



Basic Education

KwaZulu-Natal Department of Basic Education
REPUBLIC OF SOUTH AFRICA

PINETOWN AND ILEMBE DISTRICTS

LIFE SCIENCES

Grade 11

TOPIC TEST: PHOTOSYNTHESIS

MARKS: 50

TIME: 60 minutes

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 1.1.3) in your ANSWER BOOK, for example 1.1.4 D.

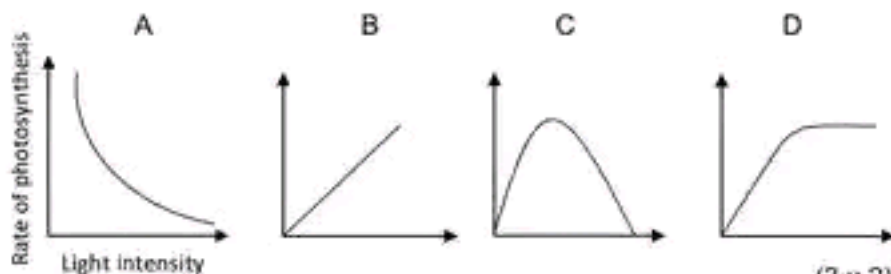
1.1.1 Which ONE of the following is a requirement in the dark phase of photosynthesis?

- A Carbon dioxide
- B Oxygen
- C Radiant energy
- D Water

1.1.2 The light phase of photosynthesis takes place ...

- A when light is absent.
- B when light is present.
- C during the night and day.
- D continuously.

1.1.3 Which ONE of the following graphs (A-D) represents the relationship between light intensity and the rate of photosynthesis most accurately?



(3 x 2)

(6)

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 1.2.4) in the ANSWER BOOK.

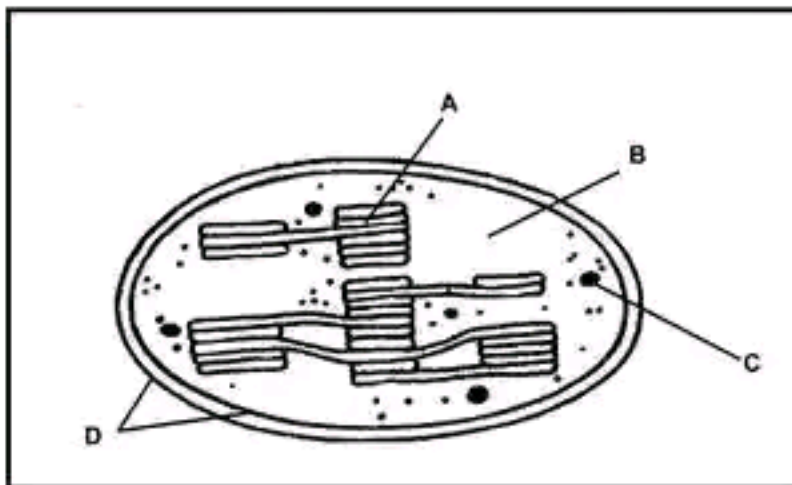
- 1.2.1 The phase of photosynthesis that is independent of light
- 1.2.2 Openings in a leaf through which gaseous exchange takes place during photosynthesis
- 1.2.3 An energy-rich carbohydrate that is formed during photosynthesis
- 1.2.4 A molecule that serves as an energy carrier during photosynthesis to help make organic molecules

(4)

TOTAL SECTION A: 10

SECTION B**Question 2**

- 2.1 The diagram below represents the chloroplast in which photosynthesis takes place.



- 2.1.1 Give the LETTER and NAME of the part:
- (a) Which stores the product of photosynthesis (2)
 - (b) Where carbon dioxide is used (2)
 - (c) Which contains chlorophyll (2)
- 2.1.2 Describe the role of water as a requirement in photosynthesis. (2)
- 2.1.3 State TWO ways in which photosynthesis is biologically important. (2)
- (10)**

- 2.2 The passage below relates to the agricultural use and manipulation of the factors that affect the rate of photosynthesis.

