

THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. /B.Ed DEGREE PROGRAMME
BOTANY – LEVEL 04
FINAL EXAMINATION 2013/2014
BOU2200/BOE4200/BTU2201/BOE4201-PLANT PHYSIOLOGY
DURATION :THREE (03) HOURS.



Date: 22nd November 2014

Time: 9.30 a.m. – 12.30 p.m.

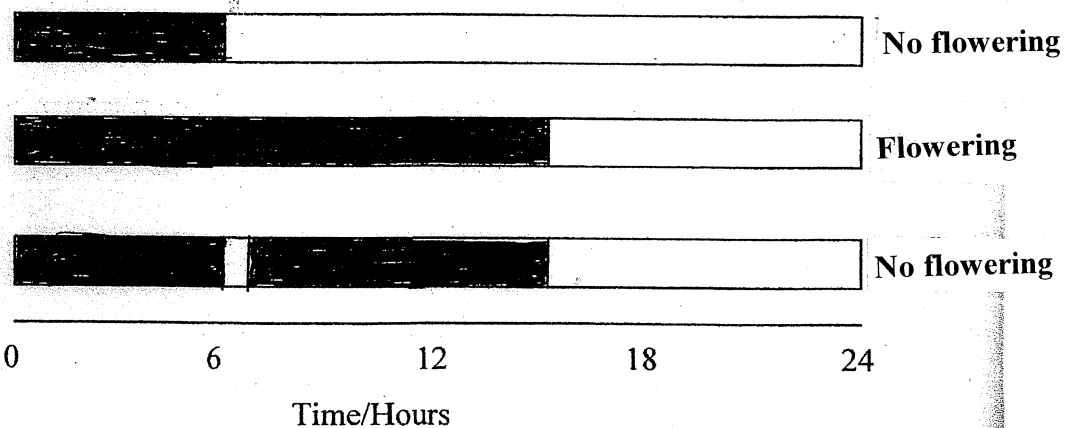
There are two (02) parts (Part I and Part II) in this paper with eight (08) questions. Each part comprises of four (04) essay type questions. You have to answer FIVE (05) questions selecting at least two (02) questions from each part.

PART I

01. It has been recognized that several physical processes are involved in both entry and movement of water into and between cells.
- a) Name these processes.
 - b) Briefly describe the components that determine the water potential of plant cells.
 - c) How would you express the relationship between these components?
 - d) State what you would expect to happen if a plant cell with an osmotic potential of – 1000 KPa and pressure potential of 200 KPa is placed in the following.
 - i. A solution of osmotic potential of – 800 KPa
 - ii. A solution of water potential of – 800 KPa
 - iii. A solution of osmotic potential of – 1000 KPa
 - iv. Pure water.
 - e) Briefly describe how you would measure the solute potential of cells using the plasmolysis process.
 - f) Define the terms “field capacity” and “permanent wilting percentage”, which are used widely to describe available soil water.

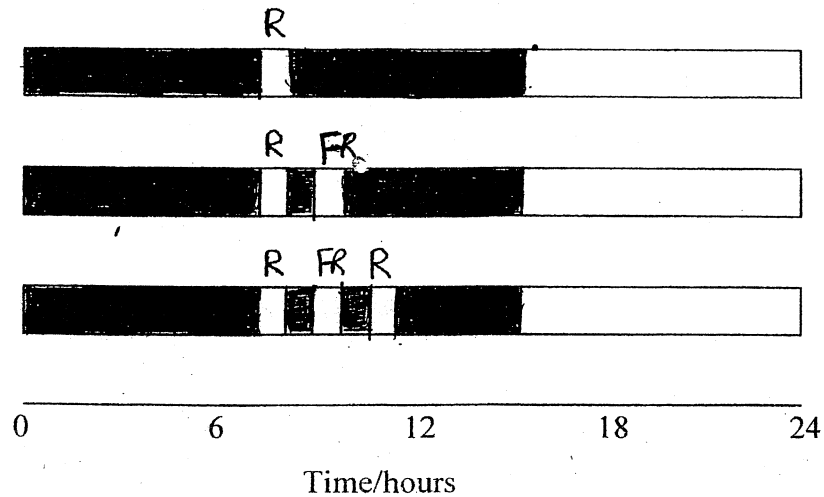
02. Plants respond to alterations of light and dark periods in a variety of ways. Flowering plants are categorized into three groups depending on the effect of day length on flowering.

- a) Briefly describe the above three groups. Cite two examples for each group.
- b) In an experiment, plant 'A' was exposed to various periods of light (unshaded bars) and darkness (shaded bars) as shown in the diagram below. In some instances, the dark period was interrupted by periods of light. The effect on the flowering is given in each case. To which of the groups you mentioned above does plant 'A' belong. Give reasons.

