MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2013/2014

SECOND YEAR SECOND SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN HORTICULTURE, BACHELOR OF SCIENCE IN AGRONOMY AND BACHELOR OF SCIENCE IN SOIL SCIENCE WITH INFORMATION TECHNOLOGY

(MAIN CAMPUS)

AAG 208: GENERAL PLANT PHYSIOLOGY

Date: *1st April, 2014* ***Time:*** *11.15AM – 1.30pm*

INSTRUCTIONS:

- This paper has two sections A&B.
- Attempt ALL questions in section A and ANY THREE in section B.

Instructions:

1. *The paper has two sections (A&B)*
2. *Attempt **ALL** questions in section A and any **three (3)** in section B*

Section A (40 marks)

Q1.

a) Define the following terms:
   (i) Plant physiology.
   (ii) Capillarity. **(1 mark each)**

b) Distinguish between the following:
   (i) Adhesive and cohesive forces of water.
   (ii) Granum and stroma thylakoids.
   (iii) Ribulosebisphosphate carboxylase and ribulosebisphospaheoxygenase.
   (iv) Aerobic and anaerobic respiration. **(2 marks each)**

c) Provide physiological explanation to the following observations:
   (i) Photosynthesis is both an **oxidation** and **reduction** process.
   (ii) Blue light though higher in energy, is **not** more effective in photosynthesis than red light.
   (iii) Water **cannot exclusively** travel via the apolplastic pathway through the soil-plant-atmosphere- continuum (SPAC).
   (iv) Anaerobic respiration is wasteful compared to aerobic respiration.
   (v) Plant cell is an osmotic system. **(2 marks each)**

Q2.

The Russian scientist, Chardakov developed an easy and rapid method of measuring water potential.

a) Highlight the physiological basis of this method. **(4 marks)**

b) Interpret the following results:

(i) The drop of dye sinks in the solution from which the plant tissue was removed.

(ii) The drop of dye gradually diffuses upward and downward in the solution from which the plant tissue was removed.

(iii) The drop of dye rises in the solution from which the plant tissue was removed. **(2 marks each)**

Q3.

a) Define respiratory quotient (RQ). **(2 marks)**

b) Calculate the RQ for the following:

(i) Glucose ($C_6H_{12}O_6$).

(ii) Linoleic acid($C_{18}H_{32}O_2$). **(2 marks each)**

c) Using glucose as the substrate oxidised, explain the contribution of the glycolysis step to the overall adenosine triphosphate (ATP) production of aerobic respiration. **(4 marks)**

Section B (30 marks)

Q4.

Plant physiology is to an extent the study of water in plant tissues.

a) Highlight the significance of the following heat properties of water to plants:

(i) High specific heat capacity of water.

(ii) High latent heat of vaporization. **(2 marks each)**

b) Basing on the water property of **nearly constant volume**, explain the process of stomatal opening and closing. **(6 marks)**

Q5.

a) Other than the specialised anatomy of the pathway, outline the other two (2) components of the cohesion mechanism of sap ascent in plants. **(2 marks)**

b) Discuss the specialised anatomy of the pathway (xylem tissues) **showing** how it (anatomy) helps in water transport up the plant. **(8 marks)**

Q6.

Discuss the various stages of the Calvin (photosynthetic carbon reduction) cycle highlighting their contributions to the overall carbon reduction reaction. **(10 marks)**

Q7.

Other than production of adenosine triphosphate (ATP), aerobic respiration also forms molecules that are used in the synthesis of several plant constituents. Explain this latter function of aerobic respiration. **(10 marks)**

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX