編號： 70

國立成功大學 107 學年度碩士班招生考試試題

系　　所：熱帶植物科學研究所

考試科目：植物生理學

考試日期：0206，節次：3

※ 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。

配合題組 (40 points)：

1. Regarding the metabolic enzymes: (12 pt)

_____ (1) The enzyme involved in the carboxylation step of the Calvin cycle

_____ (2) The enzyme involved in the reduction step of the Calvin cycle

_____ (3) The enzyme involved in the regeneration of ribulose-1,5-biphosphate (RuBP) in the Calvin cycle

_____ (4) The enzyme involved in the generation of ribulose-5-phosphate in the oxidative pentose phosphate cycle

_____ (5) The enzyme involved in starch biosynthesis

_____ (6) The enzyme involved in the initiation of C4 photosynthesis

_____ (7) The enzyme involved in the conversion of the C3 acid that continues C4 photosynthesis

_____ (8) The enzyme involved in sucrose cleavage

_____ (9) The enzyme involved in the cleavage of fructose-1,6-biphosphate into two C3-compounds

_____ (10) The enzyme involved in starch hydrolysis

_____ (11) The enzyme involved in ammonia assimilation

_____ (12) The enzyme involved in nitrogen transportation

A. 6-Phsophogluconate dehydrogenase
B. Aldolase
C. Amylase
D. Asparagine synthetase
E. Glutamine synthase
F. Glyceraldehyde-3-phosphate dehydrogenase
G. Invertase
H. Phosphoenol pyruvate carboxylase
I. Phosphoglucomutase
J. Pyruvate phosphate dikinase
K. Rubisco
L. Ribulose-5-phosphate kinase

2. Regarding metabolites or proteins: (8 pt)

_____ (1) A metabolite involved in the legume-rhizobium recognition

_____ (2) A compound involved in the light-harvesting complex in cyanobacteria

_____ (3) A protein involved in photomorphogenesis

_____ (4) A protein involved in the maintenance of low-oxygen environment in root nodules of legume.

_____ (5) The principal photosynthetic pigment in plants.

_____ (6) A protein involved in the reduction of NADPH in the electron transport chain of photosynthesis

_____ (7) A compound involved in the electron transfer route of photosystem II

_____ (8) A compound involved in the chromophore of phototropin

A. Chlorophyll
B. Ferredoxin
C. Flavin mononucleotide
D. Flavonoid
E. Leghemoglobin
F. Pheophytin
G. Phycobilin
H. Phytochrome

3. Select the hormone(s) that match to the question (10 pt)

_____ (1) Production of hormone to limit growth under stressful condition such as flooding and drought. (1pt)
_____ (2) A hormone has structure similar to animal steroid. (1 pt)
_____ (3) Two hormones have antagonistic effects on shoot and root growth. (2 pt)
_____
_____ (4) Communication of rhizobia and legume by production of two signaling molecules for symbiosis. (2 pt)
_____
_____ (5) Hormone has structure similar to a painkiller- aspirin. (1 pt)
_____ (6) A hormone responsible for the production of herbivore-induced volatiles can be recognized by carnivorous and parasitoid insects. (1 pt)
_____ (7) Hormone regulates stomatal aperture. (1 pt)
_____ (8) Systemin is a plant hormone involved in the wound response in tomato plant. Systemin belongs to what hormone category? (1 pt)

A). Auxins
B). Ethylene
C). Cytokinin
D). Gibberellic acid
E). Nod factors
F). Brassinosteroids
G). Salicylic acid
H). Jasmonic acid
I). Peptide hormones
J). Polyamines
K). Nitric acid (NO)
L). Absicisic acid
M). Flavonoids
N). Strigolactone

4. Select the most likely phenomenon or physiological effect (5 pt)

_____ (1) The ability of a single cell to divide and produce all the differentiated cells in an organism. (1 pt)
_____ (2) A mechanism, used by plants to prevent the spread of infection by microbial pathogens. (1 pt)
_____ (3) Growth response to light mainly in all shoots to ensure leaves can receive optimal sunlight. (1 pt)
_____ (4) Redistribution of statoliths in the sensor cell (1 pt)

_____ (5) The transition between vegetative growth and reproductive growth. (1 pt)

A. Thigmotropism
B. Apical dominance
C. Totipotency
D. Habituation
E. Crown gall disease
F. Phototropism
G. Triple response
H. Polar growth
I. Gravitropic bending
J. de-foliate
K. Hypersensitive response
L. Phase change
M. Vivipary

5. Select one appropriate answer for the following questions (5 pt)

_____ (1) Introduction of antisense constructs to interfere with expression of biosynthesis enzymes is an effective way to control ethylene production. Genes in the list can be used for genetic manipulation to limit ethylene synthesis (2 pt)

_____ (2) Some hormone receptors initiate protein proteolysis of repressors to activate a transcriptional regulator. Which gene in the list is the repressor of Auxin response? (1 pt)

_____ (3) Which gene in the list was considered as "Green Revolution" gene as its mutant was used in the breeding program for many semi-dwarf rice varieties. (1 pt)

_____ (4) Auxin polar transport enable auxin can only exit the cell through active export by auxin efflux carriers that specifically located at the basal side of the cell. Which protein in the list belongs to this protein family? (1 pt)

A). Isopentenyl transferase (*ipt*) gene
B). ACC synthase
C.) PIN
D.) *iaaH* and *iaaM* synthase genes
E.) ACC oxidase
F.) cytokinin oxidase
G). systemin
H). α-amylase
I). AUX/IAA
J). LacZ gene (β-galactosidase)
K). GA 20 oxidases
L). JAZ

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問答題 (60 pt)：

1. Please explain how beta-carotenes protect plants from photo-oxidation. (5 pt)
2. Please explain how CAM photosynthesis help plants adapt dry environments. (5 pt)
3. How does the pool of plastiquinol mediate the proton gradient across thylakoid membrane? (5 pt)
4. How does sucrose transport from source cells to sieve elements? (5 pt)
5. How does drought stress affect plant photosynthesis? (5 pt)
6. What is acclimation? Give an example to explain the process. (5 pt)
7. What is ABC model in controlling floral organs development? (5 pt)
8. Explain the photoperiodic regulation of flowering. (5 pt)
9. Explain the function of compatible solutes (sorbital, mannitol, malate, glycine betaine, proline, and inorganic ions) in plants response to water shortage in the soil. (5 pt)
10. What is the function of Casparian strip barrier in roots? (5 pt)
11. Phytochrome controls shade avoidance, please explain. (5 pt)
12. Control ethylene production is important part of post-harvest physiology, please explain. (5 pt)