641

THE OPEN UNIVERSITY OF SRI LANKA

B.Sc./B.Ed. DEGREE PROGRAMME

BOTANY – LEVEL 04

FINAL EXAMINATION – 2015/2016

BOU2200/BOE4200– PLANT PHYSIOLOGY

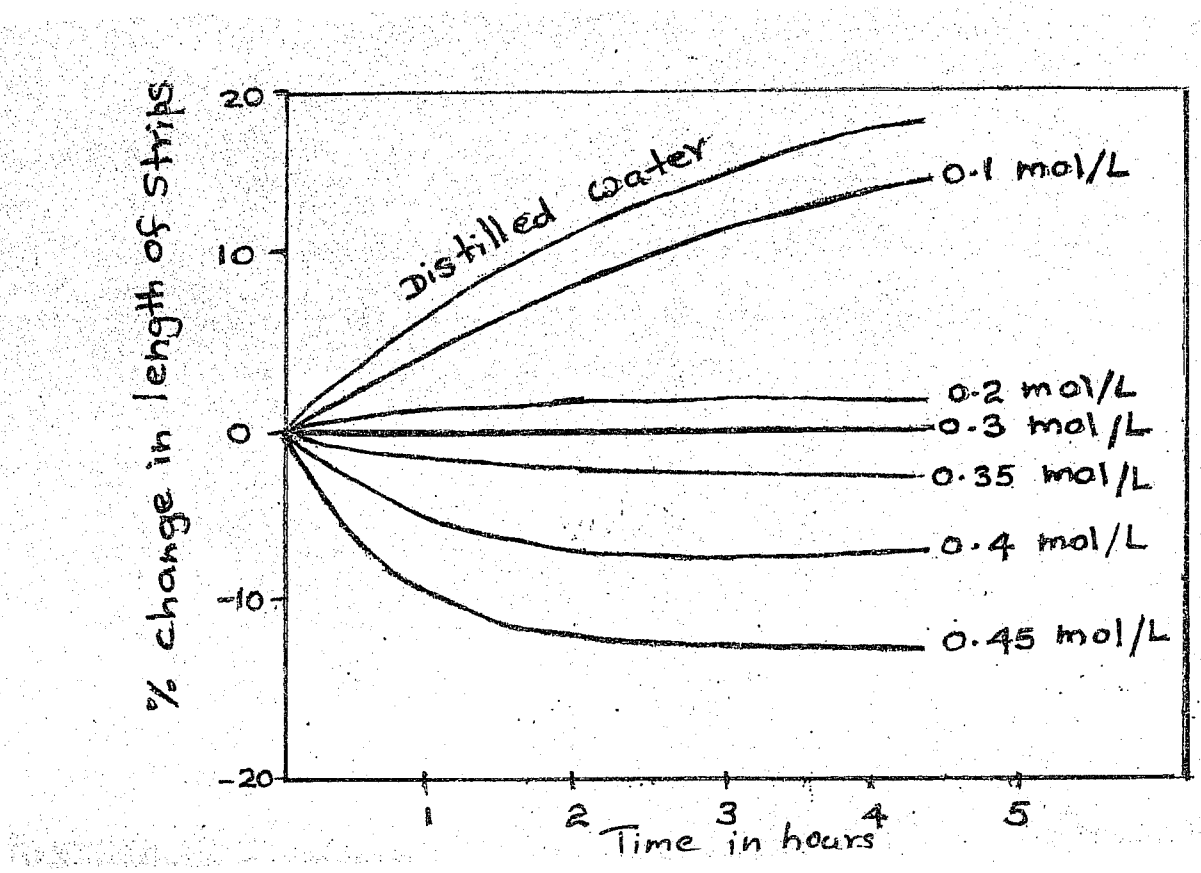
DURATION: THREE (03) HOURS

Date: 13th January 2017 **Time**: 9.30 a.m. – 12.30 p.m.

There are two 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.

