

國立成功大學
110學年度碩士班招生考試試題

編 號：63

系 所：熱帶植物與微生物科學研究所

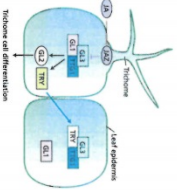
科 目：植物生理學

日 期：0203

節 次：第 3 節

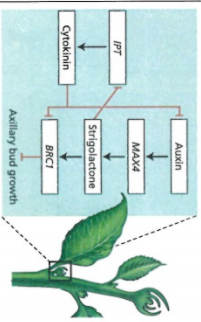
備 註：不可使用計算機

- ※ 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。
- How do plants absorb nutrients from soil? (4%) What kind of nutrients could be utilized by plants? (4%)
 - Why do plant seeds store $6n^2$? (4%) How to metabolize the $6n^2$? (4%)
 - Please list the components of non-cyclic photosynthetic electron transport and briefly explain the functions. (8%)
 - What is rubisco? (3%) How do plants regulate its activity? (5%)
 - Which type of light is most important for regulating stomatal opening? (2%) Why is it important? (3%) How to sense the light? (3%)
 - Please use the following figure and explain how the gene networks regulating leaf trichome formation. (6 %)



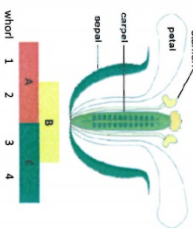
GLABRA1 (GL1): MYB transcription factor
GLABRA2 (GL2): Homeobox-domain repressor protein
GLABRA3 (GL3): Homeobox-domain repressor protein
TRANSPARENT TESTA GLABRA1 (TTGL1): WD repeat protein
TRITICOUM (TRY): MYB transcription factor

- Hormonal network regulates shoot branching. Please use the following figure to illustrate how auxins, cytokinins, and strigolactones together control apical dominance and prevent axillary bud outgrowth. (6 %)



IPY: cytokinin biosynthesis gene
MAX1: strigolactone synthase gene
BAN1/BR1/BR2: transceptor factor that prevents strigolactone binding and delays axillary bud development.

- Please explain what is the coincidence model in short-day plants (SDPs) and long-day plants (LDPs) based on oscillating light sensitivity in the flowering response. (6 %)



- What is ABC model involving key transcription factors controlling floral organs development in flower? (6 %)
 - What is double fertilization in plants? (6 %)
 - The male and female determinant genes are inherited as a single segregating unit and have many alleles (Shapolytes). Please compare the differences between gametophytic and sporophytic self-incompatibility. (6 %)
 - Please describe the characteristics of climacteric fruits (such as mango, banana and papaya) during ripening. (6 %)
 - Why leaf senescence is an active developmental program that requires up-regulation of many genes and it is not simply necrosis or death by neglect? (6 %)
 - Cytokinin has a strong anti-senescence effect, and ethylene and jasmonates promote senescence. How will you engineer plants to affect timing and execution of senescence in crop plants? (6 %)
15. Select one appropriate answer for the following questions (6 %)
- The most common gene used in plant transformation to delay leaf and flower senescence. (1 %)
 - Some hormone receptors initiate protein proteolysis of repressors to activate a transcriptional regulator. Which gene in the list is the repressor of GA response? (1 %)
 - 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 %)
 - 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 gene in the list belongs to this protein family? (1 %)
 - Introduction of antisense constructs to interfere with expression of biosynthesis enzymes is an effective way to control ethylene production. Which gene in the list can be used for genetic manipulation to limit ethylene synthesis (1 %)
 - Growth response to light mainly in all shoots and some roots to ensure leaves can receive optimal sunlight. (1 %)

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- | | |
|---|---|
| A). Isopentenyl transferase (<i>ipt</i>) gene | G). systemin |
| B). Phototropism | H). α -amylase |
| C). PIN | I). DELLA |
| D). <i>iaaH</i> and <i>iaaM</i> synthase genes | J). LacZ gene (β -galactosidase) |
| E). octopine synthase | K). GA 20 oxidases |
| F). cytokinin oxidase | L). ACC synthase |