KZN CLUSTERED DISTRICTS

GRADE 11

LIFE SCIENCES

ASSIGNMENT

PHOTOSYNTHESIS AND CELLULAR RESPIRATION

MAY 2025

MARKS: 50

TIME: 60 MINUTES

N.B. This question paper consist of 10 pages including this page.

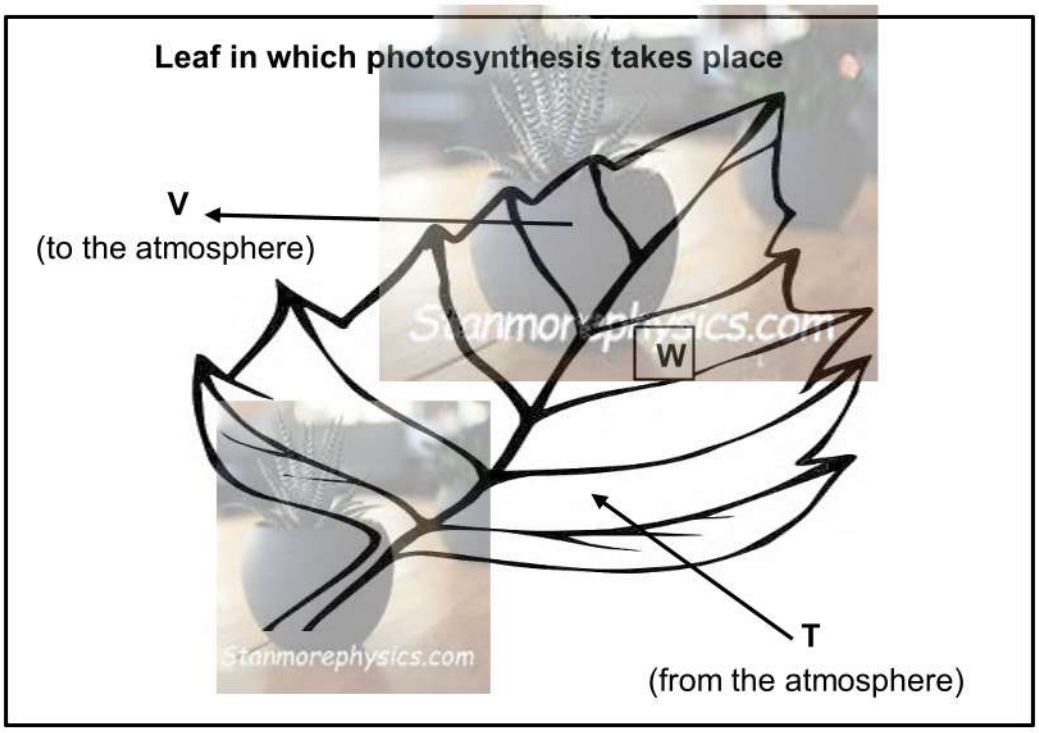
INSTRUCTIONS AND INFORMATION

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. Make 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 must use a non-programmable calculator, protractor and a compass, where necessary.
11. Write neatly and legibly.

QUESTION 1

1. The diagram below represents an organ (leaf) in a plant cell.



1.1 Identify:

(a) Gas **V** (1)

(b) Product **W** (1)

1.2 Name the process by which inorganic substance **T** is absorbed into the leaf. (1)

1.3 Tabulate ONE difference between the light phase and the dark phase of photosynthesis in relation to location only. (3)

1.4 State TWO products of the light phase of photosynthesis that are used in the dark phase. (2)

(8)

QUESTION 2

2. Read the passage below:

The grade 11 learners observed the plant cell under microscope in order to identify the organelle where photosynthesis takes place. The image size of the organelle was 70mm and was magnified x 7000.

2.1 Calculate the actual size of the organelle. (2)

2.2 Draw a labelled diagram of the organelle where photosynthesis takes place. (4)

(6)

QUESTION 3

3 During a final athletic competition, Maya sprinted in the 400m race, her heart pounding and her muscles burning.
As she neared the finish line, a sudden, sharp pain shot through her calf, twisting her leg and throwing her off balance.

"It's a cramp," she gasped, her voice strained. "I can't... I can't keep going!"