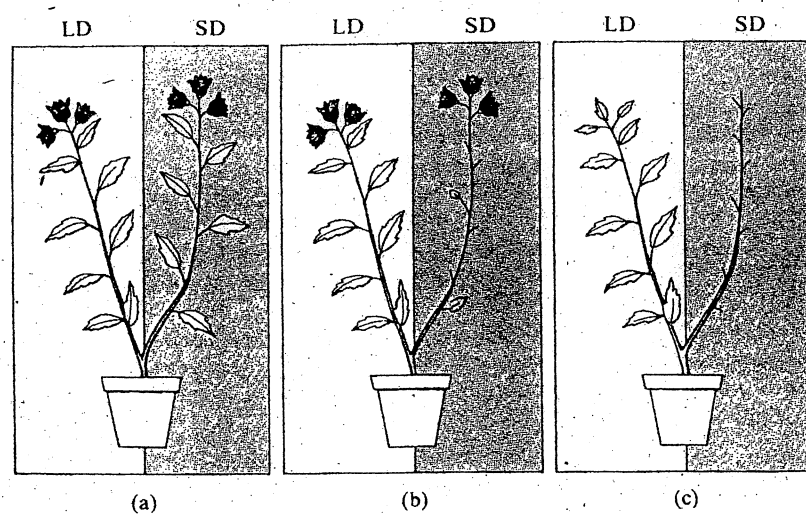


- c) In another experiment, plant 'A' was exposed to periods of light and darkness as given in the diagram below.

15 hours of darkness was interrupted by flashes of red light (R) and far-red light (FR). State whether plant 'A' will flower or not in each case giving reasons.



- d) The figure given below shows the results of an experiment conducted with two-shoot plants of *Xanthium* (a short-day species). Why do plants (a) and (b) flower, whereas (c) does not?



SD – Short – day condition; LD – Long – day condition

- e) Briefly describe how the two forms of phytochrome differ from one another. Which form of phytochrome is the physiologically active form?
- f) State the differences between photoperiodism and vernalization.
03. Growing plants using hydroponics (soil-less culture) is becoming popular around the world as it reduces the problems which are encountered in conventional crop cultivation.
- a) What is hydroponics?
- b) What are the basic requirements of any hydroponic system?
- c) Briefly mention the advantages of hydroponic culture of plants over soil-based culture.
- d) Give the major differences between the two techniques which come under the circulating method of liquid hydroponics.
- e) Briefly explain why it is important to
- i. replace the nutrient solution from time to time.
 - ii. submerge only the bottom 2 cm of the pots in nutrient solution in the root dipping technique.
- f) Name one important organic molecule present in plants containing each of the following elements.
- i. Nitrogen
 - ii. Magnesium
 - iii. Phosphorous
 - iv. Sulphur
- g) Certain fungal diseases of plants cause inhibition of potassium uptake by roots. When this happens, the plant dies due to insufficient supply of food to the growing points. Explain how the inhibition of potassium uptake can cause starvation of growing points.

04. The process known as photorespiration causes loss of carbon from the photosynthetic cycle.
- What is “photorespiration?”
 - What are the organelles associated with this process?
 - Briefly describe the biochemical reaction sequence involved in this process (structures of chemical compounds are not expected)
 - Briefly explain why it is considered to be a wasteful process.
 - Briefly state why C_3 plants show high rates of photorespiration while it is barely detectable in C_4 plants.

PART II

05. a) Plant can take up nitrogen in the form of nitrate. Describe the reactions involved in the conversion of nitrogen of nitrate ions into amino acids in plants.
- b) Briefly discuss the importance of “Biological nitrogen fixation”
06. Explain the following;
- ABA (abscisic acid) helps plants to survive through long periods of drought.
 - When placed horizontally, shoots bend upwards and roots bend downwards. Both effects are brought about primarily by auxin redistribution.
 - When embryoless halves of barley grains are treated with GA, the starch in the endosperm is converted to sugar. However, this effect is blocked by cycloheximide, an inhibitor of protein synthesis.
 - When the root system of a tomato plant is flooded for a few days, the shoot system shows symptoms of high ethylene.

07. a) Chlorophylls are generally considered to be the pigments necessary for photosynthesis, but many other pigments are present in the photosynthetic apparatus of plants. What is the purpose of having these other pigments?
- b) Using the “Z scheme”, explain the light reactions of photosynthesis. Show how the products of light reactions are utilized in the dark reactions.
08. In potato plants, the main storage substance is carbohydrate. But these carbohydrates are not produced in the storage tissue or organs. Describe how the carbohydrates synthesized in the leaves are translocated to the storage tissue.

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