LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION


# GRADE 10

# LIFE SCIENCES

## FORMAL TASK 3

## ASSIGNMENT

**02 MAY 2024**



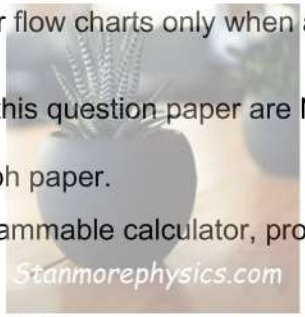
**TOTAL MARK: 100**

**DURATION: 2HRS**

THIS QUESTION PAPER CONSISTS OF 9 PAGES INCLUDING COVER PAGE

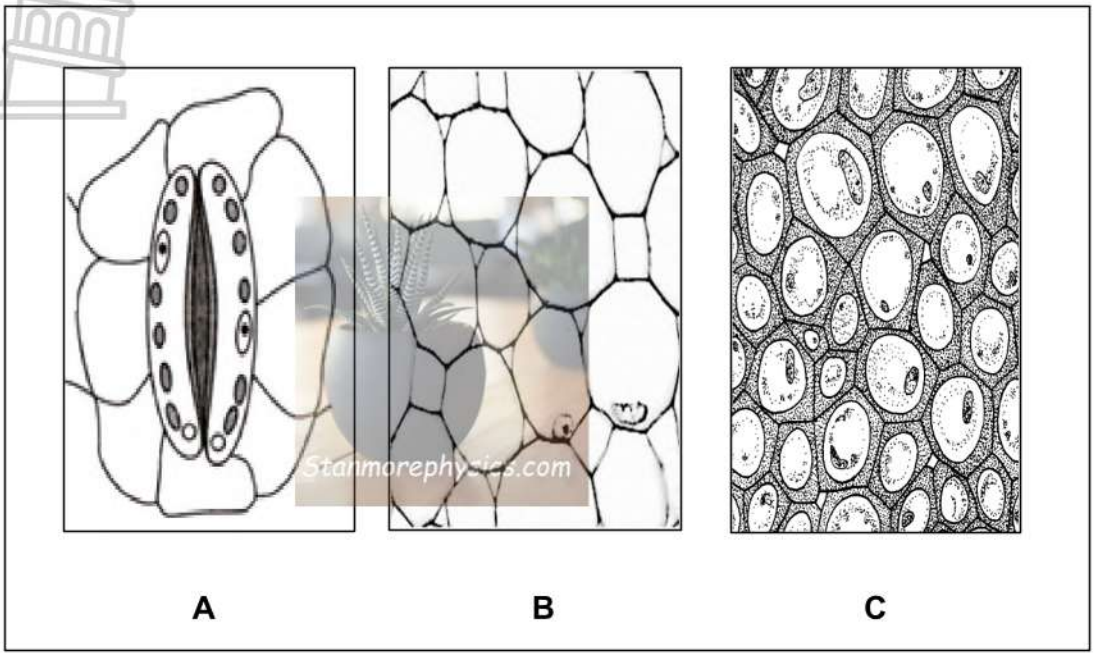
**INSTRUCTIONS AND INFORMATION**

1. Answer ALL the questions
2. **The assignment should be done in a controlled venue (avoid peer copying)**
3. Number the answers correctly according to the numbering system used in this question paper
4. Present your answers according to the instructions of each question.
5. Do ALL drawings in pencil and label them in black or blue ink.
6. Draw diagrams or flow charts only when asked to do so.
7. The diagrams in this question paper are NOT necessarily drawn to scale
8. Do NOT use graph paper.
9. Only a non-programmable calculator, protractor and a compass must be used where necessary
10. Write neatly and legibly.