PART – I

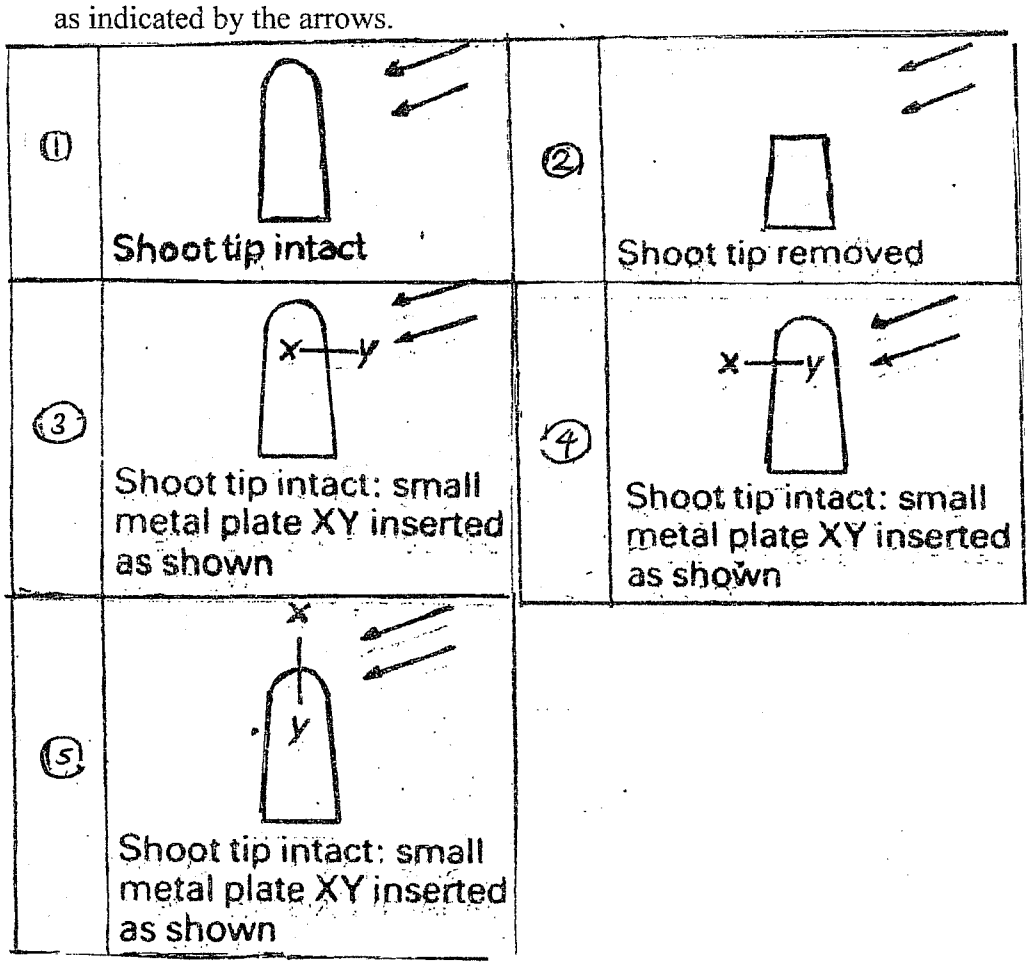
01. Strips of tissue from a potato tuber were immersed in distilled water and sucrose solutions of different concentrations and measured the length at one hour intervals. The results were as shown in the graph below.



a) What process is responsible for the changes in length in the potato strips?
b) Explain the changes in length that took place in the strips immersed in,
   i. 0.1 mol/L sucrose solution
   ii. 0.4 mol/L sucrose solution
c) What information about the potato tuber cells in indicated by the result in 0.3mol/L sucrose solution?
d) Make a labelled drawing to show the appearance of a cell of the potato tuber immersed in the 0.4 mol/L sucrose solution at the end of the experiment.
e) Distinguish between the following.
   i. A turgid cell and a flaccid cell.
   ii. Apoplast and symplast.
   iii. Active and passive absorption.
   iv. Cohesion and adhesion.

02. a) What are tropic and nastic movements? In what respects do they differ from each other.

b) Shoot apices of a plant were treated as shown below and exposed to unilateral light as indicated by the arrows.



   i. For each treatment, draw the expected response of the shoot apex to unidirectional light.
   ii. Explain briefly why you expect such responses in (i) to (5).

c) Explain how plant hormones influence geotropic responses of plants.

03. a) Name one example of an economically important

i. C_3 plant ii. C_4 plant

b) What is meant by "CO_2 fixation"?

c) Where exactly does it take place in a chloroplast? What is its relationship to the light reactions?

d) Discuss the advantages of the C_4 mechanism of CO_2 fixation to a plant living in a hot dry climate.

e) Two important enzymes in plants are Ribulose bi-phosphate (RUBP) carboxylase and phosphoenol pyruvate (PEP) carboxylase. Describe the reactions in which each is involved and their locations in leaves.

f) Briefly explain the role of the following in photosynthesis

i. Photons ii. Water iii. Chlorophyll

04. a) What is the most appropriate definition of growth?

b) Briefly describe the three distinct processes that contribute to growth and development.

c) The growth of an organ or an organism can be assessed by a variety of quantitative measures. What is the most suitable parameter for the assessment of the growth of,

i. a leaf attached to a plant.

ii. a callus tissue.

iii. rice plants.

d) Explain why dry weight measurements are preferred over fresh weight measurements when measuring growth.

e) Draw the typical sigmoid growth curve for a plant leaf and indicate on it the different phases of growth.

f) List the external and internal factors that influence the growth of plants. Explain briefly how these factors affect their growth.

PART - II

05. a) Differentiate between

i. Phytochrome and chlorophyll

ii. The two forms of phytochrome P_r and P_{fr}

b) X and Y are two plants showing reproductive photoperiodism

X – is a short day plant (SDP) with a critical day length of 11 hours.

Y – is a long day plant (LDP) with a critical day length of 15 hours.

State whether each of these plants will flower or not under the following day and light cycles. Give reasons for each case.

i.	16 hours day	;	8 hours night
ii.	8 hours day	;	16 hours night
iii.	12 hours day	;	12 hours night
iv.	11 hours day	;	13 hours night interrupted with 15 minutes light at the 4th hour.
v.	10 hours day interrupted with a 15 minutes dark period at the 4th hour	;	14 hours night

06. Discuss the following.

a) Unique characteristics of water play an important role in plant life.

b) The large bulk of water moving through a higher plant on a sunny day moves along a water potential gradient.

07. a) What is 'transpiration'?

Explain the different types of transpiration categorized on the basis of structure through which transpiration takes place.

b) Briefly describe the method employed to measure the rate of transpiration using the Potometer.

c) Write a brief account on the adaptations of plants to minimize transpiration.

08. Write short notes on the following.

a) Pollution and stress in plants.

b) Enzyme inhibition.