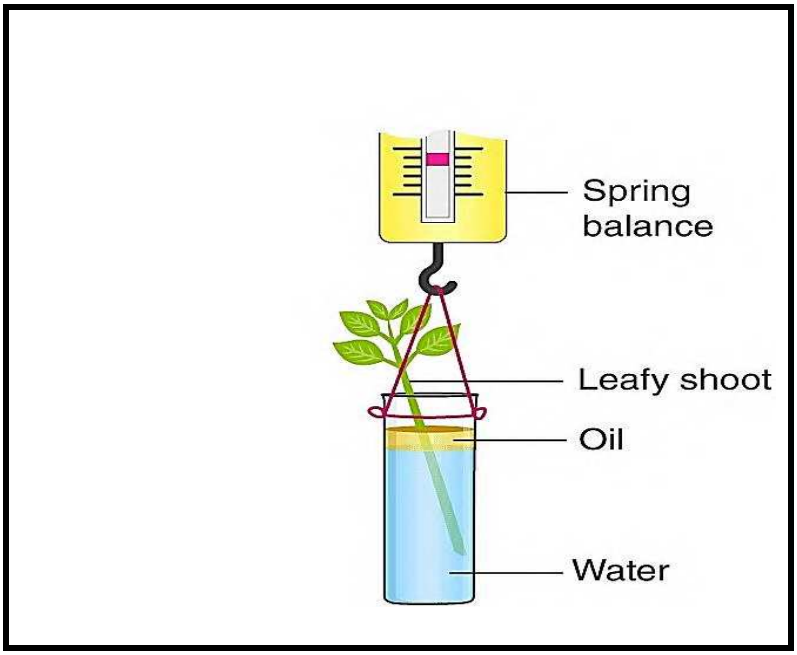
QUESTION 3

3.1 An investigation was done to determine the effect of temperature on the rate of transpiration.

The procedure was as follows:

- Four measuring cylinders (**A**, **B**, **C** and **D**) were set up as the one shown in the diagram.
- The four cylinders were left in the laboratory but were exposed to different temperatures.
- Temperature was measured in the four cylinders, using a thermometer.
- Each measuring cylinder contained a leafy twig and 80 ml water covered with a layer of oil.
- After two hours, water levels in the four cylinders were measured using the spring balance and recorded.
- Investigation was repeated 4 times.

The diagram below shows the setup of the investigation.



The table below shows the results that were obtained.

Cylinders	Temperatures(°C)	Water left in the beaker (ml)
A	15	70
B	25	65
C	35	56
D	45	45

3.1.1 Identify:

(a) Dependent variable (1)

(b) Independent variable (1)

3.1.2 Explain the purpose of the oil layer (2)

3.1.3 Explain ONE factor/precaution that needs to be taken when cutting the leafy twigs, to ensure the results are valid. (2)

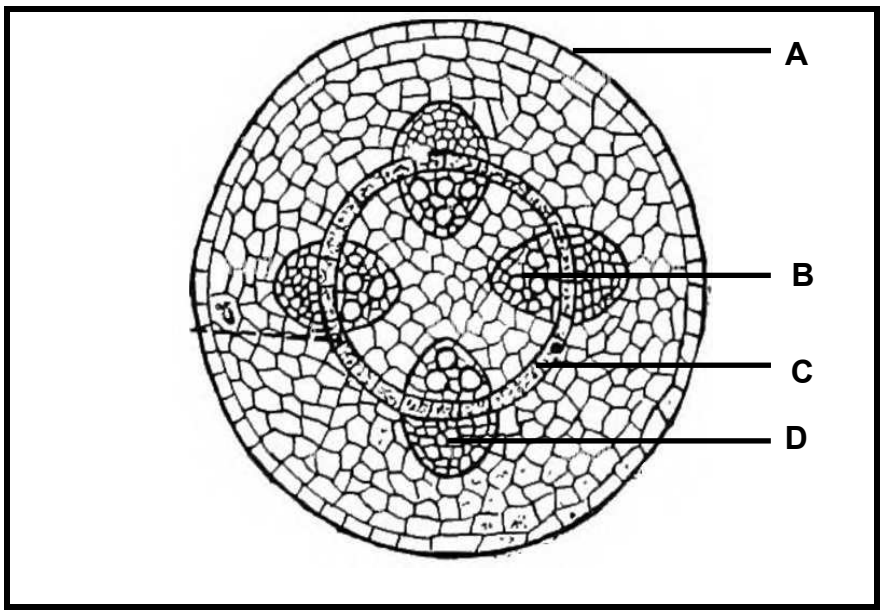
3.1.4 State TWO factors that should have been kept constant during this investigation other the one stated in the investigation. (2)

