



UNIVERSITY OF SWAZILAND

MAIN EXAMINATION PAPER

PROGRAMME: B.Sc. AGRICULTURAL EDUCATION, YEAR 3  
B.Sc. AGRONOMY, YEAR 3  
B.Sc. HORTICULTURE, YEAR 3

COURSE CODE: CP305

TITLE OF PAPER: CROP PHYSIOLOGY

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER QUESTION 1 AND ANY OTHER THREE (3) QUESTIONS

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INVIGILATOR



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## QUESTION 1

State a phrase or term (s) that correctly describes the statement that follows

- |       |       |  |
|-------|-------|--|
| i.    | _____ | Ratio between the total leaf area to total plant biomass   |
| ii.   | _____ | Complex light-absorbing molecules located in plasma membrane   |
| iii.  | _____ | Hormone action is sometimes mediated by this substance   |
| iv.   | _____ | When water potentials drop due to water deficits, turgor is insufficient to drive this process   |
| v.    | _____ | Plants that have a higher carbon dioxide compensation point  |
| vi.   | _____ | Catalyze movement of one type of ion or molecule against its concentration gradient coupled with the movement of a different ion or molecule in the opposite direction |
| vii.  | _____ | Water moves passively in response to osmotic gradients through these proteins that form complex channels across membranes  |
| viii. | _____ | Some solar-tracking plants can orient their leaves such that they can avoid full exposure to sunlight thus minimising heating and water loss                           |
| ix.   | _____ | Determination of the elemental concentrations contained in the dry matter of the entire plant or plant structures  |
| x.    | _____ | One of plant growth hormones responsible for form and shape of plant parts   |
| xi.   | _____ | Rate of increase in dry matter per unit of dry matter already present  |
| xii.  | _____ | Results from turgor produced by diffusion of water into protoplasts enclosed in walls which resist expansion   |
| xiii. | _____ | Method for regulating endogenous levels of plant growth hormones   |
| xiv.  | _____ | Relation between different rates of growth of plant organs   |

[Total, 28 marks]



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## QUESTION 2

- (a) Why is the transport rate across a membrane slower for 'transporter proteins' compared to that associated with 'channel proteins'? [6 marks]
- (b) (i) Mention two examples of mobile nutrients in plants [2 marks]  
(ii) Mention two examples of immobile nutrients in plants [2 marks]  
(iii) Why are some nutrients said to be mobile in plants while others are considered immobile in plants [4 marks]
- (c) Match the following units on the left to the plant growth analysis parameters on the right
- |  |        |
|--|--------|
| (i) $\text{m}^2 \text{kg}^{-1} \text{plant wt.}$ | A. CGR |
| (ii) $\text{gm}^{-2} \text{land area.day}^{-1}$  | B. LAR |
| (iii) $\text{gm}^{-2} \text{leaf area.day}^{-1}$ | C. RGR |
| (iv) $\text{mg g}^{-1} \text{day}^{-1}$          | D. NAR |
| (v) $\text{m}^2 \text{kg}^{-1} \text{leaf wt.}$  | E. SLA |
- [10 marks]  
[Total, 24 marks]

## QUESTION 3

- (a) What role does the 'Casparian strip' play in water and nutrient movements in plants? [4 marks]
- (b) In transpiration, water is 'lifted-up' through the plant. Explain how this happens. [8 marks]
- (c) Briefly describe specific situations and mention the hormones involved, for each of (i), (ii) and (iii) below where:
- Any two hormones cooperate (synergistic) to promote a response
  - One hormone decreases sensitivity of cells (antagonistic) to another hormone
  - Two hormones act independently but show opposite (contrasting) effects
- [12 marks]  
[Total, 24 marks]



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#### QUESTION 4

- (a) Plants exhibit three major types of movements. Briefly describe them. [6 marks]
  - (b) Explain the role of the five (5) "tropic" or "nastic" responses in plant growth and development [10 marks]
  - (c) Using any plant process, clarify the relationship between an absorption spectrum and an action spectrum. [8 marks]
- [Total, 24 marks]

#### QUESTION 5

Briefly explain the following plant processes or terms

- (a) Adenosine triphosphate (ATP) [4 marks]
  - (b) Role of temperature in photorespiration [4 marks]
  - (c) Crassulacean Acid Metabolism (CAM) photosynthesis [4 marks]
  - (d) Photomorphogenesis [4 marks]
  - (e) Circadian rhythms [4 marks]
  - (f) Net Assimilatory Rate (NAR) [4 marks]
- [Total, 24 marks]