

一、Solution culture 是從事植物生理研究的重要工具。

- (1) 請說明利用 solution culture 來從事「植物營養」研究有那些優點？(8分)
- (2) 請你以 solution culture 為工具，設計一個植物生理相關（不限於植物營養）的試驗。請敘明研究目的，並詳細陳述你的研究方法，包括試驗設計。(7分)

二、以下文字取材自 Holbrook, N.M. 2010:

Xylem cavitation breaks the continuity of the water column and prevents the transport of water under tension. Such breaks in the water columns in plants are not unusual. When plants are deprived of water, sound pulses or clicks can be detected. The formation and rapid expansion of air bubbles in the xylem, such that the pressure in the water is suddenly increased by perhaps 1 MPa or more, resulted in high-frequency acoustic shock waves through the rest of the plant. These breaks in xylem water continuity, if not repaired, would be disastrous to the plant. By blocking the main transport pathway of water, such embolisms would increase flow resistance and ultimately cause the dehydration and death of the leaves, and other organs.

- (1) 請將上述引用之文章逐字翻譯成中文。(6分)
- (2) 植物如何避免上述主題的影響？(5分)

三、解釋以下英文專有名詞，請將英文專有名詞先抄寫在答案卷再答題：(30分，每小題3分)

- (1) terpenes
- (2) Rubisco activase
- (3) respiratory quotient
- (4) cohesion-tension theory
- (5) light compensation point
- (6) carbon dioxide enrichment
- (7) oxidative pentose phosphate pathway
- (8) inorganic carbon-concentrating mechanisms
- (9) phenotypic plasticity
- (10) antifreeze protein

四、說明植物適應 (adaptation) 與馴化 (acclimation) 之不同。(6分)

五、舉出「H⁺-ATPase」參與作物的六種生理作用或路徑？(12分)

六、舉出使「光反應之電子」對作物造成「氧化逆境」的五種「環境」，並說明這五種環境對作物造成氧化逆境的原因。(10分)

七、說明鈣如何參與作物耐受乾旱、低溫與病原菌的機制，以及對重力的反應機制？(16分)