

八十六學年度 生命科學 系(所) 分生組甲 生醫組甲 組碩士班研究生入學考試
 科目 植物生理學 科號 0905 1205 共 4 頁第 1 頁 *請在試卷【答案卷】內作答

1. 請以簡圖描述高等植物葉綠體結構，並標明每一部位的功能。(5%)
2. 什麼是光系統 (photosystem)? 請以高等植物的第二光系統為例說明它的組成與運作方式。(5%)
3. 為什麼植物是綠色的? 請以簡單的葉綠素分子能階圖說明之。(5%)
4. 在整個高等植物葉綠體的電子傳遞系統中，何處是它的 rate-limiting step? 在此處電子的傳遞速率大約在什麼 time scale? (5%)
5. While there are many similarities between plant and animal mitochondria, there also are some striking differences. Describe these differences, and comments on the possible significance of these different features of plant mitochondria in terms of overall metabolism and/or physiology of the plant or some of its tissues. (10%)
6. Please elucidate the establishment of a nodule and emphasize the interaction between plant and bacterium (10%)
7. Please describe the physiological roles for gibberellins. (8%)
8. Please indicate whether the following statements are true or false. If a statement is false, explain why. (20%)
 - (1). The rapid turnover of all plant microtubules supports the idea that the transitions between different arrays or changes in orientations occur from direct movement of preformed elements rather than through processes of depolymerization/repolymerization.

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- (2). The drug cycloheximide inhibits protein synthesis by mitochondria or chloroplasts.
- (3). Sink strength is defined as the amount of carbon imported per gram of sink per time.
- (4). The medium used for plant cell culture always include glucose. Glucose is present mainly for nutrient supply.
- (5). The antibiotic erythromycin inhibits protein synthesis in energy organelles.
- (6). The degradation of plant fatty acid is compartmentalized in mitochondrion and glyoxysome, while plant fatty acid biosynthesis is localized in cytosol.
- (7). In the gametophytic system, if the incompatibility alleles in the pollen nucleus is identical with either of the alleles present in the stylar tissue, pollen tube growth in the style will be slowed and fertilization will occur.
- (8). The plant *Mimosa pudica* possesses pulvini and exhibits a nyctinic response to mechanical stimulation.
- (9). It is possible that IAA serves to prevent vivipary, a precocious germination before the embryo reaches maturity or the seed is released from the fruit.

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(10). Calcium is relative mobile and the deficiency symptoms typically appear in the oldest tissues first.

9. A group of well-watered soybean seedlings whose first foliage leaves have a Ψ_p of 1.0 MPa are transpiring at a certain rate. It is found that the leaves neither gain nor lose water when placed in an 0.2 M solution of mannitol. With the information that RT at $25^\circ\text{C} = 2.48 \text{ MPa/M}$, please calculate (12%)

(1). What is the Ψ_p of the cell?

(2). A humidifier is now turned on, which decreases their rate of transpiration to half that which was occurring before. What do you expect the Ψ_p of the leaf cells to be after a new steady state of water movement has been established?

(3). The plants are moved to a dry and hot greenhouse where their rate of transpiration increases four folds, what will the Ψ_p of the leaf cells become?

(4). What is the hydraulic permeability of the roots plus vascular system, in ml/MPa-hr, if the transpiration rate in (1). was 3 ml/hr.

10. Please fill in the blanks below. (20%)

(1). If we grow plants that synthesize more osmolytes, they might resist to (a) or (b) in the field.

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- (2). Disease resistance in many plant-pathogen interactions results from the expression of a (c) gene in the plant and a corresponding (d) gene in the pathogen and is often associated with the rapid, localized cell death of the (e) response.
- (3). The apical shoot meristem forms during (f), a process that is disrupted in mutants of which either lack entirely or have a severely reduced shoot meristem.
- (4). The lower rate of transport during the dark is due to the (g) which decreases the (h).
- (5). Low concentration of phosphate in the cytoplasm can (i) triose transport out of chloroplast.
- (6). (j) is used to transfer acetyl CoA from mitochondria to cytosol.