3.1 State:

(a) The type of respiration taking place in her leg muscles (1)

(b) Where in the cell does this type of respiration occur (1)

3.2 Describe the respiration mentioned in QUESTION 3.1 (a). (2)

(4)

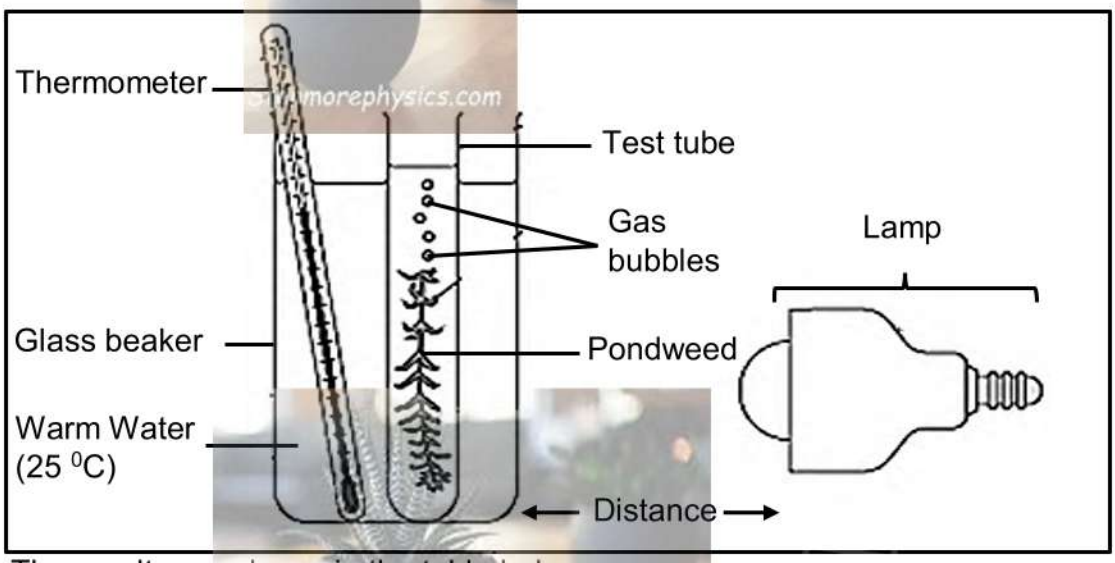
QUESTION 4

4. Grade 11 learners investigated the effect of light intensity on the rate of photosynthesis in a pondweed.

The procedure was as follows:

- The learners placed a fresh pondweed in a glass beaker with warm water.
- The lamp was placed next to the glass beaker.
- The thermometer was inserted in the glass beaker.
- The distance between the lamp and glass beaker with pondweed was altered at one-minute intervals.
- The number of gas bubbles released from the pondweed at various distances were counted and recorded.
- The learners calculated the average results of each distance.

The apparatus was set up as shown in the diagram below:



The results are shown in the table below:

Distance in cm	Number of gas bubbles per minute				
	1	2	3	4	Average
10	52	52	54	54	53
20	49	51	48	52	50
30	32	30	27	31	30
40	30	10	9	11	**X**

4.1 Name the gas bubbles released by the pondweed. (1)

4.2 State ONE importance of using the:

(a) Thermometer (1)

(b) Warm water (25 ^{0}C) (1)

(c) Lamp (1)

4.3 Identify the distance with the lowest light intensity. (1)

4.4 Name TWO factors that were kept constant in this investigation. (2)

4.5 State ONE way in which the learners improved the reliability of the results. (1)

4.6 Calculate the average number of gas bubbles released per minute when the lamp was at 40 cm from the pondweed.
Show ALL working. (2)

