GRADE 11 ASSIGNMENT

TOPIC: PHOTOSYNTHESIS

TIME: 1HOUR **MARKS: 50**

.....

INSTRUCTIONS

1. **Answer ALL the questions**

.....

1. Look at the picture of part of a plant cell.

1.1 Use the arrow on the picture and the scale to estimate the length of the chloroplast. (3)

1.2 Complete the chemical equation for photosynthesis.

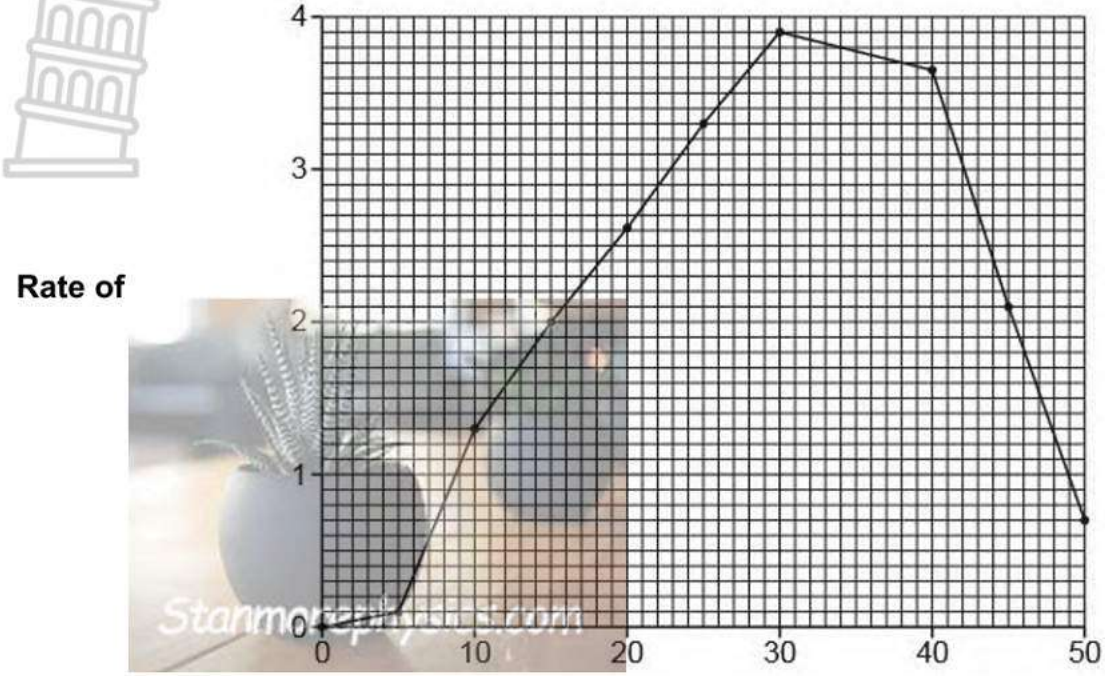
$6CO_2$ + ... ➡ $C_6H_{12}O_6$ + ... (2)

1.3 Photosynthesis takes place inside chloroplasts.

Draw a labelled diagram of this organelle in the leaves of plants. (5)

(10)

2. The graph is from an experiment to show the effect of temperature on the rate of photosynthesis



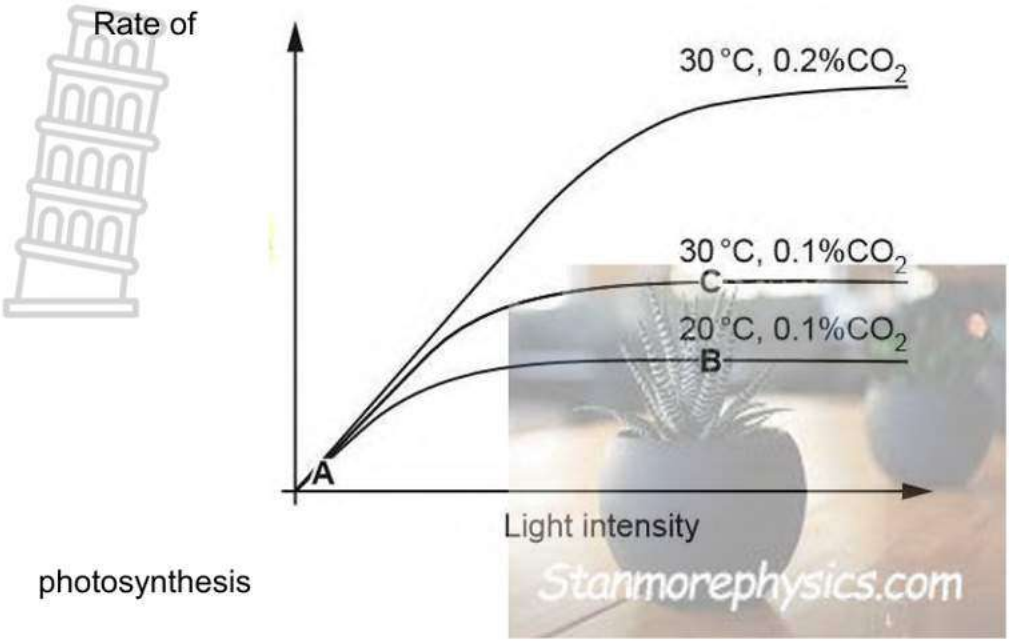
2.1 What is the optimum temperature for photosynthesis in this experiment? (1)

