



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES**

**DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES SCIENCES**

<b>QUALIFICATION : BACHELOR OF HORTICULTURE</b>	
<b>QUALIFICATION CODE: 07BHOR</b>	<b>LEVEL: 7</b>
<b>COURSE CODE: CEY720S</b>	<b>COURSE NAME: CROP ECOPHYSIOLOGY</b>
<b>DATE: JANUARY 2023</b>	
<b>DURATION: 3 HOURS</b>	<b>MARKS: 100</b>

<b>SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER(S)</b>	Dr Norman Muzhinji
<b>MODERATOR:</b>	Dr Brian Makedredze

<b>INSTRUCTIONS</b>
<ol style="list-style-type: none"><li>1. Answer ALL the questions.</li><li>2. Write clearly and neatly.</li><li>3. Number the answers clearly.</li></ol>

**PERMISSIBLE MATERIALS**

1. Examination question paper
2. Answering book

**THIS QUESTION PAPER CONSISTS OF 5 PAGES** (Excluding this front page)

Question A: Multiple choice questions (15 marks)

1. Water potential begins to become less negative
  - A. In the dark of the night
  - B. Just before dawn
  - C. At noon
  - D. Just after sunset
  
2. Why isn't lime ( $\text{CaCO}_3$ ) a very good amendment choice for the treatment of sodic soils in Namibia?
  - A. Lime is scarce in Namibia, and it would cost too much
  - B. Lime contains  $\text{Ca}^{2+}$  and won't dissolve in alkaline soil therefore not effective in the reclamation of sodic soils
  - C. Many Namibian soils are calcareous and already contain high levels of lime
  - D. Sodic soils do not occur in Namibia
  
3. In C3 and C4 plants, primary carboxylation takes place with the help of
  - A. PEP carboxylase and pyruvate carboxylase respectively
  - B. RuBP carboxylase and PEP carboxylase respectively
  - C. PEP carboxylase and RuBP carboxylase respectively
  - D. RuBP carboxylase and pyruvate carboxylase respectively
  
4. Which enzyme plays major role in opening and closing of stomata?
  - A. Beta-amylase
  - B. Pyruvic kinase
  - C. RuDP
  - D. PEP carboxylase
  
5. In the absence of transpiration, water moves into and up to the xylem because of
  - A. Root pressure
  - B. Turgor pressure
  - C. Evaporation
  - D. High soil mineral concentration
  - E. Guttation
  
6. Which of the following will cause the stomata to close?
  - A. Wilting
  - B. Increase in carbon dioxide concentration
  - C. Darkness
  - D. Very high temperatures
  - E. All of the above

7. Which one is not a cause of water logging?
- A. Rainfall
  - B. Floods
  - C. Roads
  - D. Sodium
8. Which amino acid accumulates under water stress condition in plants
- A. Proline
  - B. Methionine
  - C. Valine
  - D. Leucine
9. Which of the following is not an abiotic stress that affects the growth and productivity of many plants?
- A. Soil salinity
  - B. Low temperatures
  - C. Soil microorganism
  - D. High light intensity
10. Plant grown in saline soils is primarily inhibited by
- A. Poor water uptake due to osmotic stress
  - B. pH less than 8.5
  - C. Poor soil structure
  - D. Poor nutrient uptake
11. The pH in soils can be raised by adding
- A. Sand
  - B. Lime
  - C. Sulphur
  - D. Nitrogen
12. An inadequate supply of water can compromise plants' ability to carry out photosynthesis. How do desert plants prevent such water loss when they are subjected to high heat?
- A. By using CAM photosynthesis and by closing stomatal pores during the night
  - B. By using CAM photosynthesis and by opening stomatal pores during the night
  - C. By using CAM photosynthesis and by keeping stomatal pores closed at all times
  - D. By bypassing CAM photosynthesis and by keeping stomatal pores closed at night
13. Which type of plants are adapted to the arid conditions of Namibia
- A. C4 plants
  - B. C3 plants
  - C. CAM plants

- D. A and C are correct
14. Water logging of soil makes it physiologically dry because-
- A. This condition does not allow the capillary force to work
  - B. This condition does not allow oxygen to enter the soil
  - C. Both (a) and (b)
  - D. None of these
15. In cold places frost damage can be reduced in horticultural crops using these methods except
- A. Overhead sprinklers at night
  - B. Green houses and shade nets
  - C. Wind breaks placement
  - D. Appropriate fungicide application