**THE AGRICULTURAL USE OF THE FACTORS
THAT LIMIT PHOTOSYNTHESIS**

Flowers, fruit and vegetables can all be grown in plastic tunnels or greenhouses. The farmers use these structures to regulate the light intensity, temperature and carbon dioxide concentration.

Artificial lighting in greenhouses increases the light intensity. The glass or plastic walls of the greenhouses trap the heat of the sun within the structures, thereby raising the temperature. Carbon dioxide concentration of the air within the structure is increased by pumping carbon dioxide into the structure.

This ensures that plants grow as fast as possible and to maximize the crop yield.

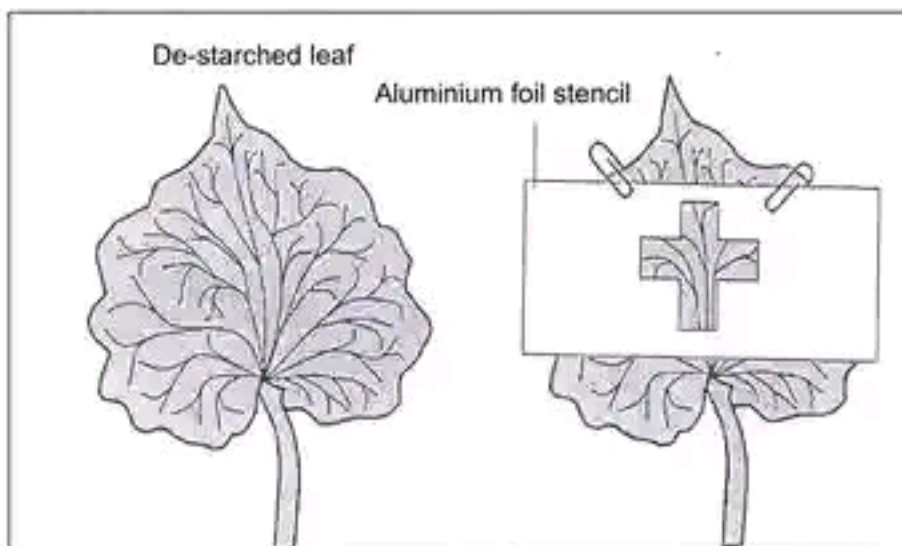
- 2.2.1 Name THREE limiting factors of photosynthesis that are mentioned in the passage. (3)
- 2.2.2 Explain why a continuous increase in carbon dioxide levels will not cause the rate of photosynthesis to increase continuously. (4)
- 2.2.3 Explain ONE other value of greenhouses to agriculture, besides its influence on the limiting factors of photosynthesis. (2)
- (9)
- [19]

Question 3

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

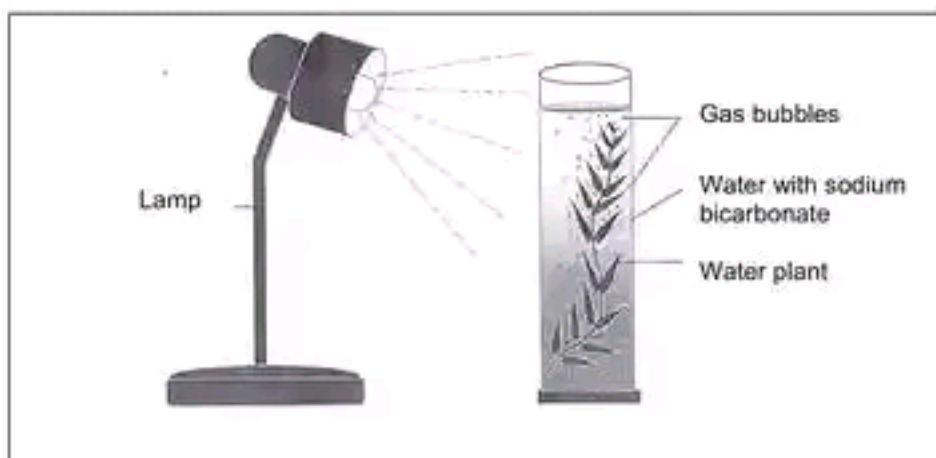
The procedure followed is given below:

- 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.