2.2 The rate of photosynthesis was recorded in 5 °C intervals.

The experiment could be improved to get a more precise value for the optimum temperature. Explain how. (2)

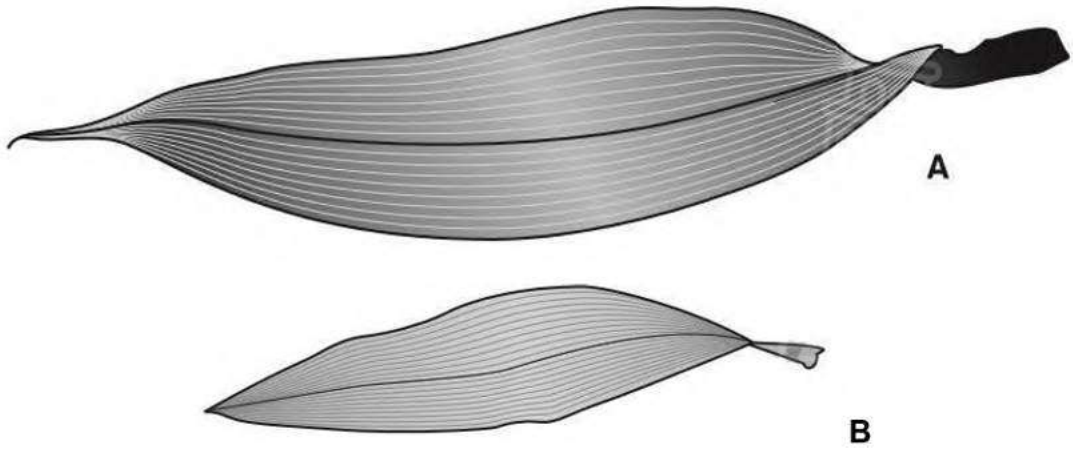
2.3 Use the results from the graph and put it into simple table format. (5)

Look at the graph. It shows how light intensity affects the rate of photosynthesis. The lines show different carbon dioxide concentrations and temperatures.



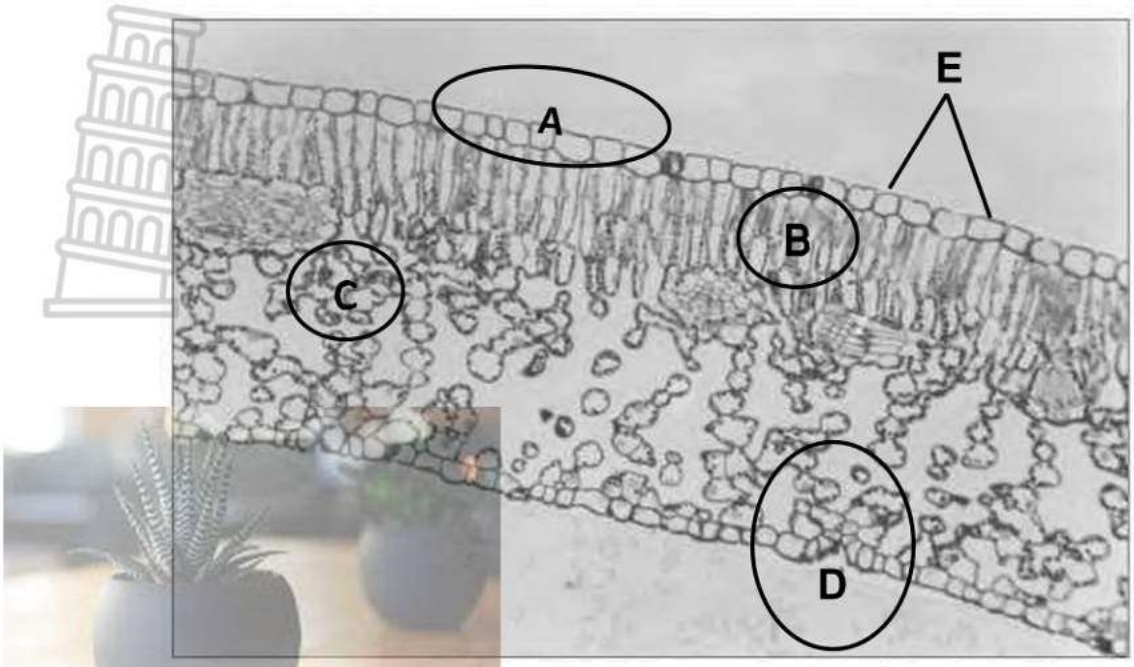
2.4 Explain what is limiting the rate of photosynthesis at the three points A, B and C on the graph. Use evidence from the graph in your answer. (3)

3. The figures below shows two leaves from the same plant.



3.1 Suggest which leaf carries out more photosynthesis and explain why. (4)

Below is a section of part of a plant as seen with a light microscope.