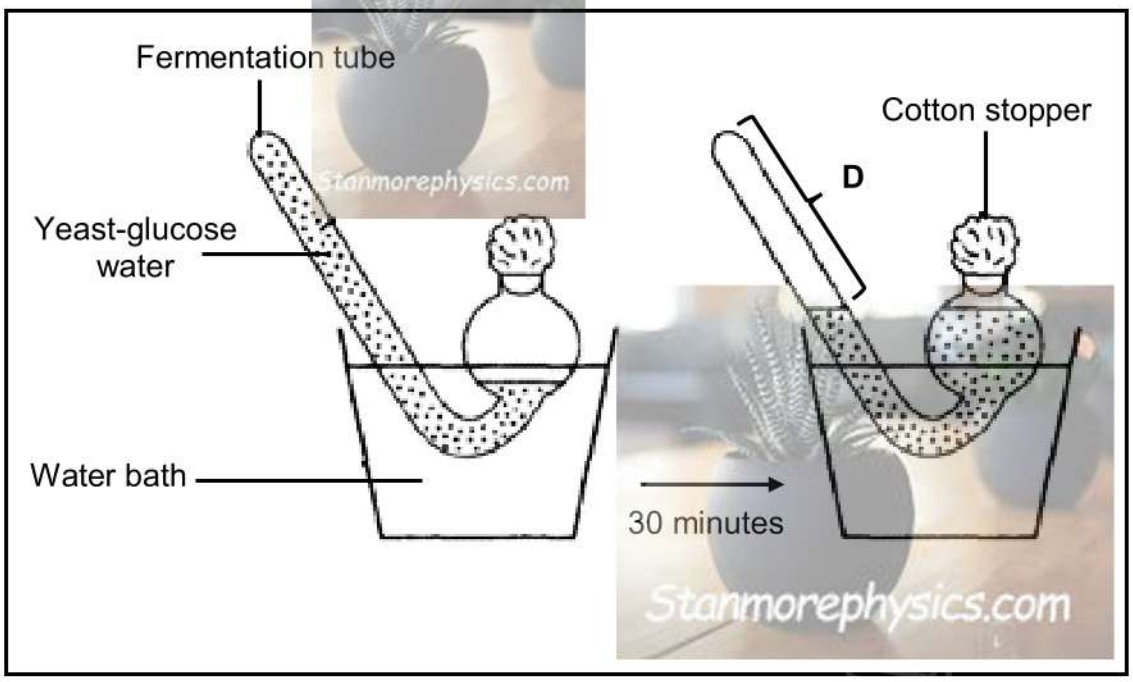
4.7 State the conclusion of this investigation. (2)
(12)

QUESTION 5

5. An investigation was carried out to determine the effect of temperature on the rate of cellular respiration in yeast.

- Five experimental groups, each containing five fermentation tubes, were set up.
- The fermentation tubes all contained the same amounts of water, glucose, and yeast.
- Each group of five tubes was placed in a water bath at a different temperature.
- After 30 minutes, the amount of gas produced at **D** in each fermentation tube was measured in millilitres.
- The average for each group was calculated.

A sample of setup apparatus is shown below.



The results are shown in the table below:

Group	Temperature (^{0}C)	Average gas produced (mL)
1	5	0
2	20	5
3	40	12
4	60	6
5	80	3

5.1 State the aim of this investigation. (1)

5.2 Identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

5.3 Identify the experimental group with the highest rate of cellular respiration. (1)

5.4 Explain your answer to QUESTION 5.3. (2)

5.5 Calculate the percentage increase of temperature from group **2** to group **3**.

Show All your working. (3)

5.6 Use the data in the table above to draw a bar graph showing the average amount of gas produced at different temperatures. (6)
(15)

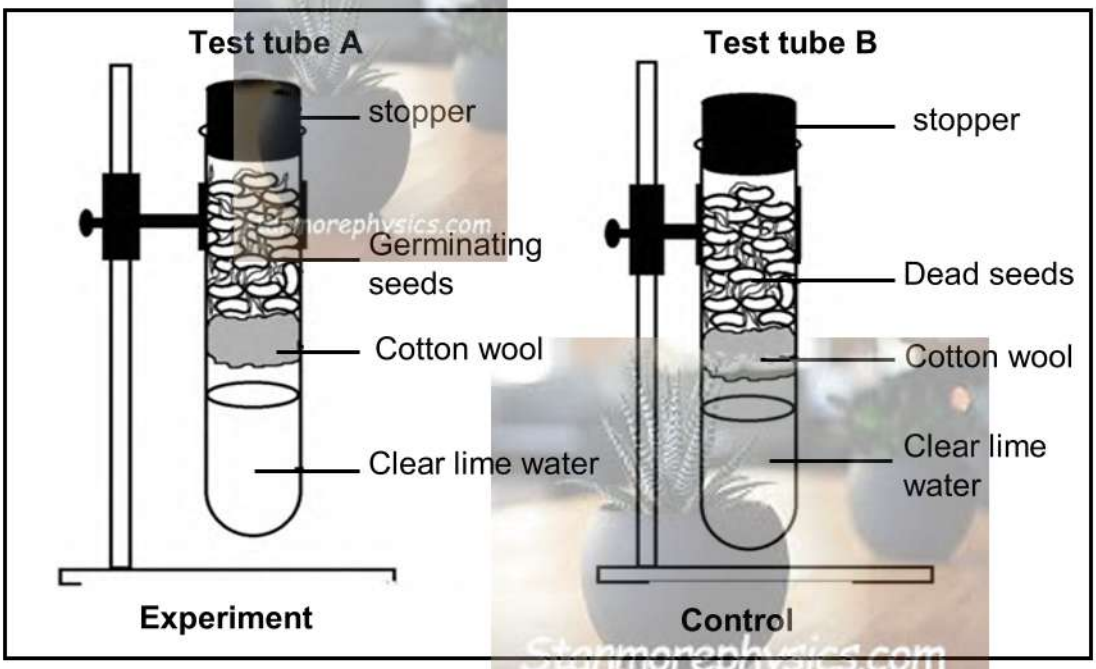
QUESTION 6

6. An investigation was conducted to determine which gas was released during cellular respiration.

The procedure was as follows:

