

National University of Lesotho

Faculty of Agriculture

BSc Crop Science

CPS 4508: Crop Physiology

Date: August 2023

Supplementary Examinations

Total time 3hrs

Total Marks: 100

Instructions to candidate

- a) Answer **ALL FOUR** Questions.
- b) Each Question Carries **25 Marks**.

-----GOODLUCK!!-----

QUESTION 1 (25 Marks)

1.1. **Explain** the concept of plant-water relations and how it represents a compromise. [5]

1.2 Identify and describe two main pathways by which water can move from the soil to the roots or from cell to cell everywhere in the plant. [10]

1.3. **With the aid of equations**, discuss why diffusion **is not the main process** for water movement from the bottom to the top of the plant plumbing system. [10]

QUESTION 2 (25 Marks)

2.1. A fourth-year Crop science BSc student designed an experiment. In this experiment designed, he/she wants to:

- i) to measure the mean water potential of storage tissues.
- ii) To determine the Solute Concentration of Cells (osmotic potential).
 - a) **List 2 methods** to be used and **explain each method fully**. [20]
 - b) In **which 2 ways** can the direction of water movement can be detected? [5]

QUESTION 2 (25 Marks)

2.1 Define the following phrases as used in Crop Physiology

- a) Water use efficiency (WUE). [5]
- b) Nutrient Use Efficiency (NUE) [5]
- c) Radiation Use Efficiency (RUE) [5]
- d) Photosynthetically Active Radiation. [5]
- e) Crop Radiation Capture and Use Efficiency [5]

QUESTION 4 (25 Marks)

4.1 Explain why the growth curve typically makes a transition from exponential to linear dry matter accumulation early in the season (i.e., what is physically happening with respect to canopy structure and activity that causes the curve to have this shape?). [8]

4.2 Why does the rate of crop dry matter accumulation decline near the end of the season, even if canopy interceptions of incident PAR remain high? [6]

4.3. Define the concept of an Ideotype crop. [5]

4.4 Why a crop ideotype development must consider genotype by environment interaction formula? [6]

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