

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

**I. True or False (20 points, 2 points for each):**

1. Leaf area index (LAI) is the ratio of photosynthetic leaf area to ground area, so a larger LAI indicates a greater growth rate.
2. Under water deficit stress, the photosynthetic efficiency is reduced.
3. Core antenna complex is not affected by the changes of growth irradiance.
4. Sucrose synthase catalyze the cleavage of sucrose to glucose and fructose.
5. In C4 plant, bundle sheath cell is responsible for carbon fixation, and mesophyll cell is responsible for Calvin cycle.
6. Active efflux of proton from guard cell triggers stomata opening.
7. The main function of leghemoglobin is to supply oxygen to the symbiotic rhizobia in root nodules.
8. Photosystems I and II are not evenly distributed on thylakoid membrane. Generally, PSI is enriched in the inner layers of thylakoid membrane.
9. Invertase has acid and alkaline forms. Acid invertase is involved in the sucrose hydrolysis during the phloem unloading.
10. The assimilation of ammonia requires alpha-ketoglutarate and glutamate.

**II. Term explanation (12 points, 3 points for each):**

1. Photophosphorylation
2. Photosynthetically active radiation (PAR)
3. Light compensation point
4. Casparian strip

**III. Questions (68 points)**

1. How do plants acquire mineral nutrients that attached to soil particle? (5 pt)
2. What is Xanthophyll cycle (3 pt)? How does it protect plant from photodamage (3 pt)?

3. What is the product of starch phosphorolytic pathway (2 pt)? Where does the process occur (2 pt)? How does it transport to cytosol (2 pt)?
4. If you have a pH meter, how to test a plant possessing CAM mechanism (3 pt)? Why (3 pt)?
5. What is the role of xylem in phloem transport (5 pt)?
6. How plants control amount of hormones accumulate in the cells? (5 pt)
7. Describe two forms of plant hormone receptor. (5 pt)
8. How does auxin regulate phototropism? (5 pt)
9. Describe what is meant by cross-talk in hormone signaling (5 pt)
10. How does the production of volatile compounds benefit an herbivore-damaged plant? (5 pt)
11. Propose the adaptive significance of each of the following drought responses:
  - A. Stomatal closure (3 pt)
  - B. Decreased leaf expansion (3 pt)
  - C. Maintenance of primary root elongation (3 pt)
  - D. Biosynthesis of compatible solutes (3 pt)
  - E. Activation of reactive-oxygen detoxifying systems (3 pt)