- 120 seeds of the same species were germinated.
- 60 of them were separated and placed in boiling water for 30 minutes.
- The other germinating seeds were placed in test tube **A**, while the seeds from the hot water were placed in test tube **B** after cooling.
- The seeds and apparatus were rinsed in formalin before the investigation

Both sets of apparatus were set up as shown in the diagram below:



6.1 State the importance of rinsing the seeds and apparatus in formalin before the investigation. (1)

6.2 Explain:

(a) Why the investigator used germinating seeds in the experiment. (2)

(b) The expected results of clear lime water in test tube **A.** (2)
(5)

GRAND TOTAL: 50

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MARKING GUIDELINES

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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.

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.

QUESTION 1

1.1

(a) V- oxygen✓ (1)

(b) W – Starch✓/glucose/carbohydrates (1)

1.2 Diffusion✓ (1)

1.3 ✓Table

Light independent phase	Light dependent phase
Stroma✓	Grana✓

(3)

(Mark the first ONE only)

1.4 1. ATP✓

2. NADPH ✓

(Mark the first TWO only) (2)

(8)

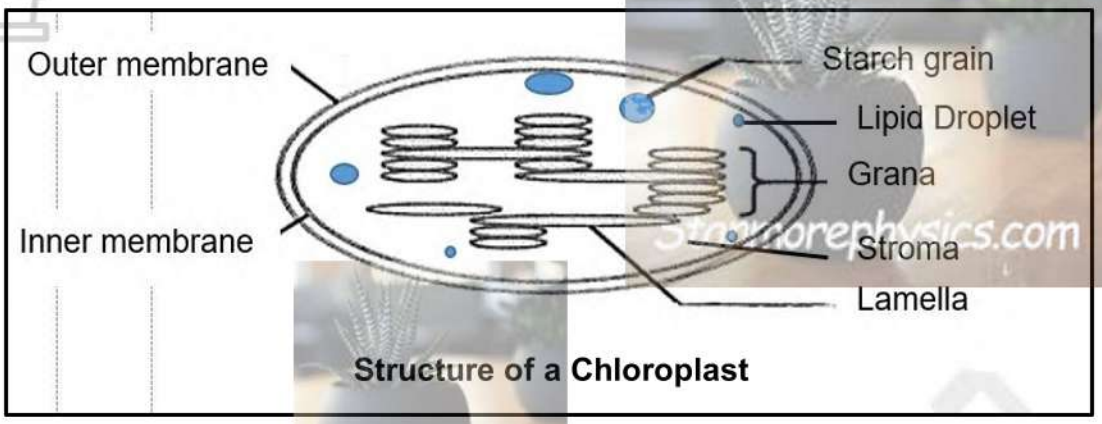
Inner membrane

QUESTION 2

2.1 Actual size=Image size/magnification:

70mm/7000mm ✓=0,01mm✓ (2)

2.2



Criteria for marking the diagram

Criteria	Mark allocation
Caption **(C)**	**1**
Correct drawing **(D)**	**1**
Labels **(L)**	**2-** Any 2 correct labels

(4)

(6)

QUESTION 3

3.1 (a) Anaerobic respiration✓ (1)

(b) Cytoplasm✓ (1)

3.2
- In the absence of oxygen in animal cell✓
- pyruvic acid is converted into lactic acid✓
- NADH and a small amount of ATP ✓released Any (2)

(4)

QUESTION 4

4.1 Oxygen✓ (1)

4.2 (a) To measure the temperature✓ (1)
(Mark the first ONE only)

(b) It is an optimum temperature at which the rate of photosynthesis is maximum✓due to high rate of enzyme activity (1)
(Mark the first ONE only)

(c) To provide light at different distances✓
(Mark the first ONE only)

4.3 40 cm✓ (1)

4.4
- Duration(1 minute) per distance ✓
- Interval between distances✓
- Reader ✓
- Type of light ✓

(Mark the first TWO only) (2)