**QUESTION 1 PLANT TISSUE**

1.1 Study the microscopic diagrams below showing different types of plant tissues.




1.1.1 Identify tissues **B** and **C** (2)

1.1.2 Explain TWO structural adaptations of tissue **A** that enable its functions (2)

1.1.3 Explain why tissue **C** would not be suitable as the main tissue in the root between the epidermis and the xylem (4)

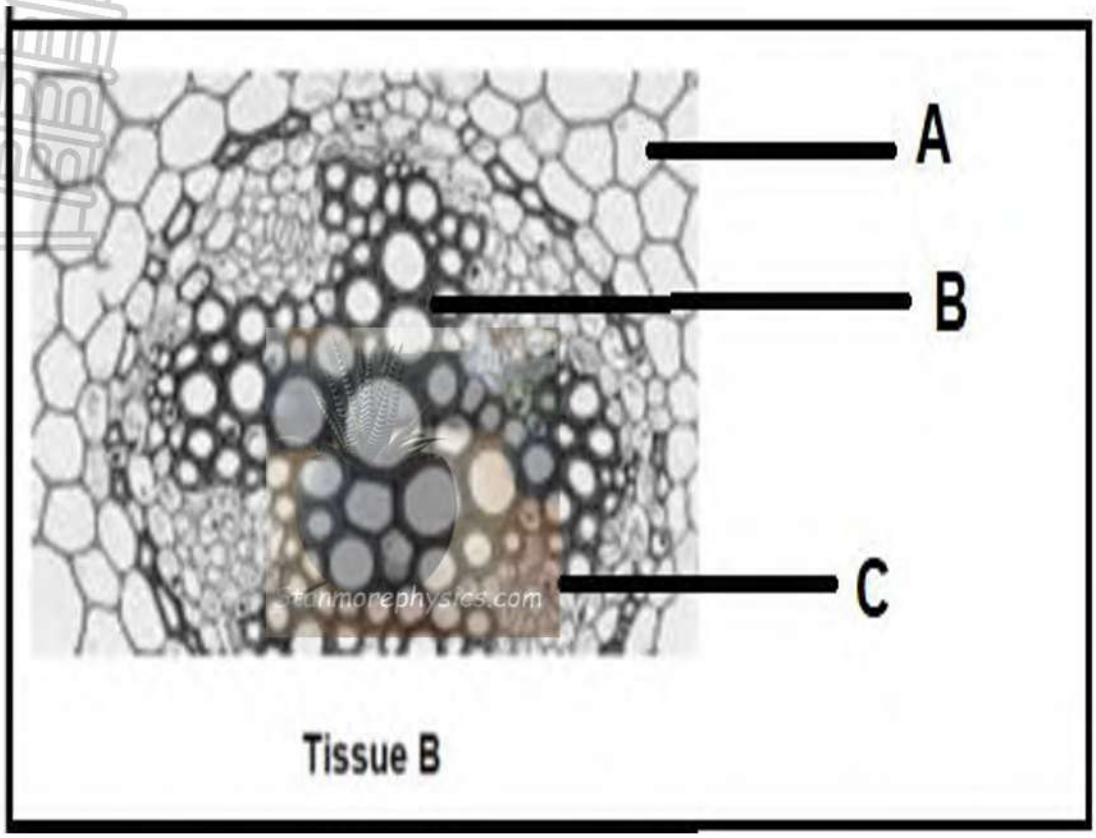
1.1.4 Tissue **A** also lines the root where it plays a role in increasing the surface area for absorption of water.

Draw a fully labelled diagram of an epidermal cell with a root hair (4)

**(12)**

1.2 Tabulate THREE differences between xylem and phloem sieve tubes (7)

1.3 Study the structure of a transverse section through dicot root showing different tissues.




1.3.1 Give the LETTER and NAME of tissue that:

a. Transport water (2)

b. Transport manufactured food from the leaves to all parts of plants (2)

