

國立彰化師範大學 102 學年度碩士班招生考試試題

系所：生物學系

組別：丙組

科目：普通生物學

☆☆請在答案紙上作答☆☆

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一、選擇題 (單選題，每題 2%，共 50%)

- One major advantage of using *Arabidopsis thaliana* as a model system for studies of plant form and function is its
(A) fast generation time. (B) exceptionally large genome. (C) large seeds.
(D) high tolerance to stress. (E) high mutation rate.
- Studies using *Arabidopsis thaliana* have led to important advances in all of the following *except*
(A) gene mapping.
(B) impact of point mutations on gene function.
(C) gene expression during plant development.
(D) evolutionary history of plants.
(E) how genes potentially interact with other genes.
- The total number of genes in a species' genome is not necessarily a good indicator of biological complexity because
(A) most genes are never turned on.
(B) many genes are repeats.
(C) this does not take into account the alternative splicing of pre-mRNA.
(D) this does not take into account mRNA-mRNA interactions.
(E) this does not take into account protein-mRNA interactions.
- Choose the option that best describes the relationship between the cell wall thickness of parenchyma cells versus sclerenchyma cells.
(A) The cell walls of parenchyma cells are thinner than those of sclerenchyma cells.
(B) The cell walls of parenchyma cells are thicker than those of sclerenchyma cells.
(C) The cell walls of both types of cells are roughly equal.
(D) The thickness of the cell walls for both types of cells is too variable for a comparison to be made.
- Which structure is *incorrectly* paired with its tissue system?
(A) root hair dermal tissue (B) palisade parenchyma ground tissue
(C) guard cell dermal tissue (D) companion cell ground tissue
(E) tracheid vascular tissue
- All of the following are plant adaptations to life on land *except*
(A) tracheids and vessels. (B) root hairs.
(C) cuticle. (D) the Calvin cycle of photosynthesis.
(E) collenchyma.

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7. The ancestors of land plants were aquatic algae. Which of the following is *not* an evolutionary adaptation to life on land?
(A) C₃ photosynthesis (B) a waxy cuticle (C) root hairs (D) xylem and phloem
(E) guard cells
8. Most angiosperms have alternate phyllotaxy. What allows each leaf to get the maximum exposure to light and reduces shading of lower leaves?
(A) a leaf area index above 8
(B) self-pruning
(C) one leaf only per node
(D) leaf emergence at an angle of 137.5° from the site of previous leaves
(E) a leaf area index above 8 and leaf emergence at an angle of 137.5° from the site of previous leaves
9. A plant developed a mineral deficiency after being treated with a fungicide. What is the most probable cause of the deficiency?
(A) Mineral receptor proteins in the plant membrane were not functioning.
(B) Mycorrhizal fungi were killed.
(C) Active transport of minerals was inhibited.
(D) The genes for the synthesis of transport proteins were destroyed.
(E) Proton pumps reversed the membrane potential.
10. If you were to prune the shoot tips of a plant, what would be the effect on the plant and the leaf area index?
(A) bushier plants; lower leaf area index (B) tall plants; lower leaf area index
(C) tall plants; higher leaf area index (D) short plants; lower leaf area index
(E) bushier plants; higher leaf area indexes
11. All of the following contributed to the dust bowl in the American southwest during the 1930s *except*
(A) overgrazing by cattle. (B) clear-cutting of forest trees. (C) plowing of native grasses.
(D) planting of field crops. (E) lack of soil moisture.
12. For this pair of items, choose the option that best describes their relationship.
(a) The average size of particles that constitute silt
(b) The average size of particles that constitute clay

(A) Item (a) is *larger* than item (b).
(B) Item (a) is *smaller* than item (b).
(C) Item (a) is exactly or very approximately *equal* to item (b).
(D) Item (a) bears no relationship to item (b).

