

# 國立成功大學

## 112學年度碩士班招生考試試題

編 號：64

系 所：熱帶植物與微生物科學研究所

科 目：植物生理學

日 期：0207

節 次：第 1 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。

**1. Select the hormone(s) that match the question (10 pt)**

- \_\_\_\_\_ (1) *Striga* is a parasitic weed; which hormone produced by plants can stimulate *Striga* seed's germination? (1 pt)
- \_\_\_\_\_ (2) Two most commonly used hormones in manipulating shoot and root morphogenesis under plant tissue culture conditions. (2 pt)
- \_\_\_\_\_ (3) Two hormones have antagonistic effects on seed development and germination (2 points)
- \_\_\_\_\_ (4) Gaseous hormones in the plant (1 pt)
- \_\_\_\_\_ (5) Hormone has a structure like a painkiller- aspirin (1 pt)
- \_\_\_\_\_ (6) A hormone responsible for producing herbivore-induced volatiles can be recognized by carnivorous and parasitoid insects (1 pt)
- \_\_\_\_\_ (7) Hormone regulates stomatal aperture (1 pt)
- \_\_\_\_\_ (8) Which hormone was first identified in oilseed rape (*Brassica napus*)? (1 pt)

- |                      |                                   |
|----------------------|-----------------------------------|
| A). Auxins           | H). Jasmonic acid                 |
| B). Ethylene         | I). Abscisic acid                 |
| C). Cytokinin        | J). Polyamines                    |
| D). Gibberellic acid | K). Nitric acid (NO)              |
| E). Peptide hormones | L). Strigolactone                 |
| F). Brassinosteroids | M). Flavonoids                    |
| G). Salicylic acid   | N). H <sub>2</sub> O <sub>2</sub> |

**2. Select the most likely phenomenon or physiological effect (10 pt)**

- \_\_\_\_\_ (1) When cultured normal callus tissues of many species are sub-cultured repeatedly over a long period, they can grow on a culture medium without hormones (such as auxin or cytokinin). (1 pt)
- \_\_\_\_\_ (2) Spray "Agent orange" containing a mixture of two synthetic auxins, 2,4-Dichlorophenoxyacetic acid (2,4-D) and 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T), on plants leading to what plant response. (1 pt)
- \_\_\_\_\_ (3) Growth response to light mainly in all shoots and some roots to ensure leaves can receive optimal sunlight. (1 pt)
- \_\_\_\_\_ (4) Spray auxin on the terminal bud of a plant. (1 pt)
- \_\_\_\_\_ (5) Exposing pea seedlings to ethylene leads to swelling of hypocotyl, exaggeration of the curvature of the apical hook, and inhibition of root elongation. (1 pt)
- \_\_\_\_\_ (6) Produce fruit without fertilization. (1 pt)
- \_\_\_\_\_ (7) Development of the plants from vegetative to reproductive development. (1 pt)
- \_\_\_\_\_ (8) Plants respond to a mechanosensory response to a touch stimulus leading to a directional growth movement. (1 pt)
- \_\_\_\_\_ (9) The inherent potentiality of a plant cell to give rise to a whole plant. (1 pt)

\_\_\_\_ (10) A complex multistep process that redirects the growth of roots and various above-ground organs in response to changes in the direction of gravity. (1 pt)

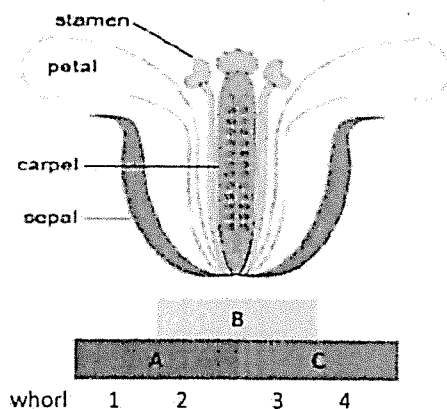
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|---------------------------|---------------------------------|
| A. Thigmotropism          | F. Phototropism                 |
| B. Triple response        | G. Gravitropic bending response |
| C. Plant cell Totipotency | H. de-foliate                   |
| D. Habituation            | I. Parthenocarpy                |
| E. Apical dominance       | J. Phase change                 |