3.1.5 Explain the implications on the leafy twig after 4 hours should the rate of transpiration continues at the constant rate for cylinder **D.** (3)

3.1.6 A Fifth cylinder was added (cylinder **E**). Its leafy twig has hairs on its leaves. Explain how would the presence of hairs affect the rate of transpiration. (3)

(14)

3.2 The diagram shows a cross section of a dicotyledonous stem.



3.2.1 Identify part **C.** (1)

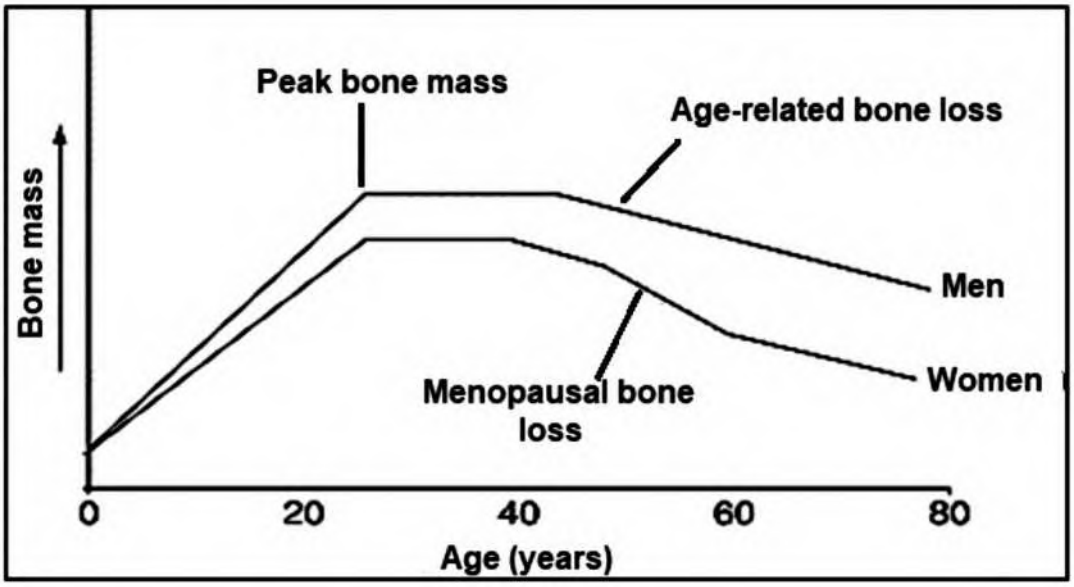
3.2.2 Describe how the structure of part **A** is suited for protection in young green plants. (3)

3.2.3 Give ONE function of part **D** (1)

3.2.4 Explain TWO reasons in which part **B** is structurally suited to transport water in plants. (4)

(9)

3.3 The graph below shows bone mass in men and woman of different age.



3.3.1 From the graph, state the ff:

(a) the age when the peak of bone mass/density starts to form in men. (1)

(b) the reason for bone loss in women. (1)

