

※ 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。

總共 100 分

一、是非題：(正確請標示“O”，錯誤請標示“X”，使用其它符號不予計分)(共 20 分，每題 1 分)

1. In photosynthesis, blue light is more efficient than red light.
2. In the end of light reaction of photosynthesis, electrons are accepted by ATP in the stroma.
3. The dark reaction of photosynthesis does not occur in the light.
4. Phosphoenolpyruvate (PEP) carboxykinase is the enzyme that fixed CO_2 in C_4 plants.
5. In general, in contrast to C_3 plants, two additional ATP are required to fix one molecule of CO_2 in C_4 plants.
6. Rubisco is required for the photosynthesis in Crassulacean acid metabolism (CAM) plants.
7. Fructose-2,6-bisphosphate in the chloroplast is considered as a regulatory metabolite for sucrose synthesis.
8. Under high CO_2 concentration, C_3 plants may have higher photosynthetic rate than C_4 plants.
9. In cyanobacterium *Anabaena*, heterocysts are responsible for nitrogen fixation.
10. In higher plants, only legumes can perform nitrogen fixation.
11. In the nodule, nitrogenase and leghemoglobin are both located inside the bacteroid.
12. Nitrogenase complex is very sensitive to O_2 .
13. The product of nitrogenase is ammonium.
14. Nitrate taken up by roots from the soil has to be assimilated immediately.
15. Phytochrome will convert to Pfr form under the far-red light.
16. Phytochrome can act as a transcription factor.
17. The chromophores of phototropins and cryptochromes are both flavin derivatives.
18. Circadian rhythm-regulated responses will be eliminated immediately when the signal of light-dark cycle is removed.
19. Long-day plants can flower in the short day when the night period is interrupted by a pulse of red light.
20. Day-neutral plants initiate flower buds only when the length of day period is equal to the length of night period.

二、單選題：(請用 A、B、C、D、E 作答，其它符號不予計分)(共 14 分，每題 2 分)

1. Which of the following are the sexual parts of a flower?
(A) stamens and carpels
(B) carpels and sepals
(C) sepals and petals
(D) stamens and sepals
(E) all of the above are the sexual parts of a flower
2. All of the following except one are examples of monocots. **CHOOSE THE EXCEPTION.**
(A) grasses
(B) orchids
(C) dandelions

- (D) lilies
(E) All of the above are examples of monocots.
3. What is the main importance of gymnosperms to human societies?
(A) their seeds are important food sources
(B) medicines for a wide variety of illnesses
(C) wood for construction, fuel, and paper
(D) floral arrangements
(E) both the use as medicines and seeds for food
4. The browning of apples is caused by the interaction of _____ and oxygen.
(A) terpenes
(B) alkaloids
(C) glycosides
(D) phenolics
(E) resins
5. Which of the following secondary compounds are structurally similar to neurotransmitters and are mostly psychoactive?
(A) saponins
(B) tannins
(C) flavonoids
(D) terpenes
(E) alkaloids
6. Which one is the primary effect of water deficit in plants?
(A) Stomatal closure
(B) Leaf abscission
(C) ROS production
(D) Water potential reduction
(E) Cell death
7. Which of the following statements about octadecanoid pathway is **FALSE**?
(A) a major signaling pathway involved in plant defenses against insect herbivores
(B) start in the peroxisome
(C) β -oxidation is required in this pathway
(D) the end product is synthesized from linolenic acid
(E) the end product is released from plant membrane lipids

三、解釋名詞：(共 4 分，每題 2 分)

1. Artemisinin
2. Evo-devo

四、配合題組 I：(共八題，請用 A、B、C、D、E、F、G、H、I、J 作答，其它符號不予計分；每題答案可能不只一個，全對才給分)(共 16 分，每題 2 分)

1. The organelle that contains the genetic information
2. The organelle that contains the tonoplast
3. The major organelle that stores morphinan alkaloids in opium poppy
4. Maintenance of cell shape and also playing fundamental roles in mitosis
5. DNA-protein complex
6. Semiautonomous organelles
7. E site, P site and A site for amino acids polymerization
8. The presence of COP II protein

- (A) endoplasmic reticulum
- (B) nucleus
- (C) golgi
- (D) vacuole
- (E) plasma membrane
- (F) plastids
- (G) mitochondria
- (H) nucleosome
- (I) ribosome
- (J) cytoskeleton

五、配合題組 II：(共五題，請用大寫英文字母 A~N 作答，其它符號不予計分；每題均有兩個答案，全對才給分)(共 10 分，每題 2 分)

Match the enzyme(s) involved in the biosynthesis of plant hormone:

1. Enzymes involved in auxin biosynthesis
2. Enzymes involved in cytokinin biosynthesis.
3. Enzymes involved in gibberellin (GA) biosynthesis.
4. Enzymes involved in abscisic acid (ABA) biosynthesis.
5. Enzymes involved in ethylene biosynthesis.

- (A). ACC oxidase
- (B). Zeatin isomerase

- (C). GA 20-oxidase
- (D). Tryptophan synthases
- (E). β -galactosidase
- (F). Salicylate hydroxylase
- (G). zeaxanthin epoxidase (ZEP)
- (H). Rubisco
- (I). α -amylase
- (J). Isopentenyl transferase (ipt) gene
- (K). 9-cis-epoxycarotenoid dioxygenase (NCED)
- (L). *iaaH* and *iaaM* synthase genes
- (M). GA 3-oxidase
- (N). ACC synthase

六、配合題組 III：(共五題，請用 A、B、C、D、E 作答，其它符號不予計分；每題僅有一個答案)

(共 5 分，每題 1 分)

1. Hormone discovered from herring sperm DNA
2. Hormone discovered from *Striga*.
3. Hormone discovered from Jasmine.
4. Hormone discovered from Willow.
5. Hormone discovered from rice.

- (A). Methyl jasmonate
- (B). Salicylic acid
- (C). Strigolactone
- (D). Gibberellin (GA)
- (E). Kinetin-Cytokinin

七、配合題組 IV：(共五題，請用 A、B、C、D、E 作答，其它符號不予計分；每題僅有一個答案)

(共 5 分，每題 1 分)

1. Repressor protein is degraded by 26 proteasome during Auxin signaling
2. Repressor protein is inactivated during abscisic acid (ABA) signaling
3. Repressor protein is degraded by 26 proteasome during Gibberellin (GA) signaling
4. Repressor protein is inactivated during ethylene signaling
5. Repressor protein is degraded by 26 proteasome during jasmonic acid (JA) signaling

- (A). DELLA
- (B). CTR
- (C). Aux/IAA
- (D). PP2C phosphatase
- (E). JAZ

八、問答題：(共五題，共 26 分)

1. What is an aquaporin? Why is it important for water transport? (5 分)
2. Explain how water can be moved from roots to the top of a 100m tree. What prevents the water column in a tree from breaking? (5 分)
3. In some cases, a plant cell can accumulate ions without consuming bioenergy. Why? (5 分)
4. Deficiencies of iron, magnesium, and nitrogen all cause chlorosis. Iron chlorosis develops only between the veins of young leaves while chlorosis due to both magnesium and nitrogen develops more in older leaves. Explain why does each deficiency lead to chlorosis and why are the patterns different? (5 分)
5. Modification reactions such as oxidation and reduction create the enormous diversity of plant natural products, providing new molecules with different biological activities from the basic scaffolds. Please illustrate what kind of modification reactions often be execute in plants? (6 分)