



**MASENO UNIVERSITY**  
**UNIVERSITY EXAMINATIONS 2016/2017**

**SECOND YEAR SECOND SEMESTER EXAMINATION FOR  
THE DEGREE OF BACHELOR OF EDUCATION SCIENCE IN  
AGRONOMY, HORTICULTURE & SOIL SCIENCE AND  
AGRICULTURAL EDUCATION & EXTENSION WITH  
INFORMATION TECHNOLOGY**

**MAIN CAMPUS**

**AAG 208: GENERAL PLANT PHYSIOLOGY**

Date: 22<sup>nd</sup> June, 2017

Time: 8.30 - 11.30am

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**INSTRUCTIONS:**

- Answer ALL Questions in section A and any other TWO in section B.



Section A (50 marks)

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Q1.

- a). Distinguish between the following:
- (i) Bulk flow and diffusion. (2 marks)
  - (ii) Solute chemical potential and solute potential. (2 marks)
  - (iii) Apoplast and symplast pathways of water ascent in plants. (2 marks)
  - (iv) Grana thylakoid and stroma thylakoid. (2 marks)
  - (v) Oxidative and reductive reactions of photosynthesis. (2 marks)
- b). Highlight the significance of the following:
- (i) The nearly constant volume of water to cell expansion. (2 marks)
  - (ii) Water's high latent heat of evaporation to the process of transpiration. (2 marks)
  - (iii) Matrix to the plant cell water potential ( $\psi_{\text{cell}}$ ). (2 marks)
  - (iv) Cohesion to sap ascent up crop plants. (2 marks)
  - (v) Carotenoids to light dependent stage of photosynthesis. (2 marks)

Q2. What

- a). Is the cell theory? (2 marks)
- b). Is the respiratory quotient (RQ) of lauric acid ( $\text{C}_{12}\text{H}_{24}\text{O}_2$ )? (2 marks)
- c). Is the role of the casparian strip of the root endodermis in the development of root pressure? (3 marks)

- d). Are the requirements for a perfect osmotic system? **(3 marks)**

**Q3.**

- a). Why do the plant leaves appear green in colour? **(2 marks)**  
b). Highlight the fate of the excitation energy following absorption of light photons by plant photosynthetic pigments. **(3 marks)**  
c). Reconcile the relatively high photosynthetic action spectrum of green light yet its (green light's) absorption spectrum is nearly zero. **(5 marks)**

**Q4.**

- a). Define water potential ( $\psi$ ). **(2 marks)**  
b). What are the major differences between vessel elements and tracheids of the xylem tissues? **(3 marks)**  
c). How can students of plant physiology demonstrate tension (negative pressure) of the sap in xylem tissues in a laboratory? **(5 marks)**

**Section B (20 marks)**

➤ Attempt any two (2) questions from this section

**Q5.**

- a) In C<sub>4</sub> species, incoming carbon dioxide (CO<sub>2</sub>) is initially fixed to a four carbon acids, malic or aspartic. These four carbon acids are later decarboxylated to release the initially fixed CO<sub>2</sub> to be fixed into a three carbon acid. Justify this rather repetitive way of fixing CO<sub>2</sub> in this group of plants. **(4 marks)**  
b) Explain the three major components of the Calvin (C-3 photosynthetic carbon reduction) cycle. **(6 marks)**

**Q6.**

- a) Other than driving forces, outline the other components of the cohesion mechanism of sap ascent in plants. **(2 marks)**  
b) Discuss the driving forces component of the cohesion mechanism of sap ascent in plants. **(8 marks)**

**Q7.**

- Compare and contrast the cyclic and non-cyclic electron transport during light dependent stage of photosynthesis. **(10 marks)**