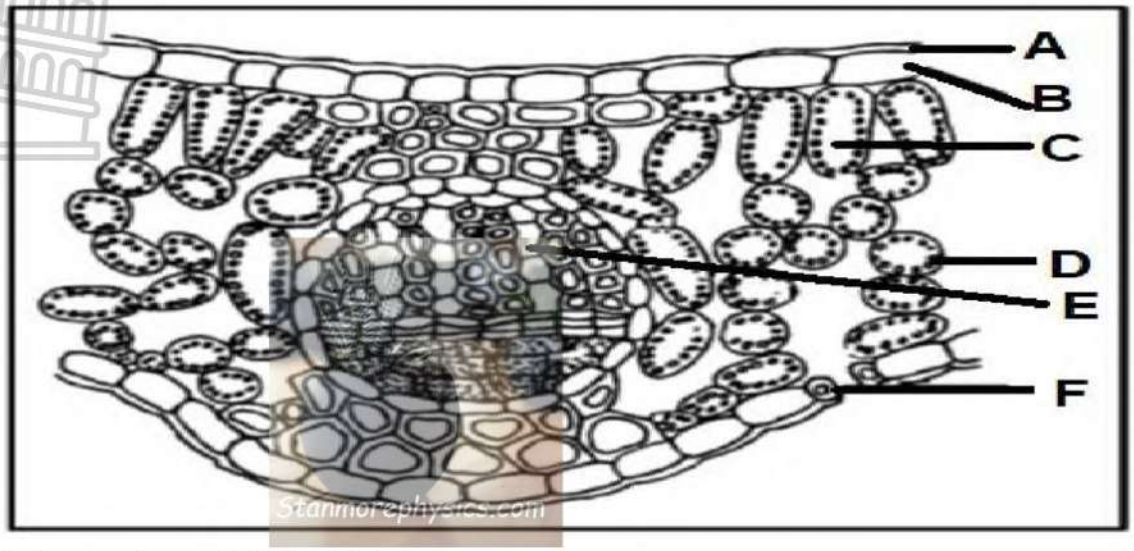
c. Store food in the form of starch (2)

1.3.2 Explain why tissue B is lignified (2)

**(8)**

**QUESTION 2 PLANT ORGAN**

2.1 Study the diagram below of the cross section of a dicotyledonous leaf




Redraw and complete the table below.

| Structure Labelled | Name | Structural suitability | Function | |
|---|---|---|---|---|
| B | Epidermis | It is transparent and contain no chloroplast. | 2.1.1_____(2) | (2) |
| D | 2.1.2_____(2) | Large intercellular space | 2.1.3_____(2) | (4) |
| C | 2.1.4_____(2) | 2.1.5_____(2) | Responsible for photosynthesis | (4) |

2.2 Give name of structure labelled A. (1)

2.3 Name the tissue responsible for transporting food to other parts of the plants. (1)

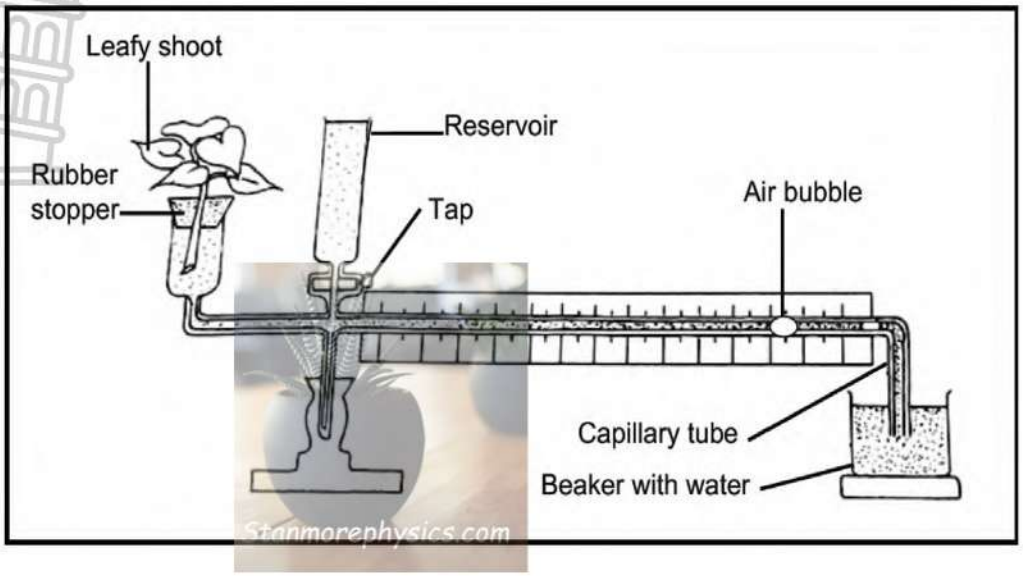
2.4 Give the collective name of structure numbered C and D (1)