3.3.2 Describe the relationship between bone density and age (2)

3.3.3 Give TWO reasons why exercise and calcium-rich foods can lower the risk of developing low bone density. (2)

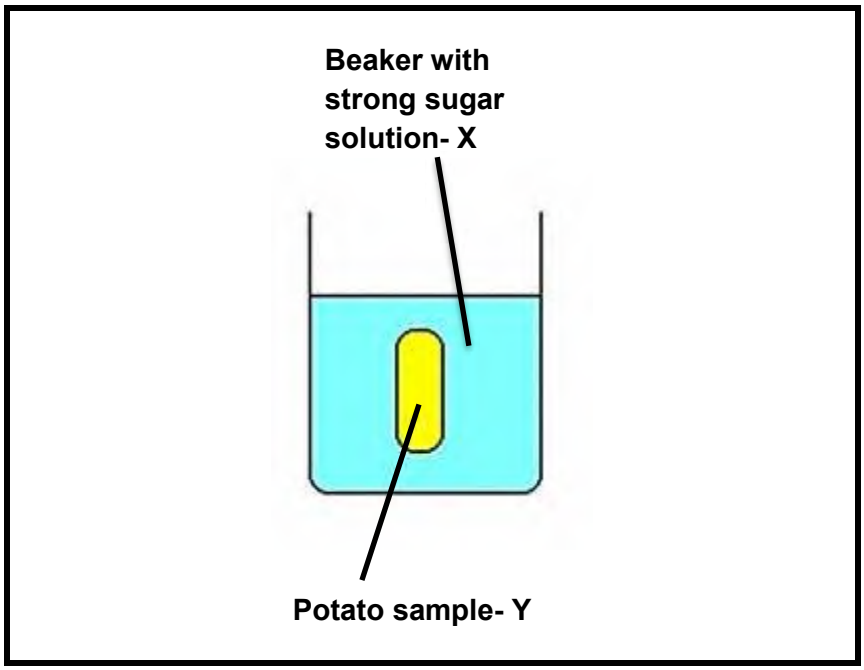
3.3.4 The cranium is part of the human skeleton.

(a) Name the part of the body that is protected by the cranium. (1)

(b) Apart from protection, list any other THREE functions of a skeleton. (3)

(10)

3.4 The diagram below shows a certain type of diffusion that involves movement of water molecules.



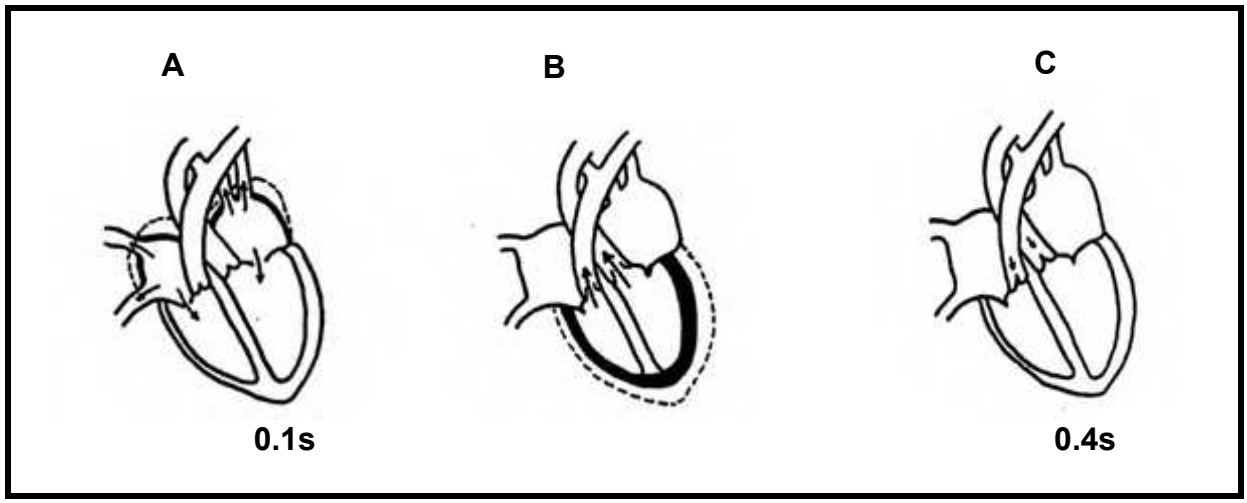
3.4.1 Identify the above type of diffusion. (1)

3.4.2 State whether the water will move from the beaker to the potato or from the potato to the beaker (**X** to **Y** or **Y** to **X**). (1)

3.4.3 Explain your answer in QUESTION 3.4.2. (3)

3.4.4 Explain the results in relation to size of potato after 24 hours. (4)
(9)

3.5 The diagram below shows the three phases of cardiac cycle and how long each phase last. Each cycle last 0.8 seconds



3.5.1 Identify phase **A.** (1)

3.5.2 State how long does phase **B** last according to the data given. (1)

3.5.3 Describe how cardiac cycle works with reference to the diagrams.

(a) **A** (1)

(b) **B** (3)

(c) **C** (2)

(8)

TOTAL QUESTION 3 [50]
TOTAL SECTION B 100
GRAND TOTAL 150

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KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

FINAL

NATIONAL SENIOR CERTIFICATE

GRADE 10

LIFE SCIENCES

JUNE COMMON TEST

MARKING GUIDELINE

2024

MARKS: 150

N.B This marking guideline 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.