3.2 Provide labels for:

(a) different types of cells A, B and C (3)

(b) structure D (1)

(c) The waxy, water-repellent layer E (1)

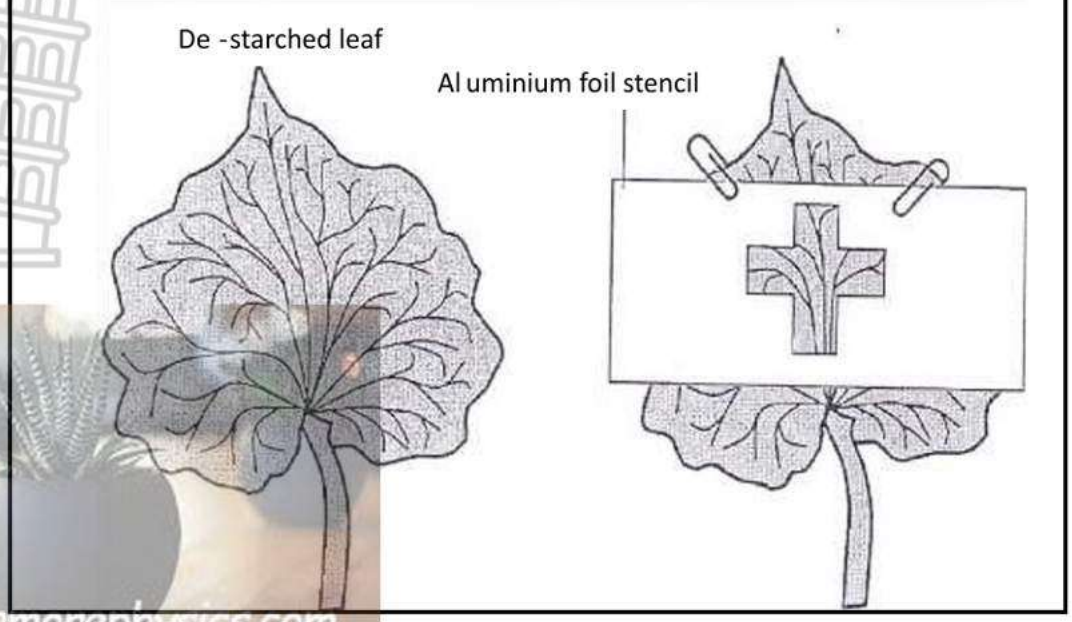
3.3 Provide a suitable heading for the above diagram (1)

(10)

4. An investigation was conducted to find out whether light is necessary for photosynthesis.

The procedure followed is given below:

- A geranium potted-plant was de-starched by placing it in a dark cupboard for 48 hours.
- A cross-shaped light-slit was cut out on aluminium foil.
- The aluminium foil stencil was then clipped onto one of the de-starched leaves, as shown in the diagram below.
- The potted plant was exposed to bright sunlight for 5 hours.
- After 5 hours, the aluminium foil stencil was removed and the leaf was tested for starch.



4.1 Explain why the plant was de-starched. (2)

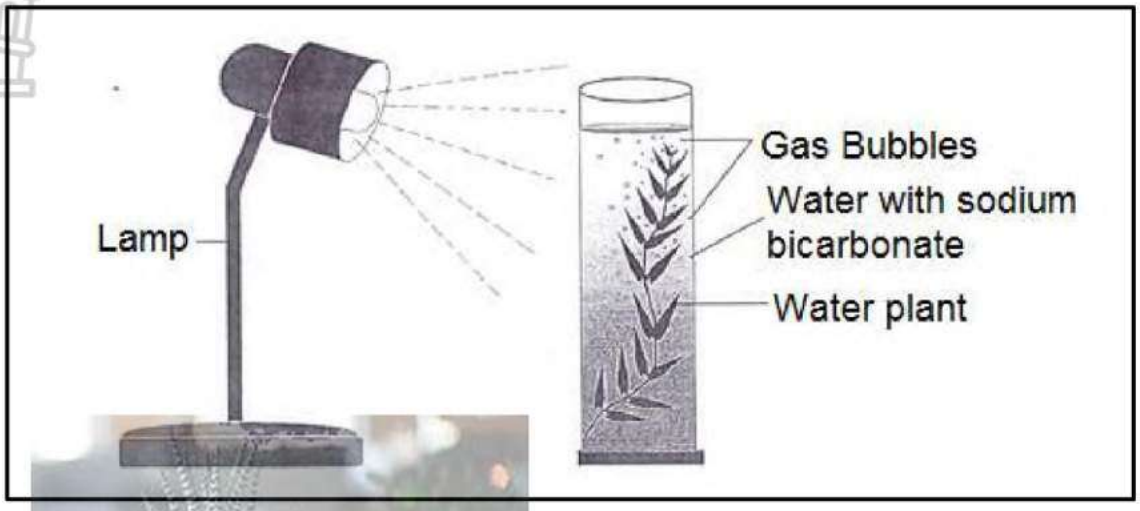
4.2 Describe the steps, in the correct sequence, that were followed during the starch test. (4)

4.3 **Draw a labelled diagram** of the leaf showing the result of the investigation. Use a pencil and shade the parts which tested positive for starch. (3)

4.4 Provide a conclusion for this experiment (1)

(10)

5. The apparatus shown below was used in an investigation to determine the effect of light intensity on the rate of photosynthesis.