2.5 Describe THREE additional structural adaptations of leaves that haven't been discussed in question 2.1 through 2.3, explaining how these adaptations support the process of photosynthesis. (6)

**QUESTION 3: SUPPORT AND TRANSPORT SYSTEM**

3.1 Mpho set up the following apparatus to investigate how temperature affects transpiration rate.




3.1.1 Identify the apparatus shown above (2)

3.1.2 What is the aim of this investigation? (2)

3.1.3 a. Independent variable (1)

b. Dependent variable (1)

3.1.4 Explain why the leafy shoot should be cut underwater. (2)

3.1.5 a. Explain the purpose of the air bubble. (2)

b. Explain how the speed of movement of the air bubble will be affected if Mpho apply Vaseline to the ventral surface of all the leave. (2)

3.1.6 What is the purpose of the water in the reservoir? (2)

3.1.7 State TWO way in which the Grade 10 learners ensured the reliability of this investigation. (2)

3.1.8 Mpho recorded the result of her experiment as indicated below. Study the results and answer questions that follows.

| Temperature $^0$C | 22 | 25 | 27 | 28 | 30 |
|---|---|---|---|---|---|
| Transpiration rate ( mol /m$^2$ sec) | 1.5 | 3.5 | 5 | 4.5 | 4 |

a. Draw a suitable graph to illustrate the above results. (6)

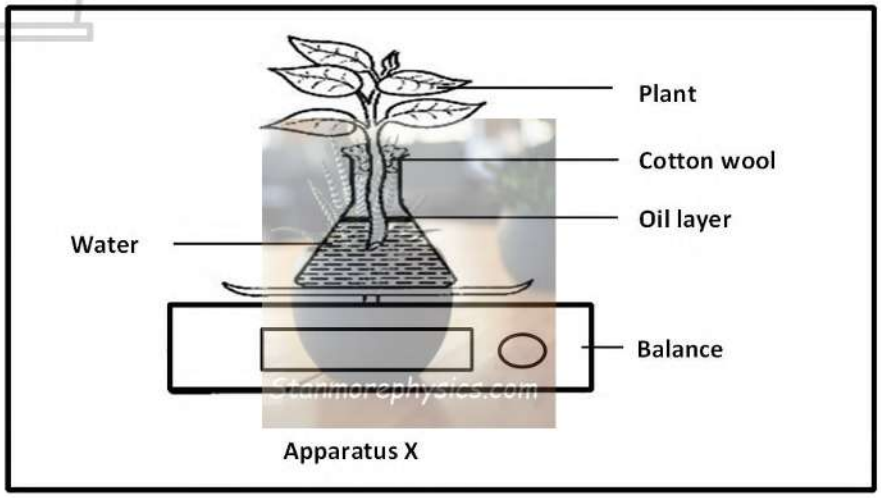
b. Give suitable conclusion for this investigation. (2)

**(24)**

3.2 An investigation was carried out to study the effect of light intensity on the opening and closing of the stomata

1. Apparatus X (shown in the diagram below) was used to measure the rate of water loss from the leaves at several light intensities.
2. At each light intensity, the apparatus was left for 15 minutes before starting measurements.
3. The water loss was recorded in the dark and at four different light intensities.



Apparatus X

| Light intensity (kilolux) | Loss of water (g/hour) |
|---|---|
| 0 | 1 |
| 10 | 15 |
| 20 | 20 |
| 30 | 22 |
| 40 | 20 |

3.2.1 Calculate the average loss of water after 5hrs (3)

3.3 The table below shows the distribution and size of stomata on the leaves of five different plants A to D.

| Plant | Average number of stomata per $cm^2$ | | Average size of stomata(µm) |
|---|---|---|---|
| | Upper epidermis | Lower Epidermis | |
| | | | |
| A | 4000 | 28000 | 7X3 |
| B | 0 | 16000 | 11X4 |
| C | 2500 | 2300 | 38X8 |
| D | 3500 | 1300 | 18X7 |
| E | 0 | 1400 | 31X8 |

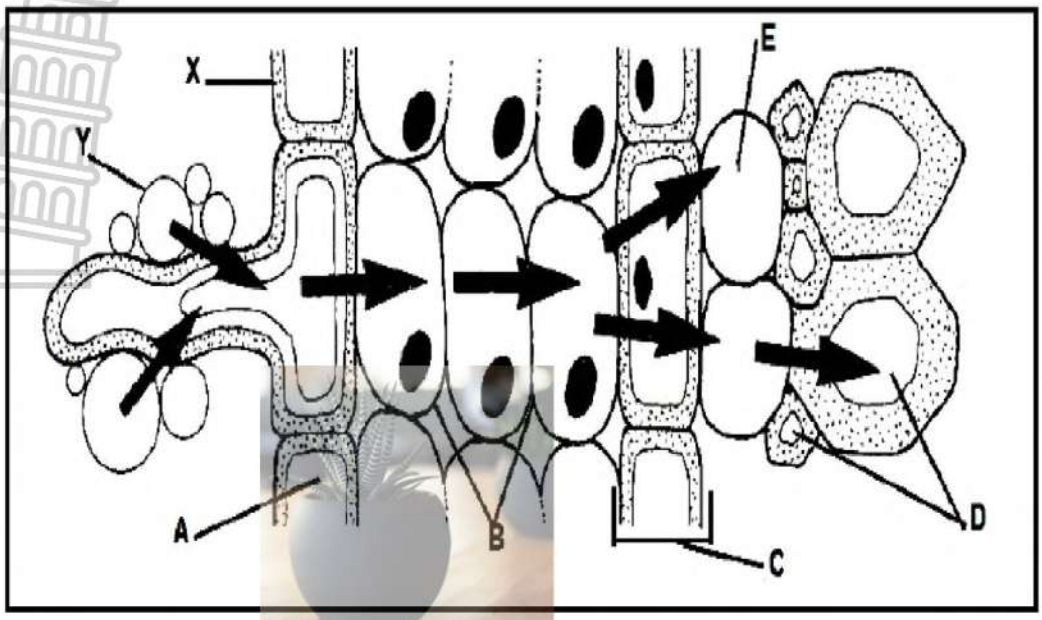
3.3.1 Based on the number of stomata, which plant is likely to have the highest rate of transpiration per $cm^2$ of leaf area? (1)

3.3.2 Based on the number of stomata, which plant is most likely to be found in a way dry area? (1)

3.3.3 Explain your answer in question 3.3.2 (2)
**(4)**

3.4 The diagram below represents the pathway of water through the root.






3.4.1 Give the structure labelled

a. A (1)

b. D (1)

c. A (1)

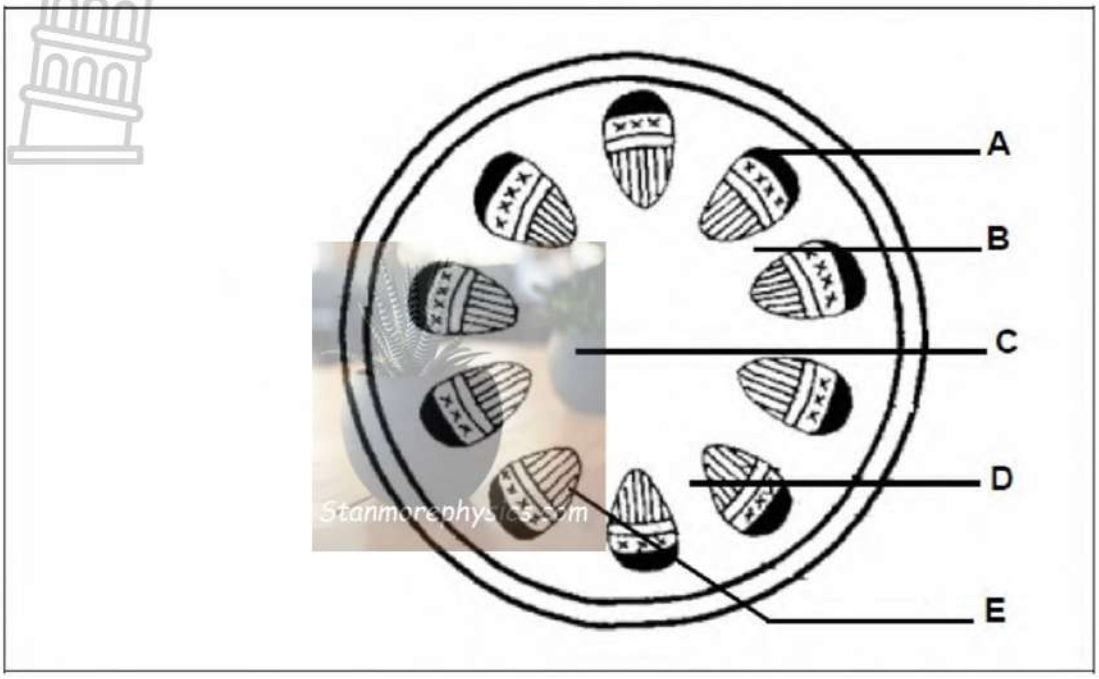
3.4.2 Name THREE structural adaptations of the root hair for the function of water absorption. (3)

3.4.3 THREE forces responsible for the upward movement of water through the tissue labelled D. (3)

**(9)**

3.5 Describe the movement of water from the xylem of the roots to the leaves of the plant **(6)**

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




3.6.1 Provide suitable caption for the above diagram (1)

3.6.2 Supply labels for Part A and E. (2)

3.6.3 The plant organ above grow over period of time. Below is the table to show its growth over years.

| | YEARS | | | |
|---|---|---|---|---|
| | 2001 | 2002 | 2003 | 2004 |
| Width of Spring Wood(mm) | 2,5 | 10,5 | 6,5 | 4,5 |
| Width of Autumn Wood( mm) | 2,5 | 4,5 | 2,5 | 2,0 |

How old is the plant? (1)

Calculate the percentage increase on the width of this organ over the period indicated on the table. (4)

**(8)**

**TOTAL 100**

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## ASSIGNMENT MARKING GUIDELINES

**02 MAY 2024**


MARKS: 100

**THIS MARKING GUIDELINE CONSISTS OF 9 PAGES**

**MARKS: 100**

## PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. If more information than the 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 the 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 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 the questions but the wrong number is given, it is acceptable.

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

12. Spelling errors
    If recognisable, accept answer, provided it does not mean something else in Life Sciences or if it is used 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 accept.

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 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.

QUESTION 1

1.1

1.1.1

B Parenchyma ✓ (1)
C Collenchyma ✓ (1)

1.1.2 -Epidermal cells are transparent ✓ (2)
- to allow sunlight to enter the leaf for photosynthesis✓

- Epidermal cells are closely packed ✓
- to protect underlying cells ✓

- Epidermal cells in stems and leaves covered by cuticle✓
- to reduce water loss ✓

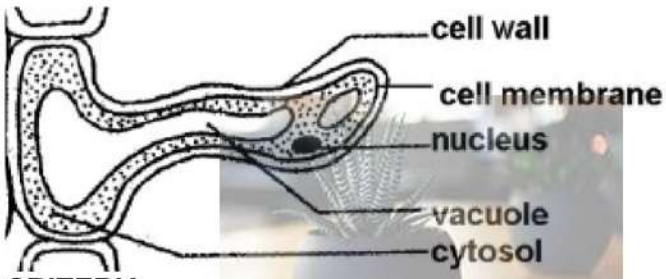
- Presence of guard cells with stomata ✓
- allow for gaseous exchange ✓

- Guard cells have chloroplasts ✓
-To allow for photosynthesis✓
Mark the first TWO only

1.1.3

- Tissue C has closely packed cells✓ /cells with no intercellular spaces (4)
- so it will not allow for movement of water/gases ✓
- The cells have thickened walls✓
- that will not allow water to pass through✓

1.1.4 Structure of Epidermal cell with Root hair




**CRITERIA**

| | |
|---|---|
| Caption | ✓ |
| Root hair drawn | ✓ |
| Any two label | ✓ ✓ |
| | |

(4)

**(14)**

1.2

| **Xylem vessels** | **Phloem sieve tubes** |
|---|---|
| Conducts water and dissolved mineral salts✓ | Conducts dissolved food✓ |
| Walls are thickened✓ /lignified | Walls are thin✓ /made up of cellulose |

| | |
|---|---|
| Cross walls perforated✓ /absent | Sieve plates present✓ |
| Transport is from root to leaves✓ | Transport is from leaves to roots✓ (7) |

1 for table + Any 3 x 2 **(6)** **(7)**

1.3

1.3.1

a. B✓ Xylem ✓ (2)

b. C ✓ Phloem ✓ (2)

c. A ✓ Parenchyma ✓ (2)

1.3.2

To strengthen the wall so that they do not collapse ✓ ✓ (2)
**(8)**



**QUESTION 2 PLANT ORGAN**

2.1

2.1.1 Epidermis -Allow light to pass through for photosynthesis✓ ✓ (2)

2.1.2 Spongy mesophyll ✓ ✓ (2)

2.1.3 Responsible for gaseous exchange✓ ✓ (2)

2.1.4 Palisade mesophyll ✓ ✓ (2)

2.1.5 Contain large amount of chloroplast ✓ ✓ (2)

**(10)**

2.2 Cuticle✓ **(1)**

2.3 Phloem tissue✓ **(1)**

2.4 Mesophyll tissue✓ **(1)**

2.5 The leaf is flattened✓- providing large surface area to absorb maximum sunlight. ✓ (2)

Xylem ✓ are close to mesophyll cells – allow water to move through tissue fast for photosynthesis. ✓ (2)

Stomata ✓ – control the intake of $CO_2$, loss of water and release of $O_2$. ✓ (2)

Large Vacuole ✓- to store products of photosynthesis✓
ANY THREE **(6)**

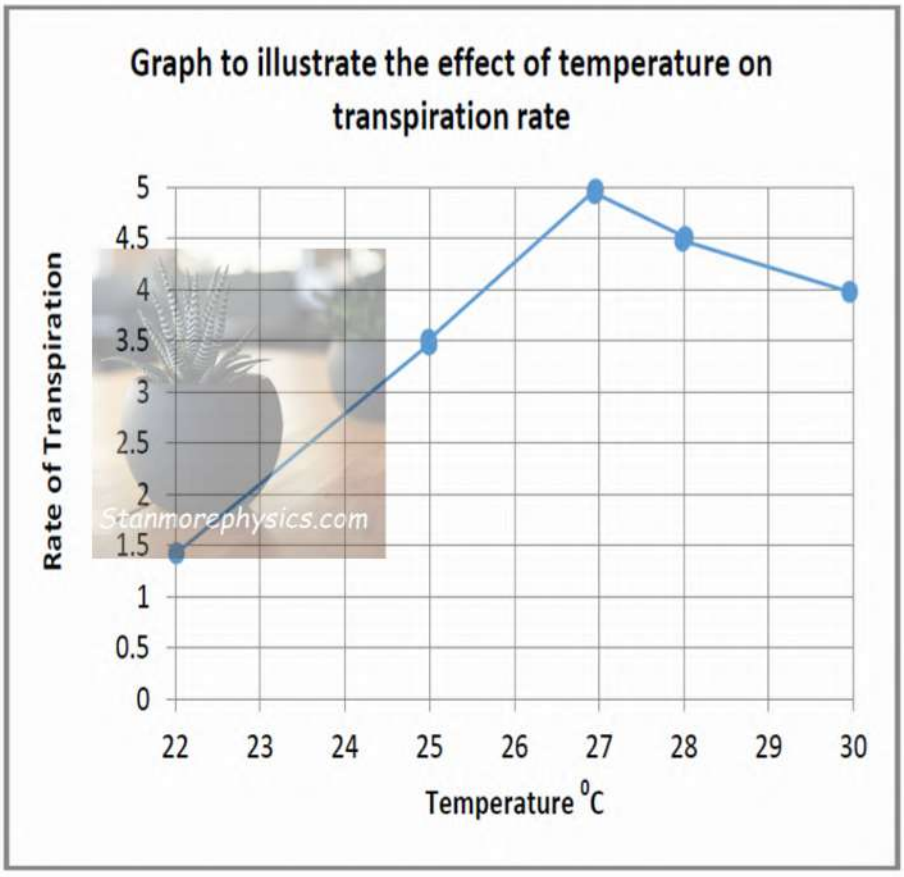
**QUESTION 3 SUPPORT AND TRANSPORT IN PLANTS**

3.1

| | | | |
|---|---|---|---|
| 3.1.1 | | Potometer ✓✓ | (2) |
| 3.1.2 | | To investigate the effects of temperature on transpiration rate✓✓ / to investigate how temperature affect the rate of transpiration. | (2) |
| 3.1.3 | a. | Temperature✓ | (1) |
| | b. | Rate of transpiration✓ | (1) |
| 3.1.4 | | -To prevent air from entering ✓<br>- and blocking the xylem vessels✓ | (2) |
| 3.1.5 | a | -To measure the rate of absorption✓<br>- which indicates the rate of transpiration ✓ | (2) |
| | b | -The speed of movement of the air bubble will be greatly reduced ✓<br>-Vaseline prevents transpiration at the ventral surfaces by blocking the stomata. ✓ | (2) |
| 3.1.6 | | To move the air bubble back ✓ | (2) |
| 3.1.7 | | -They did the investigation three times✓ /repeated the investigation<br>- Same apparatus/ potometer ✓<br>- Same light intensity/wind/humidity ✓<br>- Same person to conduct investigation✓ ANY TWO | (2) |

3.1.8

a.




RUBRIC: GRAPH

| CRITERIA | MARKS |
|---|---|
| Caption | ✓ |
| Type of Graph | ✓ |
| Correct scale X-axis and Y-axis | ✓ |
| Correct label X and Y- axis | ✓ |
| All points plotted and joined correctly | ✓✓ |

(6)

b. -As the rate of temperature increases the rate of transpiration increases to the optimum temperature✓
-the transpiration rate start to decrease✓ (2)

**(24)**

3.2

3.2.1 AVERAGE LOSS OF WATER = $\frac{(1+15+20+22+20)}{5}$ ✓✓ **(3)**

= 15,6g✓

3.3

3.3.1 Plant A ✓ (1)

3.3.2 Plant E✓ (1)

3.3.3 - Plant leaf has no stomata on the upper surface of the leaf – retention of water for needed photosynthesis is maximised. ✓
- Plant has few stomata on the lower surface of the leaf – few water will be lost. ✓ (2)

**(4)**

3

3.4

3.4.1

a. Endodermis✓ (1)
b. Xylem ✓ (1)
c. Epidermis ✓ (1)

3.4.2 -Finger-like protrusions of the epidermis✓
-Thin cell wall and cell membrane✓
-Large vacuole✓ (3)

3.4.3

Capillarity✓
Root Pressure✓
Transpiration ✓ (3)

**(9)**

3.5

- Transpiration pull*✓ is the main force that draws water upwards in a plant.
- The water potential in the intercellular air spaces of the mesophyll cells decrease✓ as water vapour is lost through the stomata of the leaves. ✓
- Water molecules diffuse from the cell walls of the mesophyll cells into the air spaces ✓ (6)
- The water potential of the mesophyll cell walls is now lower than that of the cell sap of the mesophyll cells ✓
- This water potential gradient extends back to the leaf xylem. ✓
- Tension builds up and a suction force develops at the top of the stem xylem, which pulls water up from the root xylem. A column of water is pulled upwards. ✓
- Therefore, the water that was lost through the leaves by transpiration is replaced by the absorbed water from the soil through the root hairs. ✓

**Mark FIRST FIVE + Compulsory mark** **(6)**

3.6

3.6.1 Diagram representation of the internal structure of a dicot stem✓ (1)

3.6.2 A-Sclerenchyma cap✓ (1)

E- Xylem✓ (1)

3.6.3

a. **4 years** ✓ (1)

b. **(6,5-5 )✓x 100✓** (4)
**5✓**
**=30%** ✓

**(8)**

**TOTAL** **100**