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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)**

15. **If units are not given in measurements**
    Candidates will lose marks. Memorandum 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.

SECTION A

QUESTION 1

1.1 1.1.1 C✓✓
1.1.2 B✓✓
1.1.3 C✓✓
1.1.4 D✓✓
1.1.5 B✓✓
1.1.6 C✓✓
1.1.7 D✓✓
1.1.8 D✓✓
1.1.9 A✓✓

9x2 **(18)**

1.2 1.2.1 Septum ✓
1.2.2 Iris diaphragm/diaphragm ✓
1.2.3 Aorta ✓
1.2.4 Ribosomes ✓
1.2.5 Pulmonary veins✓
1.2.6 Valve ✓
1.2.7 Arm ✓
1.2.8 Root pressure✓
1.2.9 Active transport ✓

9x1 **(9)**

1.3 1.3.1 Both A and B ✓✓
1.3.2 A only✓✓
1.3.3 Both A and B✓✓
1.3.4 None ✓✓

4x2 **(8)**

1.4 1.4.1 (a) D✓ – Ciliated columnar epithelium✓tissue (2)
(b) B✓ - Nerve tissue/motor neuron✓ (2)
(c) A ✓- Bone tissue✓ (2)
(d) C ✓- Cartilage✓ (2)
(8)

1.5 1.5.1 (a) X - guard cells/cytoplasm✓ (1)
(b) Y - stoma✓ (1)
(c) Z - chloroplast✓ (1)

1.5.2 Photosynthesis ✓
Gaseous exchange✓
Transpiration✓ (2)
(Mark the first TWO only)

1.5.3
- The cuticle and epidermis are transparent✓ to allow light to pass through for photosynthesis✓
- It is flattened✓ to provide large surface area ✓for maximum light absorption
- Epidermal tissue lacks organelles, thus allowing light to pass through
- There are no intercellular air spaces, increasing maximum absorption of light

(Mark the first TWO only) **Any**(1 x2) (2)
(7)

TOTAL SECTION A 50

SECTION B

QUESTION 2

2.1 2.1.1 Carbohydrates ✓ (1)

2.1.2 Monosaccharides ✓ (1)

2.1.3
- Building blocks of all organic material in cells✓
- Used in the formation of enzymes which control many reactions ✓
- Hormones are proteins which control✓
- Metabolic✓activities/processes
- Reserve source of energy✓
- Required for growth and repair of body tissues✓
- Haemoglobin is a protein which plays a role in the transport of oxygen and carbon dioxide✓ (2)

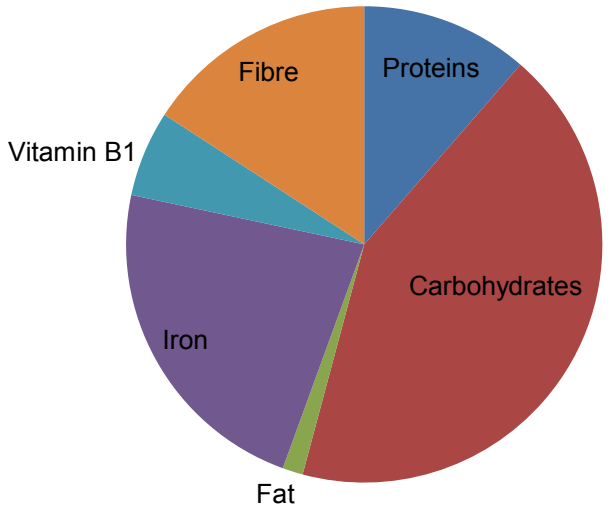
(Mark the first TWO only)

2.1.4 Iron ✓ (1)

2.1.5

Proteins	= 4/ 35 x 360	= 41°
Carbohydrates	= 15/35 x 360	= 154°
Fat	= 0.5/35 x 360	= 5°
Iron	= 8/35 x360	= 82°
Vitamin B1	= 2/35 x 360	= 21°
Fibre	= 5.5/ 35 x 360	= 57°