**Section B: Answer all questions (85 MARKS)**

1. Describe four (4) abiotic stressors that affect growth and productivity of horticultural crops. (8)
2. What are the three (3) environmental factors that affect transpiration in plants? (3)
3. Write short notes on the following, giving examples.
  - a. Plant adaptation (2)
  - b. Plant acclimatization (2)
  - c. Plant totipotency (2)
  - d. Differentiate between abiotic and biotic stresses to plants, giving example (4)
4. Plants have adapted to different environmental conditions. One of the most important conditions they have adapted to is soil salinity and sodicity.
  - a. Describe the effects of salinity on plants. (6)
  - b. Describe some of the functions of different hormones in protecting crops against salinity. (10)
  - c. Mention any three strategies that you would use to mitigate the effects of salinity on your crops in the garden. (3)
5.
  - a. With the aid of a well, labelled diagram, explain the differences and similarities between C3, C4 and CAM pathways? (15)
  - b. Under what conditions would C4 plants have an advantage over C3 plants? (3)
6. In their investigation, the scientists measured the rate of oxygen release by the leaf discs in the light. The scientists then measured the rate of oxygen uptake by the leaf discs in the dark. The graph shows the effect of temperature on
  - i. Oxygen production in the light.
  - ii. Oxygen production in the light added to oxygen uptake in the dark.

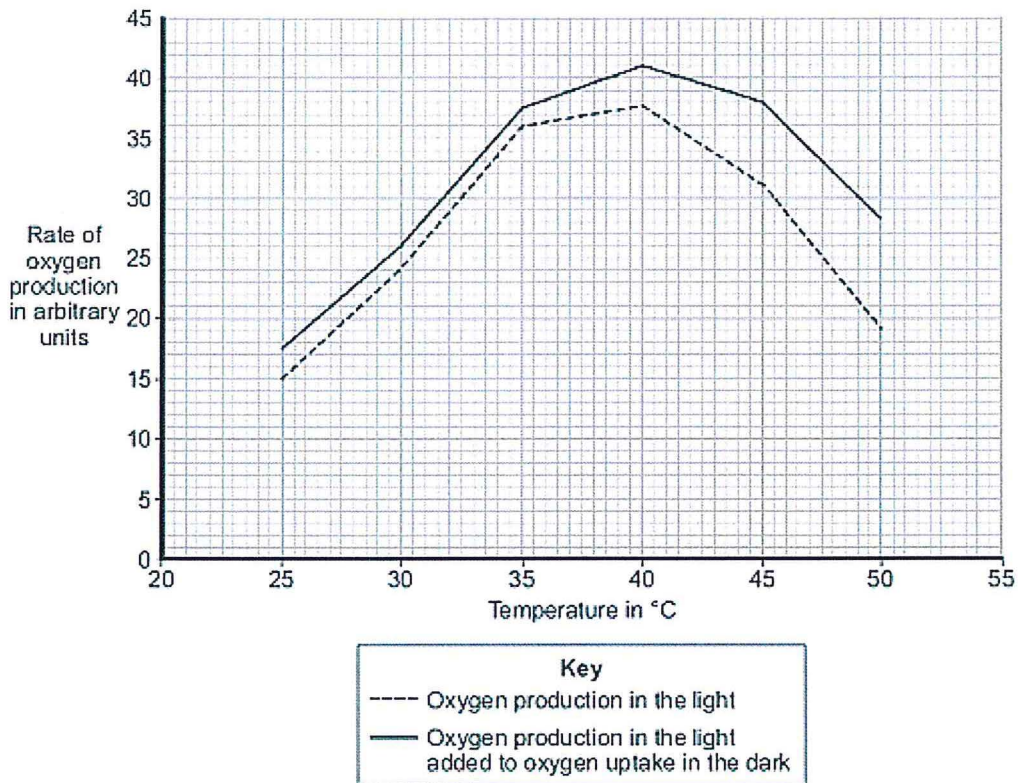


Figure 1: The effect of temperature and light on plant oxygen production

Use the information from the graph to answer each of the following questions.

- a. Describe the effect of temperature on oxygen production in the light. (3)
  - b. Explain the effect of temperature on oxygen production in the light when the temperature is increased: from 25 °C to 35 °C. (3)
7. A farmer in Namibia wants to grow orange trees in a greenhouse. He wants to sell the oranges he produces at a local market. He decides to heat the greenhouse to 35°C.
- a. Explain why he should not heat the greenhouse to a temperature higher than 35°C. Use information from the graph in your answer. (3)
  - b. To prevent water loss, plants respond by closing the stomata early to maintain the water level inside the plants. Explain the disadvantage of stomatal closure to the plants. (4)
  - c. Imagine, you are asked to compare the leaves of a potted plant with one side maintained in the shade and the other side maintained on the sunny side. Which of them has leaves that are darker green? Why? (2)