



**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: NOVEMBER 2022</b>	
<b>DURATION: 3 HOURS</b>	<b>MARKS: 100</b>

<b>FIRST OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER(S)</b>	Dr Norman Muzhinji
<b>MODERATOR:</b>	Dr Brian Makedredza

<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 4 PAGES (Excluding this front page)**

**SECTION A: Multiple choice questions (12 marks)**

1. Which hormone is most involved in response to abiotic stresses?
  - A. Abscisic acid
  - B. Ethylene
  - C. Auxin
  - D. Gibberellic acid
2. Which amino acid accumulates under water stress condition in plants
  - A. Proline
  - B. Methionine
  - C. Valine
  - D. Leucine
3. In C<sub>3</sub> and C<sub>4</sub> 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. Why isn't lime (CaCO<sub>3</sub>) 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 containing Ca<sub>2+</sub> and won't dissolve in alkaline soil therefore not effective in the reclamation of sodic soils
  - C. Many Namibian soils already contain high levels of lime
  - D. Sodic soils do not occur in Namibia
6. Which one is not a cause of water logging?
  - A. Rainfall
  - B. Floods
  - C. Roads
  - D. Sodium
7. The plant hormone that plays a role in closing of the stomata is;
  - A. Auxin
  - B. Abscisic acid
  - C. Gibberellin

- D. Ethylene
  - E. Cytochrome
8. 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
9. Transpiration is mostly affected by
- A. Humidity
  - B. Temperature
  - C. Light
  - D. Wind
10. Which chemicals are involved in flooding injury in crops?
- A. Acetic acid
  - B. Acetaldehyde
  - C. Alcohol
  - D. All of the above
11. 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
12. 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

**Section B: Answer all questions (88 MARKS)**

1. a. Describe any three (3) environmental factors that influence the geographical distribution of plant species in Namibia, give examples. (6)  
b. From your answer in 1a, select any two (2) factors and describe how you can modify them to suit the basic growing needs of a crop of your choice. (4)
2. Write short notes on the following, giving examples
  - a. Abiotic Stress of plants (2)
  - b. Genotype and environment interactions in plants. (2)
  - c. Plant phenotypic Plasticity. (2)
  - d. Dedifferentiation in plants. (2)
  - e. Distinguish between acclimation and adaptation to abiotic stress of plants. (6)
3. Plants have adapted to different environmental conditions. One of the most important conditions they have adapted to is soil salinity and sodicity.
  - a. Describe at least five (5) factors that contribute to salinity in Namibian soils. (10)
  - b. Explain at least four (4) effects of salinity on growth and development of horticultural crops. (8)
  - c. Imagine you have been instructed to grow vegetables in saline soils. Describe at least four (4) strategies that you would implement to successfully produce vegetables in such kind of soils. (4)
4. Water potential is represented by the following equation.

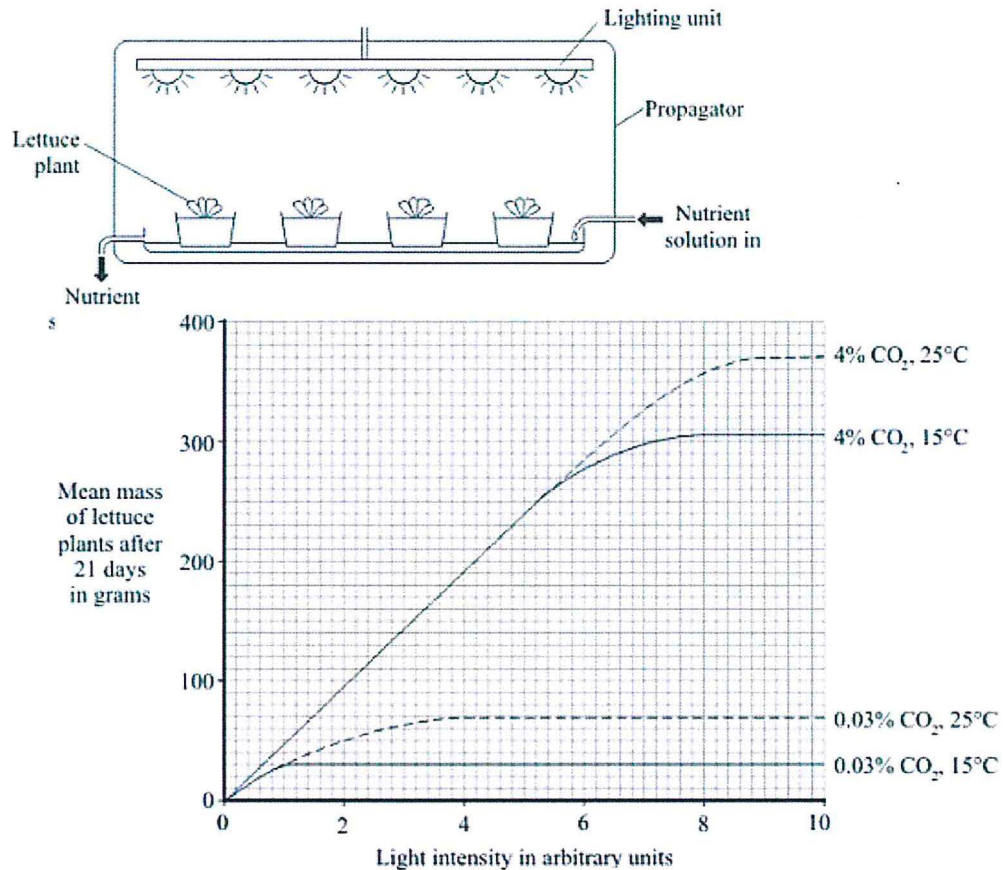
$$\Psi_w = \Psi_s + \Psi_p + \Psi_g + \Psi_m.$$

- a. Explain what each component of the equation stands for? (5)
- b. Describe how transpiration and the cohesion-tension theory can explain the movement of water from the roots through the leaves to the atmosphere. (10)
- c. Assume, you have just been appointed as a horticulturalist responsible for crop production in Karasburg, a well-known drought prone area. You have been tasked with selecting a crop that you can grow in drought conditions

Describe some of the morphological, physiological and biochemical mechanisms that the crop will use for it to survive under drought conditions. (9)



- d. Describe some of the agricultural strategies that you can use to improve the performance of horticultural crops in drought prone areas. (10)
5. The graph shows the effects of changing the temperature, light intensity, and carbon dioxide concentration on the growth of lettuce plants.



- a. Describe and explain the effect of increasing light intensity on the mean mass of lettuce plants at 4% carbon dioxide and 15 °C. (3)
- b. Growers wish to make maximum profits from their lettuces. What do they need to consider before making decisions about the growing conditions for their lettuces? (3)
6. In vegetable crops, phosphorous (P) is responsible for root formation and architecture. Low P availability induces alterations in root architecture that enhance topsoil foraging, since the topsoil is the region of greatest P availability.

Describe the root system response to low phosphorous in the soil. (2)