The distance between the light source (lamp) and the apparatus (with a water plant) was changed at regular intervals, recording the number of bubbles released by the water plant at each distance.

The results are shown in the table below.

Distance between lamp and plant (mm)	40	80	120	160	200	240	280	320	360	400	440
Bubbles formed per minute	30	30	30	25	15	10	5	3	2	0	0

5.1 For the above investigation, state:

(a) The dependent variable (1)
(b) How the dependent variable was measured (1)
(c) The independent variable (1)
(d) How the independent variable was varied (1)

5.2 State ONE way in which the reliability of the investigation could be increased. (1)

5.3 **Plot a line graph** to represent the data obtained during this investigation. (5)

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INSTRUCTIONS

1. **Answer ALL the questions**

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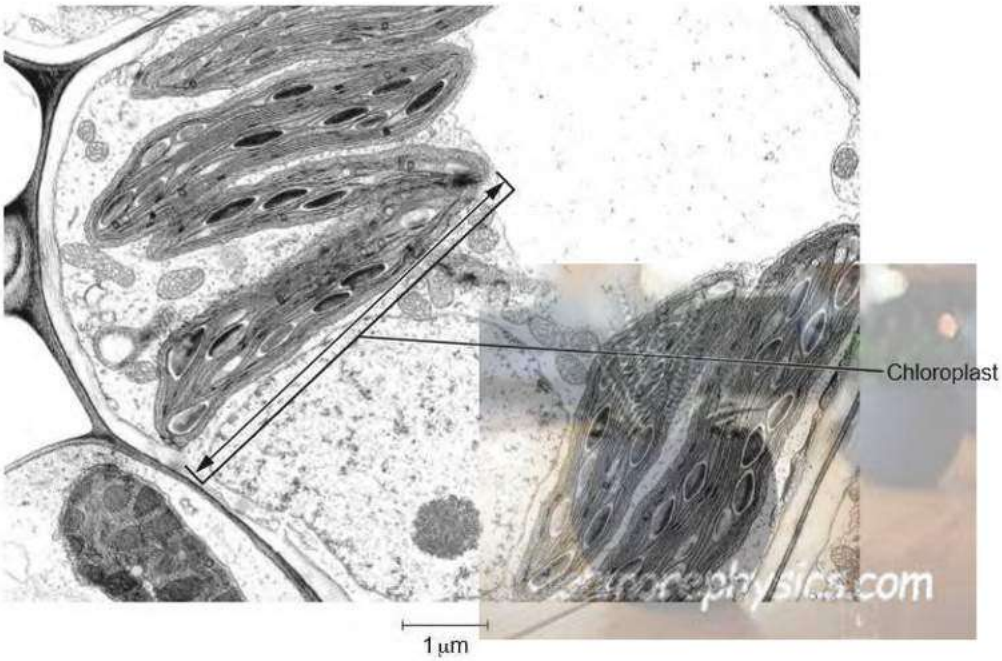
1. Look at the picture of part of a plant cell.



1.1 Use the arrow on the picture and the scale to estimate the length of the chloroplast.

Length of chloroplast = measured length of chroroplast x length of scale / measured length of scale line

= 52 mm x 1µm ✓ / 10 mm ✓

= 5.2 µm ✓

OR

Length of chloroplast = 5.2 cm x 1µm ✓ / 1 cm ✓

= 5.2 µm ✓

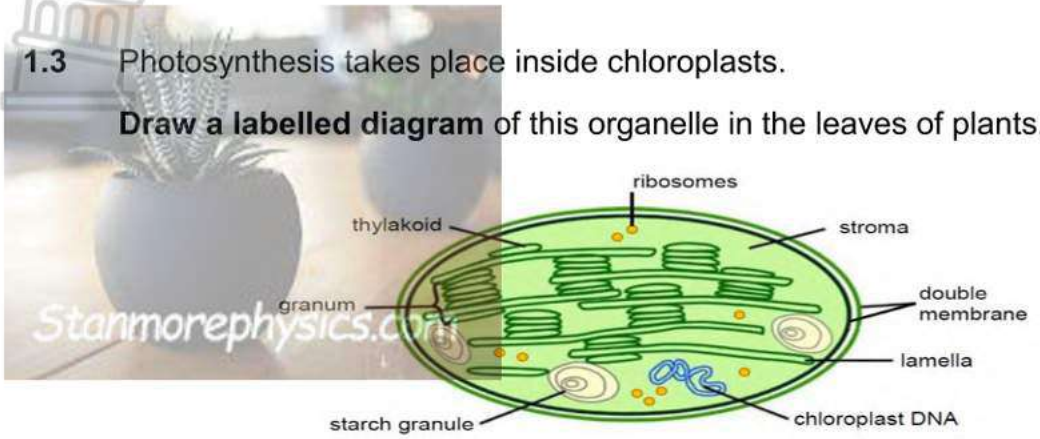
(Accept any answer between 5.0 - 5.2 cm as some schools reduced the papers). **(3)**