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13. For this pair of items, choose the option that best describes their relationship.
- (a) The amount of nitrogen in a fertilizer marked "15-10-5"
 - (b) The amount of nitrogen in a fertilizer marked "15-5-5"
- (A) Item (a) is *greater* than item (b).
 - (B) Item (a) is *less* than item (b).
 - (C) Item (a) is exactly or very approximately *equal* to item (b).
 - (D) Item (a) is unrelated to item (b).
14. For this pair of items, choose the option that best describes their relationship.
- (a) The amount of molybdenum in a gram of dried plant material
 - (b) The amount of sulfur in a gram of dried plant material
- (A) Item (a) is *greater* than item (b).
 - (B) Item (a) is *less* than item (b).
 - (C) Item (a) is exactly or very approximately *equal* to item (b).
 - (D) There is not enough information to make a meaningful comparison.
15. Which of the following plant structures shares the most common features and functions with a fungal hyphae?
- (A) stomata (B) vascular cambium (C) lenticels (D) root hairs (E) prop roots
16. The male wasp, *Campsoscolia ciliata*, transfers pollen from one orchid to another orchid of the same species. What "reward" does the male wasp receive from the orchid plants for helping with the orchid pollination?
- (A) a supply of energy-rich nectar
 - (B) volatile chemical hormones that help the male wasp find a sexually receptive female
 - (C) no reward; the male wasp is deceived by the flower shape and odor
 - (D) successful copulation with the flower
 - (E) a store of nectar that the wasp can use in time of famine
17. Which of the following plant/animal interactions is not a mutually beneficial (mutualistic) relationship?
- (A) honeybees gathering pollen from apple blossoms
 - (B) butterflies gathering nectar from lily blossoms
 - (C) beetles feeding on magnolia blossoms
 - (D) ants protecting and feeding from nectaries of Acacia
 - (E) wasps such as *Campsoscolia ciliata* transferring pollen in orchid flowers

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18. Which of the following best describes the ploidy level of a fertilized embryo sac?
- (A) All cells are diploid.
 - (B) All cells are triploid.
 - (C) All cells are polyploid.
 - (D) The ploidy level varies among species.
 - (E) There are haploid, diploid, and triploid cells.
19. A flowering plant with a deleterious mutation in microsporogenesis would most likely
- (A) fail to produce sepals. (B) fail to produce petals. (C) fail to produce anthers.
 - (D) fail to produce pollen. (E) fail to produce ovules.
20. When comparing the mature seeds of a pine tree to an apple tree, which of the following is a correct statement?
- (A) The developmental sequences postfertilization are identical.
 - (B) Both contain triploid tissue.
 - (C) The nutritive tissues are both haploid.
 - (D) Only the apple seed has a diploid seed coat.
 - (E) Both contain haploid and diploid tissues.
21. All of the following may function in signal transduction in plants *except*
- (A) calcium ions.
 - (B) nonrandom mutations.
 - (C) receptor proteins.
 - (D) phytochrome.
 - (E) secondary messengers.
22. External stimuli would be received most quickly by a plant cell if the receptors for signal transduction were located in the
- (A) plasma membrane.
 - (B) cytoplasmic matrix.
 - (C) endoplasmic reticulum.
 - (D) nuclear membrane.
 - (E) nucleoplasm.
23. What would happen if the secondary messenger cGMP was blocked in the de-etiolation pathway?
- (A) Specific protein kinase 1 would be activated, and greening would occur.
 - (B) Ca²⁺ channels would not open, and no greening would occur.
 - (C) Ca²⁺ channels could open, and specific protein kinase 2 could still be produced.
 - (D) No transcription of genes that function in de-etiolation would occur.
 - (E) Transcription of de-etiolation genes in the nucleus would not be affected.

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24. If protein synthesis was blocked in etiolated cells, what would be necessary for the "greening" of these cells?
- (A) reception of light by phytochrome
 - (B) activation of protein kinase 1 by cAMP
 - (C) activation of protein kinase 2 by Ca^{2+}
 - (D) post-translational modification of existing proteins
 - (E) 100-fold decrease in cytosolic Ca^{2+} levels
25. The detector of light during de-etiolation (greening) of a tomato plant is (are)
- (A) carotenoids.
 - (B) xanthophylls.
 - (C) phytochrome.
 - (D) chlorophyll.
 - (E) auxin.

