

THE OPEN UNIVERSITY OF SRI LANKA  
B. Sc / B. Ed DEGREE PROGRAMME  
BOTANY – LEVEL 4

BOU2200 / BOE4200/ BTU2201: PLANT PHYSIOLOGY  
FINAL EXAMINATION 2010/2011



DURATION: THREE (03) HOURS

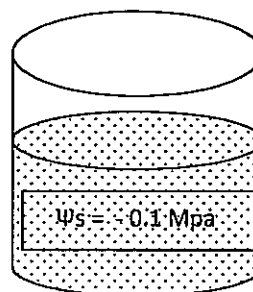
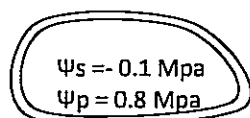
Date: 28<sup>th</sup> June 2011

Time: 9.30 am -12.30 pm

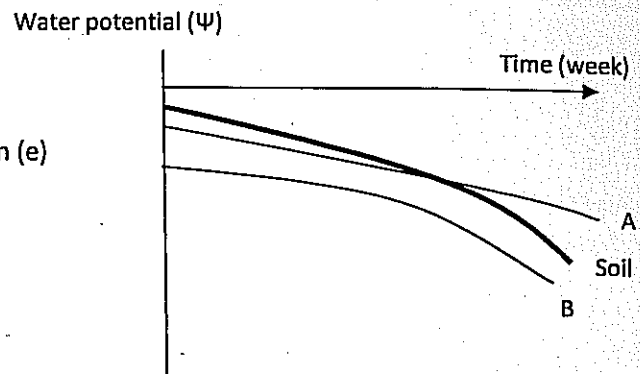
There are two (2) parts (part 1 and part 2) in this paper with eight (8) questions. Each part comprises of four (4) essay type questions. You have to answer FIVE (5) questions selecting at least TWO (2) questions from the each part.

PART 1

1. Water status of the plant is often expressed in terms of water potential and water content in cells. Plant water status depends on the soil water content.
  - a. Define the following terms
    - i. Water potential
    - ii. Relative water content
    - iii. Permanent wilting point
    - iv. Field capacity
  - b. Briefly explain the effect of intra-cellular solute molecules and cell wall on the water status of the plant cell.
  - c. Deduce whether the cell given below will be plasmolysed if it is equilibrated in the given solution.

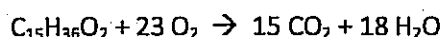


- d. State the assumptions you made in deriving the conclusion for section (c) of above.
- e. The following graph shows the variation of water potential of the soil and two plant cultivars A and B of rice. Identify the cultivar which is useful as a parental line in a breeding programme for drought tolerance.



- f. Give reasons for your choice in section (e)
2. Iron (Fe) is an essential nutrient for plant growth and is found abundantly in nature. However, plants often encounter difficulties in absorption of Fe ions.
- State main functions of Iron (Fe) in plants.
  - How do you identify an Iron (Fe) deficient plant?
  - How do Iron (Fe) ions in the soil become unavailable for the plants?
  - What is the predominantly adopted strategy of dicot plants to uptake  $Fe^{3+}$  ion?
  - What are phytosiderophores? Briefly state their role in plant iron uptake?
  - What is the element that was recently found to be present at toxic levels in rice plants grown in the north central province of Sri Lanka? Give two health hazards implicated with this element?
3. Respiration oxidizes cellular carbon synthesized through photosynthesis to  $CO_2$  and  $H_2O$ .
- Compare respiration and photosynthesis with details as complete as possible on the following aspects
    - Cellular compartments involved
    - Different types available
    - Processes and place of gas evolution
    - Reaction and place of gas utilization
    - Metabolically important intermediates produced
    - Energy molecules used or produced

- b. Illustrate the structure of the ATP synthase complex and indicate how ATP is synthesized on this complex.
- c. "Glycolysis uses up 2 ATP molecules and produces 8 ATP molecules". Explain this statement citing the reactions involved.
- d. What is the respiratory quotient for a fatty acid for which the equation for oxidation reaction is as follows?



4. Plant hormones are organic molecules that coordinate plant responses to both internal and external stimuli. They are produced in various tissues, through different biosynthetic pathways and are actively transported through the vascular tissues to different organs where they bring about specific responses.
  - a. What is the primary precursor, site and pathway of biosynthesis of the following hormones:
    - i. IBA
    - ii. GA<sub>3</sub>
    - iii. Zeatin
    - iv. C<sub>2</sub>H<sub>2</sub>
  - b. Name two hormones except auxins that are involved in regulating the initiation and growth of new branches.
  - c. "Cytokinins not only increase the greenness of the leaves but also delay the yellowing". Justify the above statement.
  - d. What are the conditions maintained in fruit storage facilities to reduce the synthesis of ethylene that causes ripening?
  - e. What is the biologically active form of brassinosteroids?
  - f. List three (03) biological functions of brassinosteroids.

PART 2

5. "Regulation of stomatal movement is essential for the regulation of both plant water status and photosynthesis. However the exact mechanism that governs stomatal movement is not clear". Discuss the above statement.
6. You have been requested by an agricultural venture to recommend a suitable soilless culture system for growing tomato plants in a green house. Present your recommendation citing advantages and disadvantages. Propose measures to overcome the disadvantages mentioned.
7. Explain the pathway and mechanism of movement of:
  - a. a water molecule in the soil to the atmosphere through the vascular system.
  - b. a glucose molecule synthesised in the leaf mesophyll cell to the root tuber.
8. "Action of enzymes is subjected to stringent regulation and modulation through diverse mechanisms in the cells". Explain this statement with the aid of suitable diagrams.

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