1.2 Complete the chemical equation for photosynthesis.

$6CO_2$ + **$6H_2O$** ✓ ⟶ $C_6H_{12}O_6$ + **$6O_2$** ✓ **(2)**

1.3 Photosynthesis takes place inside chloroplasts.

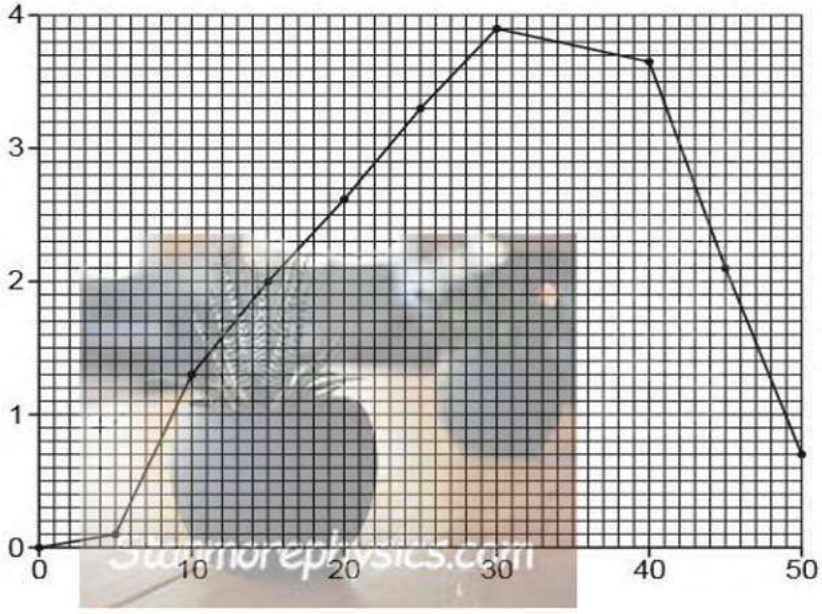
Draw a labelled diagram of this organelle in the leaves of plants. (5)



CAPTION OF DIAGRAM	1 MARK
CORRECT ORGANELLE DRAWN	1 MARK
ANY 3 CORRECT LABELS	3 MARKS

(10)

2. **The graph is from an experiment to show the effect of temperature on the rate of photosynthesis**



2.1 What is the optimum temperature for photosynthesis in this experiment? (1)

30°C ✓

2.2 The rate of photosynthesis was recorded in 5 °C intervals.

The experiment could be improved to get a more precise value for the optimum temperature. Explain how.

Increase the temperature by 1 degree only ✓for accuracy✓ (2)

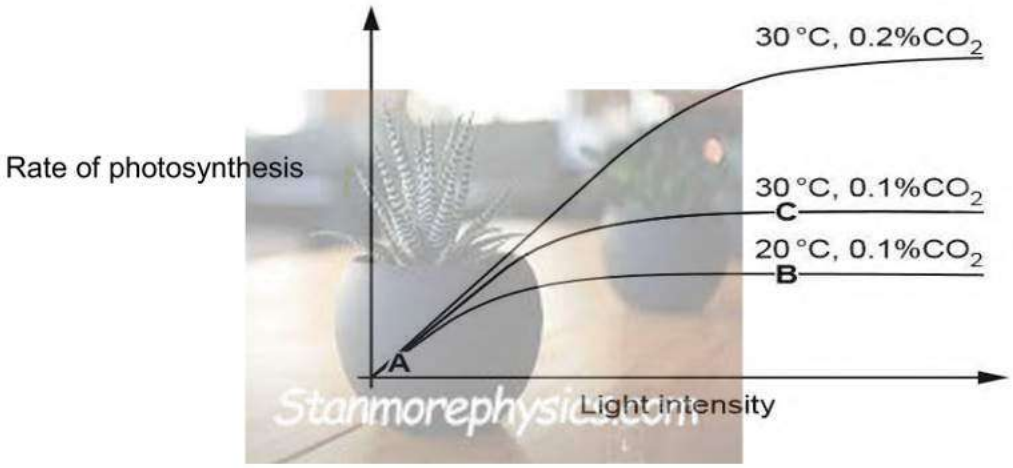
2.3 Use the results from the graph and put it into simple table format. (4)

EFFECT OF TEMPERATURE ON RATE OF PHOTOSYNTHESIS

Temperature	0	5	10	15	20	25	30	35	40	45	50
Rate of photosynthesis	0	0.1	1.3	2	2.6	3.2	3.9	3.8	3,6	3.7	0.7

CAPTION	1 MARK
CORREST HEADINGS	1 MARK
ALL VALUES FOR TEMPERATURE CORRECT	1 MARK
ALL VALUES FOR RATE OF PHOTOSYNTHESIS CORRECT	1 MARK

Look at the graph. It shows how light intensity affects the rate of photosynthesis. The lines show different carbon dioxide concentrations and temperatures.



2.4 Explain what is limiting the rate of photosynthesis at the three points A, B and C on the graph. Use evidence from the graph in your answer. (3)

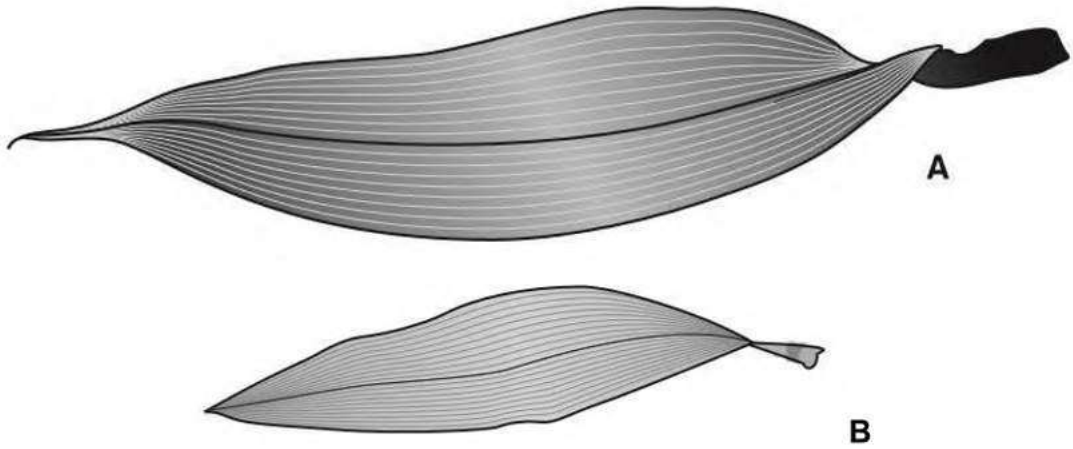
A – LOW LIGHT INTENSITY ✓

B – TEMPERATURE ✓ IS BELOW OPTIMUM / CO_2

C – CARBON DIOXIDE CONCENTRATION ✓ IS BELOW OPTIMUM

(10)

3. The figures below shows two leaves from the same plant.

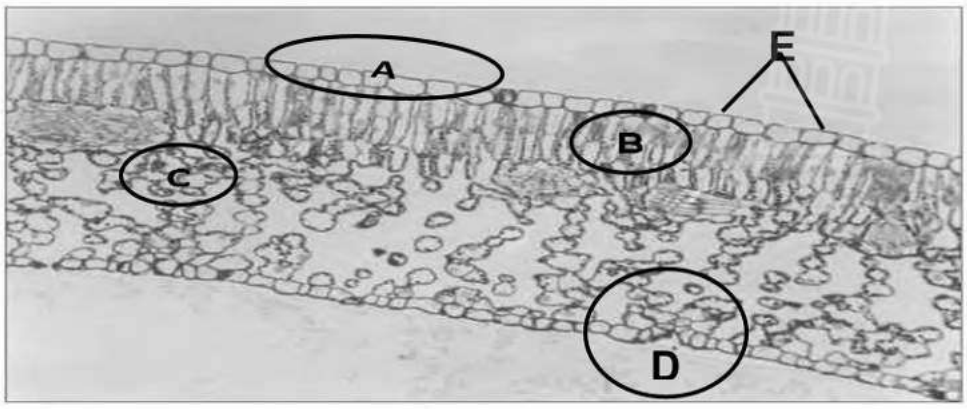


3.1 Suggest which leaf carries out more photosynthesis and explain why. (4)

***LEAF A ✓**

- **IT HAS A LARGE SURFACE AREA ✓ TO TRAP MORE SUNLIGHT ✓**
- **IT HAS MORE VEINS CONTAINING XYLEM AND PHLOEM TUBES ✓ TO TRANSPORT RAW MATERIALS AND PRODUCTS QUICKLY ✓**

Below is a section of part of a plant as seen with a light microscope.



3.2 Provide labels for:

(a) different types of cells A, B and C

- A - EPIDERMIS ✓
- B- PALISADE ✓
- C- SPONGY MESOPHYL ✓

(3)

(b) structure D (1)

- STOMA ✓/GUARD CELLS

(c) The waxy, water-repellent layer E (1)

- CUTICLE ✓

(c) Provide a suitable heading for the above diagram

- TRANSVERSE SECTION OF A LEAF ✓ (1)

(10)

4. An investigation was conducted to find out whether light is necessary for photosynthesis.

The procedure followed is given below:

- A geranium potted-plant was de-starched by placing it in a dark cupboard for 48 hours.
- A cross-shaped light-slit was cut out on aluminium foil.
- The aluminium foil stencil was then clipped onto one of the de-starched leaves, as shown in the diagram below.
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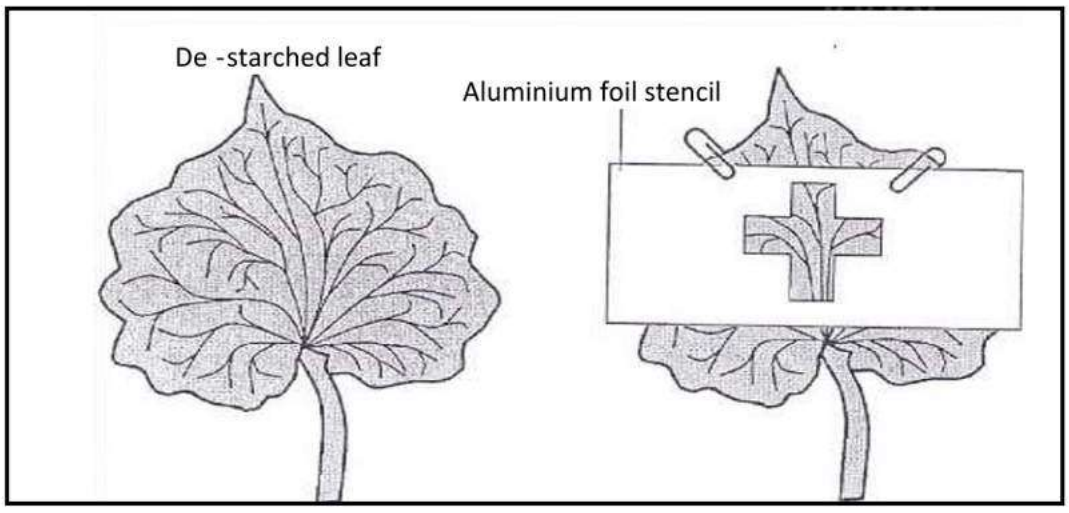
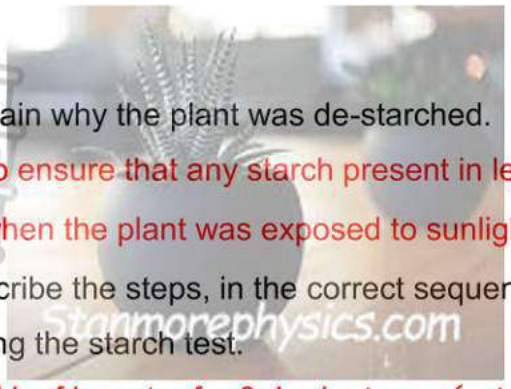
- After 5 hours, the aluminium foil stencil was removed and the leaf was tested for starch.





4.1 Explain why the plant was de-starched. (2)

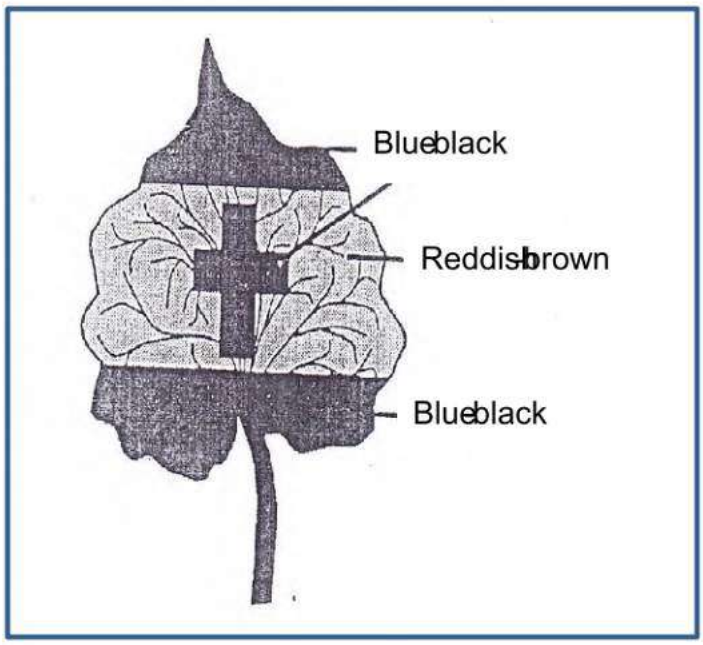
- To ensure that any starch present in leaf was produced during the investigation when the plant was exposed to sunlight for 5 hours

4.2 Describe the steps, in the correct sequence, that were followed during the starch test.

- Boil leaf in water for 3-4 minutes ✓ to soften it
- Boil leaf in alcohol for about 2 minutes ✓ to remove chlorophyll
- Rinse the leaf in cold water ✓
- Add a few drops of iodine solution to the leaf ✓

(4)

4.3 Draw a labelled diagram of the leaf showing the result of the investigation. Use a pencil and shade the parts which tested positive for starch. (3)



Leaf after starch test

Marking Guide

1 mark – correct drawing (with a cross)

