

八十五學年度 生命科學 系(所) 分生組甲 牛醫組甲 組碩士班研究生入學考試
 科目 植物生理學 科號 0905 1205 共 3 頁第 1 頁 *請在試卷【答案卷】內作答

1. Please indicate whether the following statements are true or false. If a statement is false, explain why. (20%)
 - (1). Unlike cytoplasmic organelles, the plant nucleolus is not bounded by a membrane.
 - (2). A relatively quick method for estimating the water potential of large pieces of tissues, such as whole leaves and shoots, is with the psychrometer. This method was pioneered by H. Dixon and improved by P. Scholander.
 - (3). Water vapor moves from the leaf to the atmosphere by diffusion through the cuticle.
 - (4). The medium used for plant cell culture always include glucose. Glucose is present mainly for maintaining osmotic potential.
 - (5). Plant mitochondria are similar to animal mitochondria in the aspect of the level of respiration sensitive to cyanide.
 - (6). Plant respiration is regulated by energy demand and the concentration of key metabolites such as fructose 2,6-bisphosphate.
 - (7). The fact that species with small genomes exist as fully functional flowering plants has generated a great deal of speculation about the function of the extra DNA in those species with large genomes.
 - (8). Complex polysaccharides, which are synthesized exclusively in Golgi cisternae, are assembled in a *trans-to-cis* direction.
 - (9). Since the flower primordia are initiated acropetally, the activation of axillary inflorescences occurs acropetally.
 - (10). Auxin is induced by stress and stomatal closure.

2. Please define the essential elements of plants. Plants nutrients have been divided into four basic groups by Mengel and Kirkby. Please describe all the essential elements and the forms which they are taken up by plants. (10%)

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3. Please describe in details the pathways of phloem translocation in higher plants including the sieve elements, the P-protein and materials translocated. (10%)
4. Compare and contrast the nitrogen assimilation within the plant, their substrates, their environmental requirements and their relationships to other physiological processes. (10%)
5. A cell is immersed in water at 25°C where it is observed to swell. It is then placed into increasing concentrations of mannitol; each time it shrinks some. When it is put into 0.2 M mannitol it is found to be the same size as initially. It continues to shrink in stronger solution until in 0.5 M mannitol very slight plasmolysis is observed, while in 0.6 M mannitol it is slightly plasmolyzed. In 0.5 M mannitol the volume of the cell is 15% less than it was initially. With the information that $\Psi_s = -m_iRT$ and RT at 25°C = 2.48 MPa/M, please calculate (10%)
 - (1). The cell's water potential at zero turgor.
 - (2). The cell's osmotic potential in its initial state.
 - (3). The cell's water potential initially.
 - (4). The cell's turgor pressure initially.
6. Please fill in the blanks below. (20%)
 - (1). A pressure gradient of about (a) is needed to lift water to the top of a 100-meter tree.
 - (2). The occurrence of (b) (fungus) is in natural conditions, they grow inside the plant roots and in surrounding soil, often facilitating (c) by the plants.
 - (3). The Nernst equation describes the relationship between the (d) across a membrane and the (e) of a given ion under equilibrium conditions.

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- (4). The pentose phosphate pathway oxidizes glucose to (f) and reduces (g).
 - (5). The (h) family of photoreceptors provides plants with a battery of sensors of natural radiation environment.
 - (6). During plant (i), large numbers of genes must be expressed in a highly coordinated manner to ensure that the single-celled zygote develops into an organized, multicellular structure.
 - (7). The polymerization of two diphosphorylated (j) building block generates geranyl diphosphate.
7. Carotenoids can be found in the chloroplasts of all higher plants. Where are its exact locations in chloroplasts and what are its functions? (10%)
8. Describe the electron transport system of photosystem II (PSII). How the charge separation in the reaction center of PSII is stabilized? (10%)