- 3.1.1 Explain why the plant was de-starched. (2)
- 3.1.2 Describe the steps, in the correct sequence, that were followed during the starch test. (4)
- 3.1.3 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)
- (9)

- 3.2 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

- 3.2.1 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)

- 3.2.2 State the function of sodium bicarbonate in this investigation. (1)

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

- 3.2.4 Plot a line graph to represent the data obtained during this investigation; (6)
(12)
(21)

TOTAL SECTION B: [40]
GRAND TOTAL: [50]



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Topic Test Memorandum: Photosynthesis

MARKS: 50

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SECTION A

Question 1

- | | | | |
|-----|-------|-----|-----|
| 1.1 | 1.1.1 | A✓✓ | |
| | 1.1.2 | B✓✓ | |
| | 1.1.3 | D✓✓ | (6) |

- | | | | |
|-----|-------|-----------------------------|-----|
| 1.2 | 1.2.1 | Dark phase✓ | |
| | 1.2.2 | Stomata✓ | |
| | 1.2.3 | Glucose✓ | |
| | 1.2.4 | ATP✓/Adenosine-triphosphate | (4) |

TOTAL SECTION A [10]

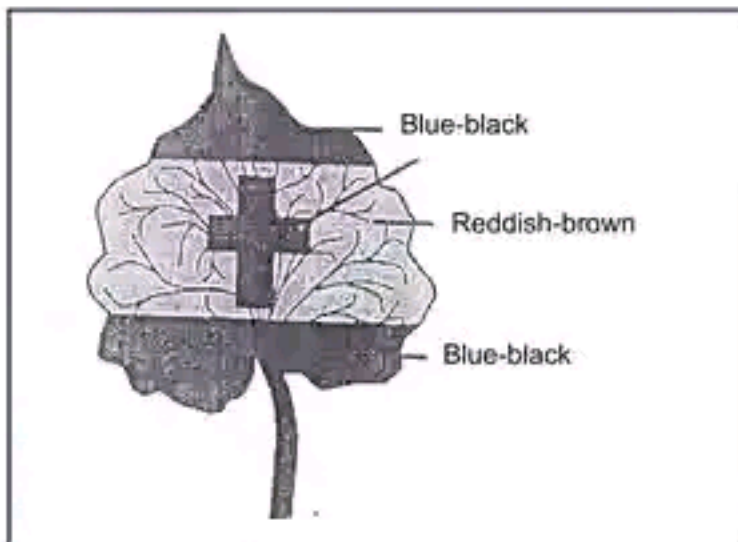
SECTION B**Question 2**

- 2.1 2.1.1 (a) C✓ – starch grain✓ (2)
 (b) B✓ – stroma✓ (2)
 (c) A✓ – granum✓ (2)
- 2.1.2 - The hydrogen from the splitting of water✓ (2)
 - combines with CO₂ to form glucose✓
- 2.1.3 - Provides food/energy for organisms in higher trophic levels✓ (2)
 - Maintains a balance of CO₂/O₂ levels in the atmosphere✓
 (Mark first TWO only) (10)
- 2.2 2.2.1 - Light intensity✓
 - Environmental temperature✓
 - Carbon dioxide concentration✓ (3)
 (Mark first THREE only)
- 2.2.2 - Excess carbon dioxide will combine with water to form carbonic acid✓
 - which causes the pH to decrease✓
 - The enzymes of photosynthesis will become denatured✓
 - causing the rate of photosynthesis to decrease✓ (4)
- 2.2.3 - Less chance of pests✓/better control of pests/less water lost through evaporation
 - which increases crop yield✓ (2)
 (Mark first ONE only) (9)
- [19]**