4.5 The students counted the bubbles four times at each distance✓
(Mark the first ONE only) (1)

4.6 $\frac{30+10+9+11}{4}$ ✓

$=15$✓ (2)

4.7 The rate of photosynthesis increases with an increase of light intensity ✓✓until the optimum intensity is reached and vice versa. (2)

(12)

QUESTION 5

5.1 To determine the effect of temperature on the rate of cellular respiration in yeast. ✓ (1)

5.2 (a) Temperature✓

(b) Rate of cellular respiration✓ (2)

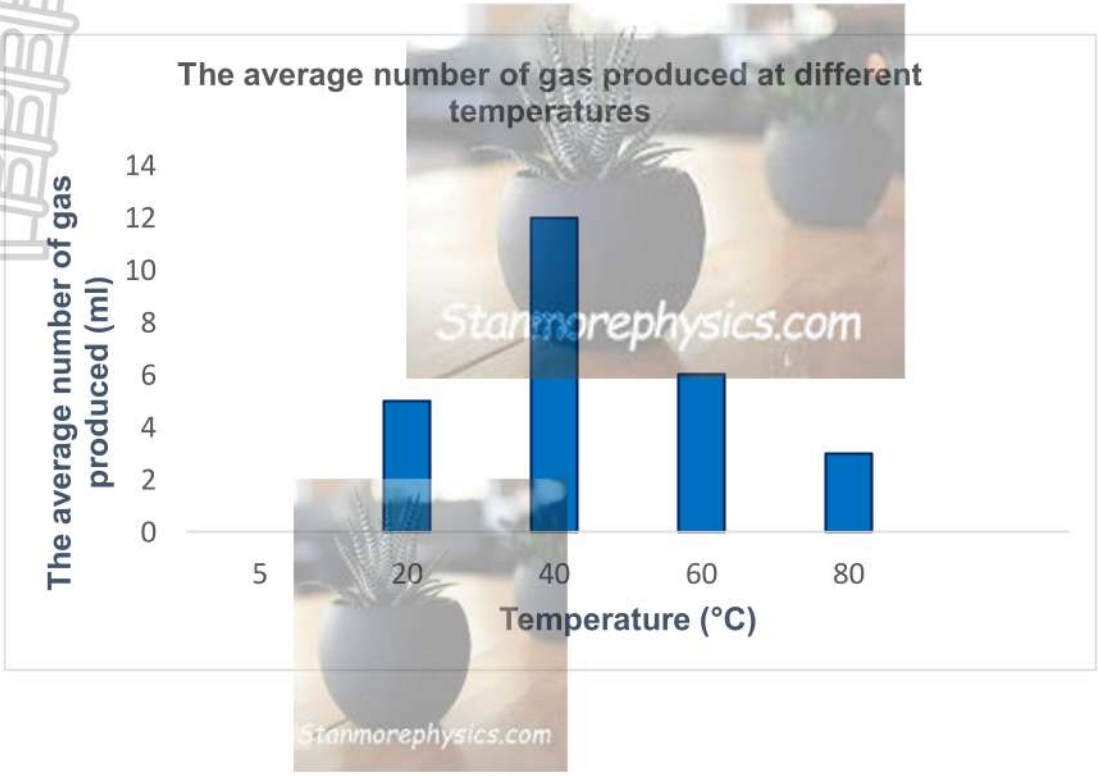
5.3 Group 3✓ (1)

5.4 40 ^{0}C is the optimum temperature✓ where enzyme activity is at optimum✓ (2)

5.5 $\frac{[40-20]}{20}$ ✓ x 100✓

= 100✓% (3)

5.6



Guidelines for assessing a graph:

CRITERIA	ELABORATION	MARK
Correct type of graph **(T)**	Bar graph drawn	1
Caption of graph **(C)**	Both variables included	1
Axes labels (L)	X-and Y axes correctly labelled Correct unit on Y-axis	1
Scale for X-and Y-axes (S)	Equal space between bars and width of bars Correct scale for Y-axis	1
Plotting of bars (P)	1- 4 bars plotted correctly 2- All 5 bars plotted correctly	1 2

(6)

(15)

QUESTION 6

6.1 To kill bacteria that may release carbon dioxide✓which may interfere with the results. (1)

6.2 (a) Germinating seeds are actively growing plant parts ✓
therefore, the rate of respiration is higher ✓ than in any other parts of the plant since more energy ✓ is required for the active growth process. (2)

(b) It turns milky in the presence of carbon dioxide, ✓✓ (2)

(5)

GRAND TOTAL: 50