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

- \_\_\_\_ (1) The most common gene used in plant transformation to delay leaf and flower senescence. (1 pt)
- \_\_\_\_ (2) Some hormone receptors initiate protein proteolysis of repressors to activate a transcriptional activation of hormone response genes. Which protein in the list is the repressor of GA response? (1 pt)
- \_\_\_\_ (3) Which gene was considered the “Green Revolution” gene as its mutant was used in the breeding program for wide semi-dwarf rice varieties? (1 pt)
- \_\_\_\_ (4) Auxin polar transport enables auxin to only exit the cell through active export by auxin efflux carriers specifically located at the basal side of the cell. Which gene in the list belongs to this protein family? (1 pt)
- \_\_\_\_ (5) Introduction of knockout or knockdown constructs to interfere with the 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 pt)

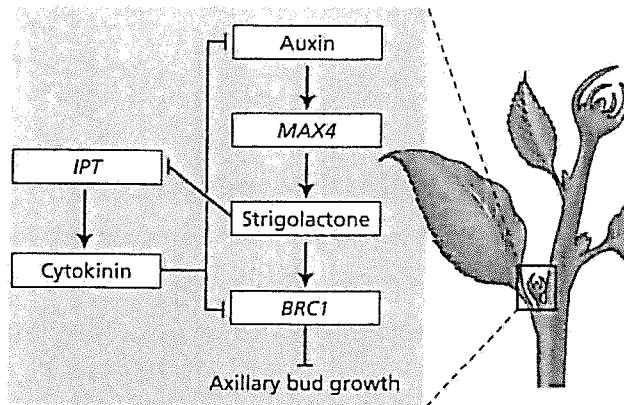
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|--|--|
| A.) <i>Isopentenyl transferase (ipt)</i> gene  | G.) systemin                                   |
| B.) <i>JAZ</i>                                 | H.) <i>ACC synthase</i>                        |
| C.) <i>PIN</i>                                 | I.) DELLA                                      |
| D.) <i>iaaH</i> and <i>iaaM synthase</i> genes | J.) <i>LacZ gene</i> ( $\beta$ -galactosidase) |
| E.) <i>octopine synthase</i>                   | K.) <i>GA 20 oxidases (semi-dwarf 1)</i>       |
| F.) <i>cytokinin oxidase</i>                   | L.) $\alpha$ -amylase                          |

4. Describe the ABC model to control floral organ development in Arabidopsis? (5%)



5. Phytochrome controls shade avoidance; please explain. (5%)
6. Please explain the coincidence model in short-day plants (SDPs) and long-day plants (LDPs) based on oscillating light sensitivity in the flowering response. (5%)
7. Explain the “acid growth hypothesis” in regulating cell elongation in response to auxin? (5%)

8. Please explain how GA plays a role in seed germination. (5%)
9. Please describe the principle of Agrobacterium-mediated plant transformation. (5%)
10. Hormonal network regulates shoot branching. The following figure illustrates how auxins, cytokinins, and strigolactones control apical dominance and prevent axillary bud outgrowth. (5%)



*IPT*: cytokinin biosynthesis gene  
*MAX4*: strigolactone synthesis gene  
*BRANCHED1 (BRC1)*: Transcription factor that prevents axillary bud outgrowth and delays early axillary bud development.

11. C4 Photosynthesis (4%)
12. Photoinhibition (4%)
13. Glyoxysome (4%)
14. Shikimate pathway (4%)
15. Osmotically active solute (4%)
16. Secondary metabolite (4%)
17. Amylopectin (4%)
18. GS-GOGAT pathway (4%)
19. Rubisco (4%)
20. Mycorrhiza (4%)