Question 3

- 3.1 3.1.1
- To ensure that any starch present✓ in leaf
 - was produced during the investigation/in the 5 hours✓ (2)
- 3.1.2
- Boil leaf in water for 3-4 minutes✓
 - Boil leaf in alcohol for about 2 minutes✓
 - Rinse the leaf in cold water✓
 - Add a few drops of iodine solution to the leaf✓ (4)

3.1.3

**Leaf after starch test**

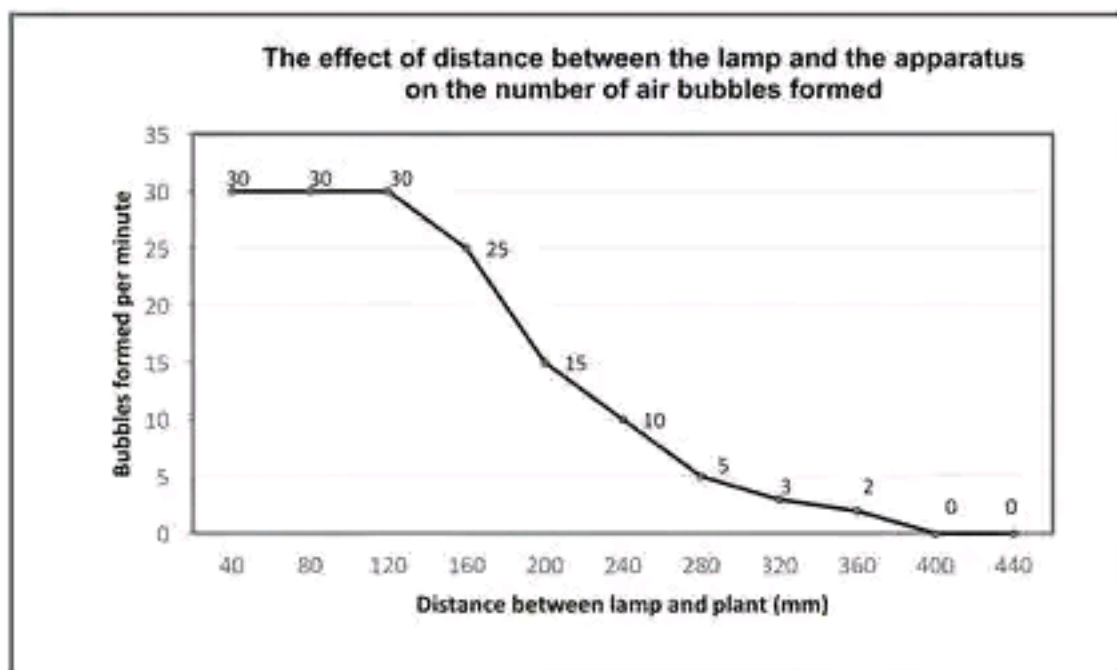
Criterion	Mark
Correct caption	1
Any 2 correct labels	2

(3)

(9)

- 3.2 3.2.1
- (a) Rate of photosynthesis✓ (1)
 - (b) Counting the number of bubbles formed per minute✓ (1)
 - (c) Light intensity✓ (1)
 - (d) Changing the distance of the lamp from the plant✓ (1)
- 3.2.2 To provide carbon dioxide within the apparatus✓ (1)
- 3.2.3
- Repeat the investigation✓
 - Take more readings/average at each distance✓
- Any 1 (1)
- (Mark first ONE only)**

3.2.4



Criterion	Elaboration	Mark
Type of graph	Line graph drawn	1
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

(6)
(12)
(21)

TOTAL SECTION B [40]

GRAND TOTAL [50]