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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

Bachelor of Science in Applied Sciences
Second Year – Semester I Examination – July/August 2023

BOT 2201 – PLANT PHYSIOLOGY

Time: Two (02) hours

This paper consists of two sections, section A and section B. Section A is compulsory. Answer any TWO (02) questions from section B.

Section A [Approximate time allocation is ONE (01) hour]

1. Answer **ALL** questions. Underline the most suitable answer for questions **a-k**. **(200 Marks)**

a) The substrate for photorespiration is
   i. phosphoglyceric acid.
   ii. glycolate.
   iii. serine.
   iv. glycine. **(5marks)**

b) In C_4 plants, Calvin cycle operates in
   i. stroma of bundle sheath chloroplasts.
   ii. grana of bundle sheath chloroplasts.
   iii. grana of mesophyll chloroplasts.
   iv. stroma of mesophyll chloroplasts. **(5 marks)**

c) Abscisic acid (ABA) controls
   i. cell division.
   ii. leaf fall and dormancy.
   iii. shoot elongation.
   iv. cell elongation and wall formation. **(5 marks)**

d) The most widely accepted theory for ascent of sap in trees is
   i. capillarity.
   ii. role of atmospheric pressure.
   iii. pulsating action of living cell.
   iv. Cohesion-Tension. **(5marks)**

e) Photosynthetic pigments found in the chloroplasts occur in
   i. thylakoid membranes.
   ii. plastoglobules.
   iii. matrix.
   iv. chloroplast envelope. **(5 marks)**

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f) Which technique has helped in investigation of Calvin cycle?
i. X-ray crystallography
ii. X-ray technique
iii. radioactive isotope technique
iv. intermittent light **(5 marks)**

g) Ferredoxin is a constituent of
i. PS I.
ii. PS II.
iii. Hill reaction.
iv. P680. **(5 marks)**

h) Guttation is mainly due to
i. root pressure.
ii. osmosis.
iii. transpiration.
iv. imbibition. **(5 marks)**

j) During light reaction of photosynthesis, which of the following phenomenon is observed during cyclic phosphorylation as well as non-cyclic phosphorylation?
i. release of O_2
ii. formation of ATP
iii. formation of NADPH
iv. involvement of PS I and PS II pigment systems **(5 marks)**

k) When a cell is fully turgid, which of the following is zero?
i. Turgor pressure
ii. Water potential
iii. Wall pressure
iv. Osmotic pressure **(5 marks)**

l) Define the term "Quantum yield" in relation to photosynthesis. **(10marks)**

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m) Write **two (02)** advantages of aquaporins in plant cells. **(10 marks)**

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n) Explain briefly the diffusion potential? **(15marks)**

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o) Explain Briefly why transpiration is an important component of temperature regulation in plants. **(10marks)**

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p) Briefly explain how a plant cell creates positive hydrostatic pressure. **(15marks)**

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q) What is meant by "tensile strength"? **(10marks)**

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r) What are "hydathodes"? **(10marks)**

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s) Briefly explain the cation exchange capacity of soil. **(10marks)**

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t) Explain how plants modify the soil to increase the availability of nutrients for their own growth. **(10 marks)**

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u) List the modes of water transport through roots. **(10marks)**

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v) Write two advantages of having Casparian strip. **(10marks)**

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w) Why does a living cell never reach equilibrium until it is dead? Explain the reason. **(10marks)**

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x) What is electrical neutrality in plant cells? **(10marks)**

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y) List the two main types of "pumps" in plant cells. **(10marks)**

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Section B

Answer <u>TWO (02)</u> questions [Approximate time allocation is ONE (01) hour].

3. Compare and contrast the mechanisms and advantages of C4 and CAM photosynthesis over C3 photosynthesis, in relation to energy efficiency, water-use efficiency, and adaptation to different environmental conditions. **(100 marks)**

4. a) Briefly discuss why RuBisCO is considered a less efficient enzyme in the context of photosynthesis. **(40 marks)**

   b) Explain the mechanism of photorespiration and its impact on photosynthetic efficiency. **(60 marks)**

5. Write short notes on the following:
   a) Seed dimorphism.
   b) Equilibrium vs steady state in plant cells.
   c) Symport vs antiport
   d) Carrier protein vs channel protein. **(25x4=100 marks)**

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