Pie chart showing nutrients present in a box of cereal



Criteria for marking graph:

Criteria	Mark allocation
Correct type of graph **(T)**	1
Caption (**C)**	1
Correct calculations **(CA)**	All calculations correct: 2 1-5 correct:1
Plotting **(P)**	All slices correct :2 1-5 correct:1

(6)

(11)

2.2
- Each enzyme has a particular shape✓
- The substrate fits into the enzyme✓(on which the enzyme work on)
- An enzyme – substrate complex is formed✓
- A chemical reaction occurs and the substrate is changed✓
- The enzyme and the product are then separated✓
- The enzyme is free to react with more of the substrate✓ **(5)**

2.3 2.3.1 (a) Matrix✓ (1)
(b) Stroma✓ (1)

2.3.2 Grana/grannum/thylakoids ✓ (1)

2.3.3
- Muscles require a large amount of energy✓ to function
- Therefore, many mitochondria ensure maximum energy production✓ by the cells (2)

2.3.4

Organelle A/ Mitochondrion	Organelle B/ Chloroplast
Found in both plant and animal cell ✓	Found in plant cells only✓
Site for cellular respiration✓	Site for photosynthesis✓

1 for the table + 4

(Only location and function)

(5)

2.3.5 Actual size = Measured size (ruler)/ Magnification ✓
= 86 mm / 4 000 ✓
= 0,0215✓ micrometres (3)
(13)

2.4 2.4.1 (a) Anaphase✓ (1)

(b) Chromatid✓ (1)

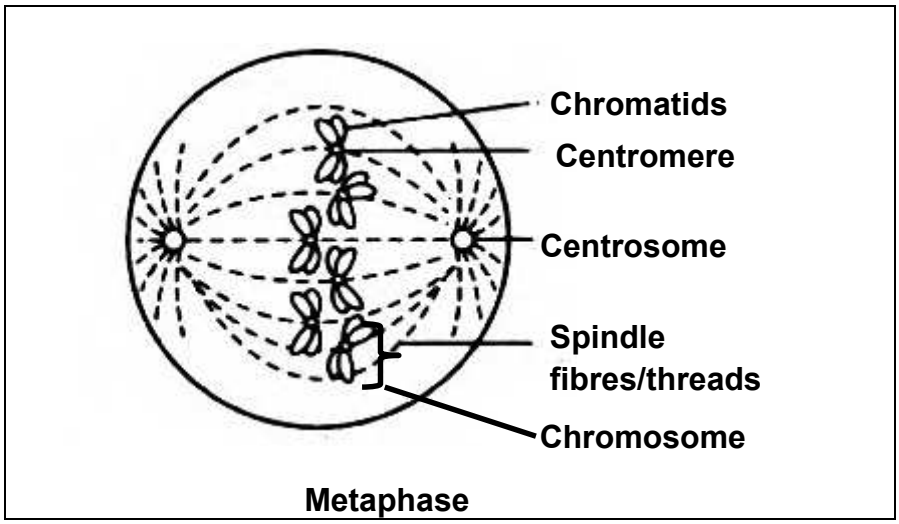
(c) A✓ (1)

2.4.2 Cancer ✓ (1)

2.4.3 6/Six ✓ (1)

2.4.4 - Part C/ spindle fibres would not be able to pull and separates chromosome✓
- There will be no chromosome/chromatids moving to each pole✓ (2)

2.4.5



Metaphase

Criteria for the marking the diagram:

Criteria	Mark allocation
Correct phase drawn **(P)**	1
Correct number of chromosome **(N)**	1
Caption **(C)**	1
Any correct label **(L)**	1

(4)

(11)

2.5 2.5.1 Meristematic tissue, is the tissue that is actively dividing✓ to form new cells✓ (2)

2.5.2 (a) - Healing✓
- Repair ✓ (2)

(Mark the first TWO only)

(2)

(b) - To provide a source of meristematic cells✓
- in case the plant is attacked again✓

2.5.3 - Act as packaging tissue✓
- Stores water, sugar and starch✓ (2)
- Intercellular air spaces allow gases and water to pass through the tissue✓
(Mark the first TWO only)

(2)

2.5.4 - Bark ✓ **(10)**
- Epidermis✓ **[50]**
(Mark the first TWO only)

TOTAL QUESTION 2

QUESTION 3

3.1 3.1.1 (a) Transpiration rate✓ (1)
(b) Temperature✓ (1)

3.1.2 - Prevent the evaporation of water from the test tube✓
- so that the final reading is reliable✓ (2)

3.1.3 - Cut leafy twig under water ✓
to prevent air from getting into the xylem tissue✓
- Make a diagonal cut ✓
to increase the surface area of absorption of water/
prevent xylem from being damaged ✓
- Use twigs of the same size and species✓
because a larger twig/ different type of species will have more leaves and will have a faster rate of transpiration✓
/ will absorb the water faster (1x2) (2)
(**Mark the first ONE only)**

3.1.4
- Same species of leafy twig✓
- Same age of leafy twigs✓
- Same type of cylinder✓
- Same person taking readings✓
- Equal amount of oil✓ (2)
(Mark the first TWO only)

3.1.5 - Water in cylinder **D** will dry out✓
- Cells in the leafy twig will lose water and dry out✓

- Leading to death of the leafy twig✓ (3)

3.1.6 - The hairs trap a thin layer of water vapour✓ close to the leaf surface.
- Leading to lower diffusion gradient✓
- resulting in less transpiration✓ (3)
(14)

3.2 3.2.1 Cambium ring / annual rings ✓ (1)

3.2.2 - Part A / epidermis is a single layer of cells✓
- That are closely packed together✓
- They are covered with waxy cuticle✓ (3)

3.2.3 Part D/phloem transport manufactured food from the leaves to all part of the plant✓ (1)
(Mark the first ONE only)

3.2.4 - The cells are elongated cells, ✓/ where the cross walls disappear to form continuous tubes for the transport of water✓
- Xylem tissue does not contain cytoplasm✓/ contains no living tissue so that the path of water is not blocked ✓by the cytoplasm
- The cellulose cell walls are strengthened with lignin, ✓ to prevent them from collapsing ✓under the strong suction pressure (4)
(Mark the first TWO only) (2 x2) **(9)**

3.3 3.3.1 (a) 24✓ (1)

(b) menopause✓ (1)

3.3.2 - As the person get older/ as age increases the bone density decreases/ become weak✓✓ (2)

3.3.3 - Exercises strengthen bone mass and make it stronger✓ / denser
- while calcium-rich food provides minerals, which build strong - bones✓, causing bone to have high density
(Mark the first TWO only) (2)

3.3.4 (a) Brain ✓ (1)

3.3.5 (b) - Movement ✓
- Support✓
- Hearing✓
- Storage of minerals✓ Any (3)
(Mark the first THREE only) **(10)**

3.4 3.4.1 Osmosis✓ (1)

3.4.2 **Y** to **X**✓ **/** from the potato to the beaker (1)

3.4.3 - Water in the beaker has more solutes/strong sugar solution ✓
- The beaker has low water potential✓
- The water will then diffuse from the potato to the beaker where there is low water potential✓ (3)

3.4.4 - Solution in beaker has more solutes than the potato✓
- Therefore, it has low water potential✓
- The water will diffuse from the potato into the solution in the beaker✓
- The potato will therefore decrease in size✓ (4)
(9)

3.5 3.5.1 Atrial systole✓ (1)

3.5.2 0.3 seconds✓ (1)

3.5.3 (a) **Diagram A**
- Muscles of the atria contract✓
- The tricuspid and bicuspid valves open to allow blood to flow from atria into the ventricles ✓ Any (1)

(b) **Diagram B**
- Muscles of the ventricles contract✓
- Both tricuspid and bicuspid valves close✓
- Semi-lunar valves of the pulmonary artery and aorta open✓
- Deoxygenated blood from the right ventricle is forced up the pulmonary artery and moves to the lungs✓
- Oxygenated blood from the left ventricles is forced up the aorta and moves to all parts of the body ✓ Any (3)

(c) **Diagram C**
- Muscles of the atria and ventricles relax✓
- Semi-lunar valves in aorta and pulmonary artery close ✓
- Deoxygenated blood from the vena cava fills the right atrium; oxygenated blood fills the left atrium✓
The cycle starts again Any (2)
(6)
(8)
[50]

TOTAL QUESTION 3 100
TOTAL SECTION B 150
GRAND TOTAL