1 mark – caption

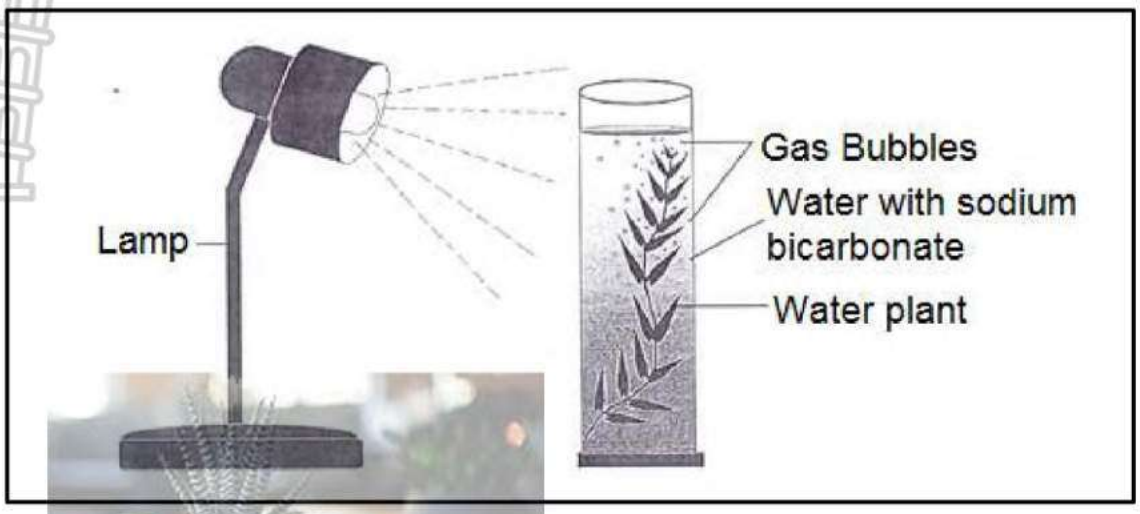
1 mark - correct labels

4.4 Provide a conclusion for this experiment. (1)

LIGHT IS NEEDED FOR PHOTOSYNTHESIS ✓

(10)

5. The apparatus shown below was used in an investigation to determine the effect of light intensity on the rate of photosynthesis.



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Bubbles formed per minute	30	30	30	25	15	10	5	3	2	0	0

5.1 For the above investigation, state:

(a) The dependent variable Rate of photosynthesis ✓ (1)

(b) How the dependent variable was measured Counting the number of bubbles formed per minute ✓ (1)

(c) The independent variable Light intensity ✓ (1)

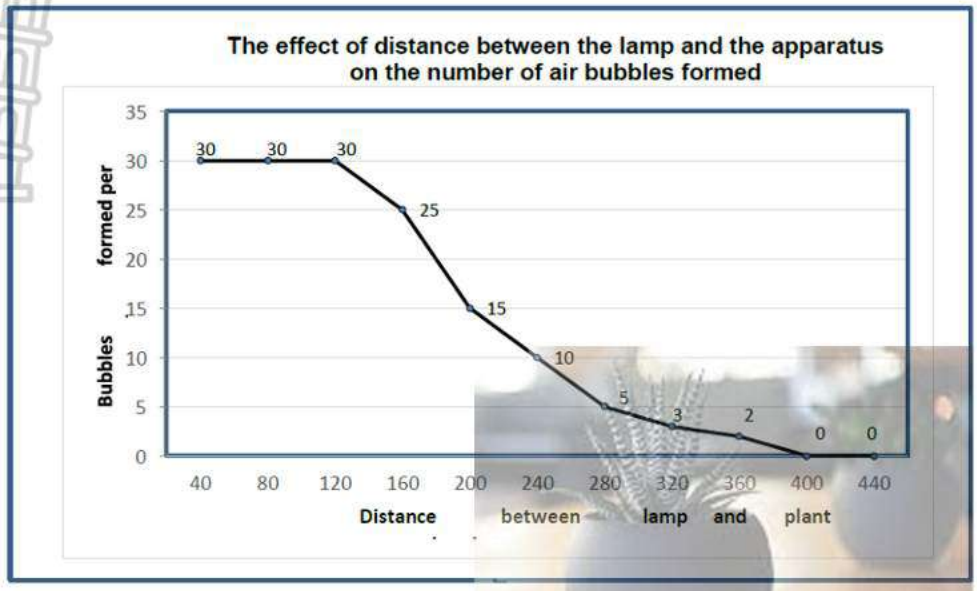
(d) How the independent variable was varied
Changing the distance of the lamp from the plant ✓ (1)

5.2 State ONE way in which the reliability of the investigation could be increased. Repeat the investigation ✓ or use more than one plant

(1)

5.3 Plot a line graph to represent the data obtained during this investigation.

(5)



Criterion	Elaboration	Mark
Caption	Includes both variables-distance between lamp and plant and no. of bubbles formed per minute	1
Scale	Appropriate scale for x-axis and y-axis	1
Labelling of axis	Correct label and units for x-axis and y-axis	1
Plotting of points	1-10 points plotted correctly – 1 mark All 11 points correctly plotted – 2 marks	2

(10)