二、簡答題 (每題 2% , 共 10%)

1. Cell cycle
2. Asexual reproduction
3. Mutation
4. Population
5. 哈溫定律

三、問答題 (每題 8% , 共 40%)

1. 請畫出雙子葉植物(例如：豌豆)主根橫切後，其主根組織 (含根毛與側根發育始原)解剖圖與中英文名稱？
2. 植物目前發現有八大荷爾蒙，例如：salicylic acid (水楊酸)、jasmonic acid (茉莉酸)、brassinosteroid (油菜固醇)，請寫出其它五種植物荷爾蒙(中英文)，並描述其生理功能？
3. 下圖為某種生物之生活史，請回答下列問題：
 - (1) 請問此種生物名稱為何 (中文)？
 - (2) 請問此生物水分運輸方式為何 (中文)？
 - (3) 請寫出一種生物，水分運輸與圖中生物相似者(中文)？
 - (4) 請解釋何謂 Archegonia (中文)？
 - (5) 圖中 Seta 構造染色體套數為何？

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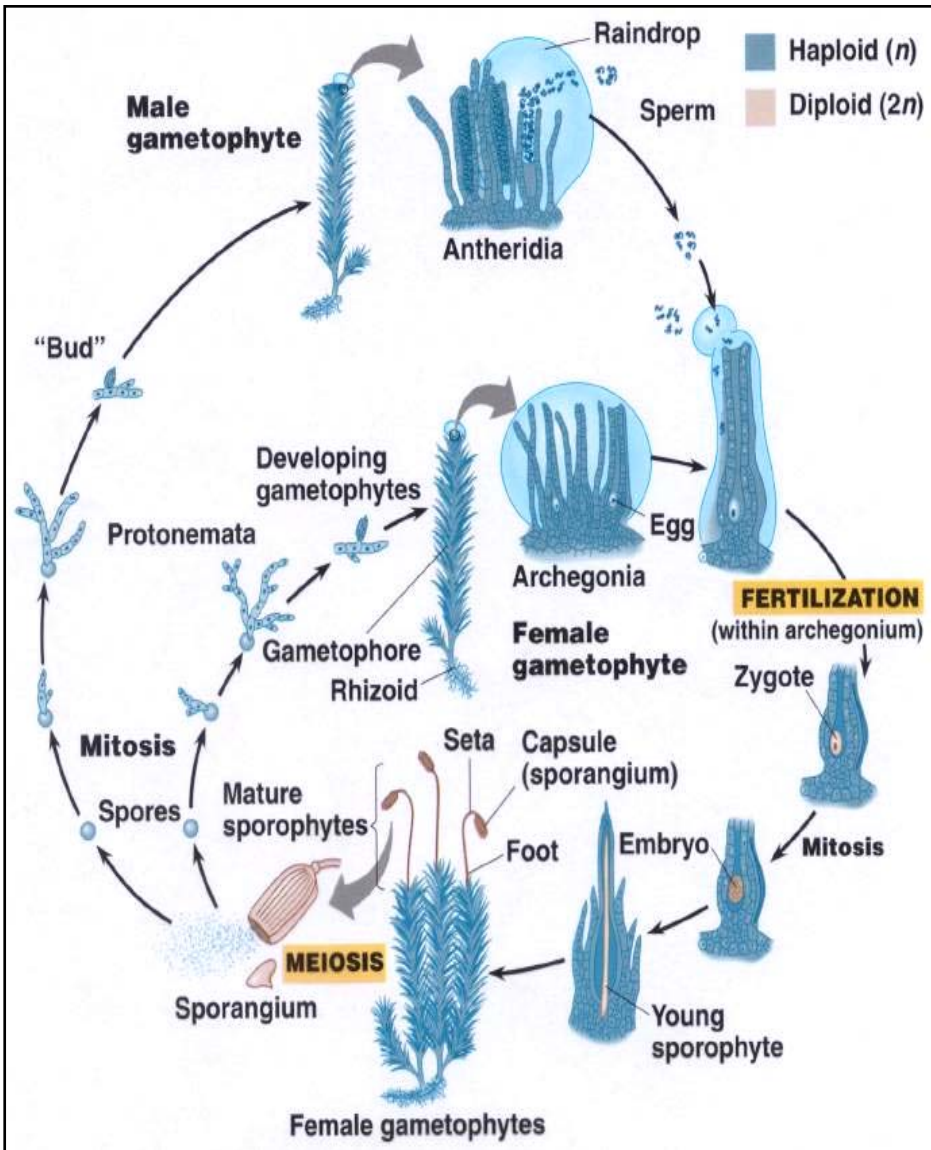
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- 請作圖說明人體泌尿系統的構造並說明再吸收過程。
- 地球生物圈中有各種不同的生態系，請做個檢索表來區分這些生態系。