00572

THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. /B.Ed DEGREE PROGRAMME
BOTANY – LEVEL 04
FINAL EXAMINATION 2014/2015
BOU2200/BOE4200 -PLANT PHYSIOLOGY
DURATION :THREE (03) HOURS.

Date: 25th October 2015 Time: 9.30 a.m. – 12.30 p.m.

There are two (02) parts (Part I and Part II) in this paper with eight (08) questions. Each part comprises of four (04) essay type questions. You have to answer FIVE (05) questions selecting at least two (02) questions from each part.

No. of Questions : 08
No. of Pages : 04

PART I

01. (a) The following table gives values of osmotic potentials (Ψ_π)of sap and pressure potentials (Ψ_p) of cells A, B and C.

Cell	Osmotic potential (Ψ_π)	Pressure potential (Ψ_p)	Osmotic potential of bathing solution.
A	- 1010 KPa	600 KPa	- 300 KPa
B	-1120 KPa	750 KPa	- 500 KPa
C	- 550 KPa	0 KPa	0 KPa

i. Calculate the water potentials of A, B and C.
ii. The cells A, B and C were bathed in solutions of osmotic potentials given in the last column of the table. Indicate the net direction of water flow in each case.

(b) Another cell at incipient plasmolysis has an osmotic potential (Ψ_π) of – 2000 KPa. What happens when it is placed in a solution of water potential (Ψ) of – 1200 KPa?

(c) What are the components of soil water potential?

(d) How does the soil water potential differ from that of a vacuolated plant cell?

(e) Distinguish between the following:
i. Diffusion and osmosis
ii. Concave plasmolysis and convex plasmolysis
iii. Capillary pores and non-capillary pores.
iv. Capillary water and gravitational water.

02. (a) Briefly state the difference between essential and beneficial elements.

(b) Differentiate between macronutrients and micronutrients.

(c) Name three (03) macroelements which when deficient, cause chlorosis in the leaves.

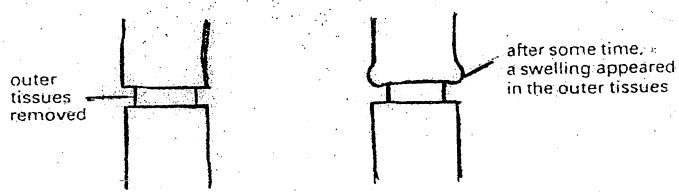
(d) Using the pattern of chlorosis appearing in leaves, how you could find out as to which of the elements you mentioned in (c) brought it about.

(e) What are the criteria by which an element is considered as essential for plants?

(f) What is meant by the "cation exchange capacity" of a soil? Explain its importance in plant mineral nutrition.

(g) What do you understand by the term "critical concentration of an element"?. What is the importance of knowing the critical concentration for different crop plants?

03. Figure given below, illustrates the results of a ringing experiment carried out by Malphigi in 1675.



(a) What was the objective of this experiment?

(b) Briefly explain why the swelling appeared in the bark tissue above the ring.

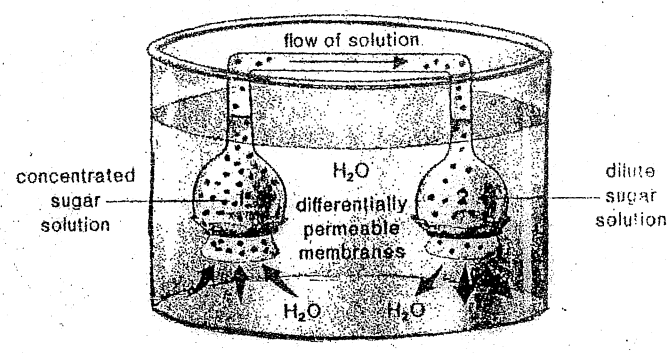
(c) What materials would you expect to get accumulated in this swelling?

(d) Briefly explain the nature and the structure of the plant tissue which is involved in the transportation of materials you mentioned in (c).

(e) What would you expect to happen, if ringing was done during winter months when trees did not bear any leaves?

(f) Give reasons for your answer to (e).

(g) Study the diagram given below and explain why there is a flow of solution from the left bulb to the right bulb.



04. (a) Name the process by which a 6 – carbon sugar is converted to pyruvic acid.

Where is the cell does this process occur?

(b) State why ATP is utilized during the first steps of glycollysis.

(c) Briefly explain the terms "substrate – level phosphorylation" and "oxidative phosphorylation"

(d) What is the role of coenzyme – A in the Kreb's cycle?

(e) Briefly describe the function of the respiratory electron transport chain.

(f) From what processes does the electron transport chain derive the reducing power for its operation?
Why is oxygen necessary for the operation of electron transport chain?

(g) What is meant by respiratory quotient (R.Q)? State the significance of R.Q value.

PART II

05. (a) What is meant by the "active site" of an enzyme?

(b) Explain the role played by the active site in each of the following:
i. Enzyme specificity
ii. Competitive inhibition.

(c) Mechanism of enzyme action is explained by the "lock and key mechanism" or "induced fit hypothesis".
Differentiate between these two.

(d) Discuss the significance of compartmentalization of enzymes in the cell.

06. Discuss the following:

(a) ABA plays an important role in ensuring the survival of plants under stress conditions, especially water stress.

(b) Tropisms in plants are growth responses to external stimuli such as light, gravity and contact.

07. (a) What is meant by "ascent of sap in plants"?

(b) Explain how water from the root xylem is moved to the top of tall trees.

(c) Give one (01) reason for breaking of the water column in the xylem.
If the water column in the xylem breaks how is it re-established?

(d) How do roots develop a root pressure?

08. Write short notes on the following:

(a) Diurnal variation of acid content in crassulacean plants.

(b) Various strategies adopted by plants